Regulation (EU) No 528/2012 concerning the making available on the market and use of biocidal products

PRODUCT ASSESSMENT REPORT OF A BIOCIDAL PRODUCT FOR NATIONAL AUTHORISATION APPLICATIONS

Product identifier in R4BP	**Sapphire Paste**
Product type:	14 (Rodenticide)
Active ingredient(s):	Brodifacoum
Case No. in R4BP	BC-SJ018879-13
Asset No. in R4BP	IE-0000811-0000
Evaluating Competent Authority	Ireland – Department of Agriculture, Food & the Marine
Internal registration/file no	**IE/BPA 70523**
Date	25.04.2018 (NA-RNL renewal)

Version 3.0

1 Version History

Date	Version	Reason for revision
2013/07/30	Version 1.0	Initial PAR
2014/02/13	Version 1.1	Editorial revision
2014/02/24	Version 1.2	Editorial revision
2014/02/15	Version 1.3	Editorial revision
2018/04/25	Version 2.0	Updated at 1st Renewal of authorisation RNL

2 Overview of applications

Application type	refMS	Case number in the refMS	Decision date	Assessment carried out (i.e. first authorisation / amendment /renewal)	Page
National Authorisation Dir.98/8/EC	IE	n/a	2013/07/30	1st Authorisation	95
NA-RNL	IE	BC-SJ018879-13	2018/04/25	Renewal	35

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1st Renewal PAR – April 2018

Regulation (EU) No 528/2012 concerning the making available on the market and use of biocidal products

PRODUCT ASSESSMENT REPORT OF A BIOCIDAL PRODUCT FOR THE RENEWAL OF A NATIONAL AUTHORISATION (NA-RNL)

Product identifier in R4BP	**Sapphire Paste**
Product type:	14 (Rodenticide)
Active ingredient(s):	Brodifacoum
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1 Conclusion

The Irish CA for the authorisation of biocidal products has processed an application for renewal for the biocidal product **Sapphire Paste** which contains the active substance Brodifacoum (0.004 % w/w). The assessment presented in the Product Assessment Report for the first authorisation showed acceptable efficacy but unacceptable risks for the environment, if the product is used as a rodenticide (product-type 14) for use in and around buildings, by the general public, professionals and trained professionals, and in open areas and waste dumps, by professionals and trained professionals.

The conditions for granting an authorisation according to Article 19 (1) of Regulation (EU) No 528/2012[1] (BPR) are not fulfilled.
In consequence the product can only be authorised in accordance with Article 19 (5) BPR, as this Article provides Member States with the legal basis to authorise products in cases where not authorising the product would result in disproportionate negative impacts for society when compared to the risks to human health arising from the use of the biocidal product.

Detailed information on the uses appropriate at the renewal of authorisation are presented in section 2.4.
General directions for use of the product are summarised in section 2.5.

Prior to renewing the approval of anticoagulant active substances and renewing the authorisations of the respective products discussions took place at EU-level to harmonise use instructions and risk mitigation measures to the greatest possible extend. As an outcome of these discussions a set of three standard SPCs (Summary of Product Characteristics) compiling the relevant sentences for the uses that may be authorised for each of the three user categories (general public, professionals and trained professionals) has been produced (for details please refer to document CA-Nov16-Doc.4.1.b – Final).

The specific conditions from Commission Implementing Regulation (EU) 2017/1381[2] for the active substance Brodifacoum were considered for the re-assessment.

The Irish CA concludes that the conditions set out in Article 5(2) b) and c) of the BPR are currently met. Anticoagulant rodenticides are considered essential to ensure appropriate rodent control in Ireland by

[1] Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products, last amended by Regulation (EU) No 334/2014 of the European Parliament and of the Council of 11 March 2014.
[2] Commission Implementing Regulation (EU) 2017/1381 of 25 July 2017 renewing the approval of Brodifacoum as an active substance for use in biocidal products of product-type 14

efficient pest management and as a consequence, to prevent or control any serious danger to human and animal health in which rodents are involved.
Rodent control in Ireland currently relies largely on the use of anticoagulant rodenticides, the non-renewal of which could lead to insufficient rodent control in Ireland. This may not only cause significant negative impacts on human or animal health or the environment, but may also affect the public's perception of its safety with regard to exposure to rodents or the security of a number of economic activities that could be vulnerable to rodents, resulting in economic and social consequences in Ireland.

The product has been classified according to the 9th ATP of Regulation (EC) No 1272/2008[3]. Detailed information on classification and labelling is provided in Section 2.3.
As a consequence of the new harmonised classification, the active substance Brodifacoum meets the criteria for exclusion according to Article 5(1) BPR as well as for substitution according to Article 10 BPR Therefore, in line with Article 23 (1) BPR a comparative assessment for the product **Sapphire Paste** has been conducted (for details see Section 3.10).

Comparative assessment
In line with Article 23 (1) BPR a comparative assessment for the product has been conducted (for details see Section 3.10).
In summary it can be concluded that the criteria according Article 23(3) a), b) BPR are not fulfilled.
According to Article 23 (6) BPR the authorisation of the product will be renewed for 5 years.

Approval of the active substance
The active substance Brodifacoum is included in the Union list of approved active substances and the specific provisions laid down there are fulfilled:

The authorisations of biocidal products containing Brodifacoum are subject to the conditions listed in the Annex to Commission Implementing Regulation (EU) 2017/1381:

Composition and formulation
The ready-to-use product is a paste bait and contains the active substance Brodifacoum.
No substance of concern has been identified.
Please refer to section 5.1 for detailed information.

Physical, chemical and technical properties
No new data was provided nor had new guidance to be taken into account for the renewal evaluation.

[3] Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

Accordingly, the conclusion from the former assessment regarding physical, chemical and technical properties remains valid.

Physical hazards and respective characteristics

No new data was provided, nor had new guidance to be taken into account for the renewal evaluation. Accordingly, the conclusion from the former assessment regarding physical hazards and respective characteristics remains valid.

Methods for detection and identification

No new data was provided, nor had new guidance to be taken into account for the renewal evaluation. Accordingly, the conclusion from the former assessment regarding methods for detection and identification remains valid.

Efficacy

The IE CA considers that the efficacy data has confirmed that Sapphire Paste is effective in the proposed areas for use, at the recommended dose rate when used as per label recommendations. No new data was provided nor had new guidance to be taken into account for re-assessment as there were no additions to the original studies submitted.

An evaluation of the studies provided demonstrated that the product proved to be both palatable to and effective against infestations of brown rats (*Rattus norvegicus*) and house mice (*Mus musculus/domesticus*).

The proposed SPC claims relating to the control of the house rat (*Rattus rattus*) have not been supported with efficacy data therefore all references to house rat control in the SPC and draft labels must be removed.

The conclusion from the former assessment regarding the product's efficacy against target organisms remains valid and the product may be authorised.

Risk assessment for human health

The human health risk assessment for this product is based on the active substance.

According to the BPC Opinion the EFSA-Guidance on dermal absorption had been taken into account when reviewing the dermal absorption of the product.

Based on the risk assessment of the active substance, a risk for professional users resulting from the intended use is unlikely.

For risk mitigation measures please refer to section 2.

Due to the new classification (Repr.1A) it is not allowed to grant authorisation for the use by general public (Article 19 (4) and (5) BPR). Therefore the product will not be authorised for the non-professional user.

Based on the risk assessment it is unlikely that the intended use(s) cause any unacceptable acute or chronic risk to professional users, bystanders and residents. Regarding the trained professional users health protection, there are no objections against the intended uses if the directions for use are followed (For details see section 2).

Risk assessment for the environment

No new data was provided. The only area where new guidance was relevant was with respect to the groundwater assessment. Following discussion at the CG-18 meeting and subsequent agreement, Tier II PEC groundwater was calculated using the FOCUS models PEARL or PELMO in the instances where Tier I indicated an exceedance of the relevant trigger value.

According to the risk assessment, the risk for poisoning of non-target predator birds and mammals during primary (acute and long-term exposure) and secondary poisoning is high as the trigger value is exceeded in all cases.

No safe use was established for the Brodifacoum product at a concentration of 50 ppm in the ecotoxicology risk assessment.

In consequence the product can only be authorised in accordance with Article 19 (5) BPR.

Overall conclusion

The assessment of the biocidal product **Sapphire Paste** remains valid. However, the authorisation has to be adapted where necessary taking into account the points mentioned above.

The biocidal product will be authorised according to Article 19 (5) BPR in conjunction with Article 23 (6) BPR.

According to Article 23 (6) BPR the authorisation of the product will be renewed for 5 years.

2 Summary of the product assessment

2.1 Administrative information

2.1.1 Identifier in R4BP

Sapphire Paste (Name changed from Sapphir Paste, at renewal)

2.1.2 Authorisation holder

Name and address of the authorisation holder	**Name**	LODI S.A.S.
	Address	Parc d'Activités des Quatre Routes 35390 Grand Fougeray France
Authorisation number	IE/BPA 70286	
Date of the authorisation	25.04.18	
Expiry date of the authorisation	25.04.23	

2.1.3 Manufacturer(s) of the product

Name of manufacturer (1)	Compagnie Générale des Biocides (CGB)
Address of manufacturer	Parc d'Activités des Quatre Routes 35390 Grand Fougeray France
Location of manufacturing sites	Parc d'Activités des Quatre Routes 35390 Grand Fougeray France
Name of manufacturer (2)	Belgagri
Address of manufacturer	1, rue des Tuiliers B-4480 Engis Belgium
Location of manufacturing sites	1, rue des Tuiliers B-4480

	Engis Belgium

2.1.4 Manufacturer(s) of the active substance(s)

Active substance	Brodifacoum
Name of manufacturer	PelGar International Limited
Address of manufacturer	Unit 13, Newman Lane Alton Hampshire GU34 2QR UK
Location of manufacturing sites	Prazska 280 02 Kolin Czech Republic

2.2 Product composition and formulation

2.2.1 Qualitative and quantitative information on the composition

Table 1

Common name	IUPAC name	Function	CAS number	EC number	Content (%)
Brodifacoum	**3-[3-[4-(4-bromophenyl)phenyl] tetralin-1-yl]-2-hydroxy-chromen-4-one**	Active Substance	**56073-10-0**	**259-980-5**	0.004

- The product contains a bittering agent and a dye.
  - ➢ Information on the full composition is provided in the confidential[4] annex (see chapter 4).
- According to the information provided the product contains no nanomaterials as defined in Article 3 paragraph 1 (z) of Regulation No. 528/2012:

2.2.2 Information on the substance(s) of concern

There are no substances of concern.

[4] Access level: "Restricted" to applicant and authority

2.2.3 Candidate(s) for substitution

The following substance was identified as a candidate for substitution:

- Brodifacoum

Brodifacoum meets the following exclusion criteria according to Article 5(1) BPR:

- toxic for reproduction category 1A
- persistent and very persistent, bioaccumulative and toxic

Therefore Brodifacoum meets the conditions laid down in Article 10 BPR, and is consequently a candidate for substitution.

2.2.4 Type of formulation

Ready-to-use bait: paste

2.3 Classification and Labelling according to the Regulation (EC) No 1272/2008[5]

Table 2

Classification **Hazard classes, Hazard categories**	**Hazard statements**
STOT RE 2	H373: May cause damage to organs (blood) through prolonged or repeated exposure
Repr. 1A	H360D: May damage the unborn child.

Table 3

Labelling		
	Code	**Pictogram / Wording**

5 Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

	GHS08	
Signal word		Danger
Hazard statements	STOT RE 2	H373: May cause damage to organs (blood) through prolonged or repeated exposure
	Repr. 1A	H360D: May damage the unborn child.
Supplemental hazard information		
Supplemental label elements		
Precautionary statements:	P201	Obtain special instructions before use
	P202	Do not handle until all safety precautions have been read and understood.
	P280	Wear protective gloves.
	P308+P313	If exposed or concerned: Get medical advice/attention.
	P314	Get Medical advice/attention if you feel unwell.
	P405	Store locked up.
	P501	Dispose of contents in accordance with local/regional/national /international regulations
Note		

2.4 Uses appropriate for further authorisation[6]

Table 4: Summary Table of Uses

No.	Use
1	House mice – professionals – indoor
2	Rats – professionals – indoor
3	House mice and/or rats – professionals – outdoor around buildings
4	House mice and/or rats – trained professionals – indoor
5	House mice and/or rats – trained professionals – outdoor around buildings
6	Rats – trained professionals – Outdoor open areas & waste dumps

6 Member States might refuse to grant an authorisation or adjust the terms and conditions of the authorisation to be granted according to Article 37 BPR.

2.4.1 Use 1 appropriate after renewal of the authorisation – House mice – professionals – indoor

Product Type(s)	14
Where relevant, an exact description of the use	Rodenticide
Target organism(s) (including development stage)	House mouse (*Mus musculus* / *Mus domesticus*) – adults and juveniles
Field(s) of use	Indoors
Application method(s)	Ready-to-use bait to be used in tamper-resistant bait stations
Application rate(s) and frequency	Mice Low infestation – 10g bait in bait points every 5 metres High infestation – 10g bait in bait points every 3 metres
Category(ies) of users	Professionals
Pack sizes and packaging material	Minimum pack size 2.5 kg **Grams of bait in individual sachet:** 10 **Packaging material and size:** **Bucket: (PP,PE)** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cardboard box with inner PE liner** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cartridge in PP**: 50 g, 100g, 150g, 200g, 250g, 260g , 270g, 280g, 310g, 500g Outer packaging - cardboard box with pack sizes of: 50 cartridges of 50g, 25 cartridges of 100g, 20 cartridges of 150g, 15 cartridges of 200g, 10 cartridges of 250g, 12 cartridges of 250g, 18 cartridges of 250g, 10 cartridges of 260g, 12 cartridges of 260g, 18 cartridges of 260g, 10 cartridges of 270g, 12 cartridges of 270g, 18 cartridges of 270g, 10 cartridges of 280g, 12 cartridges of 280g, 18 cartridges of 280g, 10 cartridges of 310g, 12 cartridges of 310g, 18 cartridges of 310g or 5 cartridges of 500g. **Pre-baited station (PP,PS,PVC)**: 2*10g or 3*10g in cardboard box of 2.5 kg, 3 kg, 3.5 kg, 4 kg, 4.5 kg and 5 kg

2.4.1.1 Use-specific instructions for use

• The bait stations should be visited at least every 2 to 3 days at the beginning of the

treatment and at least weekly afterwards, in order to check whether the bait is accepted, the bait stations are intact and to remove rodent bodies. Re-fill bait when necessary. • [When available] Follow any additional instructions provided by the relevant code of best practice.

2.4.1.2 Use-specific risk mitigation measures

• (None)

2.4.1.3 Where specific to the use, the particulars of likely direct or indirect effects, first aid instructions and emergency measures to protect the environment

When placing bait stations close to water drainage systems, ensure that bait contact with water is avoided.

2.4.1.4 Where specific to the use, the instructions for safe disposal of the product and its packaging

None

2.4.1.5 Where specific to the use, the conditions of storage and shelf-life of the product under normal conditions of storage

None

2.4.2 Use 2 appropriate after renewal of the authorisation – Rats – professionals – indoor

Product Type(s)	14
Where relevant, an exact description of the use	Rodenticide

Target organism(s) (including development stage)	Brown rats (*Rattus norvegicus*) – adults and juveniles
Field(s) of use	Indoors
Application method(s)	Ready-to-use bait to be used in tamper-resistant bait stations
Application rate(s) and frequency	Rats Low infestation 60 g bait in bait points every 10 metres High infestation 60 g bait in bait points every 5 metres
Category(ies) of users	Professionals
Pack sizes and packaging material	Minimum pack size 2.5 kg **Grams of bait in individual sachet:** 10 **Packaging material and size:** **Bucket: (PP,PE)** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cardboard box with inner PE liner** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cartridge in PP**: 50 g, 100g, 150g, 200g, 250g, 260g , 270g, 280g, 310g, 500g Outer packaging - cardboard box with pack sizes of: 50 cartridges of 50g, 25 cartridges of 100g, 20 cartridges of 150g, 15 cartridges of 200g, 10 cartridges of 250g, 12 cartridges of 250g, 18 cartridges of 250g, 10 cartridges of 260g, 12 cartridges of 260g, 18 cartridges of 260g, 10 cartridges of 270g, 12 cartridges of 270g, 18 cartridges of 270g, 10 cartridges of 280g, 12 cartridges of 280g, 18 cartridges of 280g, 10 cartridges of 310g, 12 cartridges of 310g, 18 cartridges of 310g or 5 cartridges of 500g. **Pre-baited station (PP,PS,PVC)**: 2*10g or 3*10g in cardboard box of 2.5 kg, 3 kg, 3.5 kg, 4 kg, 4.5 kg and 5 kg

2.4.2.1 Use-specific instructions for use

- The bait stations should be visited only 5 to 7 days after the beginning of the treatment and at least weekly afterwards, in order to check whether the bait is accepted, the bait stations are intact and to remove rodent bodies. Re-fill bait when necessary.
- [When available] Follow any additional instructions provided by the relevant code of best practice.

2.4.2.2 Use-specific risk mitigation measures

- (None)

2.4.2.3 Where specific to the use, the particulars of likely direct or indirect effects, first aid instructions and emergency measures to protect the environment

When placing bait stations close to water drainage systems, ensure that bait contact with water is avoided.

2.4.2.4 Where specific to the use, the instructions for safe disposal of the product and its packaging

None

2.4.2.5 Where specific to the use, the conditions of storage and shelf-life of the product under normal conditions of storage

None

2.4.3 Use 3 appropriate after renewal of the authorisation – House mice and/or rats – professionals – outdoor around buildings

Product Type(s)	14
Where relevant, an exact description of the use	Rodenticide
Target organism(s) (including development stage)	House mouse (*Mus musculus* / *Mus domesticus*) – adults and juveniles Brown rats (*Rattus norvegicus*) – adults and juveniles
Field(s) of use	Outdoors around buildings
Application method(s)	Ready-to-use bait to be used in tamper-resistant bait stations
Application rate(s) and frequency	Mice Low infestation – 10g bait in bait points every 5 metres

	High infestation – 10g bait in bait points every 3 metres Rats Low infestation – 60g bait in bait points every 10 metres High infestation – 60g bait in bait points every 5 metres
Category(ies) of users	Professionals
Pack sizes and packaging material	Minimum pack size 2.5 kg **Grams of bait in individual sachet:** 10 **Packaging material and size:** **Bucket: (PP,PE)** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cardboard box with inner PE liner** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cartridge in PP**: 50 g, 100g, 150g, 200g, 250g, 260g , 270g, 280g, 310g, 500g Outer packaging - cardboard box with pack sizes of: 50 cartridges of 50g, 25 cartridges of 100g, 20 cartridges of 150g, 15 cartridges of 200g, 10 cartridges of 250g, 12 cartridges of 250g, 18 cartridges of 250g, 10 cartridges of 260g, 12 cartridges of 260g, 18 cartridges of 260g, 10 cartridges of 270g, 12 cartridges of 270g, 18 cartridges of 270g, 10 cartridges of 280g, 12 cartridges of 280g, 18 cartridges of 280g, 10 cartridges of 310g, 12 cartridges of 310g, 18 cartridges of 310g or 5 cartridges of 500g. **Pre-baited station (PP,PS,PVC)**: 2*10g or 3*10g in cardboard box of 2.5 kg, 3 kg, 3.5 kg, 4 kg, 4.5 kg and 5 kg

2.4.3.1 Use-specific instructions for use

- Protect bait from the atmospheric conditions (e.g. rain, snow, etc.). Place the bait stations in areas not liable to flooding.
- The bait stations should be visited [for mice - at least every 2 to 3 days at] [for rats - only 5 to 7 days after] the beginning of the treatment and at least weekly afterwards, in order to check whether the bait is accepted, the bait stations are intact and to remove rodent bodies. Re-fill bait when necessary.
- Replace any bait in a bait station in which bait has been damaged by water or contaminated by dirt.
- [*When available]* Follow any additional instructions provided by the relevant code of best practice.

2.4.3.2 Use-specific risk mitigation measures

- Do not apply this product directly in the burrows.

2.4.3.3 Where specific to the use, the particulars of likely direct or indirect effects, first aid instructions and emergency measures to protect the environment

When placing bait stations close to water drainage systems, ensure that bait contact with water is avoided.

2.4.3.4 Where specific to the use, the instructions for safe disposal of the product and its packaging

None

2.4.3.5 Where specific to the use, the conditions of storage and shelf-life of the product under normal conditions of storage

None

2.4.4 Use 4 appropriate after renewal of the authorisation – House mice and/or rats – trained professionals – indoor

Product Type(s)	14
Where relevant, an exact description of the use	Rodenticide
Target organism(s) (including development stage)	House mouse (*Mus musculus* / *Mus domesticus*) – adults and juveniles Brown rats (*Rattus norvegicus*) – adults and juveniles
Field(s) of use	Indoors
Application method(s)	Ready-to-use bait to be used in covered bait points or in tamper-resistant bait stations
Application rate(s) and frequency	Mice Low infestation – 10g bait in bait points every 5 metres High infestation – 10g bait in bait points every 3 metres

	Rats Low infestation – 60g bait in bait points every 10 metres High infestation – 60g bait in bait points every 5 metres Pulsed baiting – Mice Low infestation – 10g bait in bait points every 5 metres High infestation – 10g bait in bait points every 3 metres Rats Low infestation – 60g bait in bait points every 10 metres High infestation – 60g bait in bait points every 5 metres
Category(ies) of users	Trained Professionals
Pack sizes and packaging material	Minimum pack size 2.5 kg **Grams of bait in individual sachet:** 10 **Packaging material and size:** **Bucket: (PP,PE)** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cardboard box with inner PE liner** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cartridge in PP**: 50 g, 100g, 150g, 200g, 250g, 260g , 270g, 280g, 310g, 500g Outer packaging - cardboard box with pack sizes of: 50 cartridges of 50g, 25 cartridges of 100g, 20 cartridges of 150g, 15 cartridges of 200g, 10 cartridges of 250g, 12 cartridges of 250g, 18 cartridges of 250g, 10 cartridges of 260g, 12 cartridges of 260g, 18 cartridges of 260g, 10 cartridges of 270g, 12 cartridges of 270g, 18 cartridges of 270g, 10 cartridges of 280g, 12 cartridges of 280g, 18 cartridges of 280g, 10 cartridges of 310g, 12 cartridges of 310g, 18 cartridges of 310g or 5 cartridges of 500g. **Pre-baited station (PP,PS,PVC)**: 2*10g or 3*10g in cardboard box of 2.5 kg, 3 kg, 3.5 kg, 4 kg, 4.5 kg and 5 kg

2.4.4.1 Use-specific instructions for use

Remove the remaining product at the end of treatment period.

- *[When available]* Follow any additional instructions provided by the relevant code of best practice.
- If used for pulsed baiting: Replace eaten bait only after 3 days and then at maximum 7 day intervals. Collect any spilled bait and dead rodents. [When available] Follow the specific instructions provided by the applicable code of good practice at national level.

2.4.4.2 Use-specific risk mitigation measures

- Where possible, prior to the treatment inform any possible bystanders (e.g. users of the treated area and their surroundings) about the rodent control campaign *[in accordance with the applicable code of good practice, if any]*.
- Consider preventive control measures (e.g. plug holes, remove potential food and drinking as far as possible) to improve product intake and reduce the likelihood of reinvasion.
- To reduce risk of secondary poisoning, search for and remove dead rodents during treatment at frequent intervals, in line with the recommendations provided by the relevant code of best practice.
- Do not use the product as permanent baits for the prevention of rodent infestation or monitoring of rodent activities.

2.4.4.3 Where specific to the use, the particulars of likely direct or indirect effects, first aid instructions and emergency measures to protect the environment

When placing bait stations close to water drainage systems, ensure that bait contact with water is avoided.

2.4.4.4 Where specific to the use, the instructions for safe disposal of the product and its packaging

None

2.4.4.5 Where specific to the use, the conditions of storage and shelf-life of the product under normal conditions of storage

None

2.4.5 Use 5 appropriate after renewal of the authorisation – House mice and/or rats – trained professionals – outdoor around buildings

Product Type(s)	14

Where relevant, an exact description of the use	Rodenticide
Target organism(s) (including development stage)	House mouse (*Mus musculus* / *Mus domesticus*) – adults and juveniles Brown rats (*Rattus norvegicus*) – adults and juveniles
Field(s) of use	Outdoors around buildings
Application method(s)	Ready-to-use bait to be used in covered bait points or in tamper-resistant bait stations, or in direct application of ready-to-use bait into the burrow.
Application rate(s) and frequency	Mice Low infestation – 10g bait in bait points every 5 metres High infestation – 10g bait in bait points every 3 metres Rats Low infestation – 60g bait in bait points every 10 metres High infestation – 60g bait in bait points every 5 metres - In burrows: 60-100g of bait per burrow. Pulsed baiting – Mice Low infestation – 10g bait in bait points every 5 metres High infestation – 10g bait in bait points every 3 metres Rats Low infestation – 60g bait in bait points every 10 metres High infestation – 60g bait in bait points every 5 metres
Category(ies) of users	Trained Professionals
Pack sizes and packaging material	Minimum pack size 2.5 kg **Grams of bait in individual sachet:** 10 **Packaging material and size:** **Bucket: (PP,PE)** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cardboard box with inner PE liner** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cartridge in PP**: 50 g, 100g, 150g, 200g, 250g, 260g , 270g, 280g, 310g, 500g Outer packaging - cardboard box with pack sizes of: 50 cartridges of 50g, 25 cartridges of 100g, 20 cartridges of 150g, 15 cartridges of 200g, 10 cartridges of 250g, 12 cartridges of 250g, 18 cartridges of 250g, 10 cartridges of 260g, 12 cartridges of 260g, 18 cartridges of 260g, 10 cartridges of 270g, 12 cartridges of 270g, 18 cartridges of 270g, 10 cartridges of 280g, 12 cartridges of 280g, 18 cartridges of 280g, 10 cartridges of 310g, 12 cartridges of 310g, 18 cartridges of 310g or 5 cartridges of 500g.

	Pre-baited station (PP,PS,PVC): 2*10g or 3*10g in cardboard box of 2.5 kg, 3 kg, 3.5 kg, 4 kg, 4.5 kg and 5 kg

2.4.5.1 Use-specific instructions for use

- Protect bait from the atmospheric conditions (e.g. rain, snow, etc.). Place the bait stations in areas not liable to flooding.
- Replace any bait in baiting points in which bait has been damaged by water or contaminated by dirt.
- Remove the remaining product at the end of treatment period.
- If used for pulsed baiting: Replace eaten bait only after 3 days and then at maximum 7 day intervals Collect any spilled bait and dead rodents. [When available] Follow the specific instructions provided by the applicable code of good practice at national level.
  [For outdoor use, baiting points must be covered and placed in strategic sites to minimise the exposure to non-target species]. [When available] Follow any additional instructions provided by the relevant code of best practice.
  When used in burrows: Baits must be placed to minimise the exposure to non-target species and children. Cover or block the entrances of baited burrows to reduce the risks of bait being rejected and spilled. *[When available]* Follow any additional instructions provided by the relevant code of best practice.

2.4.5.2 Use-specific risk mitigation measures

- Where possible, prior to the treatment inform any possible bystanders (e.g. users of the treated area and their surroundings) about the rodent control campaign *[in accordance with the applicable code of good practice, if any]*.
- Consider preventive control measures (e.g. plug holes, remove potential food and drinking as far as possible) to improve product intake and reduce the likelihood of reinvasion.
- To reduce risk of secondary poisoning, search for and remove dead rodents during treatment at frequent intervals, in line with the recommendations provided by the relevant code of best practice.
- Do not use the product as permanent baits for the prevention of rodent infestation or monitoring of rodent activities.

2.4.5.3 Where specific to the use, the particulars of likely direct or indirect effects, first aid instructions and emergency measures to protect the environment

When placing bait points close to surface waters (e.g. rivers, ponds, water channels, dykes, irrigation ditches) or water drainage systems, ensure that bait contact with water is avoided.

2.4.5.4 Where specific to the use, the instructions for safe disposal of the product and its packaging

None

2.4.5.5 Where specific to the use, the conditions of storage and shelf-life of the product under normal conditions of storage

None

2.4.6 Use 6 appropriate after renewal of the authorisation – Rats – trained professionals – Outdoor open areas & waste dumps

Product Type(s)	14
Where relevant, an exact description of the use	Rodenticide
Target organism(s) (including development stage)	Brown rats (*Rattus norvegicus*) – adults and juveniles
Field(s) of use	Outdoor open areas & waste dumps
Application method(s)	Ready-to-use bait to be used in covered bait points or in tamper-resistant bait stations, or in direct application of ready-to-use bait into the burrow.
Application rate(s) and frequency	Rats Low infestation – 60g bait in bait points every 10 metres High infestation – 60g bait in bait points every 5 metres - In burrows: 60-100g of bait per burrow. Pulsed baiting – Rats Low infestation – 60g bait in bait points every 10 metres

	High infestation – 60g bait in bait points every 5 metres
Category(ies) of users	Trained Professionals
Pack sizes and packaging material	Minimum pack size 2.5 kg **Grams of bait in individual sachet:** 10 **Packaging material and size:** **Bucket: (PP,PE)** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cardboard box with inner PE liner** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cartridge in PP**: 50 g, 100g, 150g, 200g, 250g, 260g , 270g, 280g, 310g, 500g Outer packaging - cardboard box with pack sizes of: 50 cartridges of 50g, 25 cartridges of 100g, 20 cartridges of 150g, 15 cartridges of 200g, 10 cartridges of 250g, 12 cartridges of 250g, 18 cartridges of 250g, 10 cartridges of 260g, 12 cartridges of 260g, 18 cartridges of 260g, 10 cartridges of 270g, 12 cartridges of 270g, 18 cartridges of 270g, 10 cartridges of 280g, 12 cartridges of 280g, 18 cartridges of 280g, 10 cartridges of 310g, 12 cartridges of 310g, 18 cartridges of 310g or 5 cartridges of 500g. **Pre-baited station (PP,PS,PVC)**: 2*10g or 3*10g in cardboard box of 2.5 kg, 3 kg, 3.5 kg, 4 kg, 4.5 kg and 5 kg

2.4.6.1 Use-specific instructions for use

- Protect bait from the atmospheric conditions (e.g. rain, snow, etc.). Place the bait stations in areas not liable to flooding.
- Replace any bait in baiting points in which bait has been damaged by water or contaminated by dirt.
- Remove the remaining product at the end of treatment period.
- *[When available]* Follow any additional instructions provided by the relevant code of best practice.

  If used for pulsed baiting: Replace eaten bait only after 3 days and then at maximum 7 day intervals. Collect any spilled bait and dead rodents. [When available] Follow the specific instructions provided by the applicable code of good practice at national level.

  [For outdoor use, baiting points must be covered and placed in strategic sites to minimise the exposure to non-target species]. [When available] Follow any additional instructions provided by the relevant code of best practice.

When used in burrows: Baits must be placed to minimise the exposure to non-target species and children. Cover or block the entrances of baited burrows to reduce the risks of bait being rejected and spilled. *[When available]* Follow any additional instructions provided by the relevant code of best practice.

2.4.6.2 Use-specific risk mitigation measures

- Where possible, prior to the treatment inform any possible bystanders (e.g. users of the treated area and their surroundings) about the rodent control campaign *[in accordance with the applicable code of good practice, if any]*.
- To reduce risk of secondary poisoning, search for and remove dead rodents during treatment at frequent intervals, in line with the recommendations provided by the relevant code of best practice.
- Do not use the product as permanent baits for the prevention of rodent infestation or monitoring of rodent activities.

2.4.6.3 Where specific to the use, the particulars of likely direct or indirect effects, first aid instructions and emergency measures to protect the environment

When placing bait points close to surface waters (e.g. rivers, ponds, water channels, dykes, irrigation ditches) or water drainage systems, ensure that bait contact with water is avoided.

2.4.6.4 Where specific to the use, the instructions for safe disposal of the product and its packaging

None

2.4.6.5 Where specific to the use, the conditions of storage and shelf-life of the product under normal conditions of storage

None

2.5 General directions for use

2.5.1 Instructions for use

2.5.1.1 Instructions for use - Professionals

- Read and follow the product information as well as any information accompanying the product or provided at the point of sale before using it.
- Carry out a pre-baiting survey of the infested area and an on-site assessment in order to identify the rodent species, their places of activity and determine the likely cause and the extent of the infestation.
- Remove food which is readily attainable for rodents (e.g. spilled grain or food waste). Apart from this, do not clean up the infested area just before the treatment, as this only disturbs the rodent population and makes bait acceptance more difficult to achieve.
- The product should only be used as part of an integrated pest management (IPM) system, including, amongst others, hygiene measures and, where possible, physical methods of control.
- Consider preventive control measures (e.g. plug holes, remove potential food and drink as far as possible) to improve product intake and reduce the likelihood of reinvasion.
- Bait stations/ points should be placed in the immediate vicinity of places where rodent activity has been previously observed (e.g. travel paths, nesting sites, feedlots, holes, burrows etc.).
- Where possible, bait stations must be fixed to the ground or other structures.
- Bait stations must be clearly labelled to show they contain rodenticides and that they must not be moved or opened (see section 2.5.3 for the information to be shown on the label).
- [If national policy or legislation require it] When the product is being used in public areas, the areas treated should be marked during the treatment period and a notice explaining the risk of primary or secondary poisoning by the anticoagulant as well as indicating the first measures to be taken in case of poisoning must be made available alongside the baits.
- Bait should be secured so that it cannot be dragged away from the bait station.
- Place the product out of the reach of children, birds, pets, farm animals and other non-target animals.
- Place the product away from food, drink and animal feeding stuffs, as well as from utensils or surfaces that have contact with these.
- Wear protective chemical resistant gloves during product handling phase (glove material to be specified by the authorisation holder within the product information).
- When using the product do not eat, drink or smoke. Wash hands and directly exposed skin after using the product.

- If bait uptake is low relative to the apparent size of the infestation, consider the replacement of bait stations to further places and the possibility to change to another bait formulation.
- If after a treatment period of 35 days baits are continued to be consumed and no decline in rodent activity can be observed, the likely cause has to be determined. Where other elements have been excluded, it is likely that there are resistant rodents so consider the use of a non-anticoagulant rodenticide, where available, or a more potent anticoagulant rodenticide. Also consider the use of traps as an alternative control measure.
- Remove the remaining bait or the bait stations at the end of the treatment period.
- Bait in sachets: Do not open the sachets containing the bait.
- Paste: a) [Where relevant] Place paste bait with a sufficiently elongated applicator (spatula) to reduce hand exposure - avoid reaching into the bucket. b) [Where relevant] Specify how the equipment (e.g. spatula) shall be cleaned and how contact with residues of the bait can be avoided.
- *[When available]* Follow any additional instructions provided by the relevant code of best practice.

2.5.1.2 Instructions for Use – Trained Professionals

- Read and follow the product information as well as any information accompanying the product or provided at the point of sale before using it.
- Carry out a pre-baiting survey of the infested area and an on-site assessment in order to identify the rodent species, their places of activity and determine the likely cause and the extent of the infestation.
- Remove food which is readily attainable for rodents (e.g. spilled grain or food waste). Apart from this, do not clean up the infested area just before the treatment, as this only disturbs the rodent population and makes bait acceptance more difficult to achieve.
- The product should only be used as part of an integrated pest management (IPM) system, including, amongst others, hygiene measures and, where possible, physical methods of control.
- The product should be placed in the immediate vicinity of places where rodent activity has been previously explored (e.g. travel paths, nesting sites, feedlots, holes, burrows etc.).
- Where possible, bait stations must be fixed to the ground or other structures.
- Bait stations must be clearly labelled to show they contain rodenticides and that they must not be moved or opened *(see section 2.5.3 for the information to be shown on the label)*.

- *[If national policy or legislation requires it]* When the product is being used in public areas, the areas treated should be marked during the treatment period and a notice explaining the risk of primary or secondary poisoning by the anticoagulant as well as indicating the first measures to be taken in case of poisoning must be made available alongside the baits.
- Bait should be secured so that it cannot be dragged away from the bait station.
- Place the product out of the reach of children, birds, pets and farm animals and other non-target animals.
- Place the product away from food, drink and animal feeding stuffs, as well as from utensils or surfaces that have contact with these.
- Wear protective chemical resistant gloves during product handling phase (glove material to be specified by the authorisation holder within the product information).
- When using the product do not eat, drink or smoke. Wash hands and directly exposed skin after using the product.
- The frequency of visits to the treated area should be at the discretion of the operator, in the light of the survey conducted at the outset of the treatment. That frequency should be consistent with the recommendations provided by the relevant code of best practice.
- If bait uptake is low relative to the apparent size of the infestation, consider the replacement of bait points to further places and the possibility to change to another bait formulation.
- If after a treatment period of 35 days baits are continued to be consumed and no decline in rodent activity can be observed, the likely cause has to be determined. Where other elements have been excluded, it is likely that there are resistant rodent so consider the use of a non-anticoagulant rodenticide, where available, or a more potent anticoagulant rodenticide. Also consider the use of traps as an alternative control measure.
- Bait in sachets: [For non-emptiable sachets - Do not open the sachets containing the bait].
- Paste: a) [Where relevant] Place paste bait with a sufficiently elongated applicator (spatula) to reduce hand exposure - avoid reaching into the bucket. b) [Where relevant] Specify how the equipment (e.g. spatula) shall be cleaned and how contact with residues of the bait can be avoided.
- IE Only: The resistance status of the target population should be taken into account when considering the choice of rodenticide to be used. In those areas where evidence of resistance to specific active ingredients is suspected, avoid their use. To control the spreading of resistance, it is advisable to alternate baits containing different anticoagulant active ingredients.

2.5.2 Risk mitigation measures

2.5.2.1 Risk mitigation measures - Professionals

- Where possible, prior to the treatment inform any possible bystanders (e.g. users of the treated area and their surroundings) about the rodent control campaign [*in accordance with the applicable code of good practice, if any*]".
- To reduce risk of secondary poisoning, search for and remove dead rodents at frequent intervals during treatment (e.g. at least twice a week). *[Where relevant, specify if more frequent or daily inspection is required*].
- Products shall not be used beyond 35 days without an evaluation of the state of the infestation and of the efficacy of the treatment.
- Do not use baits containing anticoagulant active substances as permanent baits for the prevention of rodent infestation or monitoring of rodent activities.
- The product information (i.e. label and/or leaflet) shall clearly show that:
- -the product shall not be supplied to the general public (e.g. "for professionals only").
- - the product shall be used in adequate tamper resistant bait stations (e.g. "use in tamper resistant bait stations only").
- -users shall properly label bait stations with the information referred to in section 5.3 of the SPC (e.g. label bait stations according to the product recommendations").
- Using this product should eliminate rodents within 35 days. The product information (i.e. label and/or leaflet) shall clearly recommend that in case of suspected lack of efficacy by the end of the treatment (i.e. rodent activity is still observed), the user should seek advice from the product supplier or call a pest control service.
- Do not wash the bait stations with water between applications.
- Dispose dead rodents in accordance with local requirements *[The method of disposal shall be described specifically in the national SPC and be reflected on the product label].*

2.5.2.2 Risk mitigation measures – Trained Professionals

- Where possible, prior to the treatment inform any possible bystanders about the rodent control campaign *[in accordance with the applicable code of good practice, if any]*".
- The product information (i.e. label and/or leaflet) shall clearly show that the product shall only be supplied to trained professional users holding certification demonstrating compliance with the applicable training requirements (e.g. "for trained professionals only".

- Do not use in areas where resistance to the active substance can be suspected.
- Products shall not be used beyond 35 days without an evaluation of the state of the infestation and of the efficacy of the treatment.
- Do not rotate the use of different anticoagulants with comparable or weaker potency for resistance management purposes. For rotational use, consider using a non-anticoagulant rodenticide, if available, or a more potent anticoagulant.
- Do not wash the bait stations or utensils used in covered and protected bait points with water between applications.
- Dispose of dead rodents in accordance with local requirements *[The method of disposal shall be described specifically in the national SPC and be reflected on the product label]*.

2.5.3 Particulars of likely direct or indirect effects, first aid instructions and emergency measures to protect the environment

This product contains an anticoagulant substance. If ingested, symptoms, which may be delayed, may include nosebleed and bleeding gums. In severe cases, there may be bruising and blood present in the faeces or urine.
Antidote: Vitamin K1 administered by medical/veterinary personnel only.

In case of: Dermal exposure, wash skin with water and then with water and soap.
Eye exposure, rinse eyes with eyes-rinse liquid or water, keep eyes lids open at least 10 minutes.
Oral exposure, rinse mouth carefully with water. Never give anything by mouth to unconscious person. Do not provoke vomiting. If swallowed, seek medical advice immediately and show the product's container or label.
Contact a veterinary surgeon in case of ingestion by a pet.

Bait stations must be labelled with the following information: "do not move or open"; "contains a rodenticide"; "product name or authorisation number"; "active substance(s)" and "in case of incident, call a poison centre [insert national phone number]".

Hazardous to wildlife.

2.5.4 Instructions for safe disposal of the product and its packaging

At the end of the treatment, dispose of uneaten bait and the packaging in accordance with local requirements. Use of gloves is recommended.

2.5.5 Conditions of storage and shelf-life of the product under normal conditions of storage

Shelf-life: 24 months Store in a dry, cool and well ventilated place. Keep the container closed and away from direct sunlight. Store in places prevented from the access of children, birds, pets and farm animals. Keep only in original container.

2.5.6 Other information

Because of their delayed mode of action, anticoagulant rodenticides may take from 4 to 10 days to be effective after consumption of the bait. Rodents can be disease carriers. Do not touch dead rodents with bare hands, use gloves or use tools such as tongs when disposing them. This product contains a bittering agent and a dye.

2.5.7 Documentation

2.5.7.1 Data submitted in relation to product application

Please see General Annexes section 4.1

2.5.7.2 Access to documentation

The applicant supported the evaluation of the active substance at EU level and has full access to the documents submitted by the taskforce for the EU review programme.

3 Assessment of the product

3.1 Proposed Uses

3.1.1 Use 1 – House mice – professionals – indoor

Product Type(s)	14

Where relevant, an exact description of the use	Rodenticide
Target organism(s) (including development stage)	House mouse (*Mus musculus* / *Mus domesticus*) – adults and juveniles
Field(s) of use	Indoors
Application method(s)	Ready-to-use bait to be used in tamper-resistant bait stations
Application rate(s) and frequency	Mice Low infestation – 10g bait in bait points every 5 metres High infestation – 10g bait in bait points every 3 metres
Category(ies) of users	Professionals
Pack sizes and packaging material	Minimum pack size 2.5 kg **Grams of bait in individual sachet:** 10 **Packaging material and size:** **Bucket: (PP,PE)** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cardboard box with inner PE liner** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cartridge in PP**: 50 g, 100g, 150g, 200g, 250g, 260g , 270g, 280g, 310g, 500g Outer packaging - cardboard box with pack sizes of: 50 cartridges of 50g, 25 cartridges of 100g, 20 cartridges of 150g, 15 cartridges of 200g, 10 cartridges of 250g, 12 cartridges of 250g, 18 cartridges of 250g, 10 cartridges of 260g, 12 cartridges of 260g, 18 cartridges of 260g, 10 cartridges of 270g, 12 cartridges of 270g, 18 cartridges of 270g, 10 cartridges of 280g, 12 cartridges of 280g, 18 cartridges of 280g, 10 cartridges of 310g, 12 cartridges of 310g, 18 cartridges of 310g or 5 cartridges of 500g. **Pre-baited station (PP,PS,PVC)**: 2*10g or 3*10g in cardboard box of 2.5 kg, 3 kg, 3.5 kg, 4 kg, 4.5 kg and 5 kg

3.1.2 Use 2 – Rats – professionals – indoor

Product Type(s)	14
Where relevant, an exact description of the use	Rodenticide
Target organism(s) (including development stage)	Brown rats (*Rattus norvegicus*) – adults and juveniles

Field(s) of use	Indoors
Application method(s)	Ready-to-use bait to be used in tamper-resistant bait stations
Application rate(s) and frequency	Rats Low infestation 60 g bait in bait points every 10 metres High infestation 60 g bait in bait points every 5 metres
Category(ies) of users	Professionals
Pack sizes and packaging material	Minimum pack size 2.5 kg **Grams of bait in individual sachet:** 10 **Packaging material and size:** **Bucket: (PP,PE)** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cardboard box with inner PE liner** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cartridge in PP**: 50 g, 100g, 150g, 200g, 250g, 260g , 270g, 280g, 310g, 500g Outer packaging - cardboard box with pack sizes of: 50 cartridges of 50g, 25 cartridges of 100g, 20 cartridges of 150g, 15 cartridges of 200g, 10 cartridges of 250g, 12 cartridges of 250g, 18 cartridges of 250g, 10 cartridges of 260g, 12 cartridges of 260g, 18 cartridges of 260g, 10 cartridges of 270g, 12 cartridges of 270g, 18 cartridges of 270g, 10 cartridges of 280g, 12 cartridges of 280g, 18 cartridges of 280g, 10 cartridges of 310g, 12 cartridges of 310g, 18 cartridges of 310g or 5 cartridges of 500g. **Pre-baited station (PP,PS,PVC)**: 2*10g or 3*10g in cardboard box of 2.5 kg, 3 kg, 3.5 kg, 4 kg, 4.5 kg and 5 kg

3.1.3 Use 3 - House mice and/or rats – professionals – outdoor around buildings

Product Type(s)	14
Where relevant, an exact description of the use	Rodenticide
Target organism(s) (including development stage)	House mouse (*Mus musculus* / *Mus domesticus*) – adults and juveniles Brown rats (*Rattus norvegicus*) – adults and juveniles
Field(s) of use	Outdoors around buildings
Application method(s)	Ready-to-use bait to be used in tamper-resistant bait stations

Application rate(s) and frequency	Mice Low infestation – 10g bait in bait points every 5 metres High infestation – 10g bait in bait points every 3 metres Rats Low infestation – 60 - 100g bait in bait points every 10 metres High infestation – 60 - 100g bait in bait points every 5 metres
Category(ies) of users	Professionals
Pack sizes and packaging material	Minimum pack size 2.5 kg **Grams of bait in individual sachet:** 10 **Packaging material and size:** **Bucket: (PP,PE)** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cardboard box with inner PE liner** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cartridge in PP**: 50 g, 100g, 150g, 200g, 250g, 260g , 270g, 280g, 310g, 500g Outer packaging - cardboard box with pack sizes of: 50 cartridges of 50g, 25 cartridges of 100g, 20 cartridges of 150g, 15 cartridges of 200g, 10 cartridges of 250g, 12 cartridges of 250g, 18 cartridges of 250g, 10 cartridges of 260g, 12 cartridges of 260g, 18 cartridges of 260g, 10 cartridges of 270g, 12 cartridges of 270g, 18 cartridges of 270g, 10 cartridges of 280g, 12 cartridges of 280g, 18 cartridges of 280g, 10 cartridges of 310g, 12 cartridges of 310g, 18 cartridges of 310g or 5 cartridges of 500g. **Pre-baited station (PP,PS,PVC)**: 2*10g or 3*10g in cardboard box of 2.5 kg, 3 kg, 3.5 kg, 4 kg, 4.5 kg and 5 kg

3.1.4 Use 4 - House mice and/or rats – trained professionals – indoor

Product Type(s)	14
Where relevant, an exact description of the use	Rodenticide
Target organism(s) (including development stage)	House mouse (*Mus musculus / Mus domesticus*) – adults and juveniles Brown rats (*Rattus norvegicus*) – adults and juveniles
Field(s) of use	Indoors
Application method(s)	Ready-to-use bait to be used in covered bait points or in tamper-resistant bait stations
Application rate(s) and	Mice

frequency	Low infestation – 10g bait in bait points every 5 metres High infestation – 10g bait in bait points every 3 metres Rats Low infestation – 60 - 100g bait in bait points every 10 metres High infestation – 60 - 100g bait in bait points every 5 metres
Category(ies) of users	Trained Professionals
Pack sizes and packaging material	Minimum pack size 2.5 kg **Grams of bait in individual sachet:** 10 **Packaging material and size:** **Bucket: (PP,PE)** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cardboard box with inner PE liner** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cartridge in PP**: 50 g, 100g, 150g, 200g, 250g, 260g , 270g, 280g, 310g, 500g Outer packaging - cardboard box with pack sizes of: 50 cartridges of 50g, 25 cartridges of 100g, 20 cartridges of 150g, 15 cartridges of 200g, 10 cartridges of 250g, 12 cartridges of 250g, 18 cartridges of 250g, 10 cartridges of 260g, 12 cartridges of 260g, 18 cartridges of 260g, 10 cartridges of 270g, 12 cartridges of 270g, 18 cartridges of 270g, 10 cartridges of 280g, 12 cartridges of 280g, 18 cartridges of 280g, 10 cartridges of 310g, 12 cartridges of 310g, 18 cartridges of 310g or 5 cartridges of 500g. **Pre-baited station (PP,PS,PVC)**: 2*10g or 3*10g in cardboard box of 2.5 kg, 3 kg, 3.5 kg, 4 kg, 4.5 kg and 5 kg

3.1.5 Use 5 - House mice and/or rats – trained professionals – outdoor around buildings

Product Type(s)	14
Where relevant, an exact description of the use	Rodenticide
Target organism(s) (including development stage)	House mouse (*Mus musculus / Mus domesticus*) – adults and juveniles Brown rats (*Rattus norvegicus*) – adults and juveniles
Field(s) of use	Outdoors around buildings
Application method(s)	Ready-to-use bait to be used in covered bait points or in tamper-resistant bait stations
Application rate(s) and	Mice

frequency	Low infestation – 10g bait in bait points every 5 metres High infestation – 10g bait in bait points every 3 metres Rats Low infestation – 60 - 100g bait in bait points every 10 metres High infestation – 60 - 100g bait in bait points every 5 metres
Category(ies) of users	Trained Professionals
Pack sizes and packaging material	Minimum pack size 2.5 kg **Grams of bait in individual sachet:** 10 **Packaging material and size:** **Bucket: (PP,PE)** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cardboard box with inner PE liner** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cartridge in PP**: 50 g, 100g, 150g, 200g, 250g, 260g , 270g, 280g, 310g, 500g Outer packaging - cardboard box with pack sizes of: 50 cartridges of 50g, 25 cartridges of 100g, 20 cartridges of 150g, 15 cartridges of 200g, 10 cartridges of 250g, 12 cartridges of 250g, 18 cartridges of 250g, 10 cartridges of 260g, 12 cartridges of 260g, 18 cartridges of 260g, 10 cartridges of 270g, 12 cartridges of 270g, 18 cartridges of 270g, 10 cartridges of 280g, 12 cartridges of 280g, 18 cartridges of 280g, 10 cartridges of 310g, 12 cartridges of 310g, 18 cartridges of 310g or 5 cartridges of 500g. **Pre-baited station (PP,PS,PVC)**: 2*10g or 3*10g in cardboard box of 2.5 kg, 3 kg, 3.5 kg, 4 kg, 4.5 kg and 5 kg

3.1.6 Use 6 - Rats – trained professionals – Outdoor open areas & waste dumps

Product Type(s)	14
Where relevant, an exact description of the use	Rodenticide
Target organism(s) (including development stage)	Brown rats (*Rattus norvegicus*) – adults and juveniles
Field(s) of use	Outdoor open areas & waste dumps
Application method(s)	Ready-to-use bait to be used in covered bait points or in tamper-resistant bait stations
Application rate(s) and frequency	Rats Low infestation – 60 - 100g bait in bait points every 10 metres High infestation – 60 - 100g bait in bait points every 5 metres

Category(ies) of users	Trained Professionals
Pack sizes and packaging material	Minimum pack size 2.5 kg **Grams of bait in individual sachet:** 10 **Packaging material and size:** **Bucket: (PP,PE)** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cardboard box with inner PE liner** 10 g: 2.5 kg (250*10), 3 kg (300*10), 3.5 kg (350*10), 4 kg (400*10), 4.5 kg (450*10), 5 kg (500*10), 5.5 kg (550*10), 6 kg (600*10), 6.5 kg (650*10), 7 kg (700*10), 7.5 kg (750*10), 8 kg (800*10), 8.5 kg (850*10), 9 kg (900*10), 9.5 kg (950*10), 10 kg (1000*10) **Cartridge in PP**: 50 g, 100g, 150g, 200g, 250g, 260g , 270g, 280g, 310g, 500g Outer packaging - cardboard box with pack sizes of: 50 cartridges of 50g, 25 cartridges of 100g, 20 cartridges of 150g, 15 cartridges of 200g, 10 cartridges of 250g, 12 cartridges of 250g, 18 cartridges of 250g, 10 cartridges of 260g, 12 cartridges of 260g, 18 cartridges of 260g, 10 cartridges of 270g, 12 cartridges of 270g, 18 cartridges of 270g, 10 cartridges of 280g, 12 cartridges of 280g, 18 cartridges of 280g, 10 cartridges of 310g, 12 cartridges of 310g, 18 cartridges of 310g or 5 cartridges of 500g. **Pre-baited station (PP,PS,PVC)**: 2*10g or 3*10g in cardboard box of 2.5 kg, 3 kg, 3.5 kg, 4 kg, 4.5 kg and 5 kg

3.2 Physical, chemical and technical properties

No new data was provided nor had new guidance to be taken into account for the renewal evaluation. Accordingly, the conclusion from the former assessment regarding physical, chemical and technical properties remains valid.

3.3 Physical hazards and respective characteristics

No new data was provided, nor had new guidance to be taken into account for the renewal evaluation. Accordingly, the conclusion from the former assessment regarding physical hazards and respective characteristics remains valid.

3.4 Methods for detection and identification

No new data was provided, nor had new guidance to be taken into account for the renewal evaluation. Accordingly, the conclusion from the former assessment regarding methods for detection and identification remains valid.

3.5 Efficacy against target organisms

The results from laboratory palatability and efficacy studies and field trials previously evaluated demonstrate that the product is both palatable to, and effective in controlling target populations of brown rats (*Rattus norvegicus*) and house mice (*Mus musculus/domesticus*) when applied according to the label advice. Sapphire Paste proved to be both attractive to and effective against infestations of brown rats and house mice in the trials and provided excellent control of the infestations treated based upon census baiting and tracking data.
No efficacy data using the block formulation was provided for the roof rat (*Rattus rattus*) therefore only claims relating to control of the brown rat (*Rattus norvegicus*) and house mice (*Mus musculus/domesticus*) are authorised.

Resistance to the first generation anticoagulants has been widely reported in both *Rattus norvegicus* and *Mus domesticus* since the late 1950's. The incidence of resistance to first generation anticoagulants in areas in which it is established is commonly 25-85%.
The enzyme vitamin K 2, 3 epoxide reductase (VKOR) is the target for anticoagulants. Modifications in the protein structure due to polymorphisms on the gene coding the VKOR may induce anticoagulant

resistance. Most resistant strains are characterised by one single nucleotide polymorphism (SNP). These SNPs cause the exchange of one amino acid in the VKOR enzyme. The biochemical mechanism of anticoagulant resistance has been studied in several geographic strains/VKORC1-variants of the Norway rat. Amino acid substitutions in the VKOR seem to alter its structure and function, resulting in decreased sensitivity to anticoagulant inhibition, depending on strain characteristics.

For house mice, a dominant autosomal warfarin-resistance gene was determined on chromosome 7 in house mice. Three VKORC1 sequence variants mediating resistance to anticoagulants seem to be widely distributed. House Mice carrying the homozygous of one of these variants (Y139C) were found highly resistant to warfarin and bromadiolone.

For roof rats, experiments on warfarin resistant rats indicated considerable instability in the resistance and suggested a multifactorial basis for resistance.

Some degree of resistance to difenacoum has been reported in the UK, Denmark, France and Germany but this is usually found in certain populations of rodents highly resistant to first generation anti-coagulants (Greaves et al., 1982[7]; Lund, 1984[8]; Pelz et al. 1995[9]). The resistance factor tells how much the anticoagulant dose has to be multiplied to kill resistant individuals compared to sensitive ones. The resistant factors for difenacoum in the brown rats ranged from 1.1 to 8.6 (Greaves and Cullen-Ayres 1988[10]). The study included rats resistant to warfarin and difenacoum. Resistance factors for warfarin ranged from approx. 50 to 2300. Greaves et al. (1982) reported a fivefold difenacoum dose needed to kill difenacoum resistant rats. Considerable doubt exists as to the significance of reports in UK of resistance to second-generation anticoagulants and in the UK control failures with the second-generation products are increasingly being attributed to baiting problems rather than physiological resistance (Greaves and Cullen Ayres, 1988; Quy et al. 1992a,b[11]).

Studies carried out in different European countries, in the UK more particularly (Kerins et al, 2001; see annex 1) revealed the occasional occurrence of cross-resistances to second-generation anticoagulants, such as difenacoum and bromadiolone on resistant brown rats populations to coumafene. Moreover, a publication (Baer et al., 2012) has demonstrated that the majority (91%) of warfarin resistant rat trapped in East and West parts of Belgium were also resistant to bromadiolone. The rats trapped in the region of

7 Greaves J. H.; Shepherd D. S.; Gill, J. E. (1982): An investigation of difenacoum resistance in Norway rat populations in Hampshire. *Annals of Applied Biology* 100, 581–587.

8 LUND, M. (1984): Resistance to the second generation anticoagulant rodenticides. *In Proceedings of 11th vertebrate pest conference*, Sacramento, Ca. March 6-8, 1984: 89-94.

9 Pelz H-J, Ha¨nisch D, Lauenstein G (1995) Resistance to anticoagulant rodenticides in Germany and future strategies to control *Rattus norvegicus. Pestic Sci* 43, 61–67

10 Greaves J. H.; Cullen-Ayres P. B. (1988): Genetics of difenacoum resistance in the rat. In: J. W. Suttie (Ed.), Current advances in vitamin K research, Elsevier, N.Y., 381–388.

11 Quy R.J., Shepherd D.S., Inglis I.R. (1992): Bait avoidance and effectiveness of anticoagulant rodenticides against warfarin- and difenacoum-resistant populations of Norway rats (Rattus norvegicus). *Crop Protection*, Volume 11, Issue 1, February 1992, Pages 14-20

Flanders (Northern Belgium) carried mutation Y139F. This mutation is found extensively in France where it also confers resistance to bromadiolone (Grandemange et al., 2009). The same mutation was also found in UK (Prescott et al., 2011) where applications of bromadiolone had been unsuccessful. Difenacoum is also thought to be partially resisted by rats which carry Y139F.

House mice carrying the homozygous Y139C sequence variant were found to be highly resistant to warfarin and bromadiolone. It is important to understand that all known resistance mutations, in both rats and mice, are capable of effective control with applications of the most potent second-generation anticoagulants (brodifacoum, difethialone and flocoumafen) and that no practical resistance to any of these active substances is presently known.

So, resistance to second generation anticoagulant rodenticides should not be underestimated.

An exhaustive study carried out at the French and European levels could enable to point-out resistant areas with first generation anticoagulants and potential cross-resistances to second-generation anticoagulants. It is one of the actions undertaken since 2010 in France by a group of scientists (Rodent program “impacts of anticoagulants rodenticides on ecosystems-adaptations of target rodents and effects on their predators”).

The document CropLife International (RRAC 2016) provides guidance to advisors, national authorities, professionals, practitioners and others on the nature of anticoagulant resistance in rodents, the identification of anticoagulant resistance, strategies for rodenticide application that will avoid the development of resistance and the management of resistance where it occurs.

The following are the essential elements of an effective program: survey, use of physical and chemical control techniques, environmental management, record keeping, monitoring and review.

The authorization holder should report any observed resistance incidents to the Competent Authorities or other appointed bodies involved in resistance management at the renewal of the product.

To ensure a satisfactory level of efficacy and avoid the development of resistance, the recommendations proposed in the SPC have to be implemented.

3.6 Risk assessment for human health

3.6.1 The dermal absorption value for brodifacoum was obtained by way of read across from studies on a wax block product containing difenacoum. Read across was justified based on structural similarity between the brodifacoum and difenacoum. A dermal absorption value of 0.1% was used for brodifacoum for the wax block product based on a reinterpretation of the original difenacoum dermal absorption study using

EFSA Guidance on Dermal Absorption (2012). Assessment of effects of the active substance on human health

See section 3.6.3.

3.6.2 Assessment of effects of the product on human health

See section 3.6.3.

The following new guidance had to be taken into account for the re-assessment:
A read across from difenacoum to brodifacoum was regarded as appropriate and in-line with section 6.6.2 of the guidance.

3.6.3 Exposure assessment

The dermal absorption value for brodifacoum was obtained by way of read across from studies on a wax block product containing difenacoum. Read across was justified based on structural similarity between the brodifacoum and difenacoum. A dermal absorption value of 0.1% was used for brodifacoum for the wax block product based on a reinterpretation of the original difenacoum dermal absorption study using EFSA Guidance on Dermal Absorption (2012).
Pelgar provided a letter of access for Lodi to use brodifacoum acute toxicity studies for the toxicological characterisation of the Sapphire Paste product.
The AELs considered in the risk characterization for *Brodifacoum* were:
AEL_{acute} of 0.0000033 mg/kg/day based on the maternal NOEL from a teratogenicity study of 0.001 mg/kg bw/day (rat, maternal effect)
$AEL_{medium\ term}$ of 6.7×10^{-6} mg/kg bw/day based on the NOAEL from a developmental study (female rabbit) of 0.002 mg/kg bw/day
AEL_{chr} of 3.3×10^{-6} mg/kg bw/day based on the NOAEL for females from the reproductive 2-generation study in rat of 0.001 mg/kg bw/day

The risk assessment has been conducted using the chronic AEL, a DA of 0.1%, a critical usage of 100g (trained and untrained professionals users) and the HEEG recommendation 9, 10 and 12.

For the 'transient mouthing of poison bait' scenario, 10 mg (TNsG, with bittering agent/repellent) of the product is assumed to be swallowed by an infant per poisoning event as stated in: The Human Exposure to Biocidal Products (Technical Notes for Guidance – June 2002). An oral absorption of

100% was assumed for the mouthing scenarios for the toddler risk assessment. The acute AEL was used as the endpoint in the toddler risk assessment.	
Biocidal Exposure Risk assessment for “Sapphire Paste” Brodifacoum rodenticide (40 ppm) .	
Professional user	
	Paste
Without PPE	69.1% of AEL (0.00000228 mg/kg bw/day)
With PPE	3.5% of AEL (0.000000114 mg/kg bw/day)
Cartridge and spatula application without PPE	4950 mg required to remain on hands to exceed AEL
Cartridge and spatula application without PPE	99 g required to remain on hands to exceed AEL
Non-trained professional user (farmer)	
	Paste
Without PPE	6.2% of AEL (0.000000204 mg/kg bw/day)
With PPE	0.3% of AEL (0.0000000102 mg/kg bw/day)
Exposure to children (Toddler)	
	Paste
Oral exposure -treated with repellent	1212.12% of AEL (0.00004 mg/kg bw/day)
Oral exposure - without repellent	606060.60% of AEL (0.02 mg/kg bw/day)
Derived values safe usage scenarios for professional users handling the brodifacoum paste product with and without PPE. Derived values for professional users handling the paste product without PPE	

were 0.00000228 mg/kg bw/day (69.1 % AEL). Derived values for professional users handling the paste product with PPE were 0.000000114 mg/kg bw/day (3.5% AEL).

A reverse reference calculation indicated that the amount of substance required to remain on hands during handling to exceed the AEL is highly unlikely. 4950 mg of substance are required to remain on hands to exceed 100% of the AEL without PPE. 99g of substance are required to remain on hands to exceed 100% of the AEL without PPE. Given the amount of substance used during application these levels seem unlikely to be reached.

Derived values indicated safe usage for non-trained professional users handling the paste product with and without PPE. Derived values for non-trained professional users handling the paste product without PPE were 0.000000204 mg/kg bw/day (6.2% AEL). Derived values for non-trained professional users handling the paste product with PPE were 0.0000000102 mg/kg bw/day (0.3% AEL).

Derived values indicated no safe exposure scenarios for toddlers through oral exposure/transient mouthing of the paste product. Derived values for oral exposures in the toddler found transient mounting of a paste not containing a repellent to result in a dose of 0.02 mg (606060.60% AEL). Derived values for oral exposures in the toddler found transient mounting of a paste containing a repellent to result in a dose of 0.00004 mg (1212.12% AEL). However, the design of the rat bait boxes will incorporate a tamper-proof seal system to prevent easy access to internal compartments. As a result of incorporating a tamper proof seal system toddlers are not expected to be able to gain access to the rodenticides and subsequent mouthing scenarios are deemed unlikely.

3.6.4 Risk characterisation for human health

3.6.4.1 Risk for professional users

As shown in section 3.6.2.

3.6.4.2 Risk for the general public

Not relevant.

3.6.4.3 Risk for consumers via residues in food

No new data was provided nor had new guidance to be taken into account for the renewal evaluation. Accordingly, the conclusion from the former assessment regarding risks for consumers via residues in food remain valid.

3.6.4.4 Risk characterisation from combined exposure to several active substances or substances of concern within a biocidal product[12]

The biocidal product does not contain other substances in quantities that would be of toxicological concern in the production formulation.

3.6.4.5 Summary of risk characterisation

Derived values safe usage scenarios for professional users handling the brodifacoum paste product with and without PPE. Derived values for professional users handling the paste product without PPE were 0.00000228 mg/kg bw/day (69.1 % AEL). Derived values for professional users handling the paste product with PPE were 0.000000114 mg/kg bw/day (3.5% AEL).

A reverse reference calculation indicated that the amount of substance required to remain on hands during handling to exceed the AEL is highly unlikely. 4950 mg of substance are required to remain on hands to exceed 100% of the AEL without PPE. 99 g of substance are required to remain on hands to exceed 100% of the AEL without PPE. Given the amount of substance used during application these levels seem unlikely to be reached.

Derived values indicated safe usage for non-trained professional users handling the paste product with and without PPE. Derived values for non-trained professional users handling the paste product without PPE were 0.000000204 mg/kg bw/day (6.2% AEL). Derived values for non-trained professional users handling the paste product with PPE were 0.0000000102 mg/kg bw/day (0.3% AEL).
Derived values indicated no safe exposure scenarios for toddlers through oral exposure/transient mouthing of the paste product. Derived values for oral exposures in the toddler found transient mounting of a paste not containing a repellent to result in a dose of 0.02 mg (606060.60% AEL). Derived values for oral exposures in the toddler found transient mounting of a paste containing a repellent to result in a dose of 0.00004 mg (1212.12% AEL). However, the design of the rat bait boxes will incorporate a tamper-proof seal system to prevent easy access to internal compartments. As a result of incorporating a tamper proof seal system toddlers are not expected to be able to gain access to the rodenticides and subsequent mouthing scenarios are deemed unlikely.

3.7 Risk assessment for animal health

No new data was provided, nor had new guidance to be taken into account for the renewal evaluation. Accordingly, the conclusion from the former assessment regarding animal health remains valid.

3.8 Risk assessment for the environment

The exposure assessment carried out for this product in 2013 is still valid. Regarding groundwater, the recent CG decision requires this now be assessed:

Groundwater assessment for rodenticides
As required by Article 31(3) of the BPR and Article 2(1)(f) of Regulation 492/2014, when carrying out their assessment of whether the conclusions of the first authorisation regarding Article 19(1)(iv) remain valid, applicants will have to address the groundwater assessment. Since no new guidance was agreed in the past that could become applicable at the time of the completion of the applications for renewal by 28/02/2017, the guidance of reference are the existing methods that are applied since years as standard tools for the assessment of active substances:
- Tier I according to Vol. IV Part B (the former TGD), as provided in chapter 2.3.8.6 of this guidance document.
- Tier II using the FOCUS models PEARL or PELMO for refinements in case Tier I would lead to an exceedance of the relevant trigger values.

The previous exposure assessment contained a Tier 1 assessment of groundwater PECs. The following is an extract from the report:

Exposure of groundwater may occur as a result of soil exposure which occurs via residues present in sewage sludge after using the product in sewers and via direct (spillages) and disperse release (urine and faeces) after the use of the product in the scenarios in and around buildings, open areas and waste dumps. As an indication for potential groundwater levels, the concentration in soil porewater in the various scenarios was examined. It should be noted that this is a worst-case assumption, neglecting transformation and dilution in deeper soil layers. A summary of the PECs obtained are presented in the table below. The calculated value for the open areas scenario exceeds the EU trigger value of 0.1 µg/L. However this figure is derived from a soil concentration value in a small localised area in the immediate vicinity of the baiting point. When taken in the context of a larger area (field, park, etc.) this figure would be several orders of magnitude lower. In addition it must be noted that these two scenarios give a value for groundwater under industrial soil – not agricultural soil as specified by the ESD.

Scenario	**In and around buildings**		**Open area**	**Waste dump**	
	Worst case	**Realistic**		**Worst case**	**Realistic**
PEC groundwater (mg/l)	5.3×10^{-5}	6.62×10^{-6}	1.96×10^{-4}	9.26×10^{-6}	2.31×10^{-6}

As the value for the open areas scenario exceeds the trigger (0.196µg/L) the eCA has performed a Tier II assessment using FOCUS PEARL v4.4.4. The open areas scenario outlined in the PT14 ESD describes placement of the grain bait at the bottom of a cylindrical hole of radius 4cm and depth 30cm. A larger soil cylinder of radius 28cm is assumed to be exposed to the bait. From the soil exposure performed in the 2013

evaluation, 0.0025g of active substance is deposited each campaign (Elocalsoil). The base of the cylinder has an area of 0.062m^2 (π x 0.14^2). 0.0025g spread over an area of 0.062m^2 gives an application rate of 0.0406gm^{-2} or 0.406kgha^{-1}. This application rate assumes the bait is placed uniformly across the field or park. In reality bait is placed in specific burrows at distances of 5m or greater where rodents are active. Therefore the actual use rate will be considerably lower than 0.406kg/ha. The ESD proposes a 6 day campaign during which the rodenticide is applied. This allows for a possibility of approximately 50 campaign per year. Again this is likely to be significantly greater than the actual number of campaigns per year so our assessment is expected to be highly conservative in nature. The input parameters are summarised below:

Input parameter	**Unit**	**Brodifacoum**
Physicochemical parameters		
Molecular weight	g mol^{-1}	523.4
Water solubility	mg L^{-1}	0.24 (20°C)
Molar enthalpy of dissolution	kJ mol^{-1}	27 (default)
Saturated vapor pressure	Pa	1E-06 (20°C)
Molar enthalpy of vaporisation	kJ mol^{-1}	95 (default)
Diffusion coefficient in water	m^2 d^{-1}	4.3E-05 (default)
Diffusion coefficient in air	m^2 d^{-1}	0.43 (default)
Degradation parameters		
Half-life at reference condition	d	157 (20°C)
Molar activation energy	kJ mol^{-1}	65.4 (default)
Exponent for the effect of liquid	-	0.7 (default)
Sorption parameters		
Kom value (=Koc/1.724)	L kg^{-1}	29,002
Freundlich exponent 1/n	-	1.0 (worst case assumption)
Method of subroutine	-	pH independent
Crop related parameters		
FOCUS crop	-	Grassland
Crop uptake factor	-	0
Application parameters		
Number of applications per annum	-	50
Application rate	kg ha^{-1}	0.406
Application type	-	Injection at 30 cm

Number of applications per annum	-	50

The 80th percentile PEC_{GW} values are shown below. Based on this assessment it can be concluded that there is no risk to groundwater from use of the product.

PEARL SCENARIO	**$PEC_{groundwater}$ (µg/L)**
Châteaudun	<0.001
Hamburg	<0.001
Jokioinen	<0.001
Kremsmünster	<0.001
Okehampton	<0.001
Piacenza	<0.001
Porto	<0.001
Seville	<0.001
Thiva	<0.001
• Levels above 0.1 µg/L exceed the drinking water limit for pesticides	

Effect assessment

For the effects assessment of the product containing brodifacoum the most conservative values from the combined assessment report is considered.

Conclusion on hazard to aquatic organisms:

PNEC	**Compartment**
$PNEC_{aqua}$	0.04 µg/L
$PNEC_{STP}$	> 0.0038 mg/l

Conclusion on hazard to the terrestrial organisms:

PNEC	**Compartment**
$PNEC_{soil}$	0.88 mg a.s./kg ww

Conclusion on hazard to birds:

PNEC	**PNECoral bird diet**	**PNECoral bird**
PNEC bird	1.27×10^{-4} mg/kg	1.28×10^{-5} mg/kg bw/d

Conclusion on hazard to mammals:

PNEC	
PNECoral mammals diet	2.22×10^{-4} mg/kg
PNECoral mammals	1.10×10^{-5} mg/kg bw/d

Environment Exposure Assessment

The environment exposure to brodificoum was assessed for brodificoum as a rodenticide bait (product type 14) for use indoors and around buildings, in sewer systems, open areas and waste dumps. The assessments were carried out according to the ESD PT14, the BPR Vol. IV Part B (the former TGD) and the combined assessment report of brodifacoum (Combined Assessment Report Brodifacoum PT 14; RMS Italy, 17 September 2009, revised 16 December 2010, Renewal of approval, September 2016).

Aquatic compartment

A contamination of surface water with brodifacoum from the placing of product in and around buildings is highly unlikely. A lack of exposure to surface water is also stated in the EUBEES 2 emission scenario document. Contamination of surface waters is however expected to arise following use of bait blocks in sewers.

The most sensitive organism in the aquatic tests was alga with a nominal 72 hr ErC50 of 0.04 mg/L. This **$PNEC_{water}$** of 0.04/1000 AF**= 0.00004 mg/L**.

The test with micro-organisms in inhibition of microbial activity showed that concentrations that it is not likely that brodifacoum will have a negative impact on the microbial processes in a sewage treatment plant at solubility limits. This gives a **$PNEC_{STP}$** of **= 0.0038 mg/L.**

As no specific data are available, the toxicity of brodifacoum to sediment-dwelling organisms is covered by the risk to aquatic compartment. The application of an additional factor of 10, as done in CAR A, is considered not necessary as an experimental log Kow = 4.92 (i.e. lower than 5) is available. **Therefore, the PNECsediment organisms = 0.00004 mg/l**.

The risk characterisation for the aquatic compartment is presented in the following table.

Aquatic PEC/PNEC ratios using the realistic and worst case scenario

Exposed compartment	Endpoint	PNEC mg/L	PEC Worst case	PEC Realistic	Risk quotient PEC/PNEC

Surface water	Algae	0.00004	1.77E-06	1.18E-06	0.044
Sediment	Based on aquatic data and equilibrium partitioning method	4.348E-02	1.92E-03	1.28E-03	0.044
STP	Inhibition of microbial activity	0.0038	1.93E-05	1.27E-05	0.005

The PEC/PNEC risk quotient in all compartments are below the trigger value of 1 indicating brodifacoum following the recommended use of the product does not cause an unacceptable risk to aquatic organisms.

Terrestrial compartment

Contamination of soil following the use of product in sewers is highly unlikely during application and use. However, soil may contain low concentrations of brodificoum from the spreading of sludge on land derived from waste water treatment works receiving water after the baiting of sewer systems.

Exposure of the terrestrial compartment (soil) will also occur when product is deployed outdoors. Exposure is assumed to arise through a combination of transfer (direct release) and deposition via urine and faeces (disperse release) onto soil.

Terrestrial PEC/PNEC ratios using the realistic worst case scenario

Exposed compartment	**$PNEC_{soil}$**	**PEC_{soil}**	**Risk quotient PEC/PNEC**
In and around buildings	0.88 mg/kg ww	4.68E-02 mg/kg w/w	≤ 1
Open areas	0.88 mg/kg ww	1.73E-01 mg/kg w/w	≤ 1
Waste dump	0.88 mg/kg ww	8.17E-03 mg/kg w/w	≤ 1
Sewer application of sewage sludge	0.88 mg/kg ww	4.86E-04 mg/kg w/w	≤ 1

The PEC/PNEC ratios were less than 1 when used in and around buildings, open areas, waste dumps and for sewer applications indicating that brodificoum, following recommended use of the product, does not cause unacceptable risk to organisms in any of these terrestrial compartments assessed.

Primary and Secondary Poisoning

The concentration in the final product is 0.0040% for the active substance Brodifacoum. The assessments were carried out according to the ESD PT14 (CA-Jun03-Doc.8.2-PT14 and the TGD (2003). It involves tiered approaches for assessing the risks through both primary and secondary poisoning.

Primary Poisoning

In the first tier scenario, the risk is characterised by the ratio between PEC_{oral} and $PNEC_{oral}$. The ratios PEC/PNEC are above 1 for both short and long term exposure (data not shown). This indicates a potential risk, which must be refined.

Acute risk assessment for primary poisoning of a non-target organism:

Tier 2:

In the refined risk assessment the daily uptake (ETE) is compared to the PNEC for birds and mammals. The PNEC values for each representative animal are compared with the ETE values to provide an indication of the risk to non-target animals ingesting a daily dose of the product.

Tier 2 acute risk assessment: $PEC_{oral}/PNEC_{oral}$ for non-target animals accidentally exposed to bait containing Brodifacoum after one meal

Non-target animals	ETE, concentration of Brodifacoum after one meal (one day) (mg/kg b.w.)		$PNEC_{oral}$ (dose, mg/kg b.w./d)	PEC/PNEC	
	Step 1	Step 2		Step 1	Step 2
Tree sparrow	13.8	9.67	0.0000128	1078125	755469
Chaffinch	12	8.4	0.0000128	937500	656250
Wood pigeon	4.33	4.33	0.0000128	338281	338281
Pheasant	4.31	3.02	0.0000128	336719	235938
Dog	2.4	1.68	0.000011	218182	152727
Pig	0.3	0.21	0.000011	27273	19091
Pig, young	0.96	0.672	0.000011	87273	61091

The ratios PEC/PNEC are above 1 indicating a potential risk even after refinement.

Long-risk assessment for primary poisoning of a non-target organism:

Tier 2:

In the long-term risk assessment, the EC (expected concentration of active substance in the animal) after metabolism and other elimination is calculated and used to calculate the $EC_{oral}/PNEC_{ratio}$ after 1-day and 5-day elimination of Brodifacoum. The $EC_{oral}/PNEC_{ratio}$ are above 1 after 1-day elimination of Brodifacoum indicating a potential risk (data not shown). The $EC_{oral}/PNEC_{ratio}$ for the 5-day elimination of Brodifacoum are shown below.

Tier 2 long-term risk assessment: $EC_{oral}/PNEC_{oral}$ ratio after 5-day elimination

Species	EC_{oral} after 5 days (mg/kg b.w./d)	EC_{oral} after 5 days (mg/kg b.w./d)	$PNEC_{oral}$ (mg/kg b.w./d)	Ratio $EC_{oral}/PNEC_{oral}$

	with excretion factor = .3, AV = 1, PT = 1 (mg/kg bw)[a]	with excretion factor = 0.3, AV = 0.9, PT = 0.8 (mg/kg bw)[a]		
Tree sparrow	24.46	17.14	0.0000128	1339522
Chaffinch	21.27	14.89	0.0000128	1163597
Wood pigeon	7.67	7.67	0.0000128	599806
Pheasant	7.64	5.35	0.0000128	418341
Dog	4.25	2.97	0.000011	270801
Pig	0.531	0.372	0.000011	33850
Pig, young	1.7	1.2	0.000011	108320

[a] calculation according to equation 21 in the ESD

The ratios PEC/PNEC are above 1 indicating a potential risk even after refinement.

Conclusion:

Overall, all acute and long-term $PEC_{oral}/PNEC_{oral}$ ratios are still above the trigger value of 1 indicating acute and long-term unacceptable risks

Secondary Poisoning

A Tier 1 risk assessment was carried out to assess the risk for poisoning of non-target predator birds and mammals during acute and long-term exposure via rodents poisoned. The $PEC_{oral}/PNEC_{oral}$ values exceeded the trigger value of 1 (data not shown). Therefore, a refined tier 2 assessment was carried out, based on representative species. The refined tier 2 risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes. The Brodifacoum concentrations in non-target mammals and birds consuming contaminated rodents is calculated ($ETE_{oral\ predators}$) and compared to the $PNEC_{oral}$

Tier 2 risk assessment of secondary poisoning (non resistant and resistant rodents)

Species	Exposure	$ETE_{oral\ predators}$ (mg a.s./kg/d)	$PNEC_{oral}$ (mg a.s./kg/d)	Ratio $ETE_{oral\ predators}$ / $PNEC_{oral}$
Barn owl	Day 5 before the last meal	0.880	0.0000128	68770
	Day 5 after the last meal	1.25		97828
	Day 14 after the last meal	1.64		128241
Kestrel	Day 5 before the last meal	1.33	0.0000128	104435
	Day 5 after the last meal	1.90		148563

Species	Exposure	ETE $_{oral\ predators}$ (mg a.s./kg/d)	PNEC$_{oral}$ (mg a.s./kg/d)	Ratio ETE $_{oral\ predators}$ / PNEC$_{oral}$
	Day 14 after the last meal	2.49		194750
Little owl	Day 5 before the last meal	1.00	0.0000128	78468
	Day 5 after the last meal	1.42		111623
	Day 14 after the last meal	1.87		146326
Tawny owl	Day 5 before the last meal	0.80	0.0000128	63216
	Day 5 after the last meal	0.82		89927
	Day 14 after the last meal	1.50		117885
Fox	Day 5 before the last meal	0.32	0.000011	29453
	Day 5 after the last meal	0.46		41898
	Day 14 after the last meal	0.60		54924
Polecat	Day 5 before the last meal	0.67	0.000011	61313
	Day 5 after the last meal	0.95		87221
	Day 14 after the last meal	1.25		114337
Stoat	Day 5 before the last meal	0.96	0.000011	87687
	Day 5 after the last meal	1.37		124738
	Day 14 after the last meal	1.79		163518
Weasel	Day 5 before the last meal	1.39	0.000011	126530
	Day 5 after the last meal	1.37		124738
	Day 14 after the last meal	1.79		163518

All ratios ETE$_{oral\ predators}$ / PNEC$_{oral}$ are above the trigger value of 1 indicating an unacceptable risk of secondary poisoning.

Secondary poisoning via the terrestrial food chain

Mammalian predators of the terrestrial food chain may be at risk for secondary poisoning if they feed on contaminated soil organisms such as earthworms.

Secondary poisoning risk to earthworm-eating birds and mammals

Scenario	$PEC_{oral,earthworm}$ (mg/kg wet earthworm)		PNEC (mg/kg food)	PEC/PNEC	
	Tier 1[a]	Tier 2[b]		Tier 1[a]	Tier 2[b]
Birds					
Sewer system	0.0033	0.0022	1.27×10^{-4}	1.5	17
In and around buildings	0.3791	0.0474		2985	373
Open areas	1.401	N/a		11037	N/a
Waste dumps	0.0662	0.0165		521	129
Mammals					
Sewer system	N/a	N/a	2.22×10^{-4}	N/a	N/a
In and around buildings	0.3791	0.0474		1707	213
Open areas	1.401	N/a		6313	N/a
Waste dumps	0.0662	0.0165		298	74

[a] Product specific application data and default value for release (90% direct +indirect release)
[b] Product specific application data and refined metabolism

Conclusion

The results for sewers, in and around buildings, open areas and waste dumps scenarios indicate a risk of secondary poisoning for birds and mammals consuming contaminated earthworms.

Overall conclusion

According to this risk assessment the risk for poisoning of non-target predator birds and mammals during primary (acute and long-term exposure) and secondary poisoning is high as the trigger value is exceeded in all cases.

No safe use was established for the Brodifacoum product at a concentration of 40 ppm in the ecotoxicology risk assessment.

3.9 Assessment of a combination of biocidal products

A use with other biocidal products is not intended.

3.10 Comparative assessment

The Irish CA for biocides has processed an application for renewal for this biocidal product which contains the active substance Brodifacoum. The active substance Brodifacoum meets the criteria for exclusion according to Article 5(1) BPR as well as for substitution according to Article 10 BPR (for details see chapter 2.2.3).
Therefore, in line with Article 23 (1) BPR, a comparative assessment for this product has to be conducted.

At the 60th meeting of representatives of Members States Competent Authorities for the implementation of the BPR held on 20 and 21 May 2015, all Member States submitted to the Commission a number of questions to be addressed at Union level in the context of the comparative assessment to be carried out at the renewal of anticoagulant rodenticide biocidal products ('anticoagulant rodenticides'). The questions submitted were the following:

(a) Is the chemical diversity of the active substances in authorised rodenticides in the Union adequate to minimise the occurrence of resistance in the target harmful organisms?;
(b) For the different uses specified in the applications for renewal, are alternative authorised biocidal products or non-chemical means of control and prevention methods available?;
(c) (Do these alternatives present a significantly lower overall risk for human health, animal health and the environment?;
(d) Are these alternatives sufficiently effective?;
(e) Do these alternatives present no other significant economic or practical disadvantages?

The information addressing these questions is provided in the Annex of the Commission Implementing Decision (EU) 2017/1532[13]. In accordance with Article 1 of Commission Implementing Decision (EU) 2017/1532, the Irish CA considered the information in the Annex during the comparative assessment of anticoagulant rodenticide biocidal products.

Conclusion

Based on the information provided in the Annex of the Commission Implementing Decision (EU) 2017/1532 the Irish CA came to the conclusion that in the absence of anticoagulant rodenticides, the use of rodenticides containing other active substances would lead to an inadequate chemical diversity to minimize the occurrence of resistance in the target harmful organisms. These products also showed some significant practical or economical disadvantages for the relevant uses.

[13] Commission Implementing Decision (EU) 2017/532 of 7 September 2017 addressing questions regarding the comparative assessment of anticoagulant rodenticides in accordance with Article 23(5) of Regulation (EU) No 528/2012 of the European Parliament and of the Council.

The Irish CA also considered a number of non-chemical control or prevention methods ("non-chemical alternatives"), which in our view do not provide sufficient alternatives to anticoagulant rodenticides.

In summary it can be concluded that the criteria according Article 23(3) a), b) BPR are not fulfilled. Therefore, the authorisation of this product will be renewed for 5 years.

4 General Annexes

4.1 List of studies for the biocidal product (family)

Author	Year	Title	Publication	Report no.	Legal entity owner	Report date	GLP/ GEP	Data Protection Claimed

4.2 Output tables from exposure assessment tools

None

4.3 New information on the active substance

Under the 9th Adaptation to Technical Progress of the Classification and Labelling regulation (Commission Regulation (EU) 2016/1179), anticoagulant rodenticides were classified as Toxic to Reproduction Category 1A or 1B with a specific concentration limit of 0.003%. Under Article 19 of the Biocidal Products Regulation, biocidal products with such classifications (including anticoagulant rodenticides at this and higher concentrations) shall not be authorised for use by the general public.

4.4 Residue behaviour

No assessment necessary.

4.5 Summaries of the efficacy studies (B.5.10.1-xx)[14]

Function and field of use envisaged	Test substance	Test organism(s)	Test method, test system/concentrations applied/ exposure time	Test results; effects	Reference
PT14: Rodenticide	Sapphire Paste 0.004% w/w brodifacoum	Norway rats (*Rattus norvegicus* Berkenhout). 10 wild animals. House mice (*Mus musculus* L.). 10 wild animals. A bino laboratory Norway rats (*Rattus norvegicus*) 22 animals (11 males and 11 females, 10 to 20 weeks old, including one control pair).	Laboratory test. Choice feeding test: fresh baits. 5-day pre-test control diet intake assessment and 21-day bait feeding period. During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 40 g of ground wheat grains and 45 g of the test item per day for rat and about 10 g of ground wheat grains and 15 g of the test item per day for mice) Brodipasta, equivalent to Saphir Paste, freshly manufactured	The mean acceptance of the test item was 38.7% (s.d. 28.4%) for wild Norway rats, 43.4% (s.d. 9.5%) for wild house mice and 43.8% (s.d. 18.9%) for albino Norway rats. The efficacy was excellent. Mortality was total (100%) in all test groups after a 21-day choice between this test substance and the challenge diet. The mean time to death ranged from 3 to 19 days after the first intake of treated baits.	B5.10/01
PT14: Rodenticide	Sapphire Paste 0.004% w/w brodifacoum	A bino laboratory Norway rats (*Rattus norvegicus*) 22 animals (11 males and 11 females, 10 to 20 weeks old, including one control pair) for each test group. Laboratory House mice (*Mus musculus*) 22 animals (11 males and 11 females, including one control pair) for each test	Laboratory test. Choice feeding test: fresh and aged baits. 5-day pre-test control diet intake assessment and 21-day bait feeding period. During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 30 g of ground wheat grains, in competition with the test item) Brodipasta, equivalent to Saphir Paste, stored at 20°C for respectively 6, 12 and 24	For rats, the mean acceptance of the test item was 43.8% (s.d. 18.9%) for the fresh bait, 42.0% (s.d. 16.2%) for the 6-month aged bait, 33.7% (s.d. 13.0%) for the 12-month aged bait and 37.5% (s.d. 15.9%) for the 24-month aged bait. For mice, the mean acceptance of the test item was 46.9% (s.d. 15.1%) for the 12-month aged bait and 36.0% (s.d. 14.2%) for the 24-month aged bait. The efficacy was excellent. Mortality was total (100%) in all test groups after a 21-day choice between this test substance and the challenge diet. The mean time to death ranged from 3 to 20 days after the first intake of treated baits.	B5.10/02

14 If an IUCLID file is not available, please indicate here the summaries of the efficacy studies.

		group.	months		
PT14: Rodenticide	Sapphire Paste 0.004% w/w brodifacoum	Norway rat (*Rattus norvegicus*). 20 animals (10 males, 10 females)	Laboratory test. Choice feeding test: fresh baits. 4-day pre-test control diet intake assessment, 4-day bait feeding period and 15-day control bait period. Unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during the pre-test period. During the 4-day test period, the quantity of food placed in each pot was sufficient to meet each animal's daily needs (approximately 50 g of aged rodenticide paste bait and approximately 50 g of challenged diet, in each corresponding pot) Brodifacoum paste bait, similar to Saphir Paste, aged for 3 weeks at 54°C	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.9% (s.d. 9.89%). The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 4.7 days (3 to 7 days) after the first intake of treated baits.	B5.10/03
PT14: Rodenticide	Sapphire Paste 0.004% w/w brodifacoum	House mouse (*Mus musculus*). 20 animals (10 males, 10 females)	Laboratory test. Choice feeding test: fresh baits. 4-day pre-test control diet intake assessment, 4-day bait feeding period and 15-day control bait period. Unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during the pre-test period. During the 4-day test period, the quantity of food placed in each pot was sufficient to meet each animal's daily needs (approximately 10 g of aged rodenticide paste bait and approximately 20 g of challenged diet in each corresponding pot) Brodifacoum paste bait, similar to Saphir Paste, aged for 3 weeks at 54°C	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.8% (s.d. 10.2%). The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 5.8 days (4 to 7 days) after the first intake of treated baits.	B5.10/04
PT14: Rodenticide	Sapphire Paste 0.004% w/w brodifacoum	Wild Norway Rats (*Rattus norvegicus*). At least 41 animals estimated by pre-treatment bait census	Field test carried out in a farm raising cows. After a pre-bait until the rats were feeding readily on the bait (25 days), baiting were carried out. The non-poisoned baits were replaced by the product to be tested for 10 days. At each day's treatment, the bait stations were emptied then refilled. Post-baiting (8 days) is done to assess the level of the survival rodent population. The quantity of food placed in each bait station was sufficient to meet each animal's daily needs (approximately 150 g of bait in each bait station).	The efficacy measured was 95.18%. Dead rodents found during and after the baiting and the post-baiting phases were only *Rattus norvegicus.* The field assay showed a very good efficacy with a fast decrease of the population.	B5.10/05

			Brodifacoum paste 0.004%, equivalent to Saphir Paste		
PT14: Rodenticide	Sapphire Paste 0.004% w/w brodifacoum	Wild house mouse (*Mus musculus*) At least 72 animals estimated by pre-treatment bait census	Field test carried out in a farm. After a pre-bait until the mice were feeding readily on the bait (31 days), baiting were carried out. The non-poisoned baits were replaced by the product to be tested for 8 days. At each day's treatment, the bait stations were emptied then refilled. Post-baiting (7 days) is done to assess the level of the survival rodent population. The quantity of food placed in each bait station was sufficient to meet each animal's daily needs (approximately 30 g of bait in each bait station). Brodifacoum paste 0.004%, equivalent to Saphir Paste	The efficacy measured was 89.9%. Dead rodents found during and after the baiting and the post-baiting phases were only *Mus musculus.* The field assay showed a very good efficacy with a fast decrease of the population.	B5.10/06

4.6 Other

None.

5 Confidential annex (Access level: “Restricted” to applicant and authority)

5.1 Full composition of the product

Active substance(s)				Contents				
Common name	IUPAC name	CAS No.	EC No.	Concentration	Unit[15]	w/w (%)	Minimum purity (% w/w)	Same source as for Annex I inclusion (Y/N)
Brodifacoum	3-[3-[4-(4-bromophenyl)phenyl] tetralin-1-yl]-2-hydroxy-chromen-4-one	56073-10-0	259-980-5	0.04	g/kg	0.004	[redacted]	[redacted]
Co-formulants				**Contents**				
Common name	Function	CAS No.	EC No.	Concentration	Unit	w/w (%)	Classification	Substance of concern (Y/N)
[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

15 g/l, g/kg, other. For biological products, the concentration should state the number of activity units/units of potency (as appropriate) per defined unit of formulation (e.g. per gram or per litre).

[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
			[redacted]	[redacted]	[redacted]	[redacted]		

Annex 1 - Initial PAR – July 2013

Product Assessment Report

Saphir Paste

Active substance:	**Brodifacoum**
Product-type:	**PT 14**
Type of application:	**Authorisation**
Authorisation No:	**IE/BPA 70286 (Professional)** **IE/BPA 70287 (Non-professional)**
Date:	**30 July 2013**

Biocidal Product Assessment Report (PAR) related to Product Authorisation under Directive 98/8/EC.

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

Pesticide Registration and Control Division
Department of Agriculture, Food and the Marine
Backweston Campus
Young's Cross
Celbridge
Co. Kildare
Ireland

CONTENTS

1. General information about the product application

This application for product authorisation is for:

Trade name:	Saphir Paste
Authorisation No.:	IE/BPA 70286 (Professional and Trained Professional) IE/BPA 70287 (General public / Non-professional)

Saphir Paste trade names in other Member States (based on R4BP data):

Trade name	Member State
Brodipesce Pate	Estonia, France, Latvia
Raco Force Paste	Ireland, UK
Saphir (Pasta)	Italy
Rodistar	Italy
Biosnap Rat and Mouse Killer	UK
Doff Prebaited Mouse Station	UK
Ratta Extra Brodifacoum Paste	UK

1.1 Applicant/ Authorization Holder

Company Name:	Lodi S.A.S.
Address:	Parc d'Activités des 4 Routes F-35390 Grand Fougeray, France
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

1.2 Marketing/Distributing Company (where applicable)

Company Name:	N/A
Address:	N/A
Tel:	N/A
E-mail:	N/A
Contact:	N/A

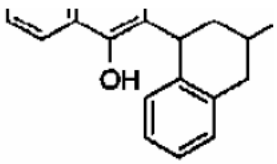
1.3 General Information on the Biocidal Product

Trade name:	Saphir Paste
Manufacturer's development code number(s):	N/A
Active substance content:	0.004% w/w Brodifacoum
Main group:	MG03 Pest Control
Product type:	PT14 (Rodenticides)
Product Specification:	See Confidential Annex
Site of product formulation:	See Confidential Annex
Frame formulation (yes/no):	No
Formulation type:	Paste Bait

Ready to use product (yes/no):	Yes
Chemical/micro-organism:	Chemical Substance
Contain or consist of GMOs[16] (yes/no):	N/A
Is the product already notified/authorised (Directive 98/8/EC) (yes/no); **If yes:** **product name:**	No N/A
Is the biocidal product equivalent to the product assessed for the purpose of Annex I inclusion to 98/8/EC (yes/no):	No.

Manufacturer of Formulated Product	
Company Name:	Company CGB (Compagnie Générale des Biocides)
Address:	Parc d'Activités des 4 Routes – F-35390 Grand Fougeray, France
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

1.4 Information on active substance(s)[17]

Active substance chemical name:	Brodifacoum
IUPAC name:	*3-[3-(4'-bromobiphenyl-4-yl)-1,2,3,4-tetrahydro-1-naphthyl]-4-hydroxycoumarin*
CAS No:	56073-10-0
EC No:	259-980-5
Purity (minimum, g/kg or g/l):	950 g/kg
Molecular formula:	$C_{31}H_{23}BrO_3$
Structural Formula:	
Manufacturing site:	See Confidential Annex
Specification of pure active substance:	See Confidential Annex

16 A copy of any written consent(s) of the competent authorities to the deliberate release into the environment of the GMOs for research and development purposes where provided for by Part B of the above-mentioned Directive was provided.

17 Please insert additional columns as necessary

Is a new active substance data package (source) supplied (yes/no):	No
If yes, Is the active substance equivalent to the active substance listed in Annex I to 98/8/EC (yes/no):	N/A
If no, does the applicant have a LoA to the active substance data packaged used to support Annex I inclusion (yes/no):	Yes (Pelgar International Ltd.)

Manufacturer of active substance(s)	
Company Name:	Pelgar International Ltd.
Address:	Unit 13 Newman Lane Industrial Estate Alton. Hants. GU34 2 QR UK
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

1.5 Information on the intended use(s) of the biocidal product

Main Group:	MG03 (Pest control)
Product-type:	PT14 (Rodenticide)
Intended use:	Brodifacoum paste bait to control rodents indoors, outdoors around buildings (amateur use) and outdoors in open areas and waste dumps (professionals only) for the protection of public health, stored products and materials.
Target organisms:	(I.1) Rodents (I.1.1) Murids (I.1.1.1) Brown rats (*Rattus Norvegicus*) (I.1.1.3) House mouse (*Mus musculus*)
Development stage:	(II.1) Juveniles (II.2) Adults
Function:	Rodenticide
Mode of action:	Anticoagulant III.2 long-term action III.2.1 anticoagulant III.2.1.1 ingestion toxin III.2.1.1.1 ingestion by eating
Application aim:	VII.1 Stored product protection/food protection VII.2 Health protection VII.3 Material protection (e.g. historical buildings, technical objects)
Category of users:	V.1 Non Professional/General public V.2 Professional V.3 Trained/specialised professional
Area of use (indoors/outdoors):	IV.1 Indoors (warehouses, houses, outbuildings) IV.2 Outdoors (in and around buildings), IV.2 Outdoors (open areas and waste dumps) IE/BPA 70286

	only
Application method:	VI.2 Covered applications VI.2.1 In bait stations(product can only be applied in bait stations for waste dump and open area applications) VI.2.2 Other coverings (this does not include application down rat holes)
Directions for use including minimum and maximum application rates, typical size of application area:	**IE/BPA 70286, IE/BPA 70287** Indoors and outdoors (in and around buildings) Rats (Adult and Juvenile): Secure 60g of bait in covered, tamper resistant baiting stations spaced 10m apart (3m apart in areas of high infestation) in areas where rats are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings). Mice (Adult and Juvenile): Secure 10g of bait, in covered, tamper resistant baiting stations spaced 5m apart (3m apart in high infestation areas) in areas where mice are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings). **IE/BPA 70286 (Professional Use Only)** Outdoors (open areas and waste dumps) Rats: Secure 60g of baits in covered tamper resistant baiting stations or covered bait points spaced 10m apart (5m apart in areas of high infestation) in areas where rats are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings). Mice: Secure 10g bait in covered tamper resistant baiting stations

	or covered bait points spaced 5m apart (3m apart in high infestation areas) in areas where mice are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings).
Potential for release into the environment (yes/no):	Yes
Potential for contamination of food/feedingstuff (yes/no):	No

1.6 Documentation

1.6.1 Data submitted in relation to product application

A full new product dossier was submitted by Lodi S.A.S in support of the product Saphir Paste containing brodifacoum. Please see the attached reference list in Annex IV:

[redacted]

2. *Classification, labelling and packaging*

Under this heading the assessment of the classification, labelling and packaging should be summarised. Further, any result of the assessments made under the following headings that require recommendations or restrictions appearing on the label should be summarised here.

2.1. Harmonised classification of the active substance

Brodifacoum is not currently classified in Annex I of Council Directive 67/548/EEC or according to Annex VI of Regulation (EC) no 1907/2006 (REACH). The following classification and labelling is proposed on the basis of available data resulting from the review programme for brodifacoum and is provided in the table below according to Directive 67/548/EEC/Regulation (EC) 1272/2008. Additionally, the extrapolation of these proposals using the BG RCI converter tool (http://www.gischem.de/ghs/konverter) is also provided in the table below in accordance with Regulation (EC) 1272/2008.

Classification of the active substance, brodifacoum, according to Directive 67/548/EEC and CLP Regulation (EC) 1272/2008:

Symbol(s):	 	**Pictogram(s):**	
Indication(s) of danger:	T+ Very Toxic N Dangerous for the Environment	**Signal word(s):**	Danger
Risk phrases:	R26/27/28: Very toxic by inhalation, in contact with skin and if swallowed. R43: May cause sensitisation by skin contact R48/23/24/25: Toxic: Danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed. R61: May cause harm to the unborn child. R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.	**Hazard statements:**	H300: Fatal if swallowed. H310: Fatal in contact with skin. H317: May cause an allergic skin reaction H330: Fatal if inhaled. H360D: May damage the unborn child. H372: Causes damage to organs through prolonged or repeated exposure through inhalation. H400: Very toxic to aquatic life H410: Very toxic to aquatic life with long lasting effects.
Safety phrases:	S20/21: When eating do not eat, drink or smoke S35: The material and its container must be disposed of in a safe way S36/37: Wear suitable protective clothing and gloves S45: In case of accident or if you feel unwell seek medical advice immediately (show the label where possible) S60: This material and its container must be disposed of as hazardous waste. S61: Avoid release to the environment. Refer to special instructions/safety data sheet.	**Precautionary statements:**	P101: If medical advice ist needed, have product container or label at hand. P103: Read label before use. P270: Do not eat, drink or smoke when using this product. P273: Avoid release to the environment. P280: Wear protective gloves and clothing P281: Use personal protective equipment as required. P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P308 + P313: IF exposed or concerned: Get medical

			advice/attention. P314: Get medical advice/attention if you feel unwell. P501: Dispose of contents/container to hazardous waste facilities in accordance with national regulations.

Specific concentration limits for brodifacoum are proved below in accordance with Directive 67/548/EEC:

Specific concentration limits:	C≥2.5% 1%≤C<2.5% 0.5%≤C<1% 0.25%≤C<0.5% 0.025%≤C<0.25% 0.0025%≤C<0.025%	T+, N; R26/27/28-48/23/24/25-43-61-50/53 T+, N; R26/27/28-48/23/24/25-43-61-51/53 T+, N; R26/27/28-48/23/24/25-61-51/53 T+, N; R26/27/28-48/23/24/25-51/53 T ; R23/24/25-48/20/21/22-52/53 Xn; R20/21/22

Additionally, brodifacoum does not exhibit hazardous physical-chemical properties. Brodifacoum is thermally stable at 52°C. It is not classified as highly flammable and does not undergo self ignition below its melting point. It is not considered to be explosive or to have oxidising properties. There is no record that it has reacted with any storage container during many years of industrial production. It is concluded therefore, that there are no hazards associated with its physico-chemical properties under normal conditions of use.

2.2. Harmonised classification and labelling of the biocidal product

The current classification and labelling, based on the biocidal product evaluation for Saphir Paste, is provided in the tables below according to Directive 99/45/EC and Regulation (EC) 1272/2008, Annex VI, Part 3.

Classification and Labelling of the biocidal product according to Directive 99/45/EC:

Symbol(s):	Not applicable
Indication(s) of danger:	Not applicable
Risk phrases:	Not applicable
Safety phrases:	S1+S2: Keep locked up and out of reach of children S13: Keep away from food, drink and animal feeding stuffs. S20 + S21: When using do not eat, drink or smoke. S24: Avoid contact with skin S35: This material and its container must be disposed of in a safe way. S37: Wear suitable gloves (Professional only) S46: If swallowed, seek medical advice immediately and show this container or label. S49: Keep only in the original container S61: Avoid release to the environment. Refer to special instructions/safety data sheet

Classification and Labelling of the biocidal product according to the CLP Regulation (EC) 1272/2008:

Pictogram(s):	Not applicable
Signal word(s):	Not applicable
Hazard statements:	Not applicable
Precautionary statements	P102: Keep out of reach of children. P103: Read label before use. P220: Keep/Store away from food, drink and animal feedingstuffs. P262: Do not get on skin P270: Do not eat, drink or smoke when using this product. P273: Avoid release to the environment P280: Wear protective gloves (Professional only) P301+310: IF SWALLOWED: Immediately call a poison centre or doctor/physician. P404+405: Store locked up in a closed container. P501: Dispose of contents/container in accordance with national regulations.

Physical-chemical properties:
Not explosive, oxidising or highly flammable and therefore does not classify from a physical-chemical point of view.

Toxicology:
There is no toxicology classification for the product under the Directive 99/45.

There is no toxicology classification for the product under the CLP Regulation 1272/2008.

Environment:
There is no environmental classification for the product under the Directive 99/45.

There is no environmental classification for the product under the CLP Regulation 1272/2008.

Other:
Further, the content of the label should be updated to comply with the labelling requirements established (for biocidal products) where the labelling requirements in Article 20(3) of Directive 98/8/EC has been implemented. The safety data sheet should comply with the requirements in Regulation (EC) 1907/2006.

Additional Labelling Requirements:

Addition safety Information:	To avoid risks to human health and the environment, comply with the instructions for use. Harmful to wildlife Use bait containers clearly marked “poison” at all surface baiting points. Remove all remains of bait, dead rodents during and after treatment and dispose of safely. Apply only in positions inaccessible to children and pets.
Special labelling provisions for Ireland:	Use Biocides Safely and Sustainably (IE/BPA 70286) Not For Amateur Sale It is illegal to use this product for uses or in a manner other than that prescribed on this label.
If a separate leaflet is attached to or supplied with the product, add the following information to the front label:	Read attached instructions before use

2.3. Packaging

The packaging details for the biocidal product, Saphir Paste, as presented by the applicant, are outlined below for amateur and professional users.

Nomenclature: PP = polypropylene, PS = polystyrene, PE = polyethylene, HDPE = high-density polyethylene, PVC = polyvinylchloride, AL = Aluminium

Amateur product packaging:
On the basis of the packaging details presented, it is considered appropriate to limit aspects of the packaging for amateur users as a risk mitigation measure. Packaging restrictions are to be limited to pre-baited bait stations and refill packs with a **maximum pack-size of 500g**. Additionally, the pasta bait should be supplied to the amateur market in sachets/wrapped in order to reduce exposure risks to amateur operators during application to bait stations.

Amateur product packaging:

Amateur product packaging: cardboard case

Container description:	Cardboard case			
Pack size(s):	50g	100g	120g	200g
Baits per pack:	5x 10g	10x 10g	12x 10g	20x 10g
Pack dimensions (LxWxH):	50 x 24 x 80	100 x 48 x 160	100 x 48 x 160	140 x 55 x 180
Inner packaging materials:	PE or PP sachet			
Outer packaging materials:	Cardboard + PE liner			
Ready-to-use (yes/no)	Yes			
Child safety features (yes/no):	No			
If yes, please specify:	N/A			
Shelf-life:	2 years			
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.			

Amateur product packaging: cardboard case

Container description:	Cardboard case			
Pack size(s):	240g	250g	480g	500g
Baits per pack:	24x 10g	25x 10g	48x 10g	50x 10g

Pack dimensions (LxWxH):	140 x 55 x 180	140 x 55 x 180	140 x 70 x 210	140 x 70 x 210
Inner packaging materials:	PE or PP sachet			
Outer packaging materials:	Cardboard + PE liner			
Ready-to-use (yes/no)	Yes			
Child safety features (yes/no):	No			
If yes, please specify:	N/A			
Shelf-life:	2 years			
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.			

Amateur product packaging: SACHETS

Container description:	Sachets			
Pack size(s):	200 g	250 g	480 g	500 g
Baits per pack:	20*10g	25*10g	48*10g	50*10g
Pack dimensions (LxWxH):	180 x 50 x 190	190 x 50 x 190	190 x 50 x 250	190 x 50 x 250
Inner packaging materials:	PE or PP sachet			
Outer packaging materials	PE	PE sachet (zip pouch)	PE	PE
Ready-to-use (yes/no)	Yes			
Child safety features (yes/no):	No			
If yes, please specify:	N/A			
Shelf-life:	2 years			
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.			

Amateur product packaging: PREBAITED BAIT STATIONS

Container description:	Pre-baited bait stations in cardboard outer		
Pack size(s):	10 g	20 g	60 g
Baits per pack:	1*10g	2*10g	6*10g
Pack dimensions (LxWxH):	135 x 43 x 80	135 x 43 x 80	240 x 105x x190
Packaging materials:	PP pre-baited station into Cardboard case		
Ready-to-use (yes/no)	Yes		
Child safety features (yes/no):	No		
If yes, please specify:	N/A		
Shelf-life:	2 years		
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.		

Professional product packaging

Professional Product packaging: Buckets

Container description:	Buckets				
Pack size(s):	1 kg	2 kg	2.5 kg	3 kg	4 kg
Baits per pack:	100*10g	200*10g	250*10g	300*10g	400*10g
Pack dimensions (LxWxH):	250 x 170 x 120	290 x 205 x 215	290 x 205 x 215	290 x 205 x 215	290 x 200 x 270
Inner Packaging materials:	PE or PP sachet or loose bait				
Outer Packaging materials:	PE or PP bucket				
Ready-to-use (yes/no)	Yes				
Child safety features (yes/no):	No				
If yes, please specify:	N/A				
Shelf-life:	2 years				

Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional Product packaging: Buckets

Container description:	Buckets				
Pack size(s):	5 kg	10 kg	15 kg	20 kg	25 kg
Baits per pack:	500*10g	1000*10g	1500*10g	2000*10g	2500*10g
Pack dimensions (LxWxH):	290 x 200 x 270	390 x 300 x 350	380 x 285 x 450	380 x 285 x 450	380 x 285 x 450
Inner Packaging materials:	PE or PP sachet or loose bait				
Outer Packaging materials:	PE or PP bucket				
Ready-to-use (yes/no)	Yes				
Child safety features (yes/no):	No				
If yes, please specify:	N/A				
Shelf-life:	2 years				
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.				

Professional product packaging: cardboard boxes

Container description:	Cardboard boxes					
Pack size(s):	3 kg	5 kg	10 kg	15 kg	20 kg	25 kg
Baits per pack:	300*10g	500*10g	1000*10g	1500*10g	2000*10g	2500*10g
Pack dimensions (LxWxH):	150 x 100 x 150	290 x 200 x 270	390 x 290 x 240	390 x 390 x 245	400 x 400 x 370	400 x 400 x 370
Inner Packaging materials:	PE or PP sachet or loose bait					
Outer Packaging materials:	Cardboard + PE liner					
Ready-to-use (yes/no)	Yes					
Child safety features (yes/no):	No					
If yes, please specify:	N/A					
Shelf-life:	2 years					
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.					

Professional product packaging: cardboard cases

Container description:	Cardboard cases				
Pack size(s):	50 g	100 g	120 g	200 g	240 g
Baits per pack:	5*10g	10*10g	12*10g	20*10g	24*10g
Pack dimensions (LxWxH):	70 x 50 x 105	100 x 48 x 160	100 x 48 x 160	140 x 55 x 190	140 x 55 x 190
Inner Packaging materials:	PE or PP sachet or loose bait				
Packaging materials:	Cardboard + PE liner				
Ready-to-use (yes/no)	Yes				

Child safety features (yes/no):	No
If yes, please specify:	N/A
Shelf-life:	2 years
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional product packaging: cardboard cases

Container description:	Cardboard cases				
Pack size(s):	250g	480g	500g	520g	720g
Baits per pack:	25*10g	48*10g	50*10g	52*10g	72*10g
Pack dimensions (LxWxH):	140 x 55 x 190	140 x 70 x 210	140 x 70 x 210	140 x 70 x 210	183 x 72 x 263
Inner Packaging materials:	PE + PP sachet or loose bait				
Packaging materials:	Cardboard + PE liner				
Ready-to-use (yes/no)	Yes				
Child safety features (yes/no):	No				
If yes, please specify:	N/A				
Shelf-life:	2 years				
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.				

Professional product packaging: cardboard cases

Container description:	Cardboard cases		
Pack size(s):	750 g	1 kg	2 kg
Baits per pack:	75*10g	100*10g	200*10g
Pack dimensions (LxWxH):	183 x 72 x 263	183 x 72 x 263	320 x 210 x 170
Inner Packaging materials:	PE + PP sachet or loose bait		
Packaging materials:	Cardboard + PE liner		
Ready-to-use (yes/no)	Yes		
Child safety features (yes/no):	No		
If yes, please specify:	N/A		
Shelf-life:	2 years		
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.		

Professional product packaging: Zip pouch

Container description:	Zip pouch
Pack size(s):	250 g
Baits per pack:	25*10g
Pack dimensions (LxWxH):	195 x 150 x 40
Outer packaging materials:	PE + PP sachet or loose bait
Inner packaging materials:	PE sachet (zip pouch)
Ready-to-use (yes/no)	Yes
Child safety features (yes/no):	No
If yes, please specify:	N/A
Shelf-life:	2 years

Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional product packaging: Prebaited bait stations

Container description:	Prebaited bait stations	
Pack size(s):	240 g	480 g
Baits per pack:	24*10g	48*10g
Pack dimensions (LxWxH):	240 x 115 x 190	240 x 115 x 190
Outer packaging materials:	cardboard case	
Inner packaging materials:	PP + PP pre-baited station	
Ready-to-use (yes/no)	Yes	
Child safety features (yes/no):	No	
If yes, please specify:	N/A	
Shelf-life:	2 years	
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.	

Container materials[18]: Case – cardboard with PE liner

Bag – PE

Sachets – PE + PP

Pre-baited bait stations – PP

Bucket – PP or PE

Box – Cardboard with PE liner

18 PP = polypropylene, PS = polystyrene, PE = polyethylene, HDPE = high-density polyethylene, PVC = polyvinylchloride

Safety features:	Covered bait stations (tamper resistant)
	Wrapped bait (sachets)

3. Summary of the product assessment

3.1. Physico/chemical properties and analytical methods

Active substance (taken from the Activa/PelGar Brodifacoum and Difenacoum Task Force CAR):
Brodifacoum is an off-white powder at 20°C and atmospheric pressure, with a relative density of 1.53. It was observed to darken and decompose at 235.8°C, whereas no decomposition or transformation occurred below 150°C. Brodifacoum is non-volatile, with a Henry's Law Constant value of 2.35E-18 $Pa.m^3.mol^{-1}$. It is essentially insoluble in water at pH 5, but its solubility proved to increase with pH, due to the variation of the ionisation degree of the 4-*hydroxycoumarin* group in pH range under investigation (5-9). Brodifacoum also turned out to be soluble in organic solvents; results showed that solubility did not vary with temperature, except for dichloromethane.

Brodifacoum dissociation constant was estimated to be 4.50. Log P_{ow} was found to be 4.92 at pH 7 and 20°C. As expected, Log P_{ow} decreased with higher temperature and pH. Brodifacoum is not highly flammable. Besides, it does not show explosive or oxidising properties. Reaction with container materials (mild steel) has not been observed, either. All results considered, it can be concluded that Brodifacoum does not exhibit hazardous physical-chemical properties.

Biocidal product:
Saphir Paste is not explosive, oxidising or highly flammable and therefore does not classify from a physical and chemical point of view. The paste bait is stable when stored for 2 weeks at 54°C and when stored at ambient temperatures (20°C) for 1 year. The paste bait is stable when stored in various different packaging materials (with the exception of the coextruded bag with cardboard box) for 1 year at ambient temperature (20°C). The test item is a ready-to-use paste bait and is not intended to be added or mixed with any other product.

3.1.1. Identity related issues

An equivalence check was carried out by Italy that showed that the PelGar source of Brodifacoum active substance was equivalent to the source of Brodifacoum active substance listed in Annex I of 98/8/EC (see Annex I: Confidential Information and Data).

Composition of the biocidal product Saphir Paste

Component	% w/w	g/kg	Chemical name	CAS no	Function
Brodifacoum	0.005	0.05	3-[3-(4'-bromobiphenyl-4-yl)-1,2,3,4-tetrahydro-1-naphthyl]-4-hydroxycoumarin	56073-10-0	Active substance
Co-formulants	See Confidential Data and Information (Annex I)				

Note: The biocidal product Saphir Paste is not the same as the representative biocidal product accompanying the Annex I inclusion. See confidential information and data for details of the composition of Saphir Paste.

3.1.2. Physico-chemical properties

LODI S.A.S. have a letter of access from PelGar International Limited which covers the all the data for the Annex I listing of the active ingredient Brodifacoum. PelGar International Limited is a member of the Activa/PelGar Difenacoum and Brodifacoum Task Force and as such has access to the complete

Annex I listing documentation submitted by this group. LODI do not have access to any of PelGar's product studies (Annex III) data for the purpose of product authorisation at the Member State level.

3.1.3. Physical, Chemical and Technical Properties of the Biocidal Product

Summary of the Physical and Chemical Properties of the Biocidal Product Saphir Paste

Section	Study	Method	Results	Comment	Reference
1.1	Appearance	Observation.	Aspect: Malleable blue paste in individual sachet Colour: 2.5PB5/6 Odour: No characteristic odour	Carried out to GLP. The results are acceptable.	"Chemical stability of Brodifacoum paste bait after accelerated storage". Study no. LODI.59/2011. 15th November 2011. Richerioux, Sandra.
1.2.1	Explosive properties	Justification (examination of the components of the formulation)	"Based on the structural formula of the components, Brodifacoum paste bait has no potential of explosivity and the test according to OECD A14 method is not required."	Carried out to GLP. The components do not contain any group that might act as an explosive agent. The RefMS accepts the Applicant's justification. Saphir Paste is not explosive.	"Explosive properties of Brodifacoum paste bait". Study no. LODI.66/2011. 25th September 2011. Richerioux, Sandra.
1.2.2	Oxidising properties	Justification (examination of the components of the formulation)	"Based on the structural formula of the components, the product have no potential for oxidising properties and the test according to OECD A17 method is not required."	Carried out to GLP. The components do not contain any group that might act as an oxidising agent. The RefMS accepts the Applicant's justification. Saphir Paste is not oxidising.	"Oxidising properties of Brodifacoum paste bait". Study no. LODI.65/2011. 8th November 2011. Richerioux, Sandra.
1.3.1	Flash point			Not required. The test item is not a liquid.	
1.3.2	Flammability	EEC method A 10	Preliminary test: The flame of a gas burner ignited the test substance pile. The test substance glowed, burned with a little flame and turned into a charred residue. A light white smoke was observed. After removal of the ignition source, the flame doesn't spread and extinguished immediately. No more propagation of combustion was observed.	Carried out to GLP. Propagation of combustion of the test item is less than 200mm length of the pile within 4 minutes. Therefore, the main test is not required. The test item is not highly	"Flammability of Brodifacoum paste bait". Study no. LODI.58/2011. 27th June 2011. Meriadec, Elodie.

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td></td><td>flammable.</td><td></td></tr>
<tr><td>1.3.3</td><td>Auto-flammability</td><td>EEC method A 16.</td><td>No self ignition temperature of the test item was recorded up to 400^{o}C (corrected value).</td><td>Carried out to GLP. The result is acceptable.
The test item is not auto-flammable.</td><td>“Self ignition temperature of solids on Brodifacoum paste bait”. Report no. 11-912011-010. 23rd January 2012. Demangel, Benjamin.</td></tr>
<tr><td>1.4.1</td><td>Free acidity/ Alkalinity</td><td></td><td>Determination is not required because pH of a 1% (m/v) aqueous dilution of Brodifacoum Paste Bait is >4 and < 10 (FAO guideline).</td><td>Not required.</td><td></td></tr>
<tr><td>1.4.2</td><td>pH (1 %)</td><td>CIPAC MT 75.3</td><td>The pH in distilled water is 6.3 after 10 minutes.</td><td>Carried out to GLP. The result is acceptable.</td><td>“pH of Brodifacoum paste bait”. Study no. LODI.64/2011. 7th October 2011. Richerioux, Sandra.</td></tr>
<tr><td>1.5.1</td><td>Viscosity</td><td></td><td></td><td>Not applicable as the product is a ready to use paste.</td><td></td></tr>
<tr><td>1.5.2</td><td>Surface tension</td><td></td><td></td><td>Not applicable as the product is a ready to use paste.</td><td></td></tr>
<tr><td>1.6</td><td>Relative density</td><td>OECD 109 and NF T20-053 method.</td><td>1.142</td><td>Carried out to GLP. A pycnometer was used to determine the relative density. The result is acceptable.</td><td>“Relative density of Brodifacoum paste bait”. Study no. LODI.52/2011. 9th September 2011. Richerioux, Sandra.</td></tr>
<tr><td>1.7.1</td><td>Storage stability
(accelerated storage)</td><td>CIPAC MT 46.
GIFAP Monograph no.17</td><td>Aspect:
<table><tr><th></th><th>Aspect</th><th>Colour</th><th>Odour</th></tr><tr><td>T_0</td><td>Malleable blue paste in individual sachet</td><td>2.5PB5/6</td><td>No characteristic odour</td></tr><tr><td>T_{14days}</td><td>Still malleable blue</td><td>10B4/4</td><td>No</td></tr></table></td><td>Carried out to GLP. The test item is stable for 2 and 3 weeks at 54^{o}C. The results indicate that the test item will be stable for 2 and 3 years at ambient temperatures. The results are acceptable.</td><td>“Chemical stability of Brodifacoum paste bait after accelerated storage”. Study no. LODI.59/2011. 15th November 2011. Richerioux, Sandra.</td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td></td><td>paste but slightly friable, in individual sachet</td><td></td><td>characteristic odour</td></tr>
<tr><td>T_{21days}</td><td>Still malleable blue paste but slightly friable, in individual sachet</td><td>10B4/4</td><td>No characteristic odour</td></tr>
</table>
Active substance content:
<table>
<tr><th></th><th>Concentration (ppm)</th><th>Deviation with declared value (%)</th><th>Deviation between T_0 and T_{14} and T_{21} (%)</th></tr>
<tr><td>T_0</td><td>45.12</td><td>+12.80</td><td>-</td></tr>
<tr><td>T_{14days}</td><td>43.62</td><td>+9.05</td><td>-3.32</td></tr>
<tr><td>T_{21days}</td><td>42.64</td><td>+6.60</td><td>-5.50</td></tr>
</table>
The declared active substance content was 40 ppm.
</td><td></td><td></td></tr>
<tr><td>1.7.2</td><td>Shelf life (storage ambient temperatures)</td><td>GIFAP Monograph no.17.</td><td>
Aspect:
T_0 = Malleable blue paste in individual bag
$T_{6months}$ = Malleable blue paste in individual bag
T_{1year} = Malleable blue paste in individual bag

Colour:
T_0 = 2.5PB5/6
$T_{6months}$ = 2.5PB5/6
T_{1year} = 2.5PB5/6

Odour:
T_0 = No characteristic odour
$T_{6months}$ = No characteristic odour
T_{1year} = No characteristic odour
</td><td>Carried out to GLP. Carried out at $20^oC \pm 2^oC$. The paste bait is stable for 1 year storage at ambient temperatures. The results are acceptable.</td><td>“Chemical stability of Brodifacoum Paste Bait after 1 year storage at 20^oC.” Study no. LODI.60/2011. 26th October 2012. Richerioux, Sandra.</td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
Active substance content:
<table>
<tr><th></th><th>Conc. (ppm)</th><th>Deviation with declared value (%)</th><th>Deviation between T_0 and T_x (%)</th></tr>
<tr><td>T_0</td><td>45.1</td><td>+12.75</td><td>-</td></tr>
<tr><td>T_{6month}</td><td>41.7</td><td>+4.25</td><td>-7.54</td></tr>
<tr><td>T_{1year}</td><td>41.6</td><td>+4.00</td><td>-7.76</td></tr>
</table>
The declared value is 40 ppm.
</td><td></td><td></td></tr>
<tr><td>1.7.3</td><td>Packaging stability
(20°C)</td><td></td><td>
Physical properties (for all types of packaging):
T_0 = Blue and malleable paste in individual bag. Presence of grease on individual bag.
$T_{6months}$ = Blue and malleable paste in individual bag. Presence of grease on individual bag.
T_{1year} = Blue and malleable paste in individual bag. Presence of grease on individual bag.

PP Bucket:
<table>
<tr><th></th><th colspan="3">Weight</th></tr>
<tr><th></th><th>Bucket (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
<tr><td>T_0</td><td>44.134</td><td>293.21</td><td>337.35</td></tr>
<tr><td>$T_{6months}$</td><td>44.428</td><td>292.67</td><td>337.11</td></tr>
<tr><td>Deviation</td><td>0.67%</td><td>-0.18%</td><td>-0.07%</td></tr>
<tr><td>T_{1year}</td><td>44.436</td><td>291.58</td><td>336.01</td></tr>
<tr><td>Deviation</td><td>0.68%</td><td>-0.56%</td><td>-0.40%</td></tr>
</table>
T_0 = Bucket with white and non-porous internal wall
$T_{6months}$ = Bucket with white and non-porous internal wall. Presence of grease on internal wall of the bucket
T_{1year} = Bucket with white and non-porous internal wall. Presence of grease on internal wall of the bucket

PE bag with cardboard box:
</td><td>
Carried out to GLP.
The deviation weights (packaging weights and test item weights) after 1 year at 20 ± 2°C are lower than 5% for the following packaging: PP bucket, PP and PE bag with cardboard box, Doypack, PS and PP prebaited baitbox. Moreover, no significant changes were observed on these packaging and on the test item.
For the coextruded bag with cardboard box, the deviation weight is higher than 5% (-8.29%) and grease was observed at the bottom of the box.
The packaging is stable for 1 year at ambient temperature with the exception of the coextruded bag with cardboard box.
The results are acceptable.
</td><td>
“Chemical and packagings stability of Brodifacoum paste bait after 3 years storage at 20°C (Analysis at T = 1year)”. Study no. LODI.62/2011.B. 30th October 2012. Richerioux, Sandra.
</td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><th></th><th colspan="4">Weight</th></tr>
<tr><th></th><th>PE bag (g)</th><th>Cardboard box (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
<tr><td>T_0</td><td>3.420</td><td>23.410</td><td>122.75</td><td>149.57</td></tr>
<tr><td>$T_{6months}$</td><td>3.512</td><td>23.690</td><td>120.47</td><td>147.64</td></tr>
<tr><td>Deviation</td><td>2.69%</td><td>1.20%</td><td>-1.86%</td><td>-1.29%</td></tr>
<tr><td>T_{1year}</td><td>3.484</td><td>23.998</td><td>121.18</td><td>148.66</td></tr>
<tr><td>Deviation</td><td>1.87%</td><td>2.51%</td><td>-1.28%</td><td>-0.61%</td></tr>
</table>
T_0 = Transparent bag without hole – cardboard box with grey and dry internal wall
$T_{6months}$ = Transparent bag, without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.
T_{1year} = Transparent bag, without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

PP bag with cardboard box:
<table>
<tr><th></th><th colspan="4">Weight</th></tr>
<tr><th></th><th>PP bag (g)</th><th>Cardboard box (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
<tr><td>T_0</td><td>6.972</td><td>23.503</td><td>111.36</td><td>141.83</td></tr>
<tr><td>$T_{6months}$</td><td>7.042</td><td>23.776</td><td>110.18</td><td>141.01</td></tr>
<tr><td>Deviation</td><td>1.00%</td><td>1.16%</td><td>-1.06%</td><td>-0.58%</td></tr>
<tr><td>T_{1year}</td><td>7.037</td><td>24.094</td><td>110.22</td><td>141.36</td></tr>
<tr><td>Deviation</td><td>0.93%</td><td>2.51%</td><td>-1.02%</td><td>-0.33%</td></tr>
</table>
T_0 = Transparent bag with one hole – cardboard box with grey and dry internal wall
$T_{6months}$ = Transparent bag with one hole. Presence of grease within bag – cardboard box with grey and dry internal wall.
T_{1year} = Transparent bag with one hole. Presence of grease within bag – cardboard box with grey and dry internal wall.
</td><td></td><td></td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
Coextruded bag with cardboard box:
<table>
<tr><th></th><th colspan="4">Weight</th></tr>
<tr><th></th><th>Coextruded bag (g)</th><th>Cardboard box (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
<tr><td>T_0</td><td>5.016</td><td>23.386</td><td>82.638</td><td>111.04</td></tr>
<tr><td>$T_{6months}$</td><td>4.600</td><td>23.950</td><td>79.887</td><td>108.91</td></tr>
<tr><td>Deviation</td><td>-8.29%</td><td>2.41%</td><td>-3.33%</td><td>-1.92%</td></tr>
<tr><td>T_{1year}</td><td>4.652</td><td>24.269</td><td>80.954</td><td>110.20</td></tr>
<tr><td>Deviation</td><td>-7.76%</td><td>3.78%</td><td>-2.04%</td><td>-0.76%</td></tr>
</table>
T_0 = Transparent and non-porous bag without hole – cardboard box with grey and dry internal wall
$T_{6months}$ = Transparent and non-porous bag without hole. Presence of grease within bag – cardboard box with grey internal wall. Presence of grease at the bottom of the box.
T_{1year} = Transparent and non-porous bag without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

Doypack:
<table>
<tr><th></th><th colspan="3">Weight</th></tr>
<tr><th></th><th>Doypack (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
<tr><td>T_0</td><td>11.803</td><td>154.86</td><td>166.66</td></tr>
<tr><td>$T_{6months}$</td><td>12.118</td><td>154.21</td><td>166.33</td></tr>
<tr><td>Deviation</td><td>2.67%</td><td>-0.42%</td><td>-0.20%</td></tr>
<tr><td>T_{1year}</td><td>12.126</td><td>154.15</td><td>166.27</td></tr>
<tr><td>Deviation</td><td>2.74%</td><td>-0.46%</td><td>-0.23%</td></tr>
</table>
T_0 = Internal wall in aluminium, without porosity and hole
$T_{6months}$ = Internal wall in aluminium, without porosity and hole. Presence of grease on internal wall of the doypack
T_{1year} = Internal wall in aluminium, without porosity and hole. Presence of grease on internal wall of the doypack
</td><td></td><td></td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
PP prebaited baitbox:
<table>
<tr><td></td><td colspan="4">Weight (g)</td></tr>
<tr><td></td><td>Bait station</td><td>Sample 1</td><td>Sample 2</td><td>Total</td></tr>
<tr><td>T_0</td><td>47.465</td><td>10.942</td><td>10.177</td><td>68.583</td></tr>
<tr><td>$T_{6months}$</td><td>47.725</td><td>10.616</td><td>9.849</td><td>68.191</td></tr>
<tr><td>Deviation</td><td>0.55%</td><td>-2.98%</td><td>-3.22%</td><td>-0.57%</td></tr>
<tr><td>T_{1year}</td><td>47.735</td><td>10.770</td><td>9.980</td><td>68.487</td></tr>
<tr><td>Deviation</td><td>0.57%</td><td>-1.57%</td><td>-1.94%</td><td>-0.14%</td></tr>
</table>
T_0 = Black box with smooth internal wall, without porosity.
$T_{6months}$ = Black box with smooth internal wall, without porosity. Presence of grease at the location of the paste.
T_{1year} = Black box with smooth internal wall, without porosity. Presence of grease at the location of the paste.

PS prebaited baitbox:
<table>
<tr><td></td><td colspan="4">Weight (g)</td></tr>
<tr><td></td><td>Bait station</td><td>Sample 1</td><td>Sample 2</td><td>Total</td></tr>
<tr><td>T_0</td><td>11.992</td><td>10.258</td><td>10.374</td><td>32.625</td></tr>
<tr><td>$T_{6months}$</td><td>12.259</td><td>9.955</td><td>10.047</td><td>32.263</td></tr>
<tr><td>Deviation</td><td>2.23%</td><td>-2.95%</td><td>-3.15%</td><td>-1.11%</td></tr>
<tr><td>$T_{6months}$</td><td>12.268</td><td>10.072</td><td>10.215</td><td>32.559</td></tr>
<tr><td>Deviation</td><td>2.30%</td><td>-1.81%</td><td>-1.53%</td><td>-0.20%</td></tr>
</table>
T_0 = Black box with smooth internal wall at the location of the paste
$T_{6months}$ = Black box with smooth internal wall at the location of the paste. Presence of grease at location of the paste.
T_{1year} = Black box with smooth internal wall at the location of the paste. Presence of grease at location of the paste.
</td><td></td><td></td></tr>
<tr><td>1.8.1</td><td>Wettability</td><td></td><td></td><td>Not applicable as the product is a ready to use paste.</td><td></td></tr>
</table>

Section	Study	Method	Results	Comment	Reference
1.8.2	Persistent foaming			Not applicable as the product is a ready to use paste.	
1.8.3.1	Suspensibility			Not applicable as the product is a ready to use paste.	
1.8.3.2	Dispersibility			Not applicable as the product is a ready to use paste.	
1.8.4	Wet/dry sieving test			Not applicable as the product is a ready to use paste.	
1.8.5	Particle size distribution			Not applicable as the product is a ready to use paste.	
1.8.6	Water content			Not applicable as the product is a ready to use paste.	
1.8.7	Emulsion stability			Not applicable as the product is a ready to use paste.	
1.8.8	Flowability, pourability and dustability			Not applicable as the product is a ready to use paste.	
1.9	Physical compatibility			Not applicable. The product is ready-to-use. It is not intended to be mixed with any other product.	

Conclusions:

Saphir Paste is not explosive, oxidising or highly flammable and therefore does not classify from a physical and chemical point of view. The paste bait is stable when stored for 2 weeks at 54^{o}C and when stored at ambient temperatures (20^{o}C) for 1 year. The paste bait is stable when stored in various different packaging materials (with the exception of the coextruded bag with cardboard box) for 1 year at ambient temperature (20^{o}C). The test item is a ready-to-use paste bait and is not intended to be added or mixed with any other product.

Data requirements:

1. The 2 year storage stability results will be available in *week 43, 2013 approximately* and will be submitted to PRCD when available.
2. The provisional dates for the submission of the packaging stability data are T = 2 years: 2013, week 45 and T = 3 years: 2014, week 45.

The paste bait is compatible with the following packaging:

PP bucket, PP and PE bag with cardboard box, Doypack, PS and PP prebaited baitbox.

The paste bait is incompatible with the following packaging:

Coextruded bag with cardboard box.

Proposed shelf life for the grain bait:

2-years (based on accelerated storage stability data).

3.1.4. Analytical methods

Saphir Paste was not assessed as part of the Annex I inclusion process therefore the Applicant has submitted the following method of analysis to cover the outstanding data gap.

<table>
<tr><td>Report:</td><td>LODI.51/2011</td></tr>
<tr><td>Title:</td><td>“Brodifacoum paste bait, Brodifacoum grain bait”</td></tr>
<tr><td>Author(s):</td><td>Richerioux, Sandra.</td></tr>
<tr><td>Date:</td><td>23rd January 2012</td></tr>
<tr><td>GLP: Yes/No</td><td>Yes</td></tr>
<tr><td>Principle of the Method:</td><td>Brodifacoum was quantified by liquid chromatography using a reverse phase column and a UV detector at 310 nm.</td></tr>
<tr><td>Linearity:</td><td>The operator prepared five solutions containing 80%, 90%, 100%, 110% and 120% of the concentration of the test item. Three injections were carried out for each solution. The concentrations used were 1.61, 1.81, 2.01, 2.21 and 2.41 mg/L.
For Brodifacoum peak 1 the r^2 was 0.9949. A calibration curve was provided and was linear.
For Brodifacoum peak 2 the r^2 was 0.9923. A calibration curve was provided and was linear.</td></tr>
<tr><td>Precision/repeatability:</td><td>Three solutions were prepared of a concentration C (~ 2.00586 mg/l) of the product. Three injections of each solution were carried out and the RSD was calculated.

Intermediary fidelity (mg/l):
<table>
<tr><th></th><th>1st Injection</th><th>2nd Injection</th><th>3rd Injection</th></tr>
<tr><td>Solution a</td><td>2.23</td><td>2.21</td><td>2.25</td></tr>
<tr><td>Solution b</td><td>2.25</td><td>2.19</td><td>2.25</td></tr>
<tr><td>Solution c</td><td>2.26</td><td>2.21</td><td>2.22</td></tr>
</table>
% RSD = 0.949

Intralaboratory fidelity (mg/l):
<table>
<tr><th></th><th>1st Injection</th><th>2nd Injection</th><th>3rd Injection</th></tr>
<tr><td>Solution a</td><td>2.21</td><td>2.28</td><td>2.23</td></tr>
<tr><td>Solution b</td><td>2.25</td><td>2.19</td><td>2.25</td></tr>
<tr><td>Solution c</td><td>2.26</td><td>2.21</td><td>2.22</td></tr>
</table>
% RSD = 1.188</td></tr>
<tr><td>Accuracy:</td><td>Recovery results:
<table>
<tr><td>Paste bait</td><th>50% doped placebo</th><th>100% doped placebo</th><th>150% doped placebo</th><th>Overall MR</th></tr>
<tr><td>Theoretical content (ppm)</td><td>22.38</td><td>41.12</td><td>59.06</td><td rowspan="2">99.28%</td></tr>
<tr><td>Experimental content (ppm) – mean of 3 injections</td><td>23.98</td><td>40.68</td><td>54.20</td></tr>
</table></td></tr>
</table>

	<table><tr><td>Mean recovery (MR)</td><td>107.15%</td><td>98.93%</td><td>91.77%</td><td></td></tr></table> The operator doped a placebo with 50, 100 and 150% of the theoretical concentration of test item. Three injections were carried out per solution. The mean recovery (MR) was calculated for each solution.
Specificity:	The operator injected a placebo. If an adjacent peak appeared, the resolution must be higher than 2. The operator then stresses the sample by adding 5 ml of acetic acid and injects the solution. If a peak appeared, the resolution must be higher than 2. No peak other than internal standard was found for the placebo paste. No peak appeared for the paste bait that was stressed with acetic acid. Chromatograms were provided and were acceptable.
Limit of detection:	The operator injected a solution containing 10 ppm of active substance and calculated the ratio S/N between the intensity of the peak and the intensity of the background noise. The operator divided by 10 then by 2 the concentration of the active substance until obtaining a ratio lower than 3. The LOD is the last concentration for which S/N is higher than 3. LOD = 0.1254 ppm
Limit of quantification:	The operator injected a solution containing 50 ppm of active substance and calculated the ratio S/N between the intensity of the peak and the intensity of the background noise. The operator divided by 10 then by 2 the concentration of the active substance to obtain a ratio lower than 10. The LOQ is the last concentration for which S/N is higher than 10. LOQ = 0.6270 ppm

Conclusion:
The method is acceptable for the determination of Brodifacoum in the paste bait.

Data requirements:
None.

3.1.5. Analytical method for the relevant impurities, isomers and co-formulants in the biocidal product

Not applicable.

3.2. Efficacy of the Biocidal Product

3.2.1. Function/Field of use
PT14: Rodenticide

3.2.2. Organisms to be controlled
Saphir Paste (containing 40 mg/kg brodifacoum) is a ready-to-use paste bait (RB) intended to control the brown rat (*Rattus norvegicus*) and the house mouse mice (*Mus musculus*). Lodi has proposed the use area as indoors and outdoors (in and around buildings, waste disposal sites, open areas) for the protection of public health stored products and materials. The use scenario encompassing waste disposal sites and open areas is intended for professional users only.
For rats, each bait point will contain 60g of bait; a mouse bait point will contain 10g bait. Bait points are placed typically every 5-10m (rats) or 2-5 m (mice) with the distances adapted to the infestation level.

Advice concerning application frequency should be included on the draft label.
The label should contain wording to the effect that effective control should be expected from bait stored up to two years under suitable storage conditions.

3.2.3. Dose/Mode of action
Anticoagulant rodenticides are vitamin K antagonists. The main site of their action is the liver, where several of the blood coagulation precursors undergo vitamin K dependent post translation processing before they are converted into the respective procoagulant zymogens. The specific point of action is thought to be the inhibition of K_1 epoxide reductase. The anticoagulants accumulate and are stored in the liver until broken down. The plasma prothrombin (procoagulant factor II) concentration provides a suitable guide to the severity of acute intoxication and to the effectiveness and required duration of the antidoting therapy (vitamin K_1).

3.2.4. Effects on the target organisms (efficacy)
Data from trials using the paste formulation were provided in the form of laboratory and field studies to verify the proposed label claims.

Laboratory palatability and efficacy studies:
One laboratory palatability and efficacy (choice) test conducted on rats (lab reared and wild) and wild mice with fresh bait.
One laboratory palatability and efficacy (choice) test conducted on rats and mice with fresh and aged bait (6, 12 & 24 month storage).
One laboratory palatability and efficacy (choice) test conducted on rats with bait with aged bait (accelerated storage).
One laboratory palatability and efficacy (choice) test conducted on mice with with aged bait (accelerated storage).

Field efficacy studies:
One field studies conducted on rats (*Rattus norvegicus*).
One field studies conducted on mice (*Mus musculus*).

The applicant provided the study reports from four laboratory studies conducted on Brodipasta which is equivalent to Saphir paste. The experiments were all choice studies conducted to high standard according to relevant in-house methods, CEB methods, EPPO guideline or in accordance with the TNsG on Product Evaluation Appendices to Chapter 7 - Product Type 14 - Efficacy Evaluation of Rodenticidal Biocidal Products endorsed at the 32nd meeting of representatives of Members States Competent Authorities.

The results from the studies are summarised in **Table 3.2**. The results achieved demonstrated that Saphir paste is palatable to the house mouse and the brown rat according to the criteria given in TNsG on Product Evaluation as the bait intake was greater than 20% of the total food consumption in all the studies. The storage treatment (even up to 24 month storage) was found not to adversely affect the

palatability or effectiveness of the product. The treated bait achieved 100% mortality across all the laboratory tests.

Results from two field studies using Saphir paste were also provided. The field trial programme demonstrated an overall efficacy based on post baiting consumption figures of 89.9% for the mouse field trial and efficacy of >95% for the brown rat field trial. The field trial programme demonstrated high effectiveness against wild populations of the brown rat (*Rattus norvegicus*) and for the mouse (*Mus musculus*) under normal use situations.

Table 3.2: Experimental data on the effectiveness of Saphir Paste containing 40 mg/kg brodifacoum.

Test organisms	Test system / Concentrations applied / exposure time	Test conditions	Test results: effects, mode of action, resistance	Reference
Norway rats (*Rattus norvegicus* Berkenhout). 10 wild animals. House mice (*Mus musculus* L.). 10 wild animals. Albino laboratory Norway rats (*Rattus norvegicus*) 22 animals (11 males and 11 females, 10 to 20 weeks old, including one control pair).	Laboratory test. Choice feeding test: fresh baits. 5-day pre-test control diet intake assessment and 21-day bait feeding period. During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 40 g of ground wheat grains and 45 g of the test item per day for rat and about 10 g of ground wheat grains and 15 g of the test item per day for mice) Brodipasta, equivalent to Saphir Paste, freshly manufactured	The animals were individually caged. The wild animals were acclimatised to test conditions for at least 3 weeks in order to discard pregnant females or sick individuals. The laboratory rats were acclimatised to test conditions for at least 5 days. Normal laboratory requirements.	The mean acceptance of the test item was 38.7% (s.d. 28.4%) for wild Norway rats, 43.4% (s.d. 9.5%) for wild house mice and 43.8% (s.d. 18.9%) for albino Norway rats. The efficacy was excellent. Mortality was total (100%) in all test groups after a 21-day choice between this test substance and the challenge diet. The mean time to death ranged from 3 to 19 days after the first intake of treated baits.	B5.10/01
Albino laboratory Norway rats (*Rattus norvegicus*) 22 animals (11 males and 11 females, 10 to 20 weeks old, including one control pair) for each test group. Laboratory House mice (*Mus musculus*) 22 animals (11 males and 11 females, including one control pair) for each test group.	Laboratory test. Choice feeding test: fresh and aged baits. 5-day pre-test control diet intake assessment and 21-day bait feeding period. During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 30 g of ground wheat grains, in competition with the test item) Brodipasta, equivalent to Saphir Paste, stored at 20°C for respectively 6, 12 and 24 months	The animals were individually caged. The laboratory rodents were acclimatised to test conditions for 8 days. Normal laboratory requirements.	For rats, the mean acceptance of the test item was 43.8% (s.d. 18.9%) for the fresh bait, 42.0% (s.d. 16.2%) for the 6-month aged bait, 33.7% (s.d. 13.0%) for the 12-month aged bait and 37.5% (s.d. 15.9%) for the 24-month aged bait. For mice, the mean acceptance of the test item was 46.9% (s.d. 15.1%) for the 12-month aged bait and 36.0% (s.d. 14.2%) for the 24-month aged bait. The efficacy was excellent. Mortality was total (100%) in all test groups after a 21-day choice between this test substance and the challenge diet. The mean time to death ranged from 3 to 20 days after the first intake of treated baits.	B5.10/02

Test organisms	Test system / Concentrations applied / exposure time	Test conditions	Test results: effects, mode of action, resistance	Reference
Norway rat (*Rattus norvegicus*). 20 animals (10 males, 10 females)	Laboratory test. Choice feeding test: fresh baits. 4-day pre-test control diet intake assessment, 4-day bait feeding period and 15-day control bait period. Unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during the pre-test period. During the 4-day test period, the quantity of food placed in each pot was sufficient to meet each animal's daily needs (approximately 50 g of aged rodenticide paste bait and approximately 50 g of challenged diet, in each corresponding pot) Brodifacoum paste bait, similar to Saphir Paste, aged for 3 weeks at 54°C	The animals were individually caged. Normal laboratory requirements: 20 - 24°C, a relative humidity range of 45% to 65%, with between 15 and 20 air changes per hour, and with a 12-hour light-dark cycle	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.9% (s.d. 9.89%). The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 4.7 days (3 to 7 days) after the first intake of treated baits.	B5.10/03
House mouse (*Mus musculus*). 20 animals (10 males, 10 females)	Laboratory test. Choice feeding test: fresh baits. 4-day pre-test control diet intake assessment, 4-day bait feeding period and 15-day control bait period. Unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during the pre-test period. During the 4-day test period, the quantity of food placed in each pot was sufficient to meet each animal's daily needs (approximately 10 g of aged rodenticide paste bait and approximately 20 g of challenged diet in each corresponding pot) Brodifacoum paste bait, similar to Saphir Paste, aged for 3 weeks at 54°C	The animals were individually caged. Normal laboratory requirements: 20 - 24°C, a relative humidity range of 45% to 65%, with between 15 and 20 air changes per hour, and with a 12-hour light-dark cycle	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.8% (s.d. 10.2%). The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 5.8 days (4 to 7 days) after the first intake of treated baits.	B5.10/04
Wild Norway Rats (*Rattus norvegicus*). At least 41 animals estimated by pre-treatment bait census	Field test carried out in a farm raising cows. After a pre-bait until the rats were feeding readily on the bait (25 days), baiting were carried out. The non-poisoned baits were replaced by the product to be tested for 10 days. At each day's treatment, the bait stations were emptied then refilled. Post-baiting (8 days) is done to assess the level of the survival rodent population. The quantity of food placed in each bait station was sufficient to meet each animal's daily needs (approximately 150 g of bait in each bait station). Brodifacoum paste 0.004%, equivalent to Saphir Paste	Natural conditions.	The efficacy measured was 95.18%. Dead rodents found during and after the baiting and the post-baiting phases were only *Rattus norvegicus.* The field assay showed a very good efficacy with a fast decrease of the population.	B5.10/05

Test organisms	Test system / Concentrations applied / exposure time	Test conditions	Test results: effects, mode of action, resistance	Reference
Wild house mouse (*Mus musculus*) At least 72 animals estimated by pre-treatment bait census	Field test carried out in a farm. After a pre-bait until the mice were feeding readily on the bait (31 days), baiting were carried out. The non-poisoned baits were replaced by the product to be tested for 8 days. At each day's treatment, the bait stations were emptied then refilled. Post-baiting (7 days) is done to assess the level of the survival rodent population. The quantity of food placed in each bait station was sufficient to meet each animal's daily needs (approximately 30 g of bait in each bait station). Brodifacoum paste 0.004%, equivalent to Saphir Paste	Natural conditions.	The efficacy measured was 89.9%. Dead rodents found during and after the baiting and the post-baiting phases were only *Mus musculus.* The field assay showed a very good efficacy with a fast decrease of the population.	B5.10/06

3.2.5. Known limitations (e.g. resistance)

Resistance is exclusively related to the active substance Brodifacoum and is discussed in Doc. II-A (please see Brodifacoum Assessment Report – 17/09/2009, revised 16/12/2010 and refer to Letter of Access from Pelgar International Limited). The resistance to Brodifacoum is not regarded as unacceptable and only few events are referred as “suspected” resistance to Brodifacoum products. In conclusion there is no reason to suspect a lack of efficacy of Brodifacoum-based products and it is possible to state that Brodifacoum is fully active against rodents' populations that developed resistance to Warfarin.

Where resistance to Brodifacoum is suspected or has been shown, resistant management strategies should be employed and products containing an alternative active substance should be used or a professional pest control operator be consulted.

Moreover, the following measures from Codes of Good Practice in Rodent control[19] (EPPO standards - Guidelines on Good Plant Protection Practice – Rodent control for crop protection and on farms- PP 2/5) are recommended and usually respected by the applicators:
- The population size of the target rodent should be evaluated before a control campaign. The number of baits and the timing of the control campaign should be in proportion to the size of the infestation.
- A complete elimination of rodents in the infested area should be achieved.
- The use instruction of products should contain guidance on resistance management for rodenticides.
- Resistant management strategies should be developed, and Brodifacoum should not be used in an area where resistance to this substance is suspected.
- The authorisation holder shall report any observed resistance incidents to the Competent Authorities or other appointed bodies involved in resistance management.
- When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary or secondary poisoning by the anticoagulant as well as indicating the first measures to be taken in case of poisoning must be made available alongside the baits.

In addition, the IE CA recommends the following in relation to resistance management:
The immediate aim of resistance management is to prevent or retard the development of resistance to a given anticoagulant while, as far as is not counterproductive, permitting its continued use. The ultimate aim is to reduce or eliminate the adverse consequences of resistance.

CropLife International has published a strategy for resistant management of rodenticides (RRAC 2003). The habitat management is addressed in the strategy in addition to chemical control. The access of rodents should be restricted by physical barriers and no food should be available for

19 EPPO standards - Guidelines on Good Plant Protection Practice – Rodent control for crop protection and on farms- PP 2/5

rodents. Rotation between different anticoagulants is not a reliable means of managing the anticoagulant resistance, as all anticoagulants have the same mode of action and the nature of resistance is also similar. The resistant individuals can be identified by conducting a blood clotting response (BCR) test (Gill et al. 1993, RRAC 2003).

Resistance management strategies

The immediate aim of resistance management is to prevent or retard the development of resistance to a given anticoagulant while, as far as is not counterproductive, permitting its continued use.

To this extent the applicant suggests the following measures to aid in the prevention of resistance:

- Maximum use of non-chemical control techniques.
- Preferential use of rodenticides and formulations to which resistance rarely develops.
- Ensure the complete eradication of the target population whenever a rodenticide is used.
- Avoid the use of first generation anticoagulants, to which resistance develops relatively easily.
- Maintain uncontrolled, susceptible populations in refugia from which emigration can occur.

It is recommended that the label states that any instances of resistance are referred to the manufacturer of the a.s.

In order to prevent the development and spreading of resistance, some resistance management strategies measures such as those from the Codes of Good Practices in rodent control are recommended:

- The population size of the target rodent should be evaluated before a control campaign. The number of baits and the timing of the control campaign should be in proportion to the infestation level.
- A complete elimination of rodents in the infested area should be achieved.
- The use instruction of products should contain guidance on resistance management for rodenticides.
- The authorisation holder shall report any observed resistance incident to the Competent Authorities or other appointed bodies involved in resistance management.

The proposed labels contain detailed instructions for use.

- The population size of the target rodent should be evaluated before a control campaign.
- The number of baits and the timing of the control campaign must be in proportion to the infestation level.
- Baits must be placed in a safe manner inaccessible to children and non-target species and not be applied to areas where food/feed, food utensils or food processing surfaces may come into contact with, or be contaminated by the product.
- Bait consumption should be regularly checked and consumed or spoilt bait replaced until consumption has stopped. The remaining baits and material must be removed and disposed of safely at the end of the treatment according to local/national wastes disposal regulation.
- Water must not be contaminated with the product or its container.
- The rodents' bodies all along the treatment must be disposed of according to local/national regulation.

In addition to the above applicant and label recommendations the RMS advocates the adoption of the following advice to avoid the development of resistance in susceptible rodent populations.

Details of treatment should be recorded.

- Apply effective Integrated Pest Management measures (remove alternative food sources, remove water sources, remove harbourage and proof susceptible areas against rodent access).
- Inspected baiting points weekly and replace old bait where necessary.
- Do not routinely use anticoagulant rodenticides as permanent baits. Use permanent baits only where there is a clear and identified risk of immigration or introduction or where protection is afforded to high-risk areas. (The RMS view is that routine use of anticoagulant baits should not be recommended in above described situations.) .
- Where rodent activity persists due to problems other than resistance, use alternative baits or baiting strategies, extend the baiting programme or apply alternative control techniques to eliminate the residual infestation (acute or sub-acute rodenticides, gassing or trapping).

Treatment of rodent infestations containing resistant individuals

- Where rodent infestations containing resistant individuals are identified, immediately use an alternative anticoagulant of higher potency. If in doubt, seek expert advice on the local circumstances.
- Alternatively use an acute or sub-acute but non-anticoagulant rodenticide.
- In both cases it is essential that complete elimination of the rodent population is achieved. Where residual activity is identified apply intensive trapping to eliminate remaining rodents. Gassing or fumigation may be useful in specific situations.
- Apply thorough Integrated Pest Management procedures (environmental hygiene, proofing and exclusion).

Application of area or block rodent control to eliminate resistance

- Where individual infestations are found to be resistant or contain resistant individuals it is possible that the resistance extends further to neighbouring properties.
- Where there are indications that resistance may be more extensive than a single infestation, apply area or block control rodent programmes.
- The area under such management should extend at least to the boundaries of the area known resistance and ideally beyond.
- These programmes must be effectively coordinated and should encompass the procedures identified above.

3.2.6. Humaneness

The use of Brodifacoum as a rodenticide could cause suffering of vertebrate target organisms. The use of anti-coagulant rodenticides is necessary as there are at present no other valuable measures available to control the rodent population in the European Union. Rodent control is needed to prevent disease transmission, contamination of food and feeding stuffs and structural damage. It is recognised that such substances do cause pain in rodents but it is considered that this is not in conflict with the requirements of Article 5.1 of Directive 98/8/EC ‘to avoid unnecessary pain and suffering of vertebrates’, as long as effective, but comparable less painful alternative biocidal substances or biocidal products or even non-biocidal alternatives are not available.

Conclusion:

The IE CA considers that the palatability and efficacy data provided is adequate to support the recommendation for the use of the product against rats and mice, even when stored for up to two years.
The treatment frequency is 2-4 applications per year, 3-6 months apart, when re-infestation occurs.

Issues identified:

Advice concerning application frequency should be included on the draft label.
The label should contain wording to the effect that effective control should be expected from bait stored up to two years under suitable storage conditions.

3.3 Biocidal Product Risk Assessment (Human Health and the Environment)

3.3.1 Description of the intended use(s)

The product is a paste rodenticide. It is a ready-to-use paste or pasta which contains 50 ppm (0.005% w/w) brodifacoum (56073-10-0) used by professional and amateur users. The bait is used in and around buildings and in sewer systems. The target organisms to be controlled are Brown rat, Roof rat or House rat, House mouse and Field mouse.

3.3.2 Hazard Assessment for Human Health

No new exposure studies have been submitted for evaluation. Signs of poisoning in rodents and other mammals are those associated with an increased tendency to bleed, leading ultimately to profuse haemorrhage. Non-target organisms are most at risk from secondary poisoning, i.e. consumption of rodent carcasses by predators such as raptors.

3.3.2.1 Toxicology of the active substance

Brodifacoum is a second-generation single-dose anticoagulant rodenticide. It disrupts the normal blood clotting mechanisms resulting in increased bleeding tendency and, eventually, profuse haemorrhage and death. Like all anticoagulant rodenticides, brodifacoum is structurally similar to vitamin K. Blood forms a clot at the site of injury by virtue of a complicated 'clotting cascade', involving numerous clotting factors. The clotting factors are made in the liver as inactive precursors, converted to active form and allowed to circulate in the bloodstream. Vitamin K is employed in the liver in the activation process, and is used in a continuous cyclic process involving several enzymes. The anticoagulant rodenticides block these enzymes, preventing regeneration of the vitamin K and preventing activation of the clotting factors.

Brodifacoum requires labelling with the symbol T+ and the risk phrases R 28 'Very toxic if swallowed'; R27 'Very toxic in contact with the skin' and R26 'Very toxic by inhalation'. Brodifacoum is not classified as a skin irritant or eye irritant.

Repeated dosing studies show effects on blood coagulation and death at low doses (µg/kg bw/day), and therefore labelling with R48/23/24/25 is warranted.

Under the GHS scheme Acute tox. 1, H310, Acute tox. 2 H300 and STOT RE 1 H372.

The Commission Working Group of Specialised Experts on Reproductive Toxicity has unanimously recommended that all AVK rodenticides should collectively be regarded as human teratogens due to the structural similarity to and the same mode of action as the known developmental toxicant warfarin (meeting in Ispra, 19-20 September 2006). Therefore based on read across data from warfarin, brodifacoum is considered to be a possible developmental toxicant and requires the classification as Reprotoxic with the labelling R61, may cause harm to the unborn child.

An almost complete oral absorption can be considered, on the basis of amount of radioactivity recovered in the excreta and retained in the tissues. *Brodifacoum* is widely distributed and bioaccumulates mainly in the liver with lower concentrations in the kidney. Hepatic bioaccumulation of *Brodifacoum* is a non-linear *vs* dose and time. The elimination kinetic from the liver was biphasic, with an half-life in the range of 282-350 days. The excretion after oral administration is very slow (11 – 14% in 10 days), occurring via the urine and the bile, both as polar metabolites (glucuronide) and parent compound. The metabolism of *Brodifacoum* is limited and the toxicologically relevant chemical species is the parent compound.

As long as dermal absorption is concerned, on the basis of the available study and reading acroos from data on other 2nd generation anticoagulant rodenticides, two different values could be used for risk characterisation depending on the type of formulation, that is 3% (pellets and grains) or 0.047% (wax block bait).

Brodifacoum is very toxic after oral administration and also via the dermal and inhalation routes. Death was the result of internal haemorrhage. Classification with T+; R26/27/28; 'Very toxic by inhalation, in contact with skin and if swallowed' is warranted.
Brodifacoum does not fulfil the EU criteria for classification as a skin or eye irritant. Although showed no sensitizing potential in a LLNA study in mice, it was able to cause skin sensitization in guinea pig and fulfils the EU criteria for classification as a skin sensitizer.

Summary of brodifacoum subchronic, chronic, mutagenic and reproductive toxicity.

Repeated oral exposure to *Brodifacoum* resulted in clinical signs and toxicity consistent with the mode of action of the rodenticide and its properties of anti-coagulant agent (lethal haemorrhages). The NOEL for subchronic oral toxicity is in the range 0.04 -0.001 mg/kg/day (the lowest values identified with sensitive end-points, such as increases in both the kaolin-cephalin time and the prothrombin time). Based on results from the acute dermal and inhalation toxicity studies, route-to-route extrapolation, consistently with the decision adopted for *Difenacoum*, it is justified to assume serious damages associated to prolonged exposure through dermal and inhalation routes also. Therefore, classification with T; R48/23/24/25 "Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed" is warranted.

Genotoxicity and Carcinogenicity

Brodifacoum displayed no mutagenic activity in a standard range of genotoxicity tests. No long-term carcinogenicity study was submitted. In fact, chronic toxicity studies were not considered to be technically feasible due to the specific action of the active substance on the test/target species. However, the anticoagulant action is apparently the only pharmacological action of Brodifacoum. The active substance has no structural alerts for carcinogenicity and no concern about possible non-genotoxic

carcinogenic potential can be derived from the toxicological studies. Therefore the justifications for non-submission of carcinogenicity data was considered acceptable.

Conclusion on Reproductive toxicity

Reproductive and developmental toxicity studies on *Brodifacoum* did not reveal any specific effects. General toxicity effects were consistent with the mode of action of the rodenticide and its properties of anti-coagulant agent. The lowest NOAELs for rabbits and rats were 0.002 and 0.001 mg/kg bw. In spite of these findings, a provisional decision has been made at the Technical Meeting of Classification and Labelling that [R61] should be applied to all anticoagulant active substances on the basis of analogy to *Warfarin*. None of the acute or subchronic performed tests gave any indication for a potential neurotoxic effect of *Brodifacoum.*

Medical data

Routine monitoring of workers (industrial users) producing *Brodifacoum* and formulating products has been carried out for the last forty years. Between June 1981 and September 1982, three poisoning incidents occurred with successful recovery. With the exception of these incidents, routine monitoring has shown no clinical effects in any workers. During this time there has been no evidence of allergenicity, sensitisation or any other abnormal effects induced by repeated and continual exposure to these anticoagulant rodenticides.

The molecules both have significant structural similarity to vitamin K. This structural similarity is responsible for the ability to interfere with i.e. block the enzymes used to regenerate vitamin K. The major differences in the active substances lie in their ‘tails’, which have varying degree of lipophilicity. There is long term experience with warfarin, widely used in anti-clotting therapy in humans for over forty years, with no association with increased incidence of cancer. The absence of adverse effects in millions of humans following four decades of long term warfarin therapy is considered sufficient evidence that warfarin is not carcinogenic. The structural similarity of brodifacoum to warfarin (see below), together with the negative results in the guideline mutagenicity tests, indicates that brodifacoum is not carcinogenic.

Warfarin Brodifacoum

TMIII09 agreed to derive $AEL_{medium\ term}$ consistently with what decided for the other AVK rodenticides. Therefore, $AEL_{medium\ term}$ was calculated from the NOAEL of 0.002 mg/kg bw/day (developmental oral toxicity study in rabbit) divided by an Assessment Factor of 300 (10 for interspecies x 10 for intraspecies x 3 additional factor for severity of effects). The $AEL_{medium\ term}$ results to be of 6.7×10^{-6} mg/kg bw/day.

Conclusions:
The following AELs should be considered in the risk characterization for *Brodifacoum*:

- AEL_{acute} of 0.0000033 mg/kg/day based on the maternal NOEL from a teratogenicity study of 0.001 mg/kg bw/day (rat, maternal effect)
- $AEL_{medium\ term}$ of 6.7×10^{-6} mg/kg bw/day based on the NOAEL from a developmental study (female rabbit) of 0.002 mg/kg bw/day
- AEL_{chr} of 3.3×10^{-6} mg/kg bw/day based on the NOAEL for females from the reproductive 2-generation study in rat of 0.001 mg/kg bw/day

Data requirements: (List if applicable)
None.

3.3.2.2 Toxicology of the biocidal product

The toxicology of the biocidal product was examined appropriately according to standard requirements. The product was not a dummy product in the EU- review program for inclusion of the active substance in Annex I of Directive 98/8/EC.

Summary of acute toxicity data for the biocidal product Ruby Block

Parameter	Test material	Species	Result	Classification	Ref.
Acute Oral Toxicity	Brodifacoum Pasta Bait. Batch: 61509601	See comments below	See comments below	none.	[redacted] (2007a). study number: 2254/0025
	Acceptable (Y/N): Yes		**Method:** OECD 420 (2001)		**GLP (Y/N): Yes**
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Acute Dermal Toxicity	Brodifacoum Pasta Bait. Batch: 61509601	See comments below	See comments below	none.	[redacted] (2007b). study number: 2254/0026
	Acceptable (Y/N): Yes		**Method:** OECD 402 (1987)		**GLP (Y/N):**

Parameter	Test material	Species	Result	Classification	Ref.
					Yes
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Acute Inhalation Toxicity	none	none	none	none	none
	Acceptable (Y/N):		**Method:**		**GLP (Y/N):**
	Comments: Inhalation exposure is not appropriate for Pasta Bait formulation. Active substance has very low volatility and is only present at 0.005% (w/w) in the semi solid, wax product. Company justification accepted.				
Information on mixture of biocidal products	none	none	none	none	none
	Acceptable (Y/N): Yes		**Method:**		**GLP (Y/N):**
	Not applicable since following the proposed uses of Pasta Bait and the label claims, the rodenticide Pasta Bait is not intended to be used in a mix with other biocidal products. Company justification accepted.				
Acute Skin Irritation	Brodifacoum Pasta Bait. Batch: 61509601	See comments below	See comments below	none	[redacted] (2007c). study number: 2254/0027
	Acceptable (Y/N): Yes		**Method:** OECD 404 (2002)		**GLP (Y/N): Yes**
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Acute Eye Irritation	Brodifacoum wax block bait. Batch: 61509601	See comments below	See comments below	none	[redacted] (2007d). study number: 2254/0028
	Acceptable (Y/N): Yes		**Method:** OECD 405 (2002)		**GLP (Y/N): Yes**
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Skin Sensitisation	none	none	none	none	none
	Acceptable (Y/N):		**Method:**		**GLP (Y/N): Yes**
	Comments: A skin sensitisation study is not available for the product so active substance data has been used to derive a classification. Brodifacoum showed no sensitizing potential in a LLNA study in mice, it was able to cause skin sensitization in guinea pig and fulfils the EU criteria for classification as a skin sensitizer (CAR IT). However, based on the generic concentration limits for mixtures at a Brodifacoum concentration of 0.005% w/w classification is not required by Directive 1999/45/EC or Regulation (EC) No 1272/2008.				

Conclusion:
According to the results of the toxicological studies, Brodifacoum paste does not classify with respect to Directive 1999/45/EC or Regulation (EC) No 1272/2008. However, safety phrases and precautionary statements are proposed by the Rapporteur.

Data requirements: (List if applicable)
None.

3.3.2.3 Toxicology of the co-formulants (substances of concern)

The biocidal product contains no other substances in quantities that would be of toxicological concern. The majority of these components are food grade materials and are not classified.

Please refer to consolidated Annexes (include. Confid Annex) for product specification and list of co-formulants.

3.3.3 Exposure Assessment for Human Health

The contact gel is used as a gel in plastic bait boxes or covered/protected gel points or contact gel can be placed on strips of insulation tape or paper tape fixed to, for example, overhead pipe-ways and ductwork. The product is applied by professional pest controllers, only.

Single-use pre-treated 'gel tubes' (plastic tube containing gel - analogous to single-use pre-treated bait boxes) are also sold. As the amount of gel in a single gel point is enclosed in a sealed tube and there is no exposure to the user, the standard risk assessment for professionals applying bait from other packs is protective of this use.

The application of Block bait is regarded as a suitable worst case scenario for Paste bait. In the Chambers study operators secured 5 compressed wax blocks (each of 20g, in total 100g bait per box this value was then doubled for 200g boxes) into a bait station by pushing bait mounting pegs in the stations through holes in wax blocks.

The most relevant route of exposure to the active substance is the dermal route. For exposure assessment only active substance from wax blocks has been modelled. The block product typically takes the form of a solid waxy block with a strong sweet smell containing 0.005% w/w Brodifacoum.

In the final CAR for brodifacoum dermal absorption values were derived from read across from data on Difenacoum. The values chosen were 0.047% for wax formulations and 3% for grain/pellet formulations. These values were deemed appropriate in the absence of product specific data.

The active substance has a low vapour pressure, therefore the potential for evaporation is low, and hence the potential for inhalation exposure is low. Inhalation exposure is only of concern during the formulation process where the active substance has a potential for becoming airborne when mixed with dry bait ingredients. In the case of wax blocks, inhalation exposure is irrelevant. Inhalation exposure from handling grain bait during loading/application and cleaning is also proposed as negligible. The only relevant inhalation exposure is assumed to be that from the decanting of loose grain, pellets and granules due to the potential release of airborne dusts.

Any potential oral exposure will be indirect exposure via possible release to the environment. Other possible exposure scenarios include dermal contact with dead animals and accidental ingestion of poison baits by children.

Key Endpoints for Exposure Assessment

The following AELs should be considered in the risk characterization for *Brodifacoum*:

- AEL_{acute} of 0.0000033 mg/kg/day based on the maternal NOEL from a teratogenicity study of 0.001 mg/kg bw/day (rat, maternal effect)

- $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day based on the NOAEL from a developmental study (female rabbit) of 0.002 mg/kg bw/day
- AEL_{chr} of 3.3 x 10^{-6} mg/kg bw/day based on the NOAEL for females from the reproductive 2-generation study in rat of 0.001 mg/kg bw/day

Data requirements: (List if applicable)
None.

Exposure to professional users

MG/PT	Field of uses envisaged	Likely concentrations at which a.s. will be used
Main group 03; PT 14	**Professional uses**	
	Rodenticide used in and around buildings Use in sewerage (only against rats)	0.005% w/w
	Non-professional uses	
	Rodenticide used in and around buildings	0.005% w/w

There are two groups of humans which may be potentially exposed to the rodenticide baits : those who handle, apply and dispose of the product or other residues such as carcasses or faeces (direct exposure) and those who may be incidentally exposed while the product is in use (incidental exposure).

Method of application

Block bait is made of paraffinic blocks to which the active substance has been added. These Brodifacoum baits are used indoors and outdoors to kill mice and rats: they are placed at the appropriate places in bait stations or covered under a curved tile, a wooden board or in a piece of tube; the animals eat some of the product and die.
Baits must be deposited in a way to minimize the risk for non-target animals and for children. Where possible, baits are secured so that they cannot be dragged away by the rodents. Preferably bait stations will be used where the bait can't be hidden, fixed or locked up.
The common strategy is to explore the site, locate runs, burrows, droppings or signs of damage and place the bait boxes at entry points into buildings and around areas where rats are known to feed. For

the mice control, as mice are sporadic feeders, many bait points are placed throughout the areas where mice are known to feed.
In sewers, the bait is eaten *in situ* by target rodents. The brown rat is the only mammal able to live in sewers.
For house and field mice control, the recommended dose is 20 to 30 g of bait every 2 to 5 meters.
For rat control, the recommended dose is 60 to 100 g of bait every 5 to 10 meters.
In sewers, place 200 to 300 g every 30-50m (never more than 300 g at each manhole).

There are three phases for the human exposure:

- Application phase: application of rodenticides by professionals and non-professionals.
In and around domestic, industrial and commercial buildings, the product is applied manually, at measured amounts in bait boxes or covered. Professional users are assumed to wear protective gloves when handling the product unlike amateur users.
In sewerage, the bait is applied only by professionals, typically hanged to a wire tied up to the wall a few centimetres above the bottom of manholes.
Bait points are controlled regularly. Any bait eaten or damaged has to be replaced. Depending on infestation rate, an advised frequency of inspection is 3 to 5 days. During the bait inspections, also a search in the zone will be done for dead rodents.

- Use phase: Post-application, *i.e.* from the use of rodenticide products and from contact with the product (*e.g*. residential exposure including indoor air contamination, contact with the product during use). The use phase is the period when the biocidal product is waiting to be consumed by the target organism. This means that no primary exposure of humans is intended and should not take place (please refer to point 3.2.4 Secondary exposure).

- Disposal phase: Disposal (including handling of surplus formulated product, burning/incineration, dumping, empty containers, dead rodents (carcasses) disposal).
When no further bait take is observed, bait stations must not be left in place. All bait stations must be removed from the site, cleaned up and the bait and bait remainders must be disposed of in accordance with local requirements.
For sewer systems no specific removal disposal is instructed.

Human exposure assessment

3.3.3.1 Identification of main paths of human exposure towards active substance from its use in biocidal product

Exposure path	Industrial use[1)]	Professional use[2)]	General public[3)]	*via* the environment[4)]
Inhalation[5)]	Not appropriate	Yes	Yes	No
Dermal[6)]	Not appropriate	Yes	Yes	No
Oral	Not appropriate	No	Yes	No

[1)] Industrial use (manufacture of active substance and formulation of products) is not covered by BPD. Workers in formulation manufacture are not exposed to levels of a.s. that would affect blood clotting.
[2)] Includes non-trained professionals.
[3)] Indirect exposure due to transient mouthing by infants is included in the scenarios for the general public.
[4)] According to the TNsG, indirect exposure *via* the environment is considered to be of minor importance as the release of rodenticides to the environment is limited.

[5)] The skin is the main exposure route with a small proportion of inhalation exposure to dust when grain-based baits are mechanically handled by professionals. The active substance is of low volatility and it is incorporated at very low concentrations into a solid, non-volatile matrix. Therefore inhalation exposure is considered as negligible.

[6)] Except for the grain block bait which is always packed in individual sachets for both professionals and general public and for grain bait only for the amateurs, dermal contact with the product is a realistic scenario.

The magnitude of human exposure to block bait can be assessed by applying standard exposure models of TNsG[20] for human exposure (2007) or the Harmonised approach for the assessment of rodenticides (anticoagulants) endorsed at TM II 2011 for professionals and amateurs users. Moreover, CONSEXPO 4.1 model can be used to assess the exposure to the biocidal product used by non-professionals.

The following basic primary exposure pathways have to be considered for a risk assessment in order to sum up the exposure of humans to Brodifacoum. The main exposure path is direct skin contact during the use of the biocidal product.
Ingestion is a secondary pathway or an accidental primary exposure during the use of the biocidal product.
Inhalation is considered as negligible.
According to the various pathways, the following absorptions will be applied in the assessment:

- Inhalatory uptake fraction: 1 (default value of 100%);
  Inhalation rate: 1.25 m^3/h (default value)
- Dermal uptake: 0.047% for wax formulations and 3 % for and grain/pellet.
- Oral uptake fraction 100%

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3.3.3.2 Professional exposure

For professional use, the operator is trained in the correct use of the bait, *i.e.* placement, number of bait points/boxes required based on the infestation rate area, the amount of bait or number of bait place packs per bait point/box and safe handling procedures.
The use of PPE - disposable gloves and a dust mask may be employed when decanting bait and disposable gloves may be employed when loading bait boxes and disposing of remaining bait and carcasses. However, when the bait is contained within a bait box there will be no exposure of the operator to the product.
PPE (coverall, boots and gloves) is required as standard when the bait is used in sewage systems.

Exposure calculations – professionals

The CEFIC/EBPF Rodenticides Data Development Group conducted an operator exposure study using flocoumafen (which may be considered a suitable surrogate for all other second generation anti-coagulants) to determine exposure during simulated use of rodenticide baits (*Chambers* 2004, unpublished, confidential). This study examined exposure to wax blocks (20g wax block baits, 5 blocks/bait box) and grain bait. Guidance is also taken from a confidential paper entitled "Harmonised Approach for Rodenticides" by the German Competent Authority, Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (BAuA).

The daily exposure frequency and its division between different tasks are based on a survey organised by CEFIC (and based on a questionnaire answered by selected pest control companies in several EU countries), and on an agreement between Member States on the common approach for exposure assessment and ECB guidelines.

The application of Block bait is regarded as a suitable worst case scenario for Paste and Cluster Baits. In the Chambers study operators secured 5 compressed wax blocks (each of 20g, in total 100g bait per box) into a bait station by pushing bait mounting pegs in the stations through holes in wax blocks.

The Chambers study determined exposure from the application phase from the following scenario: 5 operators secured 5 compressed wax blocks (each of 20g, in total 100g bait per box) into a bait station by pushing bait mounting pegs in the stations through holes in wax blocks. Three trials were conducted with 1, 5 and 10 times securing of these wax blocks. Since the results of 1, 5 and 10 securing are similar all trials were included in the calculation of the 75th percentile by the RMS. The proposed value of **28mg (of wax bait) per manipulation** is valid for loading of one bait box with 100g of wax blocks (a single manipulation constitutes the placement of a single bait station). Since the recommended amount for rat control is up to 200g bait per bait point, this exposure value is multiplied

by a factor of 2 because only 100g was used in the Chambers Study. The proposed value of **56mg (of wax bait) per manipulation** is valid for loading of one bait box with 200g of wax blocks.

For professional operators the potential total daily dermal exposure (assuming the previously agreed number of 60 manipulations from TM III/10 is applied) from the application-phase is **3360mg** wax block product (i.e. 56mg × 60 bait sites).

The Chambers study determined exposure from the disposal or post-application phase from the following scenario: 5 operators emptied a loaded bait station by sliding the wax block off the mounting pegs into a 10 L plastic bucket. This is done 1, 5 and 10 times. The proposed value of **5.75 mg per manipulation (determined by the RMS, Difenacoum CAR 2009)** is valid for cleaning of one bait box. For the resulting potential dermal exposure of post-application-phase the agreed number of 15 manipulations (TM III/10) should be taken into account. For the post-application phase the potential total daily dermal exposure is **86 mg** wax block product (i.e. 5.75mg x 15 disposal manipulations). The size of one bait block is ignored and the figure is valid for different sized blocks (e.g. 10g, 100 g).

The calculation of PCO (pest control operator) and amateur dermal exposure in placing and clean-up of rodenticidal wax blocks, taking into account measured values (75th percentiles), defaults according to ECB guidelines and the common agreement on daily exposure frequencies (TM III/10) is presented in the following table.

Pest Control Operator, No PPE:	
Amount of exposure to product (75th percentile) during securing of 10 20g wax blocks (200g). Value is for placement of 1 bait station.	56.0 mg
Amount of Brodifacoum on fingers/hands (0.005% in wax block, 20 x 10g blocks sewer maximum application worst case)	112 mg × (0.005 / 100) = 5.6×10^{-3} mg
Systemic dose per application at 1 bait station: (dermal absorption 0.047%, bw 60kg)	(5.6×10^{-3} mg) × (0.047 / 100)) / 60kg = 4.39×10^{-8} mg/kg
Amount of exposure to product (75th percentile) during clean-up and disposal per bait station	5.75 mg
Systemic dose (Brodifacoum concentration 0.005%, dermal absorption 0.047%, bw 60 kg) per clean-up of one bait station.	2.25×10^{-9} mg/kg
Assuming 'reasonable worst case' scenario of 60 bait sites and 15 clean-ups, systemic dose per day	((4.39×10^{-8} mg/kg × 60) + (2.25×10^{-9} mg/kg × 15)) = **2.6×10^{-6} mg/kg/day** **0.0026 µg/kg/day**
Expressed as a % of the AEL: $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**39% of the AEL**
Pest Control Operator, With PPE (gloves)	
Default 10-fold reduction of exposure.	**2.6×10^{-7} mg/kg/day**

	0.00026 µg/kg/day
Expressed as a % of the AEL:	
$AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**3.9% of the AEL**

Non-Trained Professional (e.g. farmer), No PPE:

Systemic dose resulting from application of product to five bait sites plus five bait sites cleaned per day, no PPE (difenacoum concentration 0.005%, dermal absorption 0.047%, bw 60 kg).	$((2.19\times10^{-8}$ mg/kg × 5) + $(2.25\times10^{-9}$ mg/kg × 5)) = **1.2×10^{-7} mg/kg/day**
Expressed as a % of the AEL:	**0.0001 µg/kg/day**
$AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**1.5%**

Non-Trained Professional (e.g. farmer), With PPE (gloves):

Default 10-fold reduction of exposure.	**1.2×10^{-8} mg/kg/day** **0.00001 µg/kg/day**
Expressed as a % of the AEL:	
$AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**0.15%**

Application by spatula and caulking gun

This calculation covers the exposure of a professional user when applying rodenticide bait via a caulking gun or spatula. The calculation is based on the information from the worked examples database, based on bridging to the paste application of wood preservative using a trowel (reverse-reference approach). The worked examples data are ADE values inside gloves so the calculation assumes that gloves are worn.

From the wood preservative example, which addresses application of pastes by brush, trowel, caulking gun and gloved hand, a good case for bridging can be made for the contact gel application by spatula (vs trowel) and by caulking gun.

The wood preservative example assumes that the application process leads to a maximum of 30 minutes' exposure per day and we must assess whether this is a reasonable exposure time for a professional pest controller using contact gel.

Time Required to Apply and Clean up Contact Gel Points

In the case of contact gel applied by caulking gun, a case could be made that this is covered by the 14 manipulations listed for paste bait. The text in the HEEG document states:
For the handling of paste bait the following was agreed: The paste bait described in the report by Vetter and Sendor was paste bait deployed using prefilled cartridges. Dermal exposure was considered possible only at removal and re-attachment of the nozzle's protection cap and was assumed to occur only before the first and after the last bait placing on a given site. Hence, the number of sites visited per day (multiplied with 2) was considered to be the relevant exposure determinant.

If a user were filling a number of gel points in a small area, the same would be true for use of our contact gel caulking gun product - the user may not find it necessary to put the cap on between filling each bait station on that site.

For spatula application, an alternative way of thinking of this is again to assume that, given the contact gel is applied by spatula in the same way as wax blocks are placed in bait points, the number of manipulations would be at a maximum the same as the number for a wax block. ie. 60+15.

The applicants experts think that to apply bait, either by spatula or by caulking gun, a maximum time of 15 seconds per bait point would be plenty of time. Clean up probably takes about half a minute per

bait point at most. (this time estimate agrees with UK Toban pasta bait which is applied in the same manner)

For application by caulking gun using the figure of 11 loadings and 3 clean ups, exposure is far lower than the 30 minutes used in the model.
Loading: 11 bait stations x 15 seconds = 2.75 minutes
Clean up: 3 bait stations x 30 seconds = 1.5 minutes
This gives a total handling time of 4.25 minutes.

For application by spatula and assuming the number of bait stations is the same as for wax blocks, this would give a total handling time of :
Loading: 60 bait stations x 15 seconds = 15 minutes
Clean up: 15 bait stations x 30 seconds = 7.5 minutes
Total time = 22.5 minutes

Therefore in both cases, the figure used in the modelling of 30 minutes is sufficient to cover a professional user.

Acceptable Exposure Level

The maximum level of exposure to the active substance has already been calculated in the AS review and is listed in the Assessment Report List of End Points as follows:

	VALUE	STUDY	SAFETY FACTOR
AEL_{acute}	0.0000033mg/kg/day	Rat developmental tox	300

Therefore maximum amount of AS = 0.0000033 mg/kg/day

Reverse-reference Calculation

For a non-volatile paste (such as this brodifacoum product), inhalation exposure is assumed to be negligible and so, using the dermal absorption data for this formulation (0.047%), to exceed the acceptable exposure level, active substance contamination to the skin would need to exceed:

0.0000033 x 2128
= 7.00×10^{-3} mg/kg/day

If the operator weights 60 kg then the AS contamination would have to exceed:
$7.00 \times 10^{-3} \times 60$ kg
= 0.42 mg/day

As the maximum concentration of AS in the ready-for-use paste formulation is 0.005%, then the weight of paste product containing 0.42 mg AS will be:
0.25/0.005 x 100
= 8400 mg

Assuming that dermal exposure will be predominantly to the hands and in this case, based on the worked examples database, gloves are assumed to be worn since professionals are expected to wear gloves, then the rate of actual hand exposure to the hands is required to exceed:
8400 mg / 30 min
= 280 mg/min

If it is considered that the penetration of brodifacoum through protective gloves is 10%, the operator would need to get about 84 g of product on the outside of the gloves and this would have to remain on the surface until the active had migrated through the paste and penetrated the glove.

Part 2 of the TNsG (2002) states that “in an HSE survey of pest controllers (1994) it was estimated that the median duration "using pesticides" was 120 minutes.” It expands to say that treatment time is

up to 100 minutes for pastes. If the 100 minutes is applied rather than 30 as suggested by the company

84g / 100 min
= 0.84 g/min

To put this exposure in context. To recieve an exposure of paste product in excess of the AEL the operator would be required to have almost the same quanity of gel on his protective glove as would load a 100g bait station. This level of exposure is considered very unlikely.

3.3.3.3 Exposure to non-professional users

Contact gels applied by gun or syringe are professional use only and are not modelled for armature use. Block baits are considered a suitable worst case for paste bait delivered in a closed sachet.

Bait boxes for use by the general public may be supplied as sealed units or as lockable, tamper-proof units that may be refilled by the user. Bait may be used in covered/protected bait points, rather than bait boxes, where appropriate.

Calculations for non-professional exposure are presented below; the first scenario assumes no exposure during application phase while the second scenario assumes that the bait boxes would have to be loaded by the user. As for the non-trained professionals, it is assumed that a non-professional user places ten bait blocks per site (200g) on five bait sites and cleans five bait sites per day.

Product type	Exposure scenario	PPE	Inhalation uptake	Dermal uptake
14	Non-professional (amateur)	None	Not relevant	1.12×10^{-8} mg/kg/day[1)]
14	Non- professional (amateur)	None	Not relevant	1.2×10^{-7} mg/kg/day[2)]

1) scenario 1, 2) scenario 2.

Scenario 1: No dermal contact during placing of baits due to sealed bait boxes. Potential exposure is only during clean-up. Default exposure value for cleanup is 5.75mg product per bait site, bromadialone present at a concentration of 0.005% (w/w), 60kg body mass, 0.047% dermal absorption value. The value is calculated from the cleanup exposure per bait station of ((2.25×10^{-8} mg/kg) × 5).

Scenario 2: Assuming that conventional bait boxes are loaded then the exposure is equal to that of the non-trained professional (e.g. farmer) with no PPE. As a worst case scenario, scenario 2 can be taken forward to risk assessment.

3.3.3.4 Exposure to children/workers/general public

Bait points should be covered or protected in such a way to prevent access to the bait. However, the ingestion of wax block bait by infants has been assessed as a potential secondary exposure route associated with the use of Brodifacoum in rodenticide products. Secondary exposure is anticipated to be acute in nature. Two different scenarios of

secondary exposure are available, the 'handling of dead rodents' scenario and the 'transient mouthing of poison bait' scenario. The former is excluded from the risk assessment due to unrealistic assumptions. The estimated exposure for the 'transient mouthing of poison bait' scenario is either $2.5\times10^{-}2$ mg/kg or 5.0×10^{-5} mg/kg, depending on the default assumptions. This results in Margin of Exposure (MOE) values of 0.01 or 6.6, respectively. It shows that infants are at significant risk for secondary exposure, i.e. there is no safe use for children.

For the 'transient mouthing of poison bait' scenario, either 5g (User Guidance) or 10 mg (TNsG, with bittering agent) of the product is assumed to be swallowed by an infant per poisoning event.

Oral exposure infant. TNsG Assumptions: Transient mouthing of poison bait (10mg) treated with repellent: (10mg × 0.00005) / 10kg bw

Transient mouthing infant. User Guidance Assumptions: Transient mouthing of poison bait (5000mg) without repellent; (5000mg × 0.00005) / 10kg bw

	Total dose (mg/kg b.w./day)	% AELacute (0.0033 µg/kg b.w.)
Oral exposure infant	0.00005	1515%
Transient mouthing infant	0.025	757575%

The RMS considered that in connection with transient mouthing of poison baits, infants are also exposed via the dermal route while handling the bait. This however is assumed to play a minor role relative to the amount that could be ingested. It is therefore not included in the overall exposure scenario.

3.3.3.5 Exposure to consumers from residues in food

Not applicable.

3.3.3.6 Overall Summary

The exposure data based on measurements in simulated use conditions are acceptable and should be used in risk assessment. The models assume that inhalation exposure is of minor importance compared with dermal exposure. The calculations have been made with the assumptions of rat control, and there are no separate calculations to assess exposure in mice control in which smaller bait sizes are used.

3.3.4 Risk Characterisation for Human Health

3.3.4.1 Professional users

Caulking gun or spatula

Calculation of the exposure of a professional user when applying rodenticide bait via a caulking gun or spatula was assessed via reverse reference scenario. Assuming that dermal exposure will be predominantly to the hands and in this case, based on the worked examples database, gloves are assumed to be worn since professionals are expected to wear gloves, then the rate of actual hand exposure to the hands is required to exceed:

8400 mg / 30 min
= 280 mg/min

If it is considered that the penetration of brodifacoum through protective gloves is 10%, the operator would need to get about 84 g of product on the outside of the gloves and this would have to remain on the surface until the active had migrated through the paste and penetrated the glove.

84g / 100 min
= 0.84 g/min

Using a reverse reference scenarios for caulking and or spatula application it was calculated that a professional operator would require exposure to 84g per day on his gloves. To recieve an exposure of paste product in excess of the AEL the operator would be required to have almost the same quanity of gel on his protective glove as would load a 100g bait station. This level of exposure is considered very unlikely.

Wrapped sachet or blocks
The exposure assessment for professional pest control operators (PCOs) under reasonable worst case assumptions (60 loadings and 15 clean-ups/day), as presented above, yielded a potential dermal exposure leading to a systemic dose 0.0026µg/kg/day day for an unprotected operator during bait handling operations. Comparison to calculated NOAEL for MOE shows that the use of rodenticide baits containing 0.005% brodifacoum results in a margin of exposure of 257.

Since pest control operators wear protective gloves by default during pest control operations, a refined assessment is conducted. The resulting margin of exposure (MOE = 2570) indicates that the use of rodenticide baits containing 0.005% brodifacoum does not cause a risk for PCOs if gloves are worn.

Likewise, the exposure assessment for non-trained professionals (e. g., farmers) under reasonable worst case assumptions (five loadings and five clean-ups/day), yielded a potential dermal exposure leading to a systemic dose of 1.2×10^{-7} mg/kg/day for an unprotected person. Even without PPE, the resulting margin of exposure (MOE = 6700) indicates that use of rodenticide baits containing 0.005 % brodifacoum is not a risk at the stated exposure frequency. A refined assessment was, nevertheless, conducted since wearing of protective gloves is recommended in the instructions for use. The resulting margin of exposure (MOE = 67000) indicates a high level of protection for non-trained professional users when gloves are worn.

The result of the risk assessment concerning use of brodifacoum in bait blocks/sachets indicates that the acceptable exposure level is not exceeded for trained professionals (PCOs) without PPE (gloves). In addition, the risk is at an acceptable level without gloves for non-trained professionals. However, use of protective gloves is recommended in all cases for hygiene reasons. In the case of application for caulking gun or spatula it was concluded that exposure to 84g of bait by a PCO on a glove was exceedingly unlikely and this application method was expected to yield safe exposure levels for trained operators.

3.3.4.2 Non-professional users

Blocks/sachets are supplied either in pre-sealed units or as loose blocks for use in covered/protected bait points or refillable bait boxes. An exposure assessment has been performed taking into account potential exposure both from application and post-application tasks as a worst-case scenario. In the calculations, amateurs were assumed to load five bait points and clean five bait points per day without PPE. The estimated daily systemic dose, 1.2×10^{-7} mg/kg/day, results in an MOE value of 6700 showing that there is also little risk to amateurs.

3.3.4.3 Children/Workers/general public

As a potential secondary exposure route, associated with the use of difenacoum in rodenticide products, ingestion of wax block bait by infants has been assessed. Secondary exposure is anticipated to be acute in nature. The estimated exposure for the scenario, 2.5×10^{-2} mg/kg/day or 5.0×10^{-5} mg/kg/day, depending on the default assumptions, results in MOE values of 0.01 or 6.6, respectively indicating that infants are at risk of poisoning. This should be addressed by ensuring all bromodialone products targeted for amateur use are provided in sealed packs and tamper resistant bait boxes with a bittering agent. The potential exposure due to dermal contact with poisoned rodents is not included in the risk assessment because the available scenarios are unrealistic.

3.3.4.4 Consumers from residues in food

Not applicable, product is not used to treat food stuffs.

3.3.4.5 Overall Summary

The calculations presented have been made with the assumptions of rat control, and there are no separate calculations to assess exposure for mice control in which smaller bait sizes are used.

Using both the MOE and AEL approaches for risk assessment indicates that there is a satisfactory margin between the predicted exposure and the NOAEL (LOAEL) as well as exposures below the threshold value for the AEL for all intended uses by trained professionals with PPE, untrained professionals and amateurs (with and without PPE). The product is deemed suitable for authorisation and appropriate personal protective equipment is advised.

Secondary exposure from transient mouthing of the product exceeds the AEL reference value (0.0023µg/kg/day), both with the assumption of 0.01 g and 5 g of product ingested by infants. This is of concern. There is no margin of safety using the existing data and models. There is no safe scenario for indirect exposure if estimated according to TNsG and User Guidance. Mitigation and protection measures such as the inclusion of bittering agents and the enclosure of product in sealed packs and tamper resistant bait boxes are essential to reducing the risk of secondary exposure. Baits should not be placed where food, feeding stuffs or drinking water could be contaminated.

Workplace operation	PPE	Exposure path	Dose (µg/kg/day)	MOE	%AEL
Trained Professional: Placing of wax block baits and clean-up	None	Dermal, hands	0.0026	257	39
Trained Professional: Placing of wax block baits and clean-up	Protective gloves	Dermal, hands	0.00026	2570	3.9
Trained Professional: Application via caulking gun/spatula and clean-up	None	Excess of 8.4g on hands to exceed AEL			
Trained Professional: Placing of wax block baits and clean-up	Protective Glove	Excess of 84g on hands to exceed AEL			
Non-Trained	None	Dermal, hands	0.0001	6700	15

Professional: Placing of wax block baits and clean-up					
Non-Trained Professional: Placing of wax block baits and clean-up	Protective gloves	Dermal, hands	0.00001	6700	1.5
Amateur: Placing of wax block baits and clean-up	None	Dermal, hands	0.0001	6700	15
Secondary Exposure Transient Mouthing of bait by infants	--	Oral	5.0×10^{-5} (TNsG)	6.6	--
			2.5×10^{-2} (User Guidance)	0.35	--

3.3.5 Effect and Exposure Assessment for the Environment

An overview of the EU review of environmental fate and behaviour and ecotoxicology for the active substance is presented below in conjunction with the exposure assessment and environmental effects for the biocidal product.

3.3.5.1 Environmental fate and behaviour of the active substance

Degradation

Biodegradation

Brodifacoum is not readily or inherently biodegradable.

The overall conclusion on biodegradation is that Brodifacoum is not readily or inherently biodegradable.

Abiotic Degradation

Brodifacoum is stable to hydrolysis (t½ > 1 year). It is however predicted to undergo rapid indirect photolysis with OH radicals and ozone (t½ = approximately 2 hours) and undergoes rapid direct photodegradation (t½ = 0.217 days). There are no predicted effects on the atmosphere.

The overall conclusion on abiotic degradation is that Brodifacoum is hydrolytically stable to hydrolysis (t½ > 1 year).

Distribution

Brodifacoum is a large aromatic organic compound of low volatility with two polar groups, which can potentially ionise at environmental pH. The active substance has a Log Pow (4.92), and is of low solubility in water (5.8 x 10-5 g/l at pH 7 and 20°C).
The DT50 value of 157 days (The Pesticide Manual 13th ed) and the Koc of 50000 (The Pesticide Manual 13th ed) indicate that Brodifacoum would be persistent and immobile in soil. The exposure to the groundwater is unlikely.
On the basis of its low volatility (vapour pressure of 2.6 10^{-22} Pa at 20°C) the exposure to the atmosphere is highly unlikely.
The overall conclusion on distribution is as follows: Brodifacoum is persistent (DT50 157 days) and immobile in soil (Koc > 9155 l/kg). Under basic conditions (high pH), Brodifacoum is not likely to be adsorbed onto soils or sewage sludge due to the ionisation of the molecule; whereas under acidic conditions (low pH), Brodifacoum is likely to be adsorbed onto soils or sewage sludge as the molecule is in its neutral or non-ionised form.

Mobility in soil

The Koc value (50000 The Pesticide Manual 13th Edition) indicates that the active substance would not be mobile in soil and is not expected to contaminate groundwater (PEC < 0.1 μg/l).

The overall conclusion on mobility in soil is as follows *Brodifacoum* is immobile in soil (Koc > 9155 l/kg). *Brodifacoum* is not expected to contaminate groundwater.

Accumulation

Based on a measured Log Kow = 4.92 it is considered that Brodifacoum has a potential for bioaccumulation. The BCFfish (3034) was calculated using the equation 74 of TGD (part II); the BCFearthworm (999) was calculated according to the equation 82d of TGD

The overall conclusion on bioaccumulation potential is as follows: No reliable bioaccumulation study is available. The measured log Kow = 4.92 (retrieved from CAR B) indicates that Brodifacoum can be potentially bioaccumulative and provides a calculated BCFfish = 3034. The experimental Kow confirms the adequacy of using, in CAR A, the calculated log Kow of 6.12 (rather than 8.5) and indicates that this value still overestimated the actual lipophilicity and, consequently, the BCF values estimated herein. The measured log Kow = 4.92 and a BCFfish = 3034 and BCFearthworm = 999, are considered therefore more reliable endpoints to be used in risk assessment.

3.3.5.1 Environmental effects (hazard) of the active substance (ecotoxicology)

Table 3.3.5.2-1 Summary of the eco-toxicological data for the active substance Brodifacoum

Parameter	Test material	Species	Result	Classification	Ref.
Short term toxicity testing on fish	ECO120140	Oncorhynchus mykiss	96-hour LC50 = 0.042 mg/L	Yes - R50/R53	W J Craig - March 2003. Chemex Environmental International Ltd report ENV5803/120140 (2003)
	Acceptability (Y/N): Yes		**Method:** OECD 203		**GLP (Y/N):** Yes
	Comments: None				
	Acceptability (Y/N): Yes		**Method:** OECD 202		**GLP (Y/N):** Yes
	Comments: Recorded under semi-static conditions.				
Toxicity to aquatic invertebrates	ECO120140	Daphnia magna	48 hour - EC50 = 0.25mg/l	Yes - R51 /R53	W J Craig - March 2003. Chemex Environmental International Ltd report - ENV5802/120140
	Acceptability (Y/N): Yes		**Method:** OECD 202		**GLP (Y/N):** Yes
	Comments: Recorded under semi-static conditions.				
Growth inhibition study on algae	ECO120140	Selenastrum capricornutum (Pseudokirkneriella subcapitata)	72h ErC50 = 0.04 mg/l	Yes - R50 /R53	W J Craig - March 2003. Chemex Environmental International Ltd. Report - ENV5801/120140
	Acceptability (Y/N): Yes		**Method:** OECD 201		**GLP (Y/N):** Yes
	Comments: None				
Inhibition of microbial activity	7909101	3h respiration inhibition test with activated sludge from a sewage treatment plant treating predominantly domestic sewage	EC10 was set > water solubility limit of 0.058 mg/l measured at pH=7 and T=20°C	No acute toxicity	Staniland, J. (2004) Chemex Environmental International Ltd. Ref: ENV7009/120140
	Acceptability (Y/N): Yes		**Method:** OECD 209		**GLP (Y/N):** Yes
	Comments: Although the results of the study (EC50 >1003mg/l) are not reliable, the study can be used to derive the NOECmicroorganisms on the basis of the brodifacoum water solubility (EC50 > 0.058 mg/l).				
Studies on sediment dwelling organisms	-	No experimental data available for sediment dwelling organisms.	-	-	-
	Acceptability (Y/N): -		**Method: -**		**GLP (Y/N): -**

	Comments: The risk for the sediment compartment will be covered by the risk for the aquatic compartment.				
Growth inhibition of aquatic plants	-	No study submitted	-	-	-
	Acceptability (Y/N): -		**Method: -**		**GLP (Y/N): -**
	Comments: The evaluation concluded that there is no need for a study as there is no evidence that brodifacoum would be toxic to aquatic plants to a greater extent than to other aquatic organisms.				
Toxicity to earthworms	Chemex reference: ECO120140	14-day LC50	> 994 mg/kg dw	No acute or chronic toxicity	Staniland, J (2005) Environmental International Ltd. Ref:ENV7010/120140
	Acceptability (Y/N): Yes		**Method:** Static test conditions according to SOP E260 based on OECD 207.		**GLP (Y/N):** Yes
	Comments: 14-day LC50 was greater than 994 mg/kg dry soil (the highest concentration applied) corresponding to a 14-d LC50 > 879.6 mg/kg wwt.				
Toxicity to birds	Difenacoum	LD50 (Japanese quail)	19 mg/kg bw	Acute toxicity	Szabolcs Gaty (2005) LAB International. Study code: 04/903-115FU
	Acceptability (Y/N): Yes		**Method:** OPPTS 850.2100		**GLP (Y/N):** Yes
	Comments: An extrapolation factor of 8.05 was applied to correct for differences in toxicity based on the acute test results for Difenacoum (LD50 = 66 mg/kg, male and females) and Brodifacoum (LD50 = 19 mg/kg bw), both related to Japanese quail. The Brodifacoum results indicate it is very toxic to birds, with an NOEC = 0.012 mg Brodifacoum/kg diet and an NOEL = 0.0012 mg Brodifacoum/kg bw/d.				
Toxicity to mammals	04359	Two-generation fertility study (rat, parent females)	NOAEL (0.001mg/kg bw/day)	Yes	Toxicological Research Centre Ltd. report 03/737-202P.
	Acceptability (Y/N): Yes		**Method:** OECD 416		**GLP (Y/N):** Yes
	Comments: Although a two-generation study is not normally required for anticoagulant rodenticides, the study is relevant for the establishment of an overall NOAEL for anticoagulant effects in rodents.				

Effects on Aquatic Organisms including the determination of PNECs:

Toxicity data are available for aquatic organisms exposed in an acute test. In a test performed under semi-static conditions, the 96-hour LC50 was 0.042mg/L for Oncorhynchus mykiss, based on measured concentrations. Daphnia magna was less sensitive than fish, with a 48-hour EC50 of 250 µg/L recorded under semi-static conditions. The endpoint was based on immobilisation and on measured concentrations of Brodifacoum in the test media. In a 72-hour algal growth inhibition test with Selenastrum capricornutum (Pseudokirkneriella subcapitata) the ErC50was 40 µg/l. The NOEC was 10µg/l with respect to specific growth rate. Results are based on measured concentrations. The outcome is that Brodifacoum is considered very toxic to aquatic organisms. The PNEC is derived from the algae 72h ErC50 = 0.04 mg/l (or fish 72h LC50 = 0.042 mg/l), and the application of an assessment factor of 1000. Therefore the **PNEC = 0.00004 mg/l**.

No experimental data are available for sediment dwelling organisms. A PNECsediment (0.043 mg/kg wwt) was derived through the Equilibrium Partitioning Method described in the TGD. However, due to the absence of measured data for the determination of a PECsed, according to TGD a quantitative risk characterization cannot be carried out. Therefore the risk for the sediment compartment will be covered by the risk for the aquatic compartment.

Based on the result of a 3h respiration inhibition test with activated sludge from a sewage treatment plant treating predominantly domestic sewage, no effects of Brodifacoum on aerobic biological sewage treatment processes are expected. As the test was carried out at nominal concentration much higher than the water solubility of Brodifacoum, the EC10 was set as greater than the water solubility limit of 0.058 mg/l measured at pH=7 and T=20°C. According to TGD, PNEC is derived applying an AF=10 to the NOEC from the respiration inhibition test. Therefore, the **PNECmicro-organisms > 0.0058 mg/l.**

No degradation or transformation products of Brodifacoum in water were detected. Toxicity of metabolites is not of concern.

PNECaquatic organisms = 0.00004 mg/l
PNECsediment organisms = 0.00004 mg/l
PNECmicro-organisms = > 0.0058 mg/l

Conclusion on hazard to the aquatic organisms:

PNEC	Task Force
PNECaquatic organisms	0.00004 mg/l
PNECsediment organisms	0.00004 mg/l
PNECmicro-organisms	> 0.0058 mg/l

The Brodifacoum a.s. results in the classification of toxic to aquatic organisms.

3.3.5.2 Effects on the Atmosphere including the determination of PNECs

Brodifacoum has a low vapour pressure (1 x 10^{-6} Pa) and a Henry's Law constant of 2.18 x 10^{-3} Pa.m3mol^{-1} (pH 7). Release to air via water is expected to be negligible. This is also supported by calculations using the TGD on risk assessment for percent release to air from a sewage treatment plant where a default of 0 is given (i.e., no release to air). The manufacture of the active substance is in a closed system. There are no releases to air of Brodifacoum from manufacturing, formulating, use or disposal phases.

Effects on Terrestrial Organisms including the determination of PNECs:

The effect of Brodifacoum on earthworms was assessed in an acute toxicity test in which E. fetida in artificial soil was exposed to concentrations of Brodifacoum up to 994 mg/kg dw. The 14-day LC50

was greater than 994 mg/kg dry soil (the highest concentration applied) corresponding to a 14-d LC50 > 879.6 mg/kg wwt. The PNEC for terrestrial organisms is derived from the LC50 with an AF of 1000 used. Therefore, **the PNECsoil ≥ 0.88 mg/kg wwt soil**.

Conclusion on hazard to terrestrial organisms:

PNEC	Task Force
PNECsoil	> 0.88 mg/kg wwt

Earthworms were not affected after acute exposure to Brodifacoum at concentration closed to 1 g/kg dw. It is concluded that Brodifacoum is of low toxicity to earthworms. **The PNECsoil ≥ 0.88 mg/kg wwt soil.**

Effects on Birds including the determination of PNECs:

Brodifacoum is moderately toxic to birds upon acute oral exposure with a LD50 value of 19 mg/kg bw in the Japanese quail.

No studies are available on the avian short term dietary toxicity.

A 6 weeks reproduction test on the Japanese quail exposure to Brodifacoum in drinking water was submitted but it was judged not adequate for risk assessment purposes. Therefore, acknowledging the decision taken at the Biocides TMIII09, the NOEC for Brodifacoum is based on the results of the chronic toxicity study with Difenacoum (with Japanese Quail), chosen as reference chemical for second generation anticoagulants. An extrapolation factor of 8.05 was applied to correct for differences in toxicity based on the acute test results for Difenacoum (LD50 = 66 mg/kg, male and females) and Brodifacoum (LD50 = 19 mg/kg bw), both related to Japanese quail. The Brodifacoum results indicate it is very toxic to birds, with an NOEC = 0.012 mg Brodifacoum/kg diet and an NOEL = 0.0012 mg Brodifacoum/kg bw/d. According to the TGD, an assessment factor of 30 is applied to derive the PNEC. Therefore the **PNECoral-birds = 0.012 mg Brodifacoum/kg diet/30 = 0.0004 mg Brodifacoum/kg diet.** In relation to dose the **PNECoral-birds = 0.0012 mg Brodifacoum/kg bw/d/30 = 0.00004 mg Brodifacoum /kg bw/d**.

Conclusion on hazard to birds:

PNEC	PNECoral bird diet	PNECoral bird
Task Force	0.0004 mg/kg	0.00004 mg/kg bw/d

Effects on Mammals including the determination of PNECs:

The lowest mammalian NOAEL (0.001mg/kg bw/day) comes from a two-generation fertility study with rats and refers to parent females. This endpoint was converted, according to TGD, to NOEC mammal, food = 0.02 mg/kg food. As the exposure lasted 90 days as a minimum, for PNEC derivation an AF oral of 90 is applied (table 23 of TGD). Therefore, the **PNECoral-mammals = 0.02/90 = 2.22E-04 mg/kg food**, corresponding to **PNECoral-mammals = 0.001 mg/kg bw day/90 = 1.1 E-05 mg/kg bw**.

Conclusion on hazard to mammals:

PNEC	Task Force
PNECoral mammals food	2.22E-04 mg/kg
PNECoral mammals	1.1 E-05 mg/kg bw

Brodifacoum is very toxic to mammals.

Metabolites

No significant amounts of metabolites are expected to be formed in soil. In rats, no toxicologically relevant metabolites have been identified which could be introduced in soil via urine or faeces.

3.3.5.3 Environmental effects (hazard) of the biocidal product

The example products in the EU-review program for approval of the active substance for inclusion in Annex I of Directive 98/8/EC were pellet bait and wax block mixtures (formulations) containing Brodifacoum.

The aquatic, terrestrial, avian and mammalian toxicity data used for the assessment of the Annex I representative biocidal product was based on data determined in the Brodifacoum active substance studies. This included the following studies.

7.8.7.1 (1)	Kaukeinen DE	1982	A Review of the Secondary Poisoning Hazard to Wildlife from the use of Anticoagulant Rodenticides Proceedings of the 10th Vertebrate Pest Conference (1982). Published	N	Public Domain
7.8.7.1 (2)	Newton I and Wyllie I	-	Effects of New Rodenticides on Owls, Institute of Terrestrial Ecology, Monks Wood Experimental Station, Abbots Ripton, Huntingdon, Cambs PE17 2LS Published	N	Public Domain
7.8.7.1 (3)	Gray A, Eadsforth CV and Dutton AJ	1994	The Toxicity of Three Second-Generation Rodenticides to Barn Owls, Pesticide Science, 42, 179-184. Published	N	Public Domain
7.8.7.1 (4)	Wyllie I, Newton, I and Freestone P	-	The Toxicity of Three Second-Generation Rodenticides to Barn Owls, Institute of Terrestrial Ecology, Monks Wood, Abbots Ripton, Huntingdon, Cambs PE17 2LS Published	N	Public Domain

There were no additional ecotoxicology studies provided for authorisation of the biocidal product in this process.

3.3.5.4 Environmental effects (hazard) of the co-formulants (substances of concern)

Please refer to Annex I of the consolidated Annexes I-IV which contains the confidential information on the co-formulants that are used in this product along with the active substance.

None of the co-formulants that carry an environmental classification are present at a sufficient concentration to trigger the classification of the product.

Product Classification & Labelling:

There is no requirement for classification and labelling with regard to the co-formulants used in the product.

There is no environmental classification for the product under the Directive 99/45.
There is no environmental classification for the product under the CLP Regulation 1272/2008.

3.3.6 Exposure Assessment for the Environment

The environmental exposure was assessed during the EU active substance review process and the current intended uses are similar.

The rodenticide product is used by professional and amateur users. The product is intended for indoors use, in and around buildings and for outdoors uses in non-agricultural open areas and waste dumps. It is not supported for use in sewers; however the applicant has included this scenario in their application as a worst case scenario.

It is always used in the same manner for all these purposes. Bait points are placed throughout the infested areas with 20g per bait point for mice and 20 to 60 g per bait point for rats. Application sites are located 2-5 m apart for mice and 5-10 m apart for rats. A shorter distance is used in severe infestations. The number of baits and the distances should be adapted to the infestation level. Bait points are inspected frequently and replenished when bait has been eaten.

Bait points are placed securely to help prevent access to non-target animals. For amateur use, the label prescribes to use tamper resistant bait stations for rat control. Baits for amateur mouse control have to be placed into/at a covered or protected bait station. For professional rodent control the use of tamper resistant bait stations is not compulsory however, if tamper resistant bait stations are not employed, the wax blocks must be fixed by strings or wire to avoid uptake by non target animals/humans, or uncontrolled dispersal.

Based on the environmental fate and behaviour of Brodifacoum, as outlined in the detailed calculations provided in Annex VI of this Product Authorisation Report, the environmental exposure assessment was conducted.

3.3.6.1 Aquatic compartment

As mentioned previously the product is not supported for use in sewers but the scenario has been included as part of the risk assessment for the other scenarios. Therefore exposure to the aquatic compartment has been assessed through the STP route also. Based on worst case ESD assumptions the maximum predicted environmental concentration (PEC) of the active substance for microorganisms in the STP is 1.93×10^{-5} mg/L. The corresponding amount in surface water is 1.77×10^{-6} mg/L. The maximum permissible concentration by directive 80/778/EEC (amended by 98/83/EC) of 0.1 µg/L is not exceeded in surface waters. Full details of the calculations are contained in Annex VI.

3.3.6.2 Atmospheric compartment

Brodifacoum has a vapour pressure of less than 10^{-6} Pa at 20^{o}C and a Henry's Law constant of less than 2.18×10^{-3} $Pa.m^3.mol^{-1}$ at pH 7. In the Assessment Report for brodifacoum it has been concluded that releases to air from manufacturing, formulating, use or disposal phases are not to be expected. An exposure assessment for air is therefore not required.

3.3.6.3 Terrestrial compartment

Exposures of soil to the active substance occurs via direct (spillages) and disperse release (deposition by urine and faeces) after the use of the product in and around buildings, open areas and waste dumps. As mentioned previously the product is not supported for use in sewers however exposure to agricultural soil via spreading of sludge from an STP has been included as part of the worst case risk assessment.

Using ESD worst-case assumptions of the typical usage patterns and release mechanisms, the maximum concentration in agricultural soil (averaged over 30 d) after 10 years of sludge application from STP is 4.86×10^{-4} mg/kg wwt. When the applicant's dosage rates are used as inputs the figure for agricultural soil is 3.24×10^{-4} mg/kg wwt. No information on the metabolism of brodifacoum was used to lower the exposure levels further.

The highest concentration of Brodifacoum in soil following use in and around buildings is 0.047 mg/kg wwt under ESD realistic worst case conditions (see table below). For a normal use pattern the ESD

recommends a total of 2.6 replenishments (as opposed to 5 for the worst case). This usage pattern leads to an estimated soil concentration of 0.006 mg/kg wwt.

For the open areas scenario ESD realistic worst-case conditions assume one application site is treated twice with the product. The fraction released during use and application is 0.25. The exposed soil area is assumed to be the lower half of the burrow wall surrounding an 8 cm diameter tunnel, with a soil mixing depth of 10 cm and up to 30 cm from the entrance hole. The amount of product used at each refilling in the control operation is not specified by the ESD. However, the Reviewer notes the ESD states “A typical initial dose for a rat hole in the Nordic countries is 100-200 g grain.hole^{-1}. However, in e.g. France a typical dose for a rat hole is about 50-100 g product.” The applicant supports a dosage of 60 g bait per refill but bearing in mind the ESD statements the reviewer feels that a dosage value of 100 g is a sufficiently worst case value to use in the exposure assessment.. The local concentration arising in soil after a campaign is predicted to be 0.173 mg/kg wwt.

The default area for a waste dump defined in the ESD is 1 ha. If bait points are placed at distances of 5 m apart in a grid covering the entire dump this would yield a total of 441 points (21 x 21). 100 g in each bait point corresponds to a total loading of 44.1 kg of bait. This is higher than the default value considered in the ESD under realistic worst-case conditions (40 kg). Consequently the applicant’s exposure calculation is not sufficient to support this use. The Reviewer generated new exposure calculations for this use. The local concentration arising in soil after such a campaign is predicted to be 0.00817 mg/kg wwt. A more realistic campaign would use a total of 11 kg of bait resulting in a local concentration of 0.00204 mg/kg wwt.

In and around buildings	Open areas	Waste dumps
Amount of product used in control operation for each bait point: 0.25 kg (ESD), 0.06 kg (applicant). Realistic worst-case: 21 day campaign Bait stations: 10 No. of replenishments: 5 (2.6 realistic) Bait stations are 5 m apart. Fraction released due to spillage: 0.01 Fraction ingested: 0.99 Spillage area: 0.09 m^2 (0.1 m around station) Frequented area: 550 m^2 (10 m around building)	Amount of product used at each refilling in the control operation: 100 g Realistic worst-case: 6 day campaign Bait stations: 1 No. of replenishments: 2 Fraction of product released to soil during application: 0.05 Fraction of product released to soil during use: 0.2	Area of waste dump: 1 ha Amount of product per station: 100 g Spacing between blocks: 5 m (worst case), 10 m (realistic) Total mass of product used: 21 x 21 x 100 g = 44.1 kg (worst case) 11 x 10 x 100 g = 11 kg (realistic) No. of replenishments: 7 Fraction of active ingredient released to soil through urine, faeces and dead animals: 0.9

3.3.6.4 Groundwater

Exposure of groundwater may occur as a result of soil exposure which occurs via residues present in sewage sludge after using the product in sewers and via direct (spillages) and disperse release (urine and faeces) after the use of the product in the scenarios in and around buildings, open areas and waste dumps. As an indication for potential groundwater levels, the concentration in soil porewater in the various scenarios was examined. It should be noted that this is a worst-case assumption, neglecting transformation and dilution in deeper soil layers. A summary of the PECs obtained are presented in the table below. The calculated value for the open areas scenario exceeds the EU trigger value of 0.1 µg/L. However this figure is derived from a soil concentration value in a small localised area in the immediate vicinity of the baiting point. When taken in the context of a larger area (field, park, etc.) this figure would be several orders of magnitude lower. In addition it must be noted that these two scenarios give a value for groundwater under industrial soil – not agricultural soil as specified by the ESD.

Scenario	In and around buildings		Open area	Waste dump		Sewer system
	Worst case	Realistic		Worst case	Realistic	
PEC groundwater (mg/l)	5.3×10^{-5}	6.62×10^{-6}	1.96×10^{-4}	9.26×10^{-6}	2.31×10^{-6}	1.93×10^{-5}

3.3.6.5 Primary & Secondary Poisoning Exposure Assessment

Non-target vertebrates may be exposed to rodenticides primarily through consumption of bait and secondarily from consumption of poisoned rodents and for predators eating earthworms which have ingested the active substance absorbed to soil. Small pellets and whole grain baits are highly attractive to birds.

In and around buildings:
Primary Poisoning:

Regarding the possible primary hazard to non-target animals this is assessed for birds and mammals.

Acute:

In the first tier scenario, PECoral is the concentration of the rodenticide in the food of a non-target organism. The PECoral is **50 mg/kg** (Brodifacoum present at 0.005% w/w in the product) and is used in the quantitative risk assessment for the acute and long-term situation.

In the second tier (refined) risk assessment the daily uptake (ETE) for birds and mammals is considered. This risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes and takes into account avoidance factor (AV), the fraction of the diet obtained in the treated area (PT) and a a default excretion factor.

Table-1 Brodifacoum concentrations in non-target birds following a single uptake of the product

Species	Body weight (g)	Daily food intake (FIR) (g/d)[a]	Conc. of a.i. after single meal (mg/kg bw/d) (ETE)	Expected conc. after elimination[b] (mg/kg bw/d) (EC)
Tree sparrow	22	7.6	17.27	12.43
Chaffinch	21.4	6.42	15.00	10.80
Wood pigeon	490	53.1	5.42	3.90
Pheasant	953	102.7	5.39	3.88
Dog	10 000	456[d]	2.28	1.64
Pig	80 000	600[e]	0.375	0.270
Pig, young	25 000	600[e]	1.20	0.864

Long-term:

In the first tier scenario, the risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes and takes into account avoidance factor (AV), the fraction of the diet obtained in the treated area (PT) and a default excretion factor.

Expected concentration of Brodifacoum in the animal after one meal followed by a 24-hour elimination period

Species	Estimated daily uptake of a compound (ETE) (mg/kg b.w./d)		Fraction of daily uptake eliminated (number between 0 and 1) (EI)	Expected concentration of active substance in the animal (EC) (mg/kg b.w./d)	
	Step 1	Step 2		Step 1	Step 2
Tree sparrow	17.27	12.43	0.3	12.09	8.71
Chaffinch	15.00	10.80	0.3	10.50	7.56
Wood pigeon	5.42	3.90	0.3	3.79	2.73
Pheasant	5.39	3.88	0.3	3.77	2.72
Dog	2.28	1.64	0.3	1.596	1.149
Pig	0.375	0.270	0.3	0.2625	0.189
Pig, young	1.20	0.864	0.3	0.864	0.6048

In the second tier scenario for primary poisoning long-term exposure according to the guidance agreed at the 23rd Biocides CA meeting, EC5 values are used for quantitative risk assessment of primary poisoning in the long-term situation.

EC_{oral} for different relevant species

Days	EC_{oral} (mg/kg b.w./d)						
Species	Tree sparrow	Chaffinch	Wood pigeon	Pheasant	Dog	Pig	Young pig
Day 1 after first meal	17.27	15.00	5.42	5.39	2.28	0.375	1.20
Day 2 before new meal	12.1	10.5	3.79	3.77	1.60	0.266	0.840
Day 3 before new meal	20.6	17.9	6.45	6.41	2.72	0.449	1.43
Day 4 before new meal	26.5	23.0	8.31	8.26	3.50	0.577	1.84
Day 5 before new	30.7	26.6	9.61	9.56	4.05	0.666	2.13

meal							

Secondary Poisoning:

Secondary poisoning hazard can only be ruled out completely when the rodenticide is used in fully enclosed spaces so that rodents cannot move to outdoor areas or to (parts of) buildings where predators may have access. Predators among mammals and birds may occur inside buildings or they may hunt in the immediate vicinity of buildings, e.g. parks and gardens. Scavengers may also search for food close to buildings.

Tier 1 exposure assessment:

According to the ESD PT 14, a normal susceptible rodent may eat anticoagulant rodenticide for a number of days before it stops eating. The feeding period has been set to a default value of 5-days, which corresponds to the feeding pattern observed in laboratory experiments. The mean time until death has been set to a default value of 7-days. Concentrations in contaminated rodents have been calculated for the time point immediately after the last meal. The factor PD (fraction of food type in diet) is set to 0.2 (minimum factor for normal case), 0.5 (normal use situation), and 1.0 (worst case situation). Regarding the elimination rate, the default of 0.3 supported by the ESD is adopted. The assessment also takes into account the concentration in resistant rodents.

	Residues of rodenticide in target animal, mg a.s./kg b.w. with bait consumption expressed as PD		
	0.2	**0.5**	**1.0**
A normal non-resistant target rodent stops eating on day 5			
Day 1 after the first meal*	1.00	2.50	5.00
Day 2 before new meal**	0.70	1.75	3.50
Day 3 before new meal	1.19	2.97	5.95
Day 4 after the last meal	1.53	3.83	7.66
Day 5**	1.77	4.43	8.86
Day 7 (mean time to death)**	1.36	3.39	6.79
A target rodent continues eating due to resistance			
Day 14 after the meal	2.31	5.79	11.58

Tier 2 Exposure Assessment:

The refined tier 2 considers exposure of relevant species of predators, based on their bodyweights and food intakes and takes into account avoidance factor (AV), the fraction of the diet obtained in the

treated area (PT) and a default excretion factor. Food intake of non-target animals can vary significantly, depending on the metabolic rates of species, the nature of their food, weather conditions, time of year, etc.

Brodifacoum concentrations in non-target mammals and birds consuming contaminated rodents

				Normal susceptible rodents caught on day 5, before their last meal.		Normal susceptible rodents caught on day 5 just after their last meal		Resistant rodents caught on day 14 just after their last meal	
Species		**Body weight *)**	**Daily mean food intake*)**	**Amount a.s. consumed by the non-target animal****	**Concentration in non-target animal**	**Amount a.s. consumed by the non-target animal*****	**Concentration in non-target animal**	**Amount a.s. consumed by the non-target animals********	**Concentration in non-target animal**
		(g)	**(g)**	**(mg)**	**(mg a.s./kg b.w.)**	**(mg)**	**(mg a.s./kg b.w.)**	**(mg)**	**(mg a.s./kg b.w.)**
Barn Owl	*Tyto alba*	294	72.9	0.32	1.10	0.51	1.72	0.61	2.06
Kestrel	*Falco tinnuncul.*	209	78.7	0.35	1.68	0.55	2.62	0.65	3.13
Little owl	*Athene noctua*	164	46.4	0.21	1.26	0.32	1.97	0.39	2.35
Tawny Owl	*Strix aluco*	426	97.1	0.43	1.01	0.67	1.58	0.81	1.89
Fox	*Vulpes vulpes*	5 700	520.2	2.31	0.41	3.62	0.63	4.32	0.76
Polecat	*Mustela putorius*	689	130.9	0.58	0.85	0.91	1.32	1.09	1.58
Stoat	*Mustela erminea*	205	55.7	0.25	1.21	0.39	1.89	0.46	2.26
Weasel	*Mustela nivalis*	63	24.7	0.11	1.74	0.17	2.72	0.21	3.25

Calculation of concentration in earthworms:
Calculations for secondary poisoning are undertaken according to the ESD PT 14 for predators eating earthworms which have ingested the active substance absorbed to soil.

Brodifacoum concentrations in earthworms

		Tier 1[a]	Tier 2[b]
Input			
C_{soil} sewer system	Concentration in soil averaged over a period of 180 days and divided by 2 (mg/kg wwt)	8.70×10^{-5}	3.70×10^{-5}
C_{soil} building	Concentration in soil immediately after intake divided by 2 (mg/kg wwt)	0.0056	0.0050
$BCF_{earthworm}$	Bioconcentration factor in earthworm (L/kg wet fish)	15820	15820
$C_{porewater}$ sewer system	Concentration in porewater (mg/L) divided by 2	5.35×10^{-7}	2.29×10^{-7}
$C_{porewater}$ building	Concentration in porewater (mg/L) divided by 2	3.48×10^{-5}	3.10×10^{-5}
F_{gut}	Fraction of gut loading in worm (kg dwt/kg wwt)	0.1	0.1
$CONV_{soil}$	Conversion factor for soil concentration wet-dry weight soil (kg wwt/kg dwt)	1.13	1.13
Output			
$PEC_{oral,\ earthworm}$ building	Predicted environmental concentration in earthworm (mg/kg wet earthworm)	0.495	0.441

3.3.6.6 Overall Summary of exposure assessment

The biocidal product is a ready-to-use bait containing 0.005% Brodifacoum as the active substance. Brodifacoum is a second-generation single-dose anticoagulant rodenticide. It is used against rat at the maximal rate of 60 g of product equivalent to 3 mg a.s. per baiting post and against mouse at 20 g product equivalent to 1 mg a.s. by baiting post. This formulation is intended for indoor and outdoor uses.

PECs were calculated in accordance with the ESD for PT14. These calculations are outlined in the previous sections. Based on environmental fate and behaviour of Brodifacoum the following PEC values were determined:

Scenario	In and around buildings		Sewer system		Open Areas		Waste Dumps	
	Worst case	Realistic	Worst case	Realistic	Worst case	Realistic	Worst case	Realistic
PEC soil (mg/kg wwt)	0.047	0.006			0.173	N/a	0.00817	0.00204
PEC groundwater (mg/l)	5.3×10^{-5}	6.62×10^{-6}			1.96×10^{-4}	n/a	9.26×10^{-6}	2.31×10^{-6}
PEC microorganisms (mg/l)			1.93×10^{-5}	1.27×10^{-5}				
PEC surface water (mg/l)			1.77×10^{-6}	1.18×10^{-6}				
PEC agricultural soil (mg/kg wwt)			4.86×10^{-4}	3.24×10^{-4}				
PEC groundwater (ag) (mg/l)			4.66×10^{-7}	3.11×10^{-7}				
PECsediment (mg/kg)			1.92×10^{-3}	1.28×10^{-3}				

No new data related to the environment fate and behaviour or the ecotoxicology of the active substance or the biocidal product has been submitted by the applicant. There were three studies submitted related to secondary poisoning to dogs and foxes and the hazard/risk to barn owls which are considered only supplementary data and not considered further in the risk assessment.

PNECs were calculated based on the studies submitted for the EU approval of the active substance. PECS for assessment of primary and secondary poisoning were determined based on the ESD for PT14 and the TGD (2003).

3.3.7 Risk Characterisation for the Environment

Brodifacoum products are non-selective and can pose a risk of primary and secondary poisoning to non-target animals.

Product containing brodifacoum are placed at secured bait points. To maximise exposure of the target rodents and minimise unintended exposure of other non-target vertebrates, the products are placed where they are most likely to be encountered by the target organisms (e.g. on habitual rat-runs).

The type of secured bait point suitable for a given situation is determined on a case-by-case basis, taking into account such factors as shielding from sunlight and moisture necessary to maintain bait integrity and the level of security required to prevent access to and/or interference by non-target animals etc.

The risks posed by products containing 50 mg Brodifacoum/kg are characterised for the following scenarios:

1. **In and around buildings (houses, animal houses, commercial and industrial sites)**
2. **Open areas**
3. **Dumps**

3.3.7.1 Aquatic compartment

A contamination of surface water with Brodifacoum from the placing of product in and around buildings is highly unlikely. A lack of exposure to surface water is also stated in the EUBEES 2 emission scenario document. Contamination of surface waters is however expected to arise following use of bait in sewers.

The most sensitive organism in the aquatic tests was alga with a nominal 72 hr ErC50 of 0.04 mg/L. This **$PNEC_{water}$** of 0.04/1000 AF**= 0.00004 mg/L**.

The test with micro-organisms in inhibition of microbial activity showed that concentrations that it is not likely that Brodifacoum will have a negative impact on the microbial processes in a sewage treatment plant at solubility limits. This gives a **$PNEC_{STP}$** of **= 0.0058 mg/L.**

As no specific data are available, the toxicity of Brodifacoum to sediment-dwelling organisms is covered by the risk to aquatic compartment. The application of an additional factor of 10, as done in CAR A, is considered not necessary as an experimental log Kow = 4.92 (i.e. lower than 5) is available. **Therefore, the PNECsediment organisms = 0.00004 mg/l**.

The risk characterisation for the aquatic compartment is presented in the following table applying the relevant PEC values as indicated in the table in the overall summary of the exposure assessment in the previous section.

Aquatic PEC/PNEC ratios using the realistic and worst case scenario

Exposed compartment	Endpoint	PNEC mg/L	PEC Worst case	PEC Realistic	Risk quotient PEC/PNEC
Surface water	Algae	0.00004	1.77E-06	1.18E-06	0.044
Sediment	Based on aquatic data and equilibrium partitioning method	4.348E-02	1.92E-03	1.28E-03	0.044

STP	Inhibition of microbial activity	0.0058	1.93E-05	1.27E-05	0.003

The PEC/PNEC risk quotient in all compartments are below the trigger value of 1 indicating Brodifacoum following the recommended use of the product does not cause an unacceptable risk to aquatic organisms.

Brodifacoum is not readily biodegradable under environmentally relevant conditions or during sewage treatment processes. Accordingly, the degradation of Brodifacoum in sediment is also anticipated to be low. However, it has limited exposure to the aquatic compartment and this is confirmed by the PEC calculations. The PEC/PNEC ratio is below the level that leads to an unacceptable risk, thus the risk for unacceptable accumulation in sediment can be regarded as low.

For an indication of the risk in relation to surface water and groundwater/porewater used for drinking refer to the section on the aquatic compartment and groundwater in the exposure assessment.

Since the potential for metabolites formation is negligible, risk characterisation is not required.

Summary: No risk is identified

3.3.7.2 Atmospheric compartment

There are no releases of brodifacoum to air from manufacturing, formulating, use or disposal phases. Based on this and the physical and chemical properties of brodifacoum, the compound is not expected to contribute to global warming, ozone depletions in the stratosphere, or acidification.

Summary: No risk is identified

3.3.7.3 Terrestrial compartment

Exposure of the terrestrial compartment (soil) will also occur when product is deployed outdoors. Exposure is assumed to arise through a combination of transfer (direct release) and deposition via urine and faeces (disperse release) onto soil.

As there is only one test result available with soil dwelling organisms the risk assessment is performed on the basis of this result using an AF and on the basis of the equilibrium partition method. For the EPM the PNEC is calculated from the aquatic toxicity data **PNECaquatic**= **0.00004 mg/kg**.

PEC/PNEC ratios using the realistic worst case scenario

Exposed compartment	Endpoint	PNEC	PEC Worst case	Risk quotient PEC/PNEC Worst case
In and around buildings	Based on aquatic data and equilibrium partitioning method Based on the availability of test result with soil dwelling organisms and AF	1. 4.348 x E-02 2. 14-d LC50 > 879.6 mg/kg wwt/1000 = 0.8796 mg/kg	0.047	1. 1.08 2. 0.053
Open areas	Based on aquatic data and equilibrium partitioning method Based on the availability of test result with soil dwelling organisms and AF	1. 4.348 x E-02 2. 14-d LC50 > 879.6 mg/kg wwt/1000 = 0.8796 mg/kg	0.173	1. 3.97 2. 0.196

Waste dump	Based on aquatic data and equilibrium partitioning method Based on the availability of test result with soil dwelling organisms and AF	1. 4.348 x E-02 2. 14-d LC50 > 879.6 mg/kg wwt/1000 = 0.8796 mg/kg	0.00817	1. 1.87 2. 9.29 x 10^{-3}

The PEC/PNEC ratio was greater than 1 when used **in and around buildings and in open areas** when applying the EPM indicating for this calculation method that Brodifacoum, following recommended use of the product, causes an unacceptable risk to organisms in this terrestrial compartment. However, this PNEC value based in and around buildings and in open areas **represents only a screening value** of contamination and is superseded by the PNEC value determined from the 14-day earthworm toxicity study.

Summary: No risk is identified

Non compartment specific effects relevant to the food chain

3.3.7.4 Primary poisoning

Referring to rodenticide applications **in sewer systems**, there is no primary poisoning hazard to non-target mammals or birds because this is not a habitat for them (*cf.* ESD PT 14).

Regarding the possible primary hazard to non-target animals following applications **in and around buildings**, several non-target species are assessed for primary poisoning risk assessments.

Acute exposure:
Non-target mammals and birds are unlikely to enter sewers and feed on product in sewage systems. Therefore, there will be no significant exposure following the use of product in sewers. Rats that live underground in sewers are also unlikely to take bait and deposit significant quantities in accessible places above ground, thus preventing exposure to non-target animals living above sewers. In conclusion, the risks to non-target mammals and birds following the use of bait containing Brodifacoum in sewers are considered to be very low.

Following applications in and around buildings, the empirical risk assumes direct or indirect consumption of the deployed baits. For primary poisoning the initial PEC_{oral} values assume that there is no bait avoidance by the non-target animals and that they obtain 100% of their diet in the treated area and have access to the product.

The concentration in the final product is 0.005% for the active substance Brodifacoum. The PECoral is 50 mg/kg (Brodifacoum present at 0.005% w/w in the product) and is used in quantitative risk assessment for the acute and long-term situation.

Tier I risk assessment: $PEC_{oral}/PNEC_{oral}$ ratio for birds and mammals exposed to Brodifacoum

	PEC_{oral} (concentration in food, mg/kg)	**$PNEC_{oral}$ (concentration in food, mg/kg)**	**PEC / PNEC**
Acute			
Bird	50	19	2.63
Mammal	50	-	-
Long-term			
Bird	50	0.0004	125000
Mammal	50	0.000011	4545454

The ratios PEC/PNEC are above 1 indicating a potential risk.

Therefore, a refined tier 2 assessment is set out below, based on representative species. The refined tier 2 risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes. Food intake of non-target animals can vary significantly, depending on the metabolic rates of species, the nature of their food, weather conditions, time of year, etc.

Tier 2 acute risk assessment: $PEC_{oral}/PNEC_{oral}$ for non-target animals accidentally exposed to bait containing Brodifacoum after one meal

Non-target animals	ETE, concentration of Brodifacoum after one meal (one day) (mg/kg b.w.)		$PNEC_{oral}$ (dose, mg/kg b.w./d)	PEC/PNEC	
	Step 1	Step 2		Step 1	Step 2
Tree sparrow	17.27	12.09	0.0004	43175	30225
Chaffinch	15.00	10.50	0.0004	37500	26250
Wood pigeon	5.42	3.79	0.0004	13550	9475
Pheasant	5.39	3.77	0.0004	13475	9425
Dog	2.28	1.596	0.000011	207272	159600
Pig	0.375	0.2625	0.000011	34090	26250
Pig, young	1.20	0.864	0.000011	109090	78545

In Tier 2, Step 1 (worst case) AV, PT and PD are all set to 1, whilst in the realistic worst case (Step 2) these AV and PT are refined to 0.9 and 0.8, respectively.

The ratios PEC/PNEC are above 1 indicating a potential risk even after refinement.

Long -term exposure:
In this assessment, long-term exposure also has to be taken into account in the evaluation of primary poisoning of rodenticides.

Tier 2 long-term risk assessment: $EC_{oral}/PNEC_{oral}$ ratio after 1-day elimination of Brodifacoum

Species	EC_{oral} (mg/kg b.w./d) after 1 day		$PNEC_{oral}$ (mg/kg b.w./d)	Ratio $PEC_{oral}/PNEC_{oral}$	
	Step 1	Step 2		Step 1	Step 2
Tree sparrow	12.09	8.71	0.0004	30225	21775
Chaffinch	10.5	7.56	0.0004	26250	18900
Wood pigeon	3.79	2.73	0.0004	9475	6825
Pheasant	3.77	2.72	0.0004	9425	6800
Dog	1.596	1.149	1.1E-05	145091	104455
Pig	0.2625	0.189	1.1E-05	23864	17182
Pig, young	0.864	0.6048	1.1E-05	78545	54982

The ratios PEC/PNEC are above 1 indicating a potential risk.

According to the guidance agreed at the 23rd Biocides CA meeting, EC_5 values are used for quantitative risk assessment of primary poisoning in the long-term situation.

Tier 2 long-term risk assessment: $EC_{oral}/PNEC_{oral}$ ratio after 5-day elimination

Species	EC_{oral} after 5 days (mg/kg b.w./d) with excretion factor = 0.3, AV = 1, PT = 1 (mg/kg bw)[a]	EC_{oral} after 5 days (mg/kg b.w./d) with excretion factor = 0.3, AV = 0.9, PT = 0.8 (mg/kg bw)[a]	$PNEC_{oral}$ (mg/kg b.w./d)	Ratio $EC_{oral}/PNEC_{oral}$
Tree sparrow	30.7	22	0.0004	55260
Chaffinch	26.6	19	0.0004	47880
Wood pigeon	9.61	7	0.0004	17298
Pheasant	9.56	7	0.0004	17208
Dog	4.05	3	0.000011	265091
Pig	0.666	0.480	0.000011	43593
Pig, young	2.13	2	0.000011	139418

The ratios PEC/PNEC are above 1 indicating a potential risk even after refinement.

Summary: Risk is identified
Overall, for primary poisoning all acute and long-term $PEC_{oral}/PNEC_{oral}$ ratios are still above the trigger value of 1 indicating acute and long-term unacceptable risks

3.3.7.5 Secondary poisoning

It is unlikely that target rodents that have ingested bait containing Brodifacoum will leave the sewer system and be exposed, in significant numbers, to predators or scavengers. Therefore, the secondary poisoning risks from the use of bait in sewers are considered to be very low.

For the first tier assessment of secondary poisoning in and around buildings the maximum residue levels in target rodents that arise on day-5 after the last meal ($ETE_{oral\ predator}$) are compared to the PNEC values for concentration in food. The first tier assessment also assumes the following three

levels of Brodifacoum bait consumption: 20%, 50% and 100% of the daily food intake of the target rodents. For long-term exposure, it is assumed that the rodents have fed entirely on rodenticide and that the non-target animals consume 50% of their daily intake on poisoned rodents.

Tier 1 risk assessment of secondary poisoning at day 5 (non-resistant rodents)

Organism group	$PNEC_{oral}$ (mg a.s./kg b.w.)	$ETE_{oral, predator}$ (mg a.s./kg b.w.)			$PEC_{oral}/PNEC_{oral}$ – day 5		
PD values		0.2	0.5	1.0	0.2	0.5	1.0
Acute							
Birds	19	2.77	6.93	13.87	3.84	9.62	19.26
Mammals	-				-	-	-
Long-term							
Birds	0.0004	1.39	3.47	6.93	10692	26692	53307
Mammals	0.000011				6261	15630	31216

Tier 1 risk assessment of secondary poisoning at day 14 (resistant rodents)

Organism group	$PNEC_{oral}$ (mg a.s./kg b.w.)	$ETE_{oral, predator}$ (mg a.s./kg b.w.)			$PEC_{oral}/PNEC_{oral}$ – day 14		
PD values	-	0.2	0.5	1.0	0.2	0.5	1.0
Acute							
Birds	19	2.31	5.79	11.58	0.121	0.30	0.60
Mammals	-				-	-	-
Long-term							
Birds	0.0004	1.15	2.31	5.79	287	5775	14475
Mammals	0.000011				104545	231000	526363

According to the tier 1 assessment the risk for secondary poisoning of non-target predator birds and mammals during long-term exposure via rodents poisoned with Brodifacoum is very high as indicated by the trigger value of 1 being exceeded in all cases. Therefore, a refined tier 2 assessment is set out below, based on representative species.

The refined tier 2 risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes. Food intake of non-target animals can vary significantly, depending on the metabolic rates of species, the nature of their food, weather conditions, time of year, etc.

Tier 2 risk assessment of secondary poisoning (non resistant and resistant rodents)

Species	Exposure	$ETE_{oral\ predators}$ (mg a.s./kg/d)	$PNEC_{oral}$ (mg a.s./kg/d)	Ratio $ETE_{oral\ predators}$ / $PNEC_{oral}$
Barn owl	Day 5 before the last meal	1.10	0.0004	2750
	Day 5 after the last meal	1.72		4300
	Day 14 after the last meal	2.06		5150
Kestrel	Day 5 before the last meal	1.68	0.0004	4200
	Day 5 after the last meal	2.62		6550
	Day 14 after the last meal	3.13		7825
Little owl	Day 5 before the last meal	1.26	0.0004	3150
	Day 5 after the last meal	1.97		4925
	Day 14 after the last meal	2.35		5875
Tawny owl	Day 5 before the last meal	1.01	0.0004	2525
	Day 5 after the last meal	1.58		3950
	Day 14 after the last meal	1.89		4725
Fox	Day 5 before the last meal	0.41	0.000011	41000
	Day 5 after the last meal	0.63		63000
	Day 14 after the last meal	0.76		76000
Polecat	Day 5 before the last meal	0.85	0.000011	77272
	Day 5 after the last meal	1.32		132000

Species	Exposure	ETE $_{oral\ predators}$ (mg a.s./kg/d)	$PNEC_{oral}$ (mg a.s./kg/d)	Ratio ETE $_{oral\ predators}$ / $PNEC_{oral}$
	Day 14 after the last meal	1.58		143636
Stoat	Day 5 before the last meal	1.21	0.000011	121000
	Day 5 after the last meal	1.89		189000
	Day 14 after the last meal	2.26		226000
Weasel	Day 5 before the last meal	1.74	0.000011	174000
	Day 5 after the last meal	2.72		272000
	Day 14 after the last meal	3.25		325000

Summary: Risk is identified
The ratios PEC/PNEC are all above 1 indicating a potential risk even after refinement.

3.3.7.6 Secondary poisoning via the terrestrial food chain

Emissions of brodifacoum to soil take place in two scenarios. In the scenario **in and around buildings** the uptake to soil proceeds directly (when considering outdoor applications as proposed in the ESD PT 14), whereas in the scenario for the **sewer** is not applicable in this PAR.

However, the TGD gives advice to take the 180 days averaged PEClocal for soil with respect to sewage sludge when calculating the PEC in earthworms. Hence, the mode of application given in the TGD is in fact not applicable for direct intake of substances.

In the product dossier $PEC_{oral,earthworm}$ for the direct soil intake has been calculated. The applicant advises that these figures be interpreted with care as concentrations in earthworm due to direct soil intake are not dealt with in the TGD. Soil concentrations used for the calculation represent a brodifacoum intake within a soil mixing depth of just 10 cm. Degradation has not been considered. Soil concentrations are halved since the TGD assumes only 50% of the soil uptake by earthworm to origin from the contaminated area.

Table-2: Secondary poisoning risk to earthworm-eating birds and mammals

Scenario	$PEC_{oral,earthworm}$ (mg/kg wet earthworm)		PNEC (mg/kg food)	PEC/PNEC	
	Tier 1[a]	Tier 2[b]		Tier 1[a]	Tier 2[b]
Birds					
Sewer system	N/a	N/a	4.0×10^{-4}	N/a	N/a
In and around buildings	0.495	0.441		1237	1102
Mammals					
Sewer system	N/a	N/a	2.22×10^{-4}	N/a	N/a
In and around buildings	0.495	0.441		2229	2004

[a] Product specific application data and default value for release (90% direct +indirect release)

[b] Product specific application data and refined metabolism

Summary: Risk is identified but is likely to have been overestimated

The results for the **in and around buildings** scenario indicate a risk of secondary poisoning for birds and mammals consuming contaminated earthworms.

3.3.7.7 Overall Summary

Based on toxicity data Brodifacoum presents a hazard to birds and non-target mammals. Non-target vertebrate animals may be exposed to the product containing Brodifacoum, either directly by ingestion of exposed product (primary poisoning) or indirectly by ingestion of the carcasses of target rodents that contain Brodifacoum residues (secondary poisoning). Brodifacoum products are non-selective and can pose a risk of primary and secondary poisoning to non-target animals. There are many uncertainties associated with quantification of the risk associated with the use of Brodifacoum products. Overall, because of the toxic nature of rodenticides and the over-riding public health requirement it is more appropriate to develop and validate risk management measures than to refine the risk assessment procedures further. It is noted that the product contains a bittering agent and this may deter some non-target animals. It is also noted that the attractiveness of the product may be impacted by the use of dye.

3.3.7.7.1 Primary poisoning:

Overall, all acute and long-term PECoral/PNECoral ratios are above the trigger value of 1 indicating acute and long-term unacceptable risks. Even when avoidance and elimination are taken into account the empirical exposure levels result in unacceptable risks to birds and mammals.

3.3.7.7.1.1 Secondary poisoning:

Via ingestion of target rodents by non-target vertebrates

All ratios of PECoral/PNECoral are above the trigger value of 1 indicating an unacceptable risk of secondary poisoning. Even when avoidance and elimination are taken into account the empirical exposure levels result in unacceptable risks to birds and mammals. Studies are submitted in the product dossier that indicate that the realistic risk for secondary poisoning is significantly lower than that using the PEC/PNEC approach. These studies are only considered as supplementary information.

Via the aquatic food chain

Only one of the proposed four use scenarios, namely use in sewers, will lead to exposure of surface water. It is concluded that risk to fish-eating birds and mammals in a real situation cannot be excluded it potentially is overestimated.

Via the terrestrial food chain

The results for the **in sewer** and **in and around buildings** scenario indicate a risk of secondary poisoning for birds and mammals consuming contaminated earthworms.

3.3.7.7.2 Conclusion for primary and secondary poisoning:

Due to the risk assessment results for primary and secondary poisoning and the uncertainty associated with quantification of this risk, risk mitigation measures must be taken into account to lead to an acceptable use of the rodenticide product.

3.3.7.7.3 The following risk mitigation measures are proposed to mitigate the primary and secondary poisoning risk to non-target mammals and lead to an acceptable use of this rodenticide:

- Use of an integrated management strategy and precautionary systems
- Unless under the supervision of a pest control operator use or other competent person do not use anticoagulants as permanent baits
- There should be proper and secure placing of baits so as to minimise the risk of consumption by other animals or children. Where possible secure baits so they cannot be dragged away.
- Users should select tamper-resistant bait boxes, secured bait boxes, covered applications or burrow baiting (placing of bait in appropriate containers or under a curved tile or in a piece of tube) to minimize exposure of non-target animals
- Monitor and replenish bait stations as appropriate

- Frequent visits to bait stations to ensure that any bait that is split or dragged out of bait stations is removed
- Unconsumed baits must be collected after termination of the control campaign and dispose of them in accordance with local requirements
- Remove dead and moribund rodents at frequent intervals, at least as often as baits are checked or replenished during a baiting campaign
- Baits should be deployed in accordance with the product labelling
- Baits should be deployed in accordance with other approved guidance on good practice.
- Restrict the use of the product to treatment campaigns of limited duration
- To minimise the likelihood of target rodents developing resistance to second-generation anticoagulant rodenticides, long-term deployment of baits as a preventative control measure is not recommended
- The resistance status of the population should be taken into account when considering the choice of rodenticide to be used.
- When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary and secondary poisoning by the anticoagulant as well as indicating the first measure to be taken in case of poisoning must be made available alongside the baits

3.4 Measures to protect man, animals and the environment

The information submitted covering the requirements as described in the TNsG on Data Requirements, common core data for the product, section 8, points 8.1 to 8.8 is provided below.

3.4.1. Methods and precautions concerning handling, use, storage, transport or fire

Methods and precautions concerning handling and use:

- Always read the label before use and follow the instructions provided.
- Do not decant product into unlabelled containers.
- Product must be handled in a safe manner.
- Avoid all unnecessary exposure, in particular avoid ingestion.
- A thorough survey of the infested area is essential, particularly in secluded and sheltered places, to determine the extent of the infestation.
- Baits must be securely deposited in baiting stations or other coverings so as to minimise the risk of consumption by companion animals, other non-target animals and children. Where possible, secure baits so that they cannot be dragged away.
- PUBLIC AREA USE: When the product is being used in public areas and tamper-resistant bait stations are not used, the following must be implemented. When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary or secondary poisoning by the anticoagulant as well as indicating the first measures to be taken in case of poisoning must be made available alongside the baits. When tamper-resistant bait stations are used, they should be clearly marked to show that they contain rodenticides and that they should not be disturbed.
- Dead rodent bodies, remains of unused bait or any fragments of bait found away from the bait station must be collected during all control operations to minimize the risk of consumption and poisoning to children, companion animals and other non-target animals.
- It is illegal to use this product for the intentional poisoning of non-target, beneficial and protected animals.
- Wash hands and face after application and use of the product, and before eating, drinking or smoking.
- For professional users the use of appropriate personal protective equipment (PPE) is advised.

Methods and precautions concerning storage:

- Store in a cool, dry, well-ventilated secure (lockable) place
- Store locked up in the original container
- Store original container tightly closed
- Keep/store out of reach of children and companion animals
- Keep/store away from food, drink and animal feedstuffs and products which may have an odour.

Methods and precautions concerning transport:
Hazard classification for transport: TOXIC, MARINE POLLUTANT

UN-No Coumarin derivative pesticide, solid, toxic, n.o.s (BRODIFACOUM)

Class 6.1 Hazard ID 66

Proper Shipping name Coumarin derivative pesticide, solid, toxic (contains brodifacoum)

UN-No 3027 Packing Group 1

Class 6.1

Methods and precautions concerning fire:

Suitable Extinguishing Media:

Keep fire exposed containers cool by spraying with water if exposed to fire. Fight surrounding fire with foam, water fog, or dry powder.

Extinguishing media which must not be used for safety reasons:

DO NOT USE WATER JETS

Specific hazards:

This product is not flammable but is combustible. Avoid run-off into water courses. Self-contained breathing apparatus should be won by fire-fighting personnel.

Special protective equipment for fire-fighters:

In the event of fire, wear self contained breathing apparatus, a chemical protection suit, suitable gloves and boots.

Residues:

Dispose of residues to certified waste disposal operator for incineration and licensed waste disposal site.

3.4.2. Specific precautions and treatment in case of an accident

Personal precautions

Wear suitable protective clothing, gloves and eye/face protection, if applicable and where appropriate.

- Respiratory Protection: No special respiratory protection equipment is recommended under normal conditions of use with adequate ventilation.
- Hand protection: Wear gloves for professional products.
- Skin protection: No special clothing/skin protection equipment is recommended under normal conditions of use.
- Eye protection: Not required.
- Ingestion: When using this product, do not eat, drink or smoke

Personal treatment

- General advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible and report the authorisation number).
- Skin contact: Obtain medical advice immediately. Remove contaminated clothing. After contact with skin, wash immediately with plenty of water, followed by soap and water in order to minimise skin contact.
- Contaminated clothing should be washed and dried before re-use.
- Eye contact: Obtain medical advice immediately. Rinse eyes immediately with copious amounts of water.
- Inhalation: Unlikely to present an inhalation hazard unless excessive dust is present. Remove person to fresh air. Obtain medical advice immediately.
- Ingestion: Do no induce vomiting. If swallowed, obtain medical advice immediately. Wash out mouth with water.

ADVICE FOR DOCTORS:

Brodifacoum is an indirect anti-coagulant. Phytomenadione, Vitamin K1, is antidotal. In the case of suspected poisoning, determine prothrombin times not less than 18 hours after consumption. If elevated, administer vitamin K1 and continue until prothrombin times normalise. Continue determination of prothrombin time for three days after withdrawal of antidote and resume reatment if elevation recurs in that time.

Report all incidents of poisonings to the relevant national poisons centre; include information on the product authorisation number, product trade name and active substance. In Ireland, this is the National Poisons Information Centre, Beaumont Hospital, Dublin (01-8092166)

Environmental precautions

- Prevent accidental exposure of the product to the environment.
- Keep un-used bait locked-up and in secure storage containers
- Bait must be secured in tamper resistant bait boxes in areas away from drains, water courses and non-target organisms.

Environmental treatment

- Clean up accidental spillages promptly by sweeping or vacuum.
- If the product gets into water or soil, it should be removed mechanically. In the event of a significant accidental release, inform the appropriate authority.
- Transfer to a suitably labelled container and dispose of to a certified waste disposal operator for incineration and licensed waste disposal site.
- Subsequently, wash the contaminated area with water, taking care to prevent the washings entering sewers or drains.
- For further instructions, see section 3.4.6 below.

3.4.3. Procedures for cleaning application equipment

No application equipment is required, therefore, no specific cleaning for equipment is required

If necessary, following use, bait boxes should be washed with detergent and water. The bait box should be washed out 3 times (triple rinsed).

3.4.4. Identity of relevant combustion products in cases of fire

This product contains paraffin wax.

3.4.5. Procedures for waste management of the biocidal product and its packaging

The best means of disposal of any product is through proper use according to the label. For the product incinerate under controlled conditions. For the pack, do not dispose of the pack in domestic refuse. Empty completely, puncture or crush and dispose of safely to Local Authority and National requirements. Dispose of packaging, remains of unused product and dead rodents to a certified waste disposal operator for incineration and licensed waste disposal site.

3.4.6. Possibility of destruction or decontamination following accidental release

Air:

Brodifacoum has a low vapour pressure, therefore the potential for evaporation is low The vapour pressure is 5 x 10^{-5} Pa. As a rodenticide, this material is not intentionally aerosolised. Therefore, destruction in air is not a concern.

Water (including drinking water):
Prevent further leakage or spillage if safe to do so. Prevent entry into watercourses, sewers.

Soil:
Direct and/or intentional release to soil is not anticipated for the use of the product as a rodenticide. In the event of a significant accidental release, inform the appropriate authority.

3.4.7. Undesirable or unintended side-effects

Toxic to mammalian and avian species, including domesticated animals, wildlife and humans. Therefore the risk to these non-target species should be considered when using bait.

3.4.8. Poison control measures

The paste baits are dyed (e.g. red or blue) to make them unattractive to wildlife, and birds in particular. In addition, in case of accidental ingestion, the presence of a dye may help to confirm that there has been ingestion and thus facilitate antidote treatment.

The product contains a human taste deterrent (adversive agent – Bitrex).

To report human poisoning incidents call the relevant national poison information centre. Include information on the product authorisation number, product trade name and active substance. Where possible provide a copy of the label or safety data sheet (SDS).

In Ireland to report a poisoning incident, call: 01 (8092566 / 8379964) The Poisons Information Centre of Ireland, Beaumont Hospital, Beaumont Road, Dublin 9.

ADVICE FOR DOCTORS:

Brodifacoum is an indirect anti-coagulant. Phytomenadione, Vitamin K1, is antidotal. In the case of suspected poisoning, determine prothrombin times not less than 18 hours after consumption. If elevated, administer vitamin K1 and continue until prothrombin times normalise. Continue determination of prothrombin time for three days after withdrawal of antidote and resume reatment if elevation recurs in that time.

Report all incidents of poisonings to the relevant national poisons centre (include information on the product authorisation number, product trade name and active substance)

4. Proposal for Decision

The assessment presented in this report has shown that the ready-to-use product, Saphir Paste, formulated by Lodi S.A.S. with the active substance Brodifacoum, at a level of 0.005% w/w, may be authorised for use as a rodenticide (product-type 14) for the control of rodents (rats and mice).

Physical-Chemical Properties:
Saphir Paste has been shown not to present a physical-chemical hazard to end users and does not classify as highly flammable, oxidising or explosive. The bait is stable when stored at ambient temperatures (20^{o}C) for one years, year two data is due week 43 of 2013. A shelf life of two years is proposed based on accelerated storage stability, palatabillty and efficacy data. A suitable method of analysis for the determination of Brodifacoum in the bait was provided.

The source of active substance used in the biocidal product Saphir Paste is the same source of active substance that is listed in Annex I of 98/8/EC. Syngenta initially supported the source, then the task force (Pelgar International Ltd and Activa) also supported the source, Italy carried out an equivalence check on the Task force source of Brodifacoum and found it to be equivalent to the Syngenta source. The RefMS accepted Italy's assessment.

Efficacy:
Saphir Paste (containing 40 mg/kg brodifacoum) is a ready-to-use paste bait (RB) intended to control the brown rat (*Rattus norvegicus*) and the house mouse mice (*Mus musculus*) indoors and outdoors (in and around buildings, open areas and waste disposal sites). The use scenario encompassing waste disposal sites and open areas is intended for professional users only. Effectiveness data has confirmed that Saphir Paste is effective in the proposed areas for use, at the recommended dose rate. Effective control should be expected from bait stored up to two years under suitable storage conditions.

Human Health:
The calculations presented have been made with the assumptions of rat control, and there are no separate calculations to assess exposure for mice control in which smaller bait sizes are used.

Using both the MOE and AEL approaches for risk assessment indicates that there is a satisfactory margin between the predicted exposure and the NOAEL (LOAEL) as well as exposures below the threshold value for the AEL for all intended uses by trained professionals with PPE, untrained professionals and amateurs (with and without PPE). The product is deemed suitable for authorisation and appropriate personal protective equipment is advised.

Secondary exposure from transient mouthing of the product exceeds the AEL reference value (0.0033µg/kg/day), both with the assumption of 0.01 g and 5 g of product ingested by infants. This is of concern. There is no margin of safety using the existing data and models. There is no safe scenario for indirect exposure if estimated according to TNsG and User Guidance. Mitigation and protection measures such as the inclusion of bittering agents and the enclosure of product in sealed packs and tamper resistant bait boxes are essential to reducing the risk of secondary exposure. Baits should not be placed where food, feeding stuffs or drinking water could be contaminated.

Environment:
The applicant did not submit any new environmental fate and behaviour studies with this product. Therefore the conclusions made at the Annex I inclusion stage for the active substance stand. The uses of this product were assessed here under the TGD and the PT14 ESD and all PEC/PNEC ratios were <1. However there is a risk for primary and secondary poisoning for non-target vertebrates. These identified risks are mitigated by applying all appropriate and available risk mitigation measures.

Conclusion:
During the active substance review of Brodifacoum by Italy, primary and secondary poisoning risks were identified for non-target organisms and for potential accidental poisoning incidents involving children. The assessment of those EU identified risks during the product authorisation evaluation of Brodifacoum have also indicated a potential risk of primary and secondary poisoning to non-target animals and the potential for the accidental primary poisoning of children. Due to these findings risk mitigation measures are applied to product authorisation.

Additionally, as the target rodents are vermin and are both direct transmitters of disease (such as through biting or contamination of food/feed by urine or faeces) or indirect carriers of disease (such as disease vectors, where fleas move from rat to humans) to humans and other animals. Transmitted diseases can include leptospirosis (or Weil's disease), trichinosis and salmonella. Authorisation of this product is considered necessary on the basis of public health grounds, since rodent populations are considered to constitute a danger to public health through the transmission of disease. However, risk mitigation measures and restrictions are required to prevent the possibility of the identified risks to non-target animals, companion animals and children.

Conditions of authorisation

Two authorisations should be issued. The first authorisation covers professional and trained professional use product. The second authorisation covers amateur use product.

This authorisation of Saphir Paste is for a period of 5-years with an annual renewal.

The concentration of the active substance, Brodifacoum, in Saphir Paste shall **not** exceed 0.05 g/kg (0.005% w/w).

Only ready-to-use Saphir Paste product is authorised.

As a poison control measure, the authorisation requires that the product shall contain an aversive, bittering agent.

The authorisation requires that the product be dyed with a colour to make them unattractive to wildlife, and birds in particular.

This product shall **not** be used as a tracking poison.

The product is authorised only for use against rats and mice (for example brown rats and house mice). Authorisation of this product does **not** allow use against non-target organisms.

The authorisation of this product for professionals and trained professionals only allows for use indoors and outdoors in the following areas: Indoors, including areas such as houses, warehouses, outbuildings and commercial premises. Outdoors uses only includes in-and-around buildings. The product can also be utilised in sewers. Brodifacoum baits must not be placed where food, feeding stuffs or drinking water can become contaminated.

The authorisation of this product for amateurs allows for use of this product indoors and outdoors around buildings in the following areas: Indoors, including only privates houses and outbuildings. Outdoors uses, including only around private building premises and private gardens and waste dumps. Brodifacoum baits should not be placed where food, feeding stuffs or drinking water can become contaminated.

The product should be used for rodent control in tamper resistant, secured bait stations or other secure coverings.

Bait stations should be clearly marked to show that they contain rodenticides and that they should not be disturbed.

Baits shall be secured to the bait station(s) so that rodents cannot remove bait from the bait box.

For amateur use products placed on the market in Ireland packaging restrictions are to be limited to pre-baited bait stations and refill packs with a maximum pack-size of 500g. Refill packs for amateurs must contain bait that is wrapped. Loose baits or grain (without wrapping) shall not be packaged for amateurs.

All product placed on the Irish market after the date of authorisation must be in compliance with the conditions of this authorisation and shall carry the approved label with the IE/BPA authorisation number and be packaged in the approved packaging.

Prior to any amendment relating to this authorised product, such as specification, use, labelling or administrative changes, application must be made to this Authority to do so

Upon annual renewal of the biocidal product, the authorisation holder shall provide statistics to PRCD on the import and export from Ireland and also manufacture statistics where appropriate for the product for the given full annual period or part thereof.

Authorisation of the biocidal product may be subject to review, following a detailed assessment of the risks involved, in accordance with the European Communities (Authorisation, Placing on the Market, Use and Control of Biocidal Products) Regulations, 2001, as amended. This review may lead to changes in or revocation of this authorisation.

Annex 2 - Toxicology Addendum to Initial PAR – July 2013

The applicant has a LoA to Pelgar studies for acute toxicity. The assessment of these studies is available below.

3.3.2.2 Toxicology of the biocidal product

The toxicology of the biocidal product was examined appropriately according to standard requirements. The product was not a dummy product in the EU- review program for inclusion of the active substance in Annex I of Directive 98/8/EC.

Summary of acute toxicity data for the biocidal product Ruby Block

Parameter	Test material	Species	Result	Classification	Ref.
Acute Oral Toxicity	Brodifacoum Pasta Bait. Batch: 61509601	Rat, female, Sprague-Dawley,	LD_{50} > 2000 mg/kg bw	none.	[redacted] (2007a). study number: 2254/0025
	Acceptable (Y/N): Yes		**Method:** OECD 420 (2001)		**GLP (Y/N): Yes**
	Comments: No mortality occurred during the study at 2000mg/kg. There were no clinical signs observed. The product was mixed with arachis oil BP this is only appropriate for an oil based product.				
Acute Dermal Toxicity	Brodifacoum Pasta Bait. Batch: 61509601	Rat, male & female, Sprague-Dawley,	LD_{50} > 2000 mg/kg bw	none.	[redacted] (2007b). study number: 2254/0026
	Acceptable (Y/N): Yes		**Method:** OECD 402 (1987)		**GLP (Y/N): Yes**
	Comments: No mortality occurred during the study at 2000mg/kg. No cutaneous reactions or systemic clinical signs related to the administration of the test item were observed.				
Acute Inhalation Toxicity	none	none	none	none	none
	Acceptable (Y/N):		**Method:**		**GLP (Y/N):**
	Comments: Inhalation exposure is not appropriate for Pasta Bait formulation. Active substance has very low volatility and is only present at 0.005% (w/w) in the semi solid, wax product. Company justification accepted.				
Information on mixture of biocidal products	none	none	none	none	none
	Acceptable (Y/N): Yes		**Method:**		**GLP (Y/N):**
	Not applicable since following the proposed uses of Pasta Bait and the label claims, the rodenticide Pasta Bait is not intended to be used in a mix with other biocidal products. Company justification accepted.				
Acute Skin Irritation	Brodifacoum Pasta Bait. Batch: 61509601	Rabbit, male, NZW, 3 in total	No irritation	none	[redacted] (2007c). study number: 2254/0027
	Acceptable (Y/N): Yes		**Method:** OECD 404 (2002)		**GLP (Y/N): Yes**
	Comments: The test item was applied at a dose of 0.5 g, on an undamaged skin area of one flank of each animal for 4 hours. Scores of 2 in two animals and 1 in the other for erythema at 24 hours had reversed 72 hours. Scores of 1 in two animals for oedema at 24 hours has reversed by 48 hours. Mean scores of 1 in two animals (24,48 &72 hours) for erythema and 0.33 for oedema were not sufficient to warrant classification. No classification required.				
Acute Eye Irritation	Brodifacoum wax block bait. Batch: 61509601	Rabbit, male, NZW, 3 in total	Slight irritation	none	[redacted] (2007d). study number:

<table>
<tr><th>Parameter</th><th>Test material</th><th>Species</th><th>Result</th><th>Classification</th><th>Ref.</th></tr>
<tr><td rowspan="3"></td><td></td><td></td><td></td><td></td><td>2254/0028</td></tr>
<tr><td colspan="2">Acceptable (Y/N): Yes</td><td colspan="2">Method: OECD 405 (2002)</td><td>GLP (Y/N): Yes</td></tr>
<tr><td colspan="5">Comments: The test item was applied at a dose of 0.1 g instilled into the conjunctival sac of one eye in each animal.
<table>
<tr><th rowspan="3"></th><th colspan="3" rowspan="2">Cornea</th><th colspan="3" rowspan="2">Iris</th><th colspan="6">Conjunctivae</th></tr>
<tr><th colspan="3">Redness</th><th colspan="3">Chemosis</th></tr>
<tr><th>Time/Animal</th><th>1</th><th>2</th><th>3</th><th>1</th><th>2</th><th>3</th><th>1</th><th>2</th><th>3</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>24 hours</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>2</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>48 hours</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>72 hours</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Mean individual scores 24, 48 and 72 h</td><td>0.0</td><td>0.0</td><td>0.0</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.0</td><td>0.3</td><td>0.0</td><td>0.3</td><td>0.0</td><td>0.0</td></tr>
</table>
Maximum mean scores of 1 for redness and 0.3 for chemosis no classification required.</td></tr>
<tr><td rowspan="3">Skin Sensitisation</td><td>none</td><td>none</td><td>none</td><td>none</td><td>none</td></tr>
<tr><td colspan="2">Acceptable (Y/N):</td><td colspan="2">Method:</td><td>GLP (Y/N): Yes</td></tr>
<tr><td colspan="5">Comments: A skin sensitisation study is not available for the product so active substance data has been used to derive a classification. Brodifacoum showed no sensitizing potential in a LLNA study in mice, it was able to cause skin sensitization in guinea pig and fulfils the EU criteria for classification as a skin sensitizer (CAR IT). However, based on the generic concentration limits for mixtures at a Brodifacoum concentration of 0.005% w/w classification is not required by Directive 1999/45/EC or Regulation (EC) No 1272/2008.</td></tr>
</table>

Conclusion:
According to the results of the toxicological studies, Brodifacoum paste does not classify with respect to Directive 1999/45/EC or Regulation (EC) No 1272/2008. However, safety phrases and precautionary statements are proposed by the Rapporteur.

Data requirements: (List if applicable)
None.

Annex III: Study Summaries of Studies Reviewed

Study summaries of new data submitted in support of the evaluation of the biocidal product (IIIB)

Section B6.1.1	**Acute Toxicity**
Annex Point IIA VI.6.1.1	Acute oral toxicity test in the rat (LD_{50})

Official use only

Reference

Reference	[redacted] (2007) Brodifacoum paste: Acute Oral Toxicity in the Rat – Fixed Dose Method. [redacted] Report No. 2254/0025
Data protection	Yes
Data owner	PelGar International Limited
Companies with Access to data	None
Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing a.s. for the purpose of its product national approval

Guidelines and Quality Assurance

Guideline study	OECD 420 Method B1 *bis* Acute Toxicity (Oral) of Commission Directive 2004/73/EC
GLP	Yes
Deviations	No

MATERIALS AND MethodS

Test material	Brodifacoum 0.005% w/w paste bait (VERTOX® Pasta Bait)
Lot / Batch number	61509601
Specification	The product used in the study is a paste bait of the a.s (0.005% w/w) in solvents. The details of the composition of the product are not provided in the report

Section B6.1.1	**Acute Toxicity**
Annex Point IIA VI.6.1.1	Acute oral toxicity test in the rat (LD_{50})
Description	Blue soft paste
Purity	0.005% brodifacoum
Stability	Stable under test conditions
Test Animals	
Species	Rats
Strain	Sprague-Dawley CD (Crl:CD® (SD) IGS BR)
Source	[redacted]
Sex	Female
Age/weight at study initiation	Age: Young adults, 8 – 12 weeks Weight: Female 187 - 217g
Number of animals per group	1 animal treated, then a further 4 animals treated
Control animals	No
Administration/ Exposure	Oral
Postexposure period	14 days
	Oral
Type	Gavage
Concentration	0.005% w/w
Vehicle	Arachis oil BP
Concentration in vehicle	200 mg/ml

Section B6.1.1	**Acute Toxicity**
Annex Point IIA VI.6.1.1	Acute oral toxicity test in the rat (LD_{50})
Total volume applied	Single dose of 2000 mg/kg in 10 ml/kg of arachis oil BP
Controls	None
Examinations	Clinical observations, mortality, body weight, necropsy
Method of determination of LD_{50}	Estimated. Classified using the Globally Harmonised Classification System
Further remarks	None

Results and Discussion

Clinical signs	There were no deaths. There were no signs of systemic toxicity. All animals showed expected gains in bodyweight over the study period. No abnormalities were noted at necropsy.
Pathology	There were no treatment related findings in animals.
Other	No other significant effects noted.
LD_{50}	Females: estimated to be > 2000 mg/kg bodyweight (Globally Harmonised Classification System – Unclassified)

Section B6.1.1 Acute Toxicity

Annex Point IIA VI.6.1.1 Acute oral toxicity test in the rat (LD_{50})

Applicant's Summary and conclusion

Materials and methods

Determination of oral LD_{50} in the rat according to OECD Guideline No. 420 and Method B1 bis Acute Toxicity (Oral) of Commission Directive 2004/73/EC

A single fasted nulliparous, non-pregnant female rat was treated with the test material at a dose level of 2000 mg/kg bodyweight. This was followed by a further group of four fasted females at the same dose level.

The test material was administered orally as a suspension in arachis oil BP. The concentration of the test suspension was 200 mg/ml and each rat was dosed with a volume of 10 ml/kg bodyweight. All animals were dosed once only by gavage using a metal cannula attached to a graduated syringe.

Clinical observations were made 0.5, 1, 2 and 4 hours after dosing and subsequently once daily for fourteen days. Morbidity and mortality checks were made twice daily.

Individual bodyweights were recorded prior to dosing and seven and fourteen days after treatment.

At the end of the observation period, the animals were killed by cervical dislocation. All animals were subjected to gross pathological examination. This consisted of an external examination and opening of the abdominal and thoracic cavities. The appearance of any macroscopic abnormalities was recorded. No tissues were retained.

Results and discussion

Following a dose of 2000 mg/kg to all animals, none of the animals died. There were no signs of systemic toxicity. All animals showed expected gains in bodyweight over the study period.

There were no abnormalities noted at necropsy.

Conclusion

Acute oral LD_{50} for the female rat is estimated to be > 2000 mg/kg

Reliability 1

Section B6.1.1	**Acute Toxicity**
Annex Point IIA VI.6.1.1	Acute oral toxicity test in the rat (LD_{50})
Deficiencies	No

Evaluation by Competent Authorities

Section B6.1.1 Acute Toxicity

Annex Point IIA VI.6.1.1 Acute oral toxicity test in the rat (LD_{50})

	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	Evaluation by Rapporteur Member State
Date	*22 March 2013*
Materials and Methods	Adopt applicants version
Results and discussion	Adopt applicants version
Conclusion	Adopt applicants version
Reliability	1
Acceptability	Acceptable
Remarks	*Is the product water or oil based .Dissolution in arachis oil is only appropriate for oil based preparations?*
	Comments from ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	*Discuss if deviating from view of rapporteur member state*

Section B6.1.1 Acute Toxicity

Annex Point IIA VI.6.1.1 Acute oral toxicity test in the rat (LD_{50})

Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Table B6_1-1. Table for Acute Toxicity

Dose [unit]	*Number of dead / number of investigated*	*Time of death (range)*	*Observations*
2000 mg/kg	0/5	-	No abnormalities detected
LD_{50} value	Females: > 2000 mg/kg		

Section B6.1.2 Acute Toxicity

Annex Point IIA VI.6.1.2 Acute dermal toxicity study in the rat

Section B6.1.2	**Acute Toxicity**
Annex Point IIA VI.6.1.2	Acute dermal toxicity study in the rat

Official use only

Reference

Reference	[redacted]2007) Brodifacoum Paste: Acute Dermal Toxicity (Limit Test) in the Rat, [redacted] Report No. 2254/0026
Data protection	Yes
Data owner	PelGar International Limited
Companies with Access to data	None
Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing a.s. for the purpose of its product national approval

Guidelines and Quality Assurance

Guideline study	OECD 402 Method B3 Acute Toxicity (Dermal) of Commission Directive 92/69/EEC
GLP	Yes
Deviations	No

MATERIALS AND MethodS

Test material	Brodifacoum 0.005% w/w paste bait (VERTOX® Pasta Bait)
Lot / Batch number	61509601
Specification	The product used in the study is a paste bait of the a.s (0.005% w/w) in solvents. The details of the composition of the product are not provided in the report

Section B6.1.2	**Acute Toxicity**
Annex Point IIA VI.6.1.2	Acute dermal toxicity study in the rat

Description	Blue paste bait
Purity	0.005% brodifacoum
Stability	Stable under test conditions
Test Animals	
Species	Rats
Strain	Sprague-Dawley CD (Crl:CD® (SD) IGS BR)
Source	[redacted]
Sex	Male and Female
Age/weight at study initiation	Age: Young adults, 8 – 12 weeks Weight: Male 245g - 263g Female 212g – 228g
Number of animals per group	10 animals/group (5 male and 5 female)
Control animals	No
Administration/ Exposure	Dermal
Postexposure period	14 days
	Dermal
Area covered	Approx 10% of the total body surface area
Occlusion	Semi-occlusive
Vehicle	No vehicle used (material moistened with arachis oil BP)

Section B6.1.2	**Acute Toxicity**
Annex Point IIA VI.6.1.2	Acute dermal toxicity study in the rat
Concentration in vehicle	Not applicable
Total volume applied	2000 mg/kg
Duration of exposure	24 hours
Removal of test substance	Residual formulation was cleansed with swabs of absorbent cotton wool moistened with distilled water.
Controls	None
Examinations	Clinical observations, mortality, body weight, necropsy
Method of determination of LD_{50}	Not stated
Further remarks	None

Results and Discussion

Clinical signs	There were no deaths. There were no signs of systemic toxicity. There were no signs of dermal irritation. All animals showed expected gains in bodyweight over the study period.
Pathology	No abnormalities were noted at necropsy.
Other	No other significant effects were noted.
LD_{50}	Males and females: > 2000 mg/kg

Applicant's Summary and conclusion

Materials and methods	The study was conducted according to OECD 402 and Method B3 Acute Toxicity (Dermal) of Commission Directive 92/69/EEC. Five male and five female rats were used in this study. On the day before treatment, the back and flanks of each animal were

Section B6.1.2 Acute Toxicity

Annex Point IIA VI.6.1.2 Acute dermal toxicity study in the rat

clipped free of hair.

The dose level, 2000 mg/kg of the formulation moistened with arachis oil BP, was applied as evenly as possible to an area of shorn skin (approximately 10% of the total body surface area). A piece of surgical gauze was placed over the treatment area and semi-occluded with a piece of self-adhesive bandage. The animals were caged individually for the 24-hour exposure period. Shortly after dosing, the dressings were examined to ensure that they were securely in place.

After the 24-hour contact period, the bandage was carefully removed and the treated skin and surrounding hair wiped with cotton wool moistened with distilled water to remove any residual test material.

The animals were observed for deaths or overt signs of toxicity 0.5, 1, 2 and 4 hours after dosing and subsequently once daily for 14 days.

After removal of the dressings and subsequently once daily for fourteen days, the test sites were examined for evidence of primary irritation and scored according to the Draize scale for erythema and eschar formation and oedema formation. Any other skin reactions, if present were also recorded.

Individual bodyweights were recorded prior to application of the test material on Day 0 and on Days 7 and 14.

At the end of the study all animals were killed humanely and subjected to gross necropsy. This consisted of an external examination and opening of the abdominal and thoracic cavities. The appearance of any macroscopic abnormalities was recorded. No tissues were retained.

Section B6.1.2	**Acute Toxicity**
Annex Point IIA VI.6.1.2	Acute dermal toxicity study in the rat
Results and discussion	There were no deaths. There were no signs of systemic toxicity. There were no signs of dermal irritation. All animals showed expected gains in bodyweight over the study period. No abnormalities were noted at necropsy. The acute dermal LD_{50} for the formulation to male and female rats was found to be greater than 2000 mg/kg bodyweight.
Conclusion	Acute dermal LD_{50} for male and female rats is > 2000 mg/kg
Reliability	1
Deficiencies	No

Evaluation by Competent Authorities

Section B6.1.2	**Acute Toxicity**
Annex Point IIA VI.6.1.2	Acute dermal toxicity study in the rat

	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	Evaluation by Rapporteur Member State
Date	*22 March 2013*
Materials and Methods	*Adopt Applicants version*
Results and discussion	Adopt Applicants version
Conclusion	Adopt Applicants version.
Reliability	1
Acceptability	
Remarks	*Is the product water or oil based .Dissolution in arachis oil is only appropriate for oil based preparations?*
	Comments from ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	*Discuss if deviating from view of rapporteur member state*

Section B6.1.2 Acute Toxicity

Annex Point IIA VI.6.1.2 Acute dermal toxicity study in the rat

Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Table B6_1-1 Table for Acute Toxicity

Dose [unit]	*Number of dead / number of investigated*	*Time of death (range)*	*Observations*
2000 mg/kg	0/10	-	There were no signs of dermal irritation.
LD_{50} value	The acute dermal LD_{50} for formulation to male and female rats is greater than 2000 mg/kg		

Annex 3 - ANNEXES to Initial PAR - July 2013

ANNEXES

Annex:

1. Confidential Information and Data
2. Summary of the Product Characteristics (SPC)
3. Study Summaries of Studies Reviewed
4. List of Studies Reviewed
5. Toxicology Calculations
6. Environmental Calculations
7. Residue Calculations

ANNEX I: Confidential Information and Data

Manufacturing site(s) of the active substance(s)[21]

Manufacturer of the active substance(s):	
Company Name:	PelGar International Ltd.
Address:	Unit 13 Newman Lane Industrial Estate, Newman Lane, Alton, Hampshire, GU34 2QR, UK.
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

Manufacturer of the active substance(s):	
Company Name:	PelGar International Ltd.
Address:	Prazska 54, 280 02 Kolin, Czech Republic.
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

Manufacturing site(s) of the biocidal product[3]

Manufacturing site of the biocidal product:	
Company Name:	CGB (Compagnie Générale des Biocides)
Address:	Parc d'Activités des 4 Routes, F-35390 Grand Fougeray France.
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

21 All sites involved in the manufacturing process of each active substance and of the product must be listed.

Assessment of the technical equivalence of Brodifacoum from two different sources (Syngenta and PelGar):

Italy carried out an assessment on the technical equivalence of the PelGar International Ltd. Brodifacoum source with the Annex I source of Brodifacoum (reference source). Brodifacoum produced by Syngenta was considered to be the reference source, since it had been evaluated first and was already included in Annex I, whereas Brodifacoum produced by PelGar was regarded as the new source. The three reports have been sent to the Commission and are available on CIRCA in the TM section (CA-Reports\CA-Reports Review Programme\A-D\Brodifacoum\Product Type 14\Assessment Report). The PelGar source of Brodifacoum was found to be equivalent to the Syngenta source of Brodifacoum (that is listed in Annex I of 98/8/EC). Ireland accepts the Italian evaluation.

Assessment of the technical equivalence of the PelGar Annex I 5-batch analysis for Brodifacoum with a new 5-batch analysis from the same source with the same manufacturing process:

PelGar produced a new 5-batch analysis to address data requirements from other countries outside the European Union. The new study covers all potential impurities of the active substance. The source and manufacturing process of Brodifacoum technical material is unchanged from that in the EU submission. As RefMS Ireland assessed the new data and found that the new 5-batch analysis data is within the specification covered by the Annex I listing. This material is therefore technically equivalent to Brodifacoum as listed in Annex I of the Biocidal Products Directive 98/8/EC.
A full technical equivalence evaluation was not carried out as the criteria for triggering a full technical equivalence evaluation were not met. The criteria are 1. Technical material from a new/different manufacturer 2. Data from industrial scale production vs pilot scale production and 3. Change in the manufacturing process, and/or manufacturing location. The full assessment can be found in the Confidential Addendum to the Product Assessment Report (Member States Only).

[redacted]

General note:
The composition of the PelGar Brodifacoum Concentrate (0.25% Concentrate – blue, 0.0625% denatonium benzoate) used by Lodi in their product can be found in the Confidential Addendum to the Product Assessment Report (Member States Only).

Product trade name: Saphir Paste

Qualitative and quantitative information on the composition/specification of the biocidal product Saphir Paste

Active substance(s)				Contents				
Common name	IUPAC name	CAS No.	EC No.	Concentration	Unit[22]	w/w (%)	Minimum purity (% w/w)	Same source as for Annex I inclusion (Y/N)
Brodifacoum	3-[3-[4-(4-bromophenyl)phenyl] tetralin-1-yl]-2-hydroxy-chromen-4-one	56073-10-0	259-980-5	0.04	g/kg	0.004	[redacted]	[redacted]
Co-formulants				**Contents**				
Common name	Function	CAS No.	EC No.	Concentration	Unit	w/w (%)	Classification	Substance of concern (Y/N)
[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
			[redacted]	[redacted]		[redacted]		

22 g/l, g/kg, other. For biological products, the concentration should state the number of activity units/units of potency (as appropriate) per defined unit of formulation (e.g. per gram or per litre).

Annex II: Summary of the Products Characteristics (SPC)

Please see separate SPC accompanying the PAR and authorisation certificate that have uploaded to the R4BP2.

Annex III: Study Summaries of Studies Reviewed

Insert study summaries with expert evaluation in data point order.

Study summaries of new data[23] submitted in support of the evaluation of the active substance (IIIA)

Physical Chemical Characteristics:

New data was submitted in support of PelGar International Limited's Brodifacoum source of active substance. This included an assessment on the reactivity of the technical concentrate towards the container material. It was argued that there will be no chemical or physical reaction between the technical concentrate and container. This information was assessed by Germany and was found to be acceptable. Ireland accepts Germany's assessment (please see Addendum to Annex I Listing Information on Data Requirements, 26.07.2011).

Methods of Analysis

New data was submitted in support of PelGar International Limited's Brodifacoum source of active substance. This included a fully validated analytical method for the determination of Brodifacoum in soil. This information was assessed by Germany and found to be acceptable. Ireland accepts Germany's assessment (please see Addendum to Annex I Listing Information on Data Requirements, 26.07.2011).

Efficacy

There were no new additional studies submitted for product authorisation.

Toxicology

There were no new additional studies submitted for product authorisation.

Environment (including Eco-Toxicology)

There were no new additional studies submitted for product authorisation.

23 Data which have not been already submitted for the purpose of the Annex I inclusion.

Study summaries of new data submitted in support of the evaluation of the biocidal product (IIIB)

Physical Chemical Characteristics

Section B3	Physical and Chemical Properties of Biocidal Product							
Subsection (Annex Point/TNsG)	**Method**	**Purity/ Specification**	**Results**	**Remarks/ Justification**	**GLP (Y/N)**	**Reliability**	**Reference**	**Official use only**
3.1 Appearance (IIB3.1/Pt. I-B3.1)								
3.1.1 Physical state and nature	GIFAP Monograph No.17 and CIPAC MT 46	Brodifacoum 40 ppm	Malleable paste in individual sachet *After 2 weeks at 54°C: still malleable paste but slightly friable in individual sachet.*		Y	1	B3.7.1: Study report "LODI.59/2011", S.Richerioux, 2011, Lodi	
3.1.2 Colour	GIFAP Monograph No.17 and CIPAC MT 46	Brodifacoum 40 ppm	Blue 2.5PB5/6 (Munsell) *After 2 weeks at 54°C: blue 10B4/4 (Munsell)*		Y	1	B3.7.1: Study report "LODI.59/2011", S.Richerioux, 2011, Lodi	
3.1.3 Odour	GIFAP Monograph No.17 and CIPAC MT 46	Brodifacoum 40 ppm	No characteristic odor *After 2 weeks at 54°C: no characteristic odor*		Y	1	B3.7.1: Study report "LODI.59/2011", S.Richerioux, 2011, Lodi	
3.2 Explosive properties (IIB3.2/Pt. I-B3.2)	OECD method EC A.14	Brodifacoum 40 ppm	Examination of components: the components do not contain any chemical group which have explosive properties. Brodifacoum Paste Bait is considered as not having explosive properties.		Y	1	B3.2: Study report "LODI.66/2011", S.Richerioux, 2011, Lodi	
3.3 Oxidising properties	EC A.17	Brodifacoum 40 ppm	Examination of components: the components do not contain any		Y	1	B3.3: Study report	

Section B3	Physical and Chemical Properties of Biocidal Product							
Subsection (Annex Point/TNsG)	**Method**	**Purity/ Specification**	**Results**	**Remarks/ Justification**	**GLP (Y/N)**	**Reliability**	**Reference**	**Official use only**
(IIB3.3/Pt. I-B3.3)			chemical group that might act as an oxidizing agent. Brodifacoum Paste Bait is considered as not having oxidizing properties. The test according to EC A.17 method is not required.				"LODI.65/2011", C.Richerioux, 2011, Lodi	
3.4 Flash-point and other indications of flammability or spontaneous ignition (IIB3.4/Pt. I-B3.4)								
Flammability	EC A.10 (solid)	Brodifacoum 40 ppm	Preliminary test: no propagation of combustion along 200 mm length of the pile within 4 minutes is observed. According to the guideline, the main test is not required. Based on the results of preliminary test, Brodifacoum Paste Bait is considered as not highly flammable.		Y	1	B3.4.1: Study report "LODI.58/2011", E.Meriadec, 2011, Lodi	
Auto-flammability	EC A.16 (solid)	Brodifacoum 40 ppm	No self ignition temperature of the test item was recorded up to 400°C (corrected value).		Y	1	B3.4.2: Study report " No. 11–912011-010", B.Demangel, 2012, Défitraces	
3.5 Acidity/Alkalinity (IIB3.5/Pt. I-B3.5)								
pH values	CIPAC MT 75.3	Brodifacoum 40 ppm	pH of a 1% (m/v) aqueous dilution of Brodifacoum Paste Bait is 6.3 after 10 minutes at 20.6°C.		Y	1	B3.5: Study report "LODI.64/2011",	

Section B3		Physical and Chemical Properties of Biocidal Product							
Subsection (Annex Point/TNsG)		Method	Purity/ Specification	Results	Remarks/ Justification	GLP (Y/N)	Reliability	Reference	Official use only
								S.Richerioux, 2011, Lodi	
	Acidity/Alkalinity	CIPAC MT 191	Brodifacoum 40 ppm	Determination not required	Determination is not required because pH of a 1% (m/v) aqueous dilution of Brodifacoum Paste Bait is higher than 4 and lower than 10 (FAO guideline).				
3.6	**Relative density/bulk density (IIB3.6/Pt. I-B3.6)**	OECD 109 and NF T20-053	Brodifacoum 40 ppm	1.14	This relative density is determined with a pycnometer at 20°C ± 2°C.	Y	1	B3.6: Study report "LODI.52/2011", S.Richerioux, 2011, Lodi	
3.7	**Storage stability - stability and shelf life (IIB3.7/Pt. I-B3.7)**								
	Stability at 0 ± 2°C				Not required for solid (paste).				
	Accelerated storage procedure for 2 weeks at 54 ± 2°C	GIFAP Monograph No.17 and CIPAC MT 46	Brodifacoum 40 ppm	After the accelerated storage procedure, no significant change was observed concerning the characteristics of the test item. Brodifacoum paste bait is considered stable after the accelerated storage during 14 and 21 days at 54°C ± 2°C.		Y	1	B3.7.1: Study report "LODI.59/2011", S.Richerioux, 2011, Lodi	
	Analytical	An analytical	Brodifacoum 40	Relative deviation of Brodifacoum		Y	1	B3.7.1:	

Section B3	Physical and Chemical Properties of Biocidal Product							
Subsection (Annex Point/TNsG)	**Method**	**Purity/ Specification**	**Results**	**Remarks/ Justification**	**GLP (Y/N)**	**Reliability**	**Reference**	**Official use only**
quantification of the active substance before and after accelerated storage	method validation of brodifacoum in Saphir Paste is presented in Doc III - Section B4	ppm	content between analysis at initial time and after 14 days at 54°C, is 3.32%; and after 21 days at 54°C, is 5.50%. These relative deviations are lower than 15%. Brodifacoum paste bait is considered stable after the accelerated storage during 14 and 21 days at 54°C ± 2°C.				Study report "LODI.59/2011", S.Richerioux, 2011, Lodi	
Dilution stability				Not applicable. The product is ready-to-use. It is not intended to be mixed with any other product.				
Shelf life: storage procedure for 1 year, 2 years and 3 years at 20 ± 2°C	GIFAP Monograph No.17	Brodifacoum 40 ppm	Storage for 1 year: study on-going, started w/b October 24th, 2011.	Temperature recording, physical state (aspect, color, odor) and quantity of a.s. are controlled at T_0, and after 1 year of storage at 20 ± 2°C.	Y	1	B3.7.2: Study plan "LODI.60/2011", S. Richerioux, 2011, Lodi	
	GIFAP Monograph No.17	Brodifacoum 40 ppm	Storage for 2 years: study on-going, started w/b October 24th, 2011.	Temperature recording, physical state (aspect, color, odor) and quantity of active substance are controlled at T_0, and after 2 years of storage at 20°C ± 2°C.	Y	1	B3.7.3: Study plan "LODI.61/2011", S. Richerioux, 2011, Lodi	
	GIFAP Monograph No.17	Brodifacoum 40 ppm	Storage for 3 years: study on-going, started w/b October 24th, 2011.	Temperature recording, physical state (aspect, color, odor) and quantity of active substance are controlled at T_0, and after 3 years of storage	Y	1	B3.7.4: Study plan "LODI.62/2011", S. Richerioux, 2011, Lodi	

Section B3	Physical and Chemical Properties of Biocidal Product							
Subsection (Annex Point/TNsG)	**Method**	**Purity/ Specification**	**Results**	**Remarks/ Justification**	**GLP (Y/N)**	**Reliability**	**Reference**	**Official use only**
				at 20°C ± 2°C. Packaging's aspect, sample and packaging's weight are controlled at T_0, and after 1 year, 2 years and 3 years of storage at 20°C ± 2°C.				
3.8 Technical characteristics (IIB3.8/Pt. I-B3.8)				Not applicable as the product is a paste.				
3.9 Compatibility with other products (IIB3.9/Pt. I-B3.9)				Not applicable. The product is ready-to-use. It is not intended to be mixed with any other product.				
3.10 Surface tension (Pt. I-B3.10)				Not applicable as the product is a paste.				
3.11 Viscosity (Pt. I-B3.10)				Not applicable as the product is a paste.				
3.12 Particle size distribution (Pt. I-B3.11)				Not applicable as the product is a paste.				

Conclusions:

Saphir Paste is not explosive, oxidising or highly flammable and therefore does not classify from a physical and chemical point of view. The paste bait is stable when stored for 2 weeks at 54^{o}C and when stored at ambient temperatures (20^{o}C) for 1 year. The

paste bait is stable when stored in various different packaging materials (with the exception of the coextruded bag with cardboard box) for 1 year at ambient temperature (20^{o}C). The test item is a ready-to-use paste bait and is not intended to be added or mixed with any other product.

Methods of Analysis

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**	
	1 Reference	**Official use only**
1.1 Reference	Richerioux S., 2012, Analytical validation for determination of Brodifacoum, Lodi, Study No. LODI.51/2011	
1.2 Data protection	Yes	
1.2.1 Data owner	LODI	
1.2.2 Criteria for data protection	Data on existing biocidal product to maintain a biocidal product's authorisation	
	2 MATERIALS AND METHODS	

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**	
2.1 Preliminary treatment		
2.1.1 Enrichment	/	
2.1.2 Cleanup	/	
2.2 Detection	Brodifacoum was quantified by liquid chromatography using a reverse phase column and an UV detector.	
2.2.1 Separation method	Chromatographic conditions: - Column: C18, 150 mm x 4.6 mm, 5 µm, 110 Å - Mobile phase: acetonitrile/Buffer pH 2.7 (70/30% v/v) - Wavelength: 310 nm - Flow: 1 mL/min - Injection volume: 20 µL - Acquisition time: 30 minutes - Retention time: Brodifacoum 1 =16.22 min Brodifacoum 2 = 17.97 min Internal Standard (1,3,5-triphenylbenzene) = 26.09 min Extraction conditions: - Extraction solvent: n-hexane/dichloromethane/methanol/acetic acid (80/16/2/2% v/v) - Protocol: 15 minutes in ultrasonic bath, 30 minutes with magnetic stirring, 4 hours settling	
2.2.2 Detector	UV detector: λ= 310 nm	
2.2.3 Analytical Standard(s)	Reference item: Name: Brodifacoum PESTANAL® Supplier: SIGMA-ALDRICH Batch number: SZB8324XV Expiry date: November 19th, 2013	
2.2.4 Interfering substance(s)	No substance may interfere with Brodifacoum.	

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**	
2.3 Linearity		

Section A4.1 **Annex Point IIA4.1** **& IIIA-IV.1**	**Analytical Methods for Detection and Identification**	
2.3.1 Calibration range	The linearity is given on an interval of concentration. The interval extends from 20% in lower part from the awaited concentration and 20% to the top of the awaited concentration. The operator prepares 5 solutions containing 80%, 90%, 100%, 110% and 120% of the concentration in the Test Item. The concentrations used are 1.61mg/L, 1.81mg/L, 2.01mg/L, 2.21mg/L and 2.41mg/L.	X
2.3.2 Number of measurements	Three measures per concentration level.	
2.3.3 Linearity	Coefficient of determination for Brodifacoum 1 peak: r^2 = 0.9949 (r = 0.9974), Coefficient of determination for Brodifacoum 2 peak: r^2 = 0.9923 (r = 0.9961), showing a good linearity (r > 0.99).	
2.4 Specificity: interfering substances	To define the specificity of the analytical method, the following items were analyzed: - Placebo - Bait stressed by adding 5 mL of acetic acid If a peak appears, the resolution (Rs) must be higher than 2: $Rs = 2 \times \frac{t_2 - t_1}{w_1 - w_2}$. with: - t_i = retention time - w_i = width at semi-height Results are: - placebo : no peak other than internal standard - stressed bait: no peak appears The specificity permits to make sure that no interference causes false-positive, or does not disturb the quantitative measurement of the Test Item.	
2.5 Recovery rates at different levels	The accuracy (precision) translates the narrowness between the value found and the value of reference. The operator dopes a placebo to 50, 100 and 150% of the theoretical concentration of Test Item. He carries out 3 injections per solution and calculates the Mean Recovery (MR) for each solution:	

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**

$$90\% < MR = \frac{\text{Experimental value}}{\text{True value}} \times 100 < 110\%$$

The recoveries of Brodifacoum are given in the following table:

Paste Bait	50% doped placebo	100% doped placebo	150% doped placebo	**Average of MR**
MR values	107.16%	98.92%	91.77%	99.28%

The recovery rates are included in the range 90% - 110%. The accuracy (precision) of the method is validated.

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**	
2.5.1 Relative standard deviation	Relative Standard Deviation (RSD) for: - intralaboratory fidelity 1.19% - intermediate fidelity 0.949%	
2.6 Limit of determination	Limit of detection: The operator injects a solution containing 10 ppm of active substance, and calculates the ratio S / N, with: - S = Signal (intensity of peak) - N = Noise (intensity of the background noise). The operator divides by 10 then by 2 the concentration of the active substance until obtaining a ratio S / N lower than 3. The limit of detection is the last concentration for which S / N is higher than 3. The limit of detection is 0.1254 ppm (S / N = 4.75).	
	Limit of quantification: The operator injects a solution containing 50 ppm of active substance, and calculates the ratio S / N, with: - S = Signal (intensity of peak) - N = Noise (intensity of the background noise). The operator divides by 10 then by 2 the concentration of the active substance until obtaining a ratio S / N lower than 10. The limit of quantification is the last concentration for which S / N is higher than 10. The limit of quantification is 0.6270 ppm (S / N = 15.25).	
2.7 Precision		
2.7.1 Repeatability	The fidelity (selectivity) translates the narrowness between series of measure and the average of the found values. It provides an indication on errors due to factors of variability (operator, equipment, calibration, environmental considerations,…). The relative standard deviation is the criterion of acceptability of the test according to the formula. The operator prepares 3 solutions of a concentration (C) of the product to be proportioned. He carries out 3 injections per solution. RSD (Relative Standard Deviation) is calculated for each solution:	

Section A4.1 Annex Point IIA4.1 & IIIA-IV.1	Analytical Methods for Detection and Identification

$$RSD < 2^{(1-0.5\log C)} \times 0.67$$

with : C = absolute concentration

The results are:

Intra-laboratory fidelity

	1st injection	2nd injection	3rd injection	Date	Opérateur
Solution a	2.21277	2.28407	2.23084	2011-09-06	SR
Solution b	2.25319	2.19532	2.24722	2011-09-06	SR
Solution c	2.26316	2.21401	2.22271	2011-09-06	SR
		RSD %=	**1.188**		

Intermediary fidelity

	1st injection	2nd injection	3rd injection	Date	Opérateur
Solution a	2.23254	2.21166	2.24662	2011-09-08	SR
Solution b	2.25319	2.19532	2.24722	2011-09-06	SR
Solution c	2.26316	2.21401	2.22271	2011-09-06	SR
		RSD %=	**0.949**		

In both cases, the fidelity (selectivity) of the method is validated.

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**	
2.7.2 Independent laboratory validation	Not available	
	3 Applicant's Summary and conclusion	
3.1 Materials and methods	The Test Item is quantified by High Performance Liquid Chromatography (HPLC) using a reverse phase column and an UV detector.	
3.2 Conclusion	In compliance with Guideline for quality in analytical chemistry (CITAC / EURACHEM), the analytical method for the determination of Brodifacoum in Paste Bait is validated during the study by definition of the linearity, the specificity, the accuracy (precision with recovery rates), the limit of detection and the limit of quantification, and the precision (with fidelity/selectivity) of the method. Linearity The response of the detector during the analysis of Brodifacoum is linear (r = 0.9974 (Brodifacoum 1), r = 0.9961 (Brodifacoum 2)). Specificity The specificity permits to make sure that no interference causes false-positive, or does not disturb the quantitative measurement of Brodifacoum. Accuracy (recovery rates) The accuracy results of Brodifacoum are in conformity with the range 90% - 110%. Indeed, the recovery results are experimentally between 91.77% and 107.16%, with an average at 99.28%. Limit of determination The limit of detection is 0.1254 ppm. The limit of quantification is 0.6270 ppm. Precision (fidelity/selectivity) Intermediate and intralaboratory fidelity is measured. In both cases, RSD are correct and the fidelity (selectivity) of the method is validated.	
3.2.1 Reliability	1	
3.2.2 Deficiencies	No deviation was requested.	
	Evaluation by Competent Authorities	
	Use separate "evaluation boxes" to provide transparency as to the comments and	

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**
	views submitted
	EVALUATION BY REFERENCE MEMBER STATE (IRELAND)
Date	25.7.2012
Materials and methods	X: The linearity range in g/kg: 0.00161, 0.00181, 0.00201, 0.00221, 0.00241 g/kg. Applicant's version is adopted.
Conclusion	The method is acceptable for the determination of Brodifacoum in the paste bait.
Reliability	1
Acceptability	Acceptable
Remarks	None.
	COMMENTS FROM OTHER MEMBER STATE *(specify)*
Date	*Give date of comments submitted*
Results and discussion	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant´s summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section A4 (4.2) **Annex Point IIA4.2 & IIIA-IV.1**	**Analytical Methods in Soil, Air, Water, Animal and human body fluids and tissues and treated food or feedingstuffs**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA	Official use only
Other existing data [X]	**Technically not feasible [ ] Scientifically unjustified [ ]**	
Limited exposure [ ]	**Other justification [ ]**	
Detailed justification:	Validated methods for the determination of Brodifacoum in several matrices (water, soil and in food or feedstuffs) are available. No method is considered needed for analysis in air due to the low vapour pressure of Brodifacoum and as it is not used in spray applications. Please refer to the Letter of Access from Pelgar.	
Undertaking of intended data submission [ ]	–	
	Evaluation by Competent Authorities	
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted	
	EVALUATION BY REFERENCE MEMBER STATE (IRELAND)	
Date	25.7.2012	
Evaluation of applicant's justification	Accept the applicant's justification.	
Conclusion	The applicants' justification for the non-submission of data is acceptable.	
Remarks	A suitable MOA was not provided in the CAR for the determination of Brodifacoum in soil. However, a new MOA for the determination of Brodifacoum in soil was provided by PelGar post Annex I inclusion. This was assessed by Germany and found to be acceptable. Please see Annex III: Study Summaries of Studies Reviewed.	
	COMMENTS FROM OTHER MEMBER STATE *(specify)*	
Date	*Give date of comments submitted*	

Section A4 (4.2) **Annex Point IIA4.2 & IIIA-IV.1**	**Analytical Methods in Soil, Air, Water, Animal and human body fluids and tissues and treated food or feedingstuffs**
Results and discussion	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant´s summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section B5 Effectiveness against target organisms and intended uses

Subsection (Annex Point)			Official use only
5.1	**Product type(s) and field(s) of use envisaged (IIB5.1)**		
5.1.1	**Product type(s)**		
	MG03: Pest control	Product type PT14: rodenticide VIII.4.1 Paste VIII.4.1.1 Ready-to-use (sachets and other)	
5.1.2	**Overall use pattern**	Saphir Paste is presented as a ready-to-use paste bait for the control of Norway rats and house mice in and around buildings, in waste disposal sites, and in open areas, for amateur and professional users.	
5.2	**Method of application including description of system used (IIB5.2)**	Method of application VI.2: covered application VI.2.1: covered application in bait stations. VI.2.2: other covering Rodenticide ready-to-use paste baits, packaged in individual sachets of 10 g, containing 0.004% of Brodifacoum as the active substance, are for use indoors and outdoors for the protection of public health, stored products and materials. They are used as a response to an infestation. Bait points are placed where there are signs of activity. A thorough survey of the infested area is essential, particularly in secluded and sheltered places, to determine the extent of the infestation. Baits should be secured inside tamper resistant bait boxes or in bait containers under secure coverings to minimize the risk of consumption and poisoning by children, companion animals and other non-target animals and contamination of the environment. Tamper-resistant and secured bait stations should be used when used by professionals in public areas or where there is a risk of primary or secondary poisoning.	

Section B5 Effectiveness against target organisms and intended uses

		The distance between two bait stations, the number and timings of application are in function of the infestation level (see point 5.3) and can be adapted upon experience of bait uptake during the campaign. Since the product is formulated as a ready-to-use bait, no dilution or other preparation are necessary. Use of gloves when handling the baits is advised on the label. Hands and face should be washed after application and use of the product, and before eating, drinking or smoking. Bait points are to be checked regularly and any consumed or spoilt bait has to be replaced until consumption has stopped. Dead rodent bodies, remains of unused bait or any fragments of bait found away from the bait station must be collected during all control operations to minimize the risk of children, companion animals and other non-target animals' consumption and poisoning. Remains of unused product and dead rodents are to be disposed of in accordance with local/national regulations.
5.3	**Application rate and if appropriate, the final concentration of the biocidal product and active substance in the system in which the preparation is to be used, *e.g.* cooling water, surface water, water used for heating purposes (IIB5.3)**	Bait points are placed manually in dry locations and in appropriate positions. Baits should be placed where they are inaccessible to children and non-target organisms and not be applied in areas where food/feed, food utensils or food processing surfaces may come into contact with, or be contaminated by the product. Bait points are placed throughout the infested areas with 60 g per bait point for rats and 10 g per bait point for mice. Application sites are located 5-10 m apart for rats and 3-5 m apart for mice. The numbers of baits and the distances have to be adapted to the infestation level. The shortest distance is to be used in severe infestations.

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5.4	**Number and timing of applications, and where relevant, any particular information relating to geographical variations, climatic variations, or necessary waiting periods to protect man and animals (IIB5.4)**	The quantity of bait used depends on the level of infestation and has to be adapted to local conditions. After the end of the baiting period, surveillance should continue and baiting must be re-started at signs of re-infestation (e.g. fresh tracks or droppings).
5.5	**Function (IIB5.5)**	Rodenticide
5.6	**Pest organism(s) to be controlled and products, organisms or objects to be protected (IIB5.6)**	
5.6.1	**Pest organism(s) to be controlled**	Target organisms to be controlled I.1.1.1 Brown rat: *Rattus norvegicus* I. I.1.1.3 House mouse: *Mus musculus* Developmental stages of target organisms to be controlled II.1 Juveniles II.2 Adults
5.6.2	**Products, organisms or objects to be protected**	Application aim VII.1 Stored product protection / food protection VII.2 Health protection VII.3 Material protection (historical buildings, technical objects)

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		The product is used for the purpose of the protection of public health, including: - Prevention of transmission of disease; - Prevention of the contamination of food and feedingstuffs and other materials, at all stages of their production, storage and use; - Protection of buildings and structures including pipes, cables and overall integrity; - Protection of livestock, wild and domestic; - Social abhorrence and stigma; - Legal requirement.
5.7	**Effects on target organisms (IIB5.7)**	Brodifacoum is a second-generation single-dose anticoagulant rodenticide. It disrupts the normal blood clotting mechanisms by inhibiting hepatic vitamin K metabolism, resulting in increased bleeding tendency and, eventually, haemorrhage and death. Symptoms appear a few hours after ingestion and the rodents die a few days later. Effectiveness of Brodifacoum depends on exposure (*i.e.* consumption of the bait by the target organism).
5.8	**Mode of action (including time delay) in so far as not covered by section A5.4 (IIB5.8)**	<u>Function / Mode of action</u> III.2 long term action III.2.1 anticoagulant III.2.1.1 ingestion toxin III.2.1.1.1 ingestion by eating The active substance, Brodifacoum is a second generation anticoagulant rodenticide, which likes other coumarin derivatives, is a vitamin K antagonist. They function by inhibiting the ability of the blood to clot at the site of a haemorrhage, by blocking the regeneration of vitamin K in the liver. Death of target organisms is due to massive internal haemorrhages after several days of ingestion of a lethal dose. Please refer to the active substance dossier (Section A5.4 and Doc. IIA).
5.9	**User: industrial, professsional, general public**	<u>Field of use</u> IV.1 indoor use

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	(non-professional) (IIB5.9)	IV.1.1 potential for contamination outdoors IV.1.1.1 yes IV.1.2 Potential for contamination of food IV.1.2.2 no IV.2: outdoor use
		<u>User category</u> V.1 non professional/ general public V.2 professional V.3 specialised professional
	1. Industrial	Not appropriate
	2. Professional	Pest control operators and non-trained professionals
	3. General public	Homeowners
5.10	**Efficacy data: The proposed label claims for the product and efficacy data to support these claims, including any available standard protocols used, laboratory tests, or field trials, where appropriate (IIB5.10)**	
5.10.1	**Proposed label claims for the**	Labels for amateurs and professional are provided in section B9.

Section B5 Effectiveness against target organisms and intended uses

	product	
5.10.2	**Efficacy data**	Please refer to Document B5.10_effectiveness
5.11	**Any other known limitations on efficacy including resistance (IIB5.10)**	
5.11.1	**Use-related restrictions**	The proposed labels contain detailed instructions for use. The population size of the target rodent should be evaluated before a control campaign. The number of baits and the timing of the control campaign have to be proportionate to the infestation level. Baits must be placed in a safe manner inaccessible to children and non-target species and not be applied to areas where food/feed, food utensils or food processing surfaces may come into contact with, or be contaminated by the product. Bait consumption should be regularly checked and consumed or spoilt bait replaced until consumption has stopped. The remaining baits and material must be removed and disposed of safely at the end of the treatment according to local/national wastes disposal regulation. The rodents' bodies all along the treatment must be disposed of according to local/national regulation.
5.11.2	**Prevention of the development of resistance**	The resistance status of the rodent population to Brodifacoum should be taken into account when considering the choice of rodenticide to be used. Where resistance to Brodifacoum is suspected or has been shown, resistant management strategies should be employed and products containing an alternative active substance should be used or a professional pest control operator be consulted. Moreover, the following measures from Codes of Good Practice in Rodent control are recommended and usually respected by the applicators: - The population size of the target rodent should be evaluated before a control campaign. The number of baits and the timing of the control campaign should be in proportion to the size of

Section B5 Effectiveness against target organisms and intended uses

	the infestation. - A complete elimination of rodents in the infested area should be achieved. - The use instruction of products should contain guidance on resistance management for rodenticides. - Resistant management strategies should be developed, and Brodifacoum should not be used in an area where resistance to this substance is suspected. - The authorisation holder shall report any observed resistance incidents to the Competent Authorities or other appointed bodies involved in resistance management. - When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary or secondary poisoning by the anticoagulant as well as indicating the first measures to be taken in case of poisoning must be made available alongside the baits.	
5.11.3 Concomittant use with other (biocidal) products	The use of the product with other biocidal products is not recommended.	

Table B5-1: Summary table of data on the method of application including description of system used

Serial number	Product type	Substance(s) used for dilution	Concentration of dilutant(s)	Other substance(s) added	Application technique	Remarks
(1)	PT14 - Rodenticide	None	Not relevant	No other active substance. The product contains a bittering agent to reduce accidental ingestion	The ready-to-use product is applied manually by placing product in a safe manner to prevent children and non-targeted animals' access. The product is to be used in and around buildings, in open areas and waste dumps.	The product is not intended to be used with any other product.

Table B5-2: Summary table of data on the number and timing of applications, and where relevant, any particular information relating to geographical variations, climatic variations, or necessary waiting periods to protect man and animals

Serial number	Product type	Application type	Number and timing of application	Waiting periods	Information on recommended variations of the application rate in different locations	Remarks
(1)	PT14 - Rodenticide	Ready-to-use bait against mice and rats For general public and for professionals For use in and around buildings, in open areas and waste dumps Application codes: I.1.1.1 and I.1.1.3, II.1 and II.2, III.2.1.1.1., IV.1 (IV.1.1.1 and IV.1.2.2) and IV.2, V.1, V.2 and V.3, VI 2.1 and VI.2.2, VII.1, VII.2 and VII.3, VIII.4.1.1	The number and timing of application depends on the infestation level.	Not applicable	The application is similar in all parts of the Community	Rodenticide use is closely related to the level of infestation. It is necessary to explore carefully the site before treatment.

Evaluation by Competent Authorities		
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	March 2013	
Materials and Methods	N/A	
Results and discussion	N/A	
Conclusion	N/A	
Reliability	N/A	
Acceptability	N/A	
Remarks	N/A	
	COMMENTS FROM ... *(specify)*	
Date	*Give date of the comments submitted*	
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*	
Results and discussion	*Discuss if deviating from view of rapporteur member state*	
Conclusion	*Discuss if deviating from view of rapporteur member state*	
Reliability	*Discuss if deviating from view of rapporteur member state*	
Acceptability	*Discuss if deviating from view of rapporteur member state*	

NOTE: Efficacy studies on the rodenticide product were conducted by LODI S.A.S., Belgagri or BIO6. Letters of Access are provided in the administrative part of the dossier. In some of the studies, the trade names are different from the current trade name Saphir Paste. A certificate from LODI S.A.S. is provided certifying that the products are similar, only the trade names change (see the attestation in the document IV-B.5.10).

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Official use only

1 Reference

1.1 Reference

Mahaut T., Dr. Cavelier M., 2003, Evaluation of the effectiveness of Brodipasta, a ready-to-use rodenticide paste bait containing 0.004% brodifacoum, against the Norway rat (*Rattus norvegicus* Berkenhout) and the house mouse (*Mus musculus* L.), Wallon Agricultural Research Centre, Gembloux, Contract No. 2003-03-Belgagri (unpublished), 20 April 2003.

1.2 Data protection

Yes

1.2.1 Data owner

Belgagri SA

A letter of access from Belgagri SA is provided for this study (see the administrative dossier).

1.2.2 Criteria for data protection

Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its authorisation.

1.3 Guideline study

In-house laboratory test method (see the Doc. IV-B5.10/01 - Appendix 1 in French - Lignes directrices pour l'évaluation de l'efficacité des rodenticides et critères de décision – Royaume de Belgique, Ministère de l'Agriculture, CRA de Gembloux, Octobre 1994)

1.4 Deviations

-

2 Method

Section B5.10/01	**Efficacy Data**
Annex Point IIB5.10 **TNsG: Pt. I-B5.10,** **Pt. III-Ch. 6**	Efficacy on rats and mice, choice feeding test, fresh product

2.1 Test Substance (Biocidal Product)	Brodifacoum
2.1.1 Trade name/ proposed trade name	Brodipasta, similar to Saphir Paste (see the attestation for the different product names used in efficacy trials reports)
2.1.2 Composition of Product tested	Paste bait, freshly manufactured Batch number R211003a. Nominal concentration: 40.0 mg a.s. / kg Measured concentration: 35.5 mg a.s./kg (S.D. 0.33%) (within the acceptable decision criteria fixed to 40.0 ± 10.0 ppm)
2.1.3 Physical state and nature	Ready-to-use paste bait (RB)
2.1.4 Monitoring of active substance concentration	Not applicable
2.1.5 Method of analysis	HPLC method – WHO/IS/ (7.ROI.1 rev 1)
2.2 Reference substance	Standard rodent diet: ground wheat grains
2.2.1 Method of analysis for reference substance	Not relevant. The challenge diet was a non-poisoned product.
2.3 Testing procedure	
2.3.1 Test population	Trial No. EFFI2003-07: 10 wild Norway rats in individual cages. Trail No. EFFI2003-08: 10 wild house mice in individual cages.

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/ **inoculum / test organism**	Trial No. ALBI2003-04: 22 albino laboratory Norway rats (11 males and 11 females, 10 to 20 weeks old, including one control pair) in individual cages. See Table 1.2
2.3.2 Test system	Laboratory test. For wild rodents, the trail was carried out with 10 rats and 10 mice. Rats were bred in three 10 m * 10 m enclosures, coming from 3 or 4 pairs captured on farms in the Gembloux area and fed with sow pellets (complete feed) and ground wheat grains. Mice were bred in mouse pens occupied by several dozen mice and fed with ground wheat grains. The populations of the enclosures are completely renewed annually. A time of at least three weeks was allowed between capture of the last rodent for the trial and the start of the trial, in order to discard pregnant females or sick individuals. Upon capture, the animals were individually housed in cages measuring 50 cm * 30 cm * 25 cm where they were given unlimited water and freshly ground wheat. The test is a choice test in which the rodents have unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during a 21-day test period. The same protocol was used for laboratory rats (stage 1 of the ageing test) except that 22 albino rats were used instead of 10 wild rats. See Table 1.2.
2.3.3 Application of Test Substance	During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 40 g of ground wheat grains and 45 g of the test item per day for rat and about 10 g of ground wheat grains and 15 g of the test item per day for mice) (see Table 1.4).
2.3.4 Test conditions	Ambient conditions in animal rooms were maintained in accordance with normal laboratory requirements. Animals were

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housed in single cages, equipped to provide food and water provided *ad libitum* during the pre-tested period and in excess during the 21-day test period (see Table 1.5).

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2.3.5 Duration of the test / Exposure time	The test consisted of a pre-test diet take assessment (conditioning period of at least 3 weeks with an estimation of the food eaten by each rodent for the last 5 days), followed by a test period (period of exposure to the test item) of 21 days.
2.3.6 Number of replicates performed	No replicate performed.
2.3.7 Controls	No for wild rodents (not required in EPPO guidelines and by the EU in order to reduce the number of test animals). One control pair of Norway rats was used for the laboratory trial.

2.4 Examination

2.4.1 Effect investigated	Palatability of the product in the presence of a competing alternative food (standard diet).
2.4.2 Method for recording / scoring of the effect	The daily intakes of challenge diet and test bait were measured and recorded. The weight of each animal was recorded during the conditioning period before the daily intake assessment.
2.4.3 Intervals of examination	Daily.
2.4.4 Statistics	Product acceptance (amount of product eaten expressed as a percentage of total [product + challenge diet] consumption) calculated for each individual and for the group, and for the different sexes of albino laboratory Norway rats. Percentage of mortality.
2.4.5 Post monitoring of the test organism	No

4 3 Results

3.1 Efficacy

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3.1.1 Dose/Efficacy curve	Not applicable
3.1.2 Begin and duration of effects	The mean 'days to death' ranged: - with wild Norway rats after 6 to 17 days of exposure. - with wild house mouse after 6 to 19 days of exposure. - with albino Norway rats after 3 to 8 days of exposure.
3.1.3 Observed effects in the post monitoring phase	Mortality was total (100%) in all test groups after a 21-day choice test.
3.2 Effects against organisms or objects to be protected	Not applicable.
3.3 Other effects	Not applicable.
3.4 Efficacy of the reference substance	Not applicable.
3.5 Tabular and/or graphical presentation of the	Wild Norway rats, fresh bait:

	Initial weight of the animals	Day of death*	Mean intake (mg a.s./kg	Mean quantity consumed by each animal during the 21-day	% acceptance*

Section B5.10/01 **Efficacy Data**

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, fresh product

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summarised results

	(g)		b.w.)*	test period*		
				Treated	Control	
Average	279.6	9.9	0.72	4.56	10.70	38.7
SD	73.4	4.1	0.48	2.44	8.45	28.4

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

Wild house mice, fresh bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)*	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treated	Control	
Average	15.3	9.5	2.75	1.04	1.42	43.4
SD	3.7	3.7	0.65	0.31	0.65	9.5

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

Albino Norway rats, fresh bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)*	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treated	Control	
Fresh bait ♂	Mean = 188 SD = 5.2	Mean = 4.9 SD = 1.5	Mean = 1.07 SD = 0.37	Mean = 5.05 SD = 1.81	Mean = 8.51 SD = 2.26	Mean = 37.4% SD = 12.6%
Fresh bait ♀	Mean = 165 SD = 10.3	Mean = 6.1 SD = 1.2	Mean = 0.95 SD = 0.36	Mean = 3.98 SD = 1.63	Mean = 4.43 SD = 2.96	Mean = 50.1% SD = 22.5%
Fresh bait ♂+♀	Mean = 176 SD = 14.2	Mean = 5.5 SD = 1.4	Mean = 1.01 SD = 0.36	Mean = 4.52 SD = 1.76	Mean = 6.47 SD = 3.31	Mean = 43.8% SD = 18.9%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg)..

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3.6 Efficacy limiting factors

Not applicable

3.6.1 Occurrences of resistances

Not applicable

3.6.2 Other limiting factors

4 Relevance of the results compared to field conditions

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4.1 Reasons for laboratory testing	This laboratory test is designed to determine the palatability of fresh product. Either the amount of bait consumed, in which the active substance is incorporated, or the mortality of the rodents is a measure for the palatability of the fresh bait in controlled and recognised conditions.
4.2 Intended actual scale of biocide application	Not applicable
4.3 Relevance compared to field conditions	
4.3.1 Application method	Rats and mice had the choice between bait and alternative food. This is intended to represents field conditions in which the animals have unrestricted access to food in competition with treated bait.
4.3.2 Test organism	House mice and Norway rats, the target organisms, are used both for laboratory and field tests. In addition, as proposed in the TNsG on Product Evaluation Appendices to Chapter 7 Product Type 14, wild rodents have been tested for the bait-choice test.
4.3.3 Observed effect	Brodifacoum Paste Bait was sufficiently attractive to rats and mice to divert them from feeding only on the familiar diet. The observed effects of high consumption of the test item by rodents and the total mortality of the test group are both relevant to field conditions.
4.4 Relevance for read-across	Yes and field data are available as well.

5 Applicant's Summary and conclusion

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5.1 Materials and methods

The test material is a paste bait freshly manufactured (T_0) containing nominally 40 mg/kg of Brodifacoum.

The test was a laboratory choice feeding test. It consisted in at least 3-week acclimatisation period (conditioning period) followed by a 21-day test period.

The test group consisted of 10 wild Norway rats, 10 wild house mice and 22 albino laboratory Norway rats (11 males and 11 females), including a control pair. Rats and mice body weights', test substance and food consumption, observation of mortality were recorded during the essay.

The treated bait and control bait were placed in 2 food bowls and the quantity in each pot exceeded the normal daily requirement for each animal. The positions of the test item and of the challenge diet bowls were alternated daily.

The percentage of ingested bait containing the product in the bait choice feeding and the percentage of dead animals were used as criteria for this essay.

5.2 Reliability

1

5.3 Assessment of efficacy, data analysis and interpretation

Acceptance of the Brodifacoum Paste Bait was very good.

The mean acceptance of the test item was 38.7% (S.D. 28.4%) for wild Norway rats, 43.4% (S.D. 9.5%) for wild house mice and 43.8% (S.D. 18.9%) for laboratory Norway rats, showing that the Brodifacoum Paste Bait is a palatable formulation.

Mortality was total (100%) in all test groups, after a 21-day choice between this test substance and the challenge diet, with a mean 'days to death' ranging from the 3rd to the 19th day of exposure.

5.4 Conclusion

The study showed that, when freshly manufactured, Brodifacoum Paste Bait is palatable to wild Norway rats, to wild house mice and to laboratory Norway rats, with a mean palatability against ground laboratory diet above 20% (the minimum acceptance was observed for male albino rats: 37.4% (S.D. 12.6%). The test item also resulted in 100% mortality after a 21-day choice between this formulation and challenge diet.

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According to the European Commission document (European Commission, 2008), Section 4.1 “Norms and Criteria”:
“In the bait choice feeding test the percentage of ingested bait containing the product should be normally ≥ 20%. When the test results in ≥ 90% mortality, a lower level than 20% of the total food consumption is acceptable.”
The results obtained in the choice test with the test item Brodifacoum Paste Bait, freshly manufactured meet the required criteria.
The results of this test reflect field conditions as animals have unrestricted access to a well-known food.
It can be concluded that the tested Brodifacoum Paste Bait is palatable in the presence of a competing alternative food (standard diet).

5.5 Proposed efficacy specification

The efficacy of the test item is very good to excellent (100% mortality).

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Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, fresh product

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	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	March 2013.
Materials and Methods	**2.4.1** Effect observed included palatability and mortality.
Results and discussion	The mean acceptance of the test item was 38.7% for wild Norway rats, 43.4% for wild house mice and 43.8% for albino Norway rats. The efficacy was excellent. Mortality was total (100%) in all test groups. The mean time to death ranged from 3 to 19 days after the first intake of treated baits.
Conclusion	Agree with applicant's version.
Reliability	1
Acceptability	Acceptable.
Remarks	None.
	COMMENTS FROM ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	*Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section B5.10/01 Efficacy Data

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, fresh product

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1.2 Test organism

Criteria	Details
Species	Wild and albino Norway rats (*Rattus norvegicus* Berkenhout) Wild house mice (*Mus musculus* L.)
Strain	Not specified
Source	Not specified
Laboratory culture	Yes for albino Norway rats
Stage of life cycle and stage of stadia	Healthy non-pregnant adults
Mixed age population	No relevant details
Other specification	The mean initial body weight of rats ranged from 190 to 420 g for wild Norway rats, from 11 to 22 g for wild house mice and from 150 to 196 g for laboratory Norway rats
Number of organisms tested	10 animals per species for wild rodents 22 animals, 11 males and 11 females for laboratory rats (including one pair control)
Method of cultivation	Wild animals were captured on farms in the Gembloux area. Wild rats are first placed in three 10 m * 10 m enclosures and each enclosure is occupied by several dozen rodents, bred from 3 or 4 pairs captured and fed with sow pellets (complete feed) and ground wheat grains. Wild mice are placed in a shed with several dozen mice fed with ground wheat grains per pen. The populations of the enclosures are completely renewed annually. Upon capture, rats and mice were individually housed in cages measuring 50 cm * 30 cm * 25 cm where they were given unlimited water and freshly ground

	wheat. The same protocol was used for laboratory rats (stage 1 of the ageing test) except that 22 albino rats were used instead of 10 wild rats. Animals were weighted and kept individually in cages under controlled conditions.
Pre-treatment of test organisms before exposure	The wild animals were acclimatised to test conditions for at least 3 weeks in order to discard pregnant females or sick individuals (with an estimation of the food eaten by each rodent for the last 5 days). The laboratory rats were acclimatised to test conditions for at least 5 days.
Initial density/number of test organisms in the test system	10 wild rats and 10 wild mice. Each animal was individually caged. 22 laboratory rats. Each animal was individually caged.

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Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

Efficacy on rats and mice, choice feeding test, fresh product

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1.3 Test system

Criteria		Details
4.1.1	**Culturing apparatus / test chamber**	Mice and rats were individually caged under standard conditions.
4.1.2	**Number of vessels / concentration**	Two symmetrically-placed food bowls at the front of each cage.
4.1.3	**Test culture media and/or carrier material**	The test bait was a paste bait containing nominally 40 mg/kg of Brodifacoum, provided by the sponsor, and manufactured in October 2003. The challenge diet was ground wheat grains.
4.1.4	**Nutrient supply**	Not applicable
4.1.5	**Measuring equipment**	Weighing scale

1.4 Application of test substance

Criteria	Details
Application procedure	During the conditioning period, the animals had access to freshly ground wheat grains. The amount of food consumed by each animal was determined daily to the nearest 0.1 g by the difference method. On each morning, food bowls were weighed, replenished and re-weighed. During the 21-day test period, rats had access to about 45 g of fresh test item and to 40 g of the challenge diet and mice to about 15 g of fresh test item and to 10 g of the challenge diet and the positions of the bowls containing the two diets were alternated daily.
Delivery method	The challenge diet and test bait were placed in 2 food bowls.
Dosage rate	The contents of the food bowls were made up daily to provide an excess of the animals' daily requirement from each bowl.
Carrier	Not applicable
Concentration of liquid carrier	Not applicable
Liquid carrier control	Not applicable
Other procedures	No other relevant details.

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Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, fresh product

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1.5 Test conditions

Criteria	Details
4.1.6 Substrate	Not applicable
4.1.7 Incubation temperature	Ambient temperature
4.1.8 Moisture	Ambient relative humidity
4.1.9 Aeration	Not specified
4.1.10 Method of exposure	Oral exposure
4.1.11 Aging of samples	Fresh test bait
4.1.12 Other conditions	No other relevant details

Section B5.10/02	**Efficacy Data**
Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	

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1 Reference

1.1 Reference	Dr. De Proft M., Dr. Meeùs P., 2005, Study of ageing behaviour of Brodipasta, a ready-to-use bait containing 0.004% brodifacoum, Wallon Agricultural Research Centre, Gembloux, Report No. 11595, Experiment ROD 2003-03 (unpublished), 01 June 2005.
1.2 Data protection	Yes
1.2.1 Data owner	Belgagri SA A letter of access from Belgagri SA is provided for this study (see the administrative dossier).
1.2.2 Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its authorisation.
1.3 Guideline study	In-house laboratory test method (see the Doc. IV-B5.10/02 - Appendix 1 in French - Lignes directrices pour l'évaluation de l'efficacité des rodenticides et critères de décision - – Royaume de Belgique, Ministère de l'Agriculture, CRA de Gembloux, Octobre 1994)
1.4 Deviations	-

2 Method

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2.1 Test Substance (Biocidal Product)	Brodifacoum
2.1.1 Trade name/ proposed trade name	Brodipasta, similar to Saphir Paste (see the attestation for the different product names used in efficacy trials reports)
2.1.2 Composition of Product tested	Paste bait, manufactured on October 2003 and stored at 20°C for respectively 6, 12 and 24 months for the tests on aged product. Batch number R211003a. Nominal concentration: 40.0 mg a.s. / kg Measured concentration: - freshly manufactured test item. 35.5 mg a.s./kg (S.D: 0.33%) - after 6 months storage: 39.4 mg a.s./kg (S.D. 0.64%). - after 1 year storage: 36.1 mg a.s./kg (S.D. 0.55%). - after 2 years storage: 34.2 mg a.s./kg (S.D. 1.17%). Within two years, Brodipasta gave results conform to the chemical criteria of the Guidelines for Evaluation of Rodenticides.
2.1.3 Physical state and nature	Ready-to-use paste bait (RB) of about 15 g
2.1.4 Monitoring of active substance concentration	Not applicable
2.1.5 Method of analysis	HPLC method – WHO/IS/ (7.ROI.1.rev 1). Chemical analyses were performed on the samples placed at -18°C at

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	the exact date of the request ageing period.
2.2 Reference substance	Standard rodent diet: crushed wheat.
2.2.1 Method of analysis for reference substance	Not relevant. The challenge diet was a non-poisoned product.
2.3 Testing procedure	
2.3.1 Test population / inoculum / test organism	Trial No. ALBI2003-04, Trial No. ALBI2004-04, Trial No. ALBI2005-03, Trial No. ALBI2005-08: 22 albino laboratory Norway rats (11 males and 11 females, 10 to 20 weeks old, including one control pair) in individual cages, to test respectively the acceptance of the fresh product and of the 6, 12 and 24 months-aged test item (stored at 20°C). Trial No. ALBI2005-04, Trial No. ALBI2005-09: 22 laboratory House mice (11 males and 11 females, including one control pair) in individual cages, to test respectively the acceptance of the 12 and 24 months-aged test item (stored at 20°C). See Table 1.2
2.3.2 Test system	Laboratory test. Each test starts after an 8 days acclimatization period of the rodent in individual cages. During this period, rodents receive water and crushed wheat *ad libidum*. The test is a choice test in which the rodents have unrestricted access to the test bait and to palatable and

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	familiar alternative food (challenge diet) during a 21-day test period. See Table 1.2.
2.3.3 Application of Test Substance	During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 30 g of ground wheat grains, in competition with the test item) (see Table 1.4).
2.3.4 Test conditions	Ambient conditions in animal rooms were maintained in accordance with normal laboratory requirements. Animals were housed in single cages that were equipped to provide food and water provided *ad libitum* during the pre-tested period and in excess during the 21-day test period (see Table 1.5).
2.3.5 Duration of the test / Exposure time	The test consisted of a pre-test diet take assessment (conditioning period of 8 days with an estimation of the food eaten by each rodent for the last 5 days), followed by a test period (period of exposure to the test item) of 21 days.
2.3.6 Number of replicates performed	No replicate performed.
2.3.7 Controls	A control pairs of Norway rats and house mice was used for each test. These control rodents were continued to be fed only with crushed wheat.

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2.4 Examination	
2.4.1 Effect investigated	Palatability of the product in the presence of a competing alternative food (standard diet).
2.4.2 Method for recording / scoring of the effect	The daily intakes of challenge diet and test bait were measured and recorded. The weight of each animal was recorded during the conditioning period before the daily intake assessment.
2.4.3 Intervals of examination	Daily.
2.4.4 Statistics	Product acceptance (amount of product eaten expressed as a percentage of total [product + challenge diet] consumption) calculated for each individual, for the group, and for the different sexes of rodents. Percentage of mortality.
2.4.5 Post monitoring of the test organism	No
	5 3 Results
3.1 Efficacy	
3.1.1 Dose/Efficacy curve	Not applicable
3.1.2 Begin and duration of effects	The mean ‘days to death’ ranged: - with albino Norway rats and fresh bait after 3 to 8 days of exposure.

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- with albino Norway rats and 6 months-aged bait after 4 to 11 days of exposure.
- with albino Norway rats and 12 months-aged bait after 3 to 14 days of exposure.
- with albino Norway rats and 24 months-aged bait after 3 to 7 days of exposure.
- with House mice and 12 months-aged bait after 4 to 10 days of exposure.
- with House mice and 24 months-aged bait after 3 to 20 days of exposure.

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3.1.3 Observed effects in the post monitoring phase

Mortality was total (100%) in all test groups after a 21-day choice between this test substance and the challenge diet.

3.2 Effects against organisms or objects to be protected

Not applicable.

3.3 Other effects

Not applicable.

3.4 Efficacy of the reference substance

Not applicable.

3.5 Tabular and/or graphical presentation of the summarised results

Albino Norway rats, fresh bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)*	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treated	Control	
Fresh bait ♂	Mean = 188 SD = 5.2	Mean = 4.9 SD = 1.5	Mean = 1.07 SD =	Mean = 5.05 SD = 1.81	Mean = 8.51 SD = 2.26	Mean = 37.4% SD = 12.6%

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			0.37			
Fresh bait ♀	Mean = 165 SD = 10 3	Mean = 6.1 SD = 1.2	Mean = 0.95 SD = 0.36	Mean = 3.98 SD = 1.63	Mean = 4.43 SD = 2.96	Mean = 50.1% SD = 22.5%
Fresh bait ♂ +♀	Mean = 176 SD = 14.2	Mean = 5.5 SD = 1.4	Mean = 1.01 SD = 0.36	Mean = 4.52 SD = 1.76	Mean = 6.47 SD = 3.31	Mean = 43.8% SD = 18.9%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg)..

Albino Norway rats, 6 months-aged bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treat	Contr	

Section B5.10/02 **Efficacy Data**

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

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			*	ed	ol	
6-m old bait ♂	Mean = 180 SD = 6.9	Mean = 6.4 SD = 2.1	Mean = 0.99 SD = 0.42	Mean = 4.43 SD = 1.87	Mean = 7.68 SD = 4.12	Mean = 39.0% SD = 17.6%
6-m old bait ♀	Mean = 159 SD = 6.0	Mean = 6.0 SD = 1.7	Mean = 1.04 SD = 0.30	Mean = 4.17 SD = 1.23	Mean = 5.48 SD = 2.61	Mean = 45.0% SD = 14.9%
6-m old bait ♂ +♀	Mean = 170 SD = 12.5	Mean = 6.2 SD = 1.9	Mean = 1.02 SD = 0.36	Mean = 4.30 SD = 1.55	Mean = 6.58 SD = 3.54	Mean = 42.0% SD = 16.2%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg)..

Section B5.10/02 **Efficacy Data**

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

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Albino Norway rats, 12 months-aged bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)*	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treated	Control	
12-m old bait ♂	Mean = 177 SD = 5.5	Mean = 5.6 SD = 1.9	Mean = 1.04 SD = 0.63	Mean = 4.64 SD = 2.86	Mean = 9.58 SD = 3.96	Mean = 32.8% SD = 14.6%
12-m old bait ♀	Mean = 159 SD = 6.6	Mean = 7.1 SD = 2.8	Mean = 0.90 SD = 0.39	Mean = 3.63 SD = 1.64	Mean = 6.69 SD = .73	Mean = 34.5% SD = 11.9%
12-m old	Mean = 168.	Mean = 6.4	Mean =	Mean = 4.13	Mean = 8.13	Mean = 33.7% SD

bait ♂ +♀	4 SD = 11.0	SD = 2.5	0.97 SD = 0.52	SD = 2.33	SD = 3.32	= 13.0%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg)..

Albino Norway rats, 24 months-aged bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)*	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treated	Control	
24-m old bait ♂	Mean = 187 SD = 7.0	Mean = 4.9 SD = 1.4	Mean = 0.92 SD = 0.43	Mean = 4.29 SD = 2.03	Mean = 10.49 SD = 3.80	Mean = 29.9% SD = 15.6%
24-m old	Mean = 168	Mean = 5.9	Mean =	Mean = 3.69	Mean = 4.59	Mean = 45.0% SD

bait ♀	SD = 5.9	SD = 0.7	0.88 SD = 0.29	SD = 1.20	SD = 1.81	= 12.7%
24-m old bait ♂ +♀	Mean = 177.6 SD = 11.9	Mean = 5.4 SD = 1.2	Mean = 0.90 SD = 0.36	Mean = 3.99 SD = 1.65	Mean = 7.54 SD = 4.19	Mean = 37.5% SD = 15.9%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg)...

House mice, 12 months-aged bait:

	Initial weight of the animals	Day of death*	Mean intake (mg a.s./	Mean quantity consumed by each animal during the 21-day test	% acceptance*

Section B5.10/02 **Efficacy Data**

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

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	(g)		kg b.w.) *	period*		
				Treated	Control	
12-m old bait ♂	Mean = 20.4 SD = 1.1	Mean = 6.4 SD = 1.7	Mean = 2.86 SD = 0.97	Mean = 1.46 SD = 0.51	Mean = 2.45 SD = 0.54	Mean = 37.1% SD = 10.5%
12-m old bait ♀	Mean = 19.9 SD = 0.9	Mean = 6.6 SD = 2.1	Mean = 2.80 SD = 1.03	Mean = 1.39 SD = 0.49	Mean = 1.07 SD = 0.48	Mean = 56.6% SD = 12.8%
12-m old bait ♂ +♀	Mean = 20.1 SD = 1.0	Mean = 6.5 SD = 1.9	Mean = 2.83 SD = 0.97	Mean = 1.42 SD = 0.49	Mean = 1.76 SD = 0.86	Mean = 46.9% SD = 15.1%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

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Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

House mice, 24 months-aged bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)*	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treated	Control	
24-m old bait ♂	Mean = 20.5 SD = 0.4	Mean = 7.7 SD = 2.9	Mean = 2.95 SD = 1.74	Mean = 1.52 SD = 0.93	Mean = 2.45 SD = 0.64	Mean = 36.7% SD = 14.0%
24-m old bait ♀	Mean = 19.5 SD = 1.6	Mean = 9.2 SD = 5.6	Mean = 2.20 SD = 0.99	Mean 1.06 SD = 0.44	Mean = 2.09 SD = 0.89	Mean = 35.2% SD = 15.1%
24-m old bait	Mean = 20.0 SD	Mean = 8.5 SD	Mean = 2.58	Mean = 1.29 SD	Mean = 2.27 SD	Mean = 36.0% SD = 14.2%

Section B5.10/02 **Efficacy Data**

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

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♂ +♀	= 1.2	= 4.4	SD = 1.43	= 0.75	= 0.78	

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

3.6 Efficacy limiting factors

3.6.1 Occurrences of resistances

Not applicable

3.6.2 Other limiting factors

Not applicable

4 Relevance of the results compared to field conditions

Section B5.10/02	**Efficacy Data**
Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
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4.1 Reasons for laboratory testing	This laboratory test is designed to determine the palatability of aged product. Either the amount of bait consumed, in which the active substance is incorporated, or the mortality of the rodents is a measure for the palatability of the bait in controlled and recognised conditions.
4.2 Intended actual scale of biocide application	Not applicable
4.3 Relevance compared to field conditions	
4.3.1 Application method	Rats and mice had the choice between bait and alternative food. This is intended to represents field conditions in which the animals have unrestricted access to food in competition with treated bait.
4.3.2 Test organism	House mice and Norway rats, the target organisms, are used both for laboratory and field tests.
4.3.3 Observed effect	Brodifacoum Paste Bait was sufficiently attractive to rats and mice to divert them from feeding only on the familiar diet. The observed effects of high consumption of the test item by rodents and the total mortality of the test group are both relevant to field conditions.
4.4 Relevance for read-across	Yes and field data are available as well.

5 Applicant's Summary and conclusion

Section B5.10/02	**Efficacy Data**
Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	

5.1 Materials and methods	The test material is a paste bait freshly manufactured (T_0) containing nominally 40 mg/kg of Brodifacoum and the same paste bait stored at 20°C for 6, 12 and 24 months. The test was a laboratory choice feeding test. It consisted in a 8-day acclimatisation period (conditioning period) followed by a 21-day test period. The test groups consisted of 22 albino laboratory Norway rats (11 males and 11 females) or 22 laboratory House mice (11 males and 11 females) with a control pair for each group. Rats and mice body weights, test substances and food consumption, observation of mortality were recorded during the essay. The treated bait and control bait were placed in 2 food bowls and the quantity in each pot exceeded the normal daily requirement for each animal. The positions of the test item and of the challenge diet bowls were alternated daily.
5.2 Reliability	1
5.3 Assessment of efficacy, data analysis and interpretation	Acceptance of the Brodifacoum Paste Bait was very good. For laboratory Norway rats, the mean acceptance of the test item was 43.8% (S.D. 18.9%) for the fresh bait, 42.0% (S.D. 16.2%) for the 6 months-aged bait, 33.7% (S.D: 13.0%) for the 12 months-aged bait and 37.5% (S.D. 15.9%) for the 24 months-aged bait showing that the Brodifacoum Paste Bait is a palatable formulation for rats.

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Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
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For laboratory house mice, the mean acceptance of the test item was 46.9% (S.D. 15.1%) for the 12 months-aged bait and 36.0% (S.D. 14.2%) for the 24 months-aged bait showing that the Brodifacoum Paste Bait is a palatable formulation for mice.
Mortality was total (100%) in all test groups, after a 20-day choice between this test substance and the challenge diet, with a mean 'days to death' ranging from the 3rd to the 20th day of exposure.

5.4 Conclusion

The study showed that, when freshly manufactured or stored until two years at 20°C, Brodifacoum Paste Bait is palatable to laboratory house rats and mice, with a mean palatability above 20% (the minimum acceptance was observed for male albino rats with the 24 months-aged bait: 29.9% (S.D. 15.6%). The test item also resulted in 100% mortality after a 20-day choice between this formulation and challenge diet.
According to the European Commission document (European Commission, 2008), Section 4.1 "Norms and Criteria":
"In the bait choice feeding test the percentage of ingested bait containing the product should be normally ≥ 20%. When the test results in ≥ 90% mortality, a lower level than 20% of the total food consumption is acceptable."
The results obtained in the choice test with the test item Brodifacoum Paste Bait, freshly manufactured or stored until 2 years meet the required criteria.

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Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	

	The results of this test reflect field conditions as animals have unrestricted access to a well-known food. It can be concluded that the tested Brodifacoum Paste Bait is palatable in the presence of a competing alternative food (standard diet) and that a 24 months validity period can be accepted for the test item.
5.5 Proposed efficacy specification	The efficacy of the test item is very good to excellent (100% mortality).

Section B5.10.2 Efficacy Data

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	March 2013.
Materials and Methods	**2.4.1** Effect observed included palatability and mortality.
Results and discussion	For rats, the mean acceptance of the test item was 43.8% for the fresh bait, 42.0% for the 6-month aged bait, 33.7% for the 12-month aged bait and 37.5% for the 24-month aged bait. For mice, the mean acceptance of the test item was 46.9% for the 12-month aged bait and 36.0% for the 24-month aged bait. The efficacy was excellent. Mortality was total (100%) in all test groups. The mean time to death ranged from 3 to 20 days after the first intake of treated baits.
Conclusion	Agree with applicant's version.
Reliability	1
Acceptability	Acceptable.
Remarks	None.
	COMMENTS FROM ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section B5.10/02 Efficacy Data

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

TNsG: Pt. I-B5.10,

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1.2 Test organism

Criteria	Details
Species	Albino Norway rats (*Rattus norvegicus*) Laboratory house mice (*Mus musculus*)
Strain	Not specified
Source	Not specified
Laboratory culture	Yes
Stage of life cycle and stage of stadia	Healthy non-pregnant adults
Mixed age population	No relevant details
Other specification	The mean initial body weight of rats ranged from 149 to 199 g for laboratory Norway rats and from 16 to 22 g for laboratory house mice.
Number of organisms tested	22 rodents, 11 males and 11 females for each test group (including one pair control)
Method of cultivation	22 laboratory rodents were used per group, weighted and kept individually in cages under controlled conditions before the start of the test period.
Pre-treatment of test organisms before exposure	The animals were acclimatised to test conditions for 8 days in order to discard sick individuals.
Initial density/number of test organisms in the test system	22 laboratory rodents per group. Each animal was individually caged.

1.3 Test system

Criteria		Details
5.1.1	**Culturing apparatus / test chamber**	Mice and rats were individually caged under standard conditions.
5.1.2	**Number of vessels / concentration**	Two symmetrically-placed food bowls at the front of each cage.
5.1.3	**Test culture media and/or carrier material**	The test bait was a paste bait containing nominally 40 mg/kg of Brodifacoum, provided by the sponsor, manufactured in October 2003. The challenge diet was crushed wheat.
5.1.4	**Nutrient supply**	Not applicable
5.1.5	**Measuring equipment**	Weighing scale

Section B5.10/02 Efficacy Data

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.4 Application of test substance

Criteria	Details
Application procedure	During the conditioning period, the animals had access to crushed wheat. The amount of food consumed by each animal was determined daily to the nearest 0.1 g by the difference method. On each morning, food bowls were weighed, replenished and re-weighed. During the 21-day test period, the rodents had access to about 30 g of ground wheat grains, in competition with the test item. The positions of the bowls containing the two diets were alternated daily.
Delivery method	The challenge diet and test bait were placed in 2 food bowls.
Dosage rate	The contents of the food bowls were made up daily to provide an excess of the animals' daily requirement from each bowl.
Carrier	Not applicable
Concentration of liquid carrier	Not applicable
Liquid carrier control	Not applicable
Other procedures	No other relevant details.

1.5 Test conditions

Criteria		Details
5.1.6	**Substrate**	Not applicable
5.1.7	**Incubation temperature**	Ambient temperature
5.1.8	**Moisture**	Ambient relative humidity
5.1.9	**Aeration**	Not specified
5.1.10	**Method of exposure**	Oral exposure
5.1.11	**Aging of samples**	6, 12 and 24-month aged test bait
5.1.12	**Other conditions**	No other relevant details

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

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1 REFERENCE

Official use only

1.1 Reference	Loiseau M., 2012, Choice feeding trial for Brodifacoum paste bait (aged product) against rat, Biotrial Pharmacology, Study code 0BSIX2, Biotrial Pharmacology (unpublished), 11 January 2012
1.2 Data protection	Yes
1.2.1 Data owner	BIO6 S.A. A letter of access from BIO6 S.A. is provided for this study (see the administrative dossier)
1.2.2 Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its authorisation.
1.3 Guideline study	The study was conducted according to the TNsG on Product Evaluation Appendices to Chapter 7 - Product Type 14 - Efficacy Evaluation of Rodenticidal Biocidal Products endorsed at the 32nd meeting of representatives of Members States Competent Authorities.
1.4 Deviations	None

2 METHOD

2.1 Test Substance (Biocidal Product)	Brodifacoum
2.1.1 Trade name/ proposed trade name	Brodifacoum paste bait, similar to Saphir Paste (see the attestation for the different product names used in efficacy trials reports)
2.1.2 Composition of Product tested	Brodifacoum paste bait, manufactured and aged for 3 weeks at 54°C, provided by the sponsor and stored at room temperature at Biotrial Pharmacology. Batch number RB20110902brodif Nominal concentration: 40.0 mg a.s. / kg Measured concentration: 37 mg a.s./kg (see the Doc. IIIB5.10/03 - Appendix 1)
2.1.3 Physical state and nature	Ready for use bait (RB)
2.1.4 Monitoring of active substance	Not applicable.

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

concentration	
2.1.5 Method of analysis	Not applicable.
2.2 Reference substance	Standard rat diet.
2.2.1 Method of analysis for reference substance	Not relevant. The challenge diet was a non-poisoned product.
2.3 Testing procedure	
2.3.1 Test population / inoculum / test organism	20 animals (10 males, 10 females). Norway rat (*Rattus norgevicus*). See details in Table 1.2
2.3.2 Test system	Laboratory test. The animals were individually caged. The test is a choice test in which the rodents have unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during a 4-day test period. During the conditioning period the animals were fed with standard meal and supplied with water *ad libitum* (see Table 1.3)
2.3.3 Application of Test Substance	Rats received the test item from two symmetrically-placed food bowls at the front of each cage, one filled with the test product, the other with the challenge diet. The positions of the bowls were alternated daily. The contents of the food bowls were made up daily to provide an excess of the animals' daily requirement from each bowl (approximately 50 g of the aged rodenticide paste bait and of the challenge diet, in each corresponding pot) (see Table 1.4).
2.3.4 Test conditions	Ambient conditions in animal rooms were maintained in accordance with normal laboratory requirements; with a temperature range of 20 - 24°C, a relative humidity range of 45% to 65%, with between 15 and 20 air changes per hour, and with a 12-hour light-dark cycle. Animals were housed in single polypropylene cages that were equipped to provide food and water *ad libitum* during the pre-tested period and the post-treatment and in excess during the 4-day test period (see Table 1.5).

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Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product
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2.3.5 Duration of the test / Exposure time	The duration of the test was at least of 25 days: - at least 6 days of acclimatization (including 4-day pre-test period when food intake and body weight of each animal were determined daily), - 4-day test period (period of exposure to the test item from day 7 to day 11) - 15-day observation period.	
2.3.6 Number of replicates performed	No replicate performed.	
2.3.7 Controls	No, not required in EPPO guidelines and in "TNsG Chapter 7 TP14" for choice tests. They are not required by the EU in order to reduce the number of test animals.	
2.4 Examination		
2.4.1 Effect investigated	Palatability of the product in the presence of a competing alternative food (standard diet).	X
2.4.2 Method for recording / scoring of the effect	The following parameters were measured and recorded for each animal: The daily intakes of challenge diet and test bait were measured between day 3 and day 11. The body weight was measured from day 3 to day 25. The mortality was observed from day 3 to day 25. During the experiment, animals showing morbid conditions were euthanized.	
2.4.3 Intervals of examination	Daily.	
2.4.4 Statistics	The percentage of intake of aged Brodifacoum paste bait and of challenge diet. The percentage of mortality, the body weight.	
2.4.5 Post monitoring of the test organism	Yes, 15-day post treatment observation period.	
	3 RESULTS	
3.1 Efficacy		
3.1.1 Dose/Efficacy curve	Not applicable	

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

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3.1.2 Begin and duration of effects

The mean day to death was 4.7 ± 1.2 days after the beginning of the Brodifacoum paste bait consumption (range 3 to 7 days).

3.1.3 Observed effects in the post monitoring phase

Mortality occurred in 100% of the female and male rats, 7 days after the beginning of poison consumption.

3.2 Effects against organisms or objects to be protected

Not applicable.

3.3 Other effects

Not applicable.

3.4 Efficacy of the reference substance

Not applicable.

3.5 Tabular and/or graphical presentation of the summarised results

Body weight and mean time of death:

Rats	Initial weight of the animals at day 6 (before the choice feeding test)* (g)	Final weight of the animal at day 10 (at the end of the choice feeding test)* (g)	Day of death*
Aged bait ♂	Mean = 285 SD = 7.15	Mean = 316 SD =7.84	Mean = 4.44 SD = 1.01
Aged bait ♀	Mean = 226 SD =9.10	Mean = 243 SD =10.6	Mean = 5.00 SD = 1.33
Aged bait* ♂ + ♀	Mean = 256 SD =31.4	Mean = 278 SD =38.3	Mean = 4.74 SD = 1.19

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

Acceptance of the Brodifacoum paste bait between day 7 (the first day of the choice feeding test) and day 10 (the last day of the choice feeding test):

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Rats	% acceptance at day7	% acceptance at day 8	% acceptance at day 9	% acceptance at day 10
Aged bait ♂	48%	50%	43%	30%
Aged bait ♀	61%	55%	52%	38%

Mean intake of the Brodifacoum paste bait between day 7 (the first day of the choice feeding test) and day 10 (the last day of the choice feeding test):

Rats	Mean intake* (mg a.s./kg b.w.) at day7	Mean intake* (mg a.s./kg b.w.) at day 8	Mean intake* (mg a.s./kg b.w.) at day 9	Mean intake* (mg a.s./kg b.w.) at day 10
Aged bait ♂	2,4	2,2	1,5	0,7
Aged bait ♀	2,6	2,1	1,7	0,8

Mean consumption and % acceptance during the whole test period (from day 7 to day 10):

Rats	Mean quantity consumed by each animal during the test period*		Mean intake* (mg a.s./kg b.w.) during the test period	% acceptance during the test period*
	Treated	Control		
Aged bait ♂	Mean = 50.6 SD = 12.9	Mean = 62.6 SD = 14.0	Mean 1.69 SD = 0.39	Mean = 44.9% SD = 7.88%
Aged bait ♀	Mean = 42.4 SD = 11.2	Mean = 37.3 SD = 8.6	Mean = 1.78 SD = 0.44	Mean = 52.9% SD = 10.4%
Aged bait ♂+♀	Mean = 46.5 SD = 12.4	Mean = 49.9 SD = 17.2	Mean = 1.74 SD = 0.41	Mean = 48.9% SD = 9.89%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

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Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

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3.6 Efficacy limiting factors	
3.6.1 Occurrences of resistances	Not applicable
3.6.2 Other limiting factors	Not applicable

4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS

4.1 Reasons for laboratory testing	This laboratory test is designed to determine the palatability of aged product. Either the amount of bait consumed, in which the active substance is incorporated, or the mortality of the rodents is a measure for the palatability of the bait in controlled and recognised conditions.
4.2 Intended actual scale of biocide application	Not applicable

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5.2 4.3 Relevance compared to field conditions	
5.3 4.3.1 Application method	Rats had the choice between bait and alternative food. This is intended to represent field conditions in which the animals have unrestricted access to food in competition with treated bait.
5.4 4.3.2 Test organism	Norway rats are the intended target organisms and are used both for laboratory and field tests.
5.5 4.3.3 Observed effect	Brodifacoum paste bait was sufficiently attractive to rats to divert them from feeding only on the familiar diet. The observed effects of high consumption of the test item by rodents and the total mortality of the test group are both relevant to field conditions.
5.6 4.4 Relevance for read-across	Yes, and field data are available as well.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1 Materials and methods	The study was conducted according to TNsG on Product evaluation, Chapter 7. The test material is a paste bait containing Brodifacoum aged for 3 weeks at 54°C. The test animals were 10 males and 10 females Norway rats. The test was a laboratory choice feeding test. It consisted in at least 6-day acclimatisation (conditioning) period then a 4-day test period, followed by a 15-day observation period. The treated bait and control bait were placed in 2 food bowls and the quantity in each pot exceeded the normal daily requirement for each animal. The positions of the test item and of the challenge diet bowls were alternated daily. Amount of product consumed, body weight and mortality were recorded daily for each animal.
5.2 Reliability	1 (no deviation from standards)

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Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

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5.3 Assessment of efficacy, data analysis and interpretation	The mean initial weight of the test animals at day 6 (before the choice feeding test) was 285 and 226 g (males and females, respectively). Acceptance of the Brodifacoum paste bait was good. During the 4-day testing period, challenged diet consumption and Brodifacoum paste bait consumption of the 10 female and 10 male rats were almost similar (49.9 g, (S.D. 17.2 g) and 46.5 g (S.D. 12.4 g)), respectively, n=20) corresponding to a percentage intake Brodifacoum paste bate of 48.9% (S.D. 9.9% (n=20). Mortality was total (100%), with a mean day to death of 4.7 ± 1.2. days.
5.4 Conclusion	The study showed that Brodifacoum paste bait stored at 54°C for 3 weeks is palatable to Sprague Dawley rats, with a mean palatability against ground laboratory diet above 20% during the 4-day testing period (the minimum acceptance was observed for male rats: 44.9% (S.D. 7.88%). The test item also resulted in 100% mortality after a 4-day choice between the aged test item formulation and challenge diet. According to the European Commission document (European Commission, 2008), Section 4.1 “Norms and Criteria”, in the bait choice feeding test, the percentage of ingested bait containing the product should be normally ≥ 20%. When the test results in ≥ 90% mortality, a lower level than 20% of the total food consumption is acceptable. The results obtained in the choice test with the test item Brodifacoum paste bait meet the required criteria. The results of this test reflect field conditions as animals have unrestricted access to a well-known food. It can be concluded that the Brodifacoum paste bait stored at 54°C for 3 weeks is palatable in the presence of a competing alternative food (standard diet).
5.5 Proposed efficacy specification	The efficacy of the test item is very good to excellent (100% mortality, 7 days after the beginning of the Brodifacoum paste bait consumption).

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	March 2013.
Materials and Methods	**2.4.1** Effect observed included palatability and mortality.
Results and discussion	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.9%. The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 4.7 days (3 to 7 days) after the first intake of bait.
Conclusion	Agree with applicant's version.
Reliability	1
Acceptability	Acceptable.
Remarks	None.
	COMMENTS FROM ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	*Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

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1.2 Test organism

Criteria	Details
Species	Norway rat (*Rattus norvegicus*)
Strain	Sprague Dawley rats
Source	Centre d'élevage R. Janvier (Saint Berthevin cedex, France)
Laboratory culture	Yes
Stage of life cycle and stage of stadia	Healthy non-pregnant adults
Mixed age population	No
Other specification	Mean body weight ranged from 232 to 240 g for male and from 192 to 211 g for female at their arrival at Biotrial Pharmacology.
Number of organisms tested	20 rats, 10 males and 10 females. Rats were numbered by marking their tail using indelible markers.
Method of cultivation	At their arrival and during all the experiment, animals were individually housed in polypropylene cages (floor area = 530 cm^2) under standard conditions: room temperature (22±2°C), hygrometry (55±10%), light/dark cycle (12h/12h), air replacement (15-20 volumes/hour), water and food (SAFE A04) *ad libitum.*
Pre-treatment of test organisms before exposure	The animals were acclimatised for at least 6 days before the choice feeding test.
Initial density/number of test organisms in the test system	20 animals. Each animal was individually caged.

1.3 Test system

Criteria	Details
Culturing apparatus / test chamber	Rats were individually caged in polypropylene cages (floor area = 530 cm^2) under standard conditions.
Number of vessels / concentration	Two symmetrically-placed food bowls at the front of each cage.
Test culture media and/or carrier material	The test bait is a paste bait stored at 54°C for 3 weeks, provided by the sponsor. The challenge diet is standard meal, provided by the laboratory. Water was supplied *ad libitum*.
Nutrient supply	Not applicable
Measuring equipment	Weighing scale

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

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1.4 Application of test substance

Criteria	Details
Application procedure	During the 4-day pre-test period (the last 4 days of the acclimatization period (day 3 to day 6)), the animals had access to standard meal from two symmetrically-placed food bowls at the front of each cage. On day 3, 2 pots were placed in each cage, both filled with challenge diet (non-poisoned source). On day 4, day 5 and day 6, the remaining food was weighted and replaced every day by fresh diet. The place of the 2 pots was daily interchanged in order to avoid any place preference. Food consumption was calculated daily for each animal between day 3 and day 6. Any rodent not eating normally by the last day was discarded. During the 4-day test period (from day 7 to day 10), in each cage the animal had access to 1 pot containing approximately 50 g of aged rodenticidal paste bait and 1 pot containing approximately 50 g of challenge diet (non-poisoned source). The place of the 2 pots was daily interchanged in order to avoid any place preference. On day 8, day 9 and day 10, remaining diet in each pot was weighted and discarded before to provide approximately 50 g of fresh diet in each pot. On day 11, diet in each pot was weighted and discarded before to provide challenged diet *ad libitum.* Then, animals were daily observed up to day 25. Daily consumption of the bait and the challenged diet was measured from day 3 to day 11. Body weight and mortality were measured from day 3 to day 25. During the experiment, any moribund animal was sacrificed.
Delivery method	The challenge diet and test bait were placed in 2 food bowls.
Dosage rate	The contents of the food bowls were made up daily to provide an excess of the animals' daily

	requirement from each bowl (*i.e.* > 50 g).
Carrier	Not applicable
Concentration of liquid carrier	Not applicable
Liquid carrier control	Not applicable
Other procedures	No other relevant details.

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Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

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1.5 Test conditions

Criteria	Details
Substrate	Not applicable
Incubation temperature	Ambient temperature was 20-24°C
Moisture	Relative humidity range of 45 to 65%
Aeration	15-20 air changes per hour
Method of exposure	Oral exposure
Aging of samples	Aged bait stored at 54°C for 3 weeks
Other conditions	12h light-dark cycle

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Annex Point IIB5.10
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Efficacy on mice, choice feeding test, aged product

Official use only

1 REFERENCE

1.1 Reference	Loiseau M., 2012, Choice feeding trial for Brodifacoum paste bait (aged product) against albino house mice, Biotrial Pharmacology, Study code 0BSIX1, Biotrial Pharmacology (unpublished), 11 January 2012
1.2 Data protection	Yes
1.2.1 Data owner	BIO6 S.A. A letter of access from BIO6 S.A. is provided for this study (see the administrative dossier).
1.2.2 Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its authorisation.
1.3 Guideline study	The study was conducted according to the TNsG on Product Evaluation Appendices to Chapter 7 - Product Type 14 - Efficacy Evaluation of Rodenticidal Biocidal Products endorsed at the 32nd meeting of representatives of Members States Competent Authorities.
1.4 Deviations	None

2 METHOD

2.1 Test Substance (Biocidal Product)	Brodifacoum
2.1.1 Trade name/ proposed trade name	Brodifacoum paste bait, similar to Saphir Paste (see the attestation for the different product names used in efficacy trials reports)
2.1.2 Composition of Product tested	Brodifacoum paste bait, manufactured and aged for 3 weeks at 54°C, provided by the sponsor and stored at room temperature at Biotrial Pharmacology. Batch number RB20110902brodif Nominal concentration: 40.0 mg a.s. / kg Measured concentration: 37 mg a.s./kg (see the Doc. IV-B5.10/04 - Appendix 1)
2.1.3 Physical state and nature	Ready-to-use bait (RB)
2.1.4 Monitoring of active substance concentration	Not applicable.

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2.1.5 Method of analysis	Not applicable.
2.2 Reference substance	Standard mice diet.
2.2.1 Method of analysis for reference substance	Not relevant. The challenge diet was a non-poisoned product.
2.3 Testing procedure	
2.3.1 Test population / inoculum / test organism	20 animals (10 males, 10 females). House mouse (*Mus musculus*). See details in Table 1.2
2.3.2 Test system	Laboratory test. The animals were individually caged. The test is a choice test in which the rodents have unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during a 4-day test period. During the conditioning period the animals were fed with standard meal and supplied with water *ad libitum* (see Table 1.3)
2.3.3 Application of Test Substance	Mice received the test item from two symmetrically-placed food bowls at the front of each cage, one filled with the test product, the other with the challenge diet. The positions of the bowls were alternated daily. The contents of the food bowls were made up daily to provide an excess of the animals' daily requirement from each bowl (approximately 10 g of the aged rodenticide paste bait and approximately 20 g of the challenge diet, in each corresponding pot) (see Table 1.4).
2.3.4 Test conditions	Ambient conditions in animal rooms were maintained in accordance with normal laboratory requirements; with a temperature range of 20 - 24°C, a relative humidity range of 45% to 65%, with between 15 and 20 air changes per hour, and with a 12-hour light-dark cycle. Animals were housed in single polypropylene cages that were equipped to provide food and water *ad libitum* during the pre-tested period and the post-treatment and in excess during the 4-day test period (see Table 1.5).
2.3.5 Duration of the test / Exposure	The duration of the test was at least of 25 days: - at least 6 days of acclimatization (including 4-day pre-test period when

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Annex Point IIB5.10 Efficacy on mice, choice feeding test, aged product
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time	food intake and body weight of each animal were determined daily), - 4-day test period (period of exposure to the test item from day 7 to day 11) - 15-day observation period.	
2.3.6 Number of replicates performed	No replicate performed.	
2.3.7 Controls	No, not required in EPPO guidelines and in "TNsG Chapter 7 TP14" for choice tests. They are not required by the EU in order to reduce the number of test animals.	
2.4 Examination		
2.4.1 Effect investigated	Palatability of the product in the presence of a competing alternative food (standard diet).	X
2.4.2 Method for recording / scoring of the effect	The following parameters were measured and recorded for each animal: The daily intakes of challenge diet and test bait were measured between day 3 and day 11. The body weight was measured from day 3 to day 25. The mortality was observed from day 3 to day 25. During the experiment, animals showing morbid conditions were euthanized.	
2.4.3 Intervals of examination	Daily.	
2.4.4 Statistics	The percentage of intake of aged Brodifacoum paste bait and of challenge diet. The percentage of mortality, the body weight.	
2.4.5 Post monitoring of the test organism	Yes, 15-day post treatment observation period.	
	3 RESULTS	
3.1 Efficacy		
3.1.1 Dose/Efficacy curve	Not applicable	
3.1.2 Begin and duration of effects	The mean day to death was 5.8 ± 1.2 days after the beginning of the Brodifacoum paste bait consumption (range 4 to 7 days).	
3.1.3 Observed	Mortality occurred in 100% of the female and male mice, 7 days after	

effects in the post monitoring phase	the beginning of poison consumption.
3.2 Effects against organisms or objects to be protected	Not applicable.
3.3 Other effects	Not applicable.
3.4 Efficacy of the reference substance	Not applicable.
3.5 Tabular and/or graphical presentation of the summarised results	Body weight and mean time of death:

Mice	Initial weight of the animals at day 6 (before the choice feeding test)* (g)	Final weight of the animal at day 10 (at the end of the choice feeding test)* (g)	Day of death*
Aged bait ♂	Mean = 29.6 SD = 1.65	Mean = 29.2 SD =2.25	Mean = 5.60 SD = 1.26
Aged bait ♀	Mean = 23.1 SD =0.99	Mean = 23.2 SD =1.40	Mean = 5.90 SD = 1.20
Aged bait* ♂ + ♀	Mean = 26.4 SD =3.59	Mean = 26.2 SD =3.58	Mean = 5.75 SD = 1.21

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

Acceptance of the Brodifacoum paste bait between day 7 (the first day of the choice feeding test) and day 10 (the last day of the choice feeding test):

Mice	% acceptance at day7	% acceptance at day 8	% acceptance at day 9	% acceptance at day 10

Aged bait ♂	54%	38%	40%	32%
Aged bait ♀	51%	65%	57%	45%

Mean intake of the Brodifacoum paste bait between day 7 (the first day of the choice feeding test) and day 10 (the last day of the choice feeding test):

Rats	Mean intake* (mg a.s./kg b.w.) at day7	Mean intake* (mg a.s./kg b.w.) at day 8	Mean intake* (mg a.s./kg b.w.) at day 9	Mean intake* (mg a.s./kg b.w.) at day 10
Aged bait ♂	3.7	1.9	1.7	0.8
Aged bait ♀	4.1	4.0	3.1	1.6

Mean consumption and % acceptance during the whole test period (from day 7 to day 10):

Mice	Mean quantity consumed by each animal during the test period*		Mean intake* (mg a.s./kg b.w.) during the test period	% acceptance during the test period*
	Treated	Control		
Aged bait ♂	Mean = 6.21 SD = 2.11	Mean = 8.13 SD = 1.41	Mean 2.06 SD = 0.71	Mean = 42.4% SD = 8.98%
Aged bait ♀	Mean = 7.54 SD = 1.55	Mean = 6.11 SD = 1.49	Mean = 3.20 SD = 0.57	Mean = 55.2% SD = 6.78%
Aged bait ♂+♀	Mean = 6.88 SD = 1.93	Mean = 7.12 SD = 1.75	Mean = 2.63 SD = 0.86	Mean = 48.8% SD = 10.2%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

3.6 Efficacy limiting factors

3.6.1 Occurrences Not applicable

of resistances	
3.6.2 Other limiting factors	Not applicable

4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS

4.1 Reasons for laboratory testing	This laboratory test is designed to determine the palatability of aged product. Either the amount of bait consumed, in which the active substance is incorporated, or the mortality of the rodents is a measure for the palatability of the bait in controlled and recognised conditions.
4.2 Intended actual scale of biocide application	Not applicable
5.7 4.3 Relevance compared to field conditions	
5.8 4.3.1 Application method	Mice had the choice between bait and alternative food. This is intended to represent field conditions in which the animals have unrestricted access to food in competition with treated bait.
5.9 4.3.2 Test organism	House mice are the intended target organisms and are used both for laboratory and field tests.
5.10 4.3.3 Observed effect	Brodifacoum paste bait was sufficiently attractive to mice to divert them from feeding only on the familiar diet. The observed effects of high consumption of the test item by rodents and the total mortality of the test group are both relevant to field conditions.
5.11 4.4 Relevance for read-across	Yes, and field data are available as well.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1 Materials and	The study was conducted according to TNsG on Product evaluation,

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Annex Point IIB5.10 Efficacy on mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

methods	Chapter 7. The test material is a paste bait containing Brodifacoum aged for 3 weeks at 54°C. The test animals were 10 males and 10 females House mice. The test was a laboratory choice feeding test. It consisted in at least 6-day acclimatisation (conditioning) period then a 4-day test period, followed by a 15-day observation period. The treated bait and control bait were placed in 2 food bowls and the quantity in each pot exceeded the normal daily requirement for each animal. The positions of the test item and of the challenge diet bowls were alternated daily. Amount of product consumed, body weight and mortality were recorded daily for each animal.
5.2 Reliability	1 (no deviation from standards)
5.3 Assessment of efficacy, data analysis and interpretation	The mean initial weight of the test animals at day 6 (before the choice feeding test) was 30 and 23 g (males and females, respectively). Acceptance of the Brodifacoum paste bait was good. During the 4-day testing period, challenged diet consumption and Brodifacoum paste bait consumption of the 10 female and 10 male mice were almost similar (7.12 g, (S.D. 1.75 g) and 6.88 g (S.D. 1.93 g)), respectively, n=20) corresponding to a percentage intake Brodifacoum paste bate of 48.8% (S.D. 10.2% (n=20). Mortality was total (100%), with a mean day to death of 5.8 ± 1.2 days.
5.4 Conclusion	The study showed that Brodifacoum paste bait aged for 3 weeks at 54°C is palatable to house mice, with a mean palatability against ground laboratory diet above 20% during the 4-day testing period (the minimum acceptance was observed for male albino mice: 42.4% (S.D. 8.98%). The test item also resulted in 100% mortality after a 4-day choice between the aged test item formulation and challenge diet. According to the European Commission document (European Commission, 2008), Section 4.1 “Norms and Criteria”, in the bait choice feeding test, the percentage of ingested bait containing the product should be normally ≥ 20%. When the test results in ≥ 90% mortality, a lower level than 20% of the total food consumption is acceptable. The results obtained in the choice test with the test item Brodifacoum

	paste bait meet the required criteria. The results of this test reflect field conditions as animals have unrestricted access to a well-known food. It can be concluded that the Brodifacoum paste bait stored at 54°C for 3 weeks is palatable in the presence of a competing alternative food (standard diet).
5.5 Proposed efficacy specification	The efficacy of the test item is very good to excellent (100% mortality, 7 days after the beginning of the Brodifacoum paste bait consumption).

Section B5.10/04 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	March 2013.
Materials and Methods	**2.4.1** Effect observed included palatability and mortality.
Results and discussion	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.8%. The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 5.8 days (4 to 7 days) after the first intake of bait.
Conclusion	Agree with applicant's version.
Reliability	1
Acceptability	Acceptable.
Remarks	None.
	COMMENTS FROM ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	*Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section B5.10/04 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.2 Test organism

Criteria	Details
Species	House mice (*Mus musculus*)
Strain	
Source	Centre d'élevage R. Janvier (Saint Berthevin cedex, France)
Laboratory culture	Yes
Stage of life cycle and stage of stadia	Healthy non-pregnant adults
Mixed age population	No
Other specification	Mean body weight ranged from 23 to 25 g for male and from 20 to 22 g for female at their arrival at Biotrial Pharmacology.
Number of organisms tested	20 mice, 10 males and 10 females. Mice were numbered by marking their tail using indelible markers.
Method of cultivation	At their arrival and during all the experiment, animals were individually housed in polypropylene cages (floor area = 530 cm^2) under standard conditions: room temperature (22±2°C), hygrometry (55±10%), light/dark cycle (12h/12h), air replacement (15-20 volumes/hour), water and food (SAFE A04) *ad libitum.*
Pre-treatment of test organisms before exposure	The animals were acclimatised for at least 6 days before the choice feeding test.
Initial density/number of test organisms in the test system	20 animals. Each animal was individually caged.

1.3 Test system

Criteria	Details
Culturing apparatus / test chamber	Mice were individually caged in polypropylene

	cages (floor area = 530 cm^2) under standard conditions.
Number of vessels / concentration	Two symmetrically-placed food bowls at the front of each cage.
Test culture media and/or carrier material	The test bait is a paste bait stored at 54°C for 3 weeks, provided by the sponsor. The challenge diet is standard meal, provided by the laboratory. Water was supplied *ad libitum*.
Nutrient supply	Not applicable
Measuring equipment	Weighing scale

Section B5.10/04 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.4 Application of test substance

Criteria	Details
Application procedure	During the 4-day pre-test period (the last 4 days of the acclimatization period (day 3 to day 6)), the animals had access to standard meal from two symmetrically-placed food bowls at the front of each cage. On day 3, 2 pots were placed in each cage, both filled with challenge diet (non-poisoned source). On day 4, day 5 and day 6, the remaining food was weighted and replaced every day by fresh diet. The place of the 2 pots was daily interchanged in order to avoid any place preference. Food consumption was calculated daily for each animal between day 3 and day 6. Any rodent not eating normally by the last day was discarded. During the 4-day test period (from day 7 to day 10), in each cage the animal had access to 1 pot containing approximately 10 g of aged rodenticidal paste bait and 1 pot containing approximately 20 g of challenge diet (non-poisoned source). The place of the 2 pots was daily interchanged in order to avoid any place preference. On day 8, day 9 and day 10, remaining diet in each pot was weighted and discarded before to provide the same quantity of fresh diet in each pot. On day 11, diet in each pot was weighted and discarded before to provide challenged diet *ad libitum.* Then, animals were daily observed up to day 25. Daily consumption of the bait and the challenged diet was measured from day 3 to day 11. Body weight and mortality were measured from day 3 to day 25. During the experiment, any moribund animal was sacrificed.
Delivery method	The challenge diet and test bait were placed in 2 food bowls.
Dosage rate	The contents of the food bowls were made up daily to provide an excess of the animals' daily requirement from each bowl (*i.e.* > 10 g).

Carrier	Not applicable
Concentration of liquid carrier	Not applicable
Liquid carrier control	Not applicable
Other procedures	No other relevant details.

Section B5.10/04 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.5 Test conditions

Criteria	Details
Substrate	Not applicable
Incubation temperature	Ambient temperature was 20-24°C
Moisture	Relative humidity range of 45 to 65%
Aeration	15-20 air changes per hour
Method of exposure	Oral exposure
Aging of samples	Aged bait stored at 54°C for 3 weeks
Other conditions	12h light-dark cycle

Section B5.10/05	**Efficacy Data**
Annex Point IIB5.10	Efficacy on rats, field test
TNsG: Pt. I-B5.10,	
Pt. III-Ch. 6	

Official use only

1 Reference

1.1 Reference

Lecomte L., Doyen A., 2011, Assessment of the efficacy of a rodenticide, in natural conditions, LODI (unpublished), Assay Number LODI.03/2011, 27 October 2011

1.2 Data protection

Yes

1.2.1 Data owner

Lodi

1.2.2 Criteria for data protection

Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its authorisation.

1.3 Guideline study

CEB Method No.002: Méthode d'essai d'efficacité pratique de raticides. J. Giban

EPPO Guidelines PP 1/114(2): Efficacy evaluation of rodenticides. Field tests against synanthropic rodents

1.4 Deviations

Yes.
The test was conducted regarding the CEB census baiting method. The initial consumption plateau is lower than the recommended 5 000 g/day and the initial quantity of bait by bait point is lower than 500 g.

2 Method

Section B5.10/05	**Efficacy Data**
Annex Point IIB5.10 **TNsG: Pt. I-B5.10,** **Pt. III-Ch. 6**	Efficacy on rats, field test

2.1 Test Substance (Biocidal Product)	Brodifacoum
2.1.1 Trade name/ proposed trade name	Brodifacoum paste 40 ppm, equivalent to Saphir Paste (see the attestation for the different product names used in efficacy trials reports)
2.1.2 Composition of Product tested	Paste bait containing 40 mg/kg of brodifacoum Batch No. 030711 Nominal concentration: 40.0 mg a.s. / kg Measured concentration: 38.4 mg a.s./kg (within the acceptable decision criteria fixed to 40.0 ± 25%) (see the Doc. IV-B5.10/05 - Appendix 1)
2.1.3 Physical state and nature	Ready-to-use paste bait (RB)
2.1.4 Monitoring of active substance concentration	Not applicable
2.1.5 Method of analysis	Not applicable.
2.2 Reference substance	None
2.2.1 Method of analysis for reference substance	Not applicable
2.3 Testing procedure	
2.3.1 Test population	Wild Norway Rats (*Rattus norvegicus*). See Table 1.2

Section B5.10/05	**Efficacy Data**
Annex Point IIB5.10 **TNsG: Pt. I-B5.10,** **Pt. III-Ch. 6**	Efficacy on rats, field test

/ **inoculum /** **test organism**	
2.3.2 Test system	The test was carried out on a farm raising cows infested with *Rattus norvegicus* (see Table 1.3).
2.3.3 Application of Test Substance	See table 1.4 When the pre-baiting consumption reached the plateau (day 25), the non-poisoned baits were replaced by the product to be tested (day 26). After the baiting period, the residual consumption was determined to be compared with the initial consumption. During the baiting period, bait stations received 150 g baits (40 mg/kg of Brodifacoum). Baits were replaced daily.
2.3.4 Test conditions	Natural conditions (see table 1.5).
2.3.5 Duration of the test / Exposure time	Duration of the whole test: 43 days The practical efficacy trial included three consecutive periods: - first period: determination of the consumption plateau of the initial population to measure initial daily consumption (25 days). - second period: rodenticide application (10 days). - third period: establishment of the consumption plateau of the surviving population to measure residual consumption (8 days). The comparison of the two consumption plateaus obtained experimentally before and after the rodenticide treatment enables the calculation, as a relative value, of the treatment efficacy.
2.3.6 Number of replicates performed	None (field test).
2.3.7 Controls	No control as the test is a field efficacy trial.
2.4 Examination	
2.4.1 Effect	Percentage of bait consumed after the control operation compared to the amount of bait consumed before the control

Section B5.10/05	Efficacy Data
Annex Point IIB5.10 TNsG: Pt. I-B5.10, Pt. III-Ch. 6	Efficacy on rats, field test

investigated	operation as an index of population size.
2.4.2 Method for recording / scoring of the effect	Bait consumption was recorded on daily basis and for each bait point. The bait stations were emptied of their content every day, around the same hour, and then refilled with the initial quantity of bait. Remaining uneaten baits were collected in separate bags and weighted with a laboratory balance at the laboratory.
2.4.3 Intervals of examination	Daily.
2.4.4 Statistics	The treatment efficacy, as a relative value, was calculated as follows: $E = \left[\frac{C_i - C_r}{C_i} \right] * 100$ Where: E = efficacy; C_i = initial consumption, average consumption before the treatment (when the plateau is reached); C_r = residual consumption, average consumption after the treatment (when the plateau is reached). A graph showing the variation of total daily consumption (consumption in all the bait stations of the experimental site) was completed every day.
5.11.1 2.4.5 Post monitoring of the test organism	Post-baiting residual consumption was determined for 8 days

3 Results

3.1 Efficacy

Initial consumption was calculated by averaging the consumption of the last three consecutive days (on the plateau).

Residual consumption was calculated by averaging the consumption of the last six consecutive days (on the plateau).

Section B5.10/05	Efficacy Data
Annex Point IIB5.10 **TNsG: Pt. I-B5.10,** **Pt. III-Ch. 6**	Efficacy on rats, field test

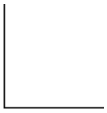
	The efficacy measured was 95.18%.
3.1.1 Dose/Efficacy curve	Not applicable
3.1.2 Begin and duration of effects	Once the total daily consumption is considered to be stabilized, as a plateau is reached for three consecutive days during the pre-baiting period, the non-poisoned baits were replaced by the product to be tested. The graph of the total daily bait consumption is given in section 3.5.
3.1.3 Observed effects in the post monitoring phase	Total daily consumption was measured for 8 days after the baiting period to assess the level of the survival rodent population, with the same methods than those employed to measure pre-treatment activity. The consumption reached a plateau (about 50 g/day) and was lower than during the pre-baiting period (about 1 038 g/day). No adverse effects were reported.
3.2 Effects against organisms or objects to be protected	
3.3 Other effects	Not applicable.
3.4 Efficacy of the reference substance	Not applicable.
3.5 Tabular and/or graphical presentation of the summarised results	Daily consumption during the prebaiting period (g/day): 

Section B5.10/05 **Efficacy Data**

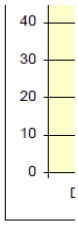
Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

Efficacy on rats, field test

Daily consumption during the baiting phase (g/day):



Daily consumption during the post-baiting period (g/day):



3.6 Efficacy limiting factors

Not applicable

3.6.1 Occurrences of resistances

Not applicable

3.6.2 Other limiting factors

4 Relevance of the results compared

Section B5.10/05	**Efficacy Data**
Annex Point IIB5.10	Efficacy on rats, field test
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	

to field conditions

4.1 Reasons for laboratory testing

Not applicable.

4.2 Intended actual scale of biocide application

4.3 Relevance compared to field conditions

4.3.1 Application method

4.3.2 Test organism

4.3.3 Observed effect

4.4 Relevance for read-across

5 Applicant's Summary and conclusion

Section B5.10/05	**Efficacy Data**
Annex Point IIB5.10 **TNsG: Pt. I-B5.10,** **Pt. III-Ch. 6**	Efficacy on rats, field test

5.1 Materials and methods	The field assay, appropriate to the geographic regions in which the product will be used, was conducted in an experimentation station infested with wild *Rattus norvegicus* to assess under actual in-use conditions the palatability of the bait and the mortality it causes. A pre-baiting period (25 days) allowed to place bait points correctly and to determine a plateau of food consumption by the wild rats population. During the baiting period, 50 bait points were used with 150 g of bait (40 mg/kg of Brodifacoum) replaced daily for 10 days. The location of the bait points and the amount of bait consumed each day were recorded. During the post-baiting period (8 days), the food consumption was recorded up to reach a plateau. The total amount of census bait consumed give an index of the population size. The level of control is expressed as a percentage reduction in the pre-treatment index.
5.2 Reliability	1
5.3 Assessment of efficacy, data analysis and interpretation	The percentage of bait consumed after the control operation compared to the amount of bait consumed before the control operation was ≤ 10%, satisfying the criteria proposed for a good rodenticide efficacy in the field trials.
5.4 Conclusion	With an efficacy of 95.18% and a control restricted to *Rattus norvegicus* only (dead rodents found during and after the baiting and the post-baiting phases were only *Rattus norvegicus*), the field assay showed a very good efficacy with a fast decrease of the population.
5.5 Proposed efficacy specification	Efficacy of more than 95%.

Section B5.10/05 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, field test

TNsG: Pt. I-B5.10,

Pt. III-Ch. 6

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	March 2013.
Materials and Methods	Agree with applicant's version.
Results and discussion	The efficacy measured was 95.18%.
Conclusion	Agree with applicant's version.
Reliability	1
Acceptability	Acceptable.
Remarks	None.
	COMMENTS FROM ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	*Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section B5.10/05 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, field test

TNsG: Pt. I-B5.10,

Pt. III-Ch. 6

1.2 Test organism

Criteria	Details
Species	*Rattus norvegicus*
Strain	Wild
Source	Not applicable
Laboratory culture	Not applicable
Stage of life cycle and stage of stadia	Not applicable
Mixed age population	Yes
Other specification	None
Number of organisms tested	About 41, estimated by pre-treatment bait census
Method of cultivation	Not applicable
Pre-treatment of test organisms before exposure	The rodents were fed with grain baits (non-poisoned cereals) with negligible variations of weight due to the desiccation or hygrometry. Baits were placed in bait stations from which uneaten bait can be collected. The map of the site indicating the location of bait points is provided. Baits were placed where rats are regularly seen by the owner of the farm, where rats have recently been seen, where rats signs have been seen (holes, droppings…), where rats are liable to walk away and all around the station in order to surround the infestation. At day 16, some bait points were removed if the consumption was too weak (< 1 g).
Initial density/number of test organisms in the test system	The initial consumption calculated as the average of the consumption of the last three days of the pre-baiting period is 1 037.8 g/day. The average consumption per rat is estimated to be 25 g/day (ESD for biocides used as rodenticides). Therefore, the number of rats with a continuous supply of non-poisoned baits could be estimated ≥ 41 rats.

Section B5.10/05 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, field test

TNsG: Pt. I-B5.10,

Pt. III-Ch. 6

1.3 Test system

Criteria		Details
5.11.2	**Culturing apparatus / test chamber**	The test was carried out in a farm raising cows in France (Le Petit Closelande, F- 35470 Bain de Bretagne). The station map and the locations of the bait points are provided. The owner of the farm told that there was no current rodenticide treatment.
5.11.3	**Number of vessels / concentration**	Not applicable
5.11.4	**Test culture media and/or carrier material**	The Brodifacoum-based paste baits are ready-to-use. Paste baits were placed in bait stations.
5.11.5	**Nutrient supply**	During the baiting period, the non-poisoned baits were replaced by the rodenticide. The bait stations were refilled with a quantity of rodenticide equal to the bait quantity initially placed into the bait stations.
5.11.6	**Measuring equipment**	The uneaten baits were collected in separate bags and the weighing was carried out at the laboratory, using a laboratory balance.

1.4 Application of test substance

Criteria	Details
Application procedure	During the baiting period, bait stations were refilled with a quantity of rodenticide equal to the non-poisoned bait quantity placed during the pre-baiting period. In the same way as during the pre-baiting period, the bait stations were emptied of their contents every day, around the same hour (± 1h), then refilled with the initial quantity of rodenticide. The uneaten rodenticides of each bait station were collected in separate bags. The weighing was carried out at the laboratory. The baiting period lasted for 10 days.
Delivery method	During the baiting period, 150 g of bait (40 mg/kg of Brodifacoum) were placed into receptacles (bait stations).
Dosage rate	The bait stations received 150 g of bait each and were emptied and then refilled every day.
Carrier	Not applicable
Concentration of liquid carrier	Not applicable
Liquid carrier control	Not applicable
Other procedures	No other relevant details.

Section B5.10/05 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, field test

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.5 Test conditions

Criteria	Details
5.11.7 Substrate	Not applicable
5.11.8 Incubation temperature	Not applicable
5.11.9 Moisture	Natural conditions
5.11.10 Aeration	Natural conditions
5.11.11 Method of exposure	The baits are placed in feeding trays (bait stations)
5.11.12 Aging of samples	No
5.11.13 Other conditions	Natural conditions

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10,	
Pt. III-Ch. 6	

Official use only

1 Reference

1.1 Reference

Lecomte L., Doyen A., 2011, Assessment of the efficacy of a rodenticide, in natural conditions, LODI (unpublished), Assay Number LODI.04/2011, 27 October 2011

1.2 Data protection

Yes

1.2.1 Data owner

Lodi

1.2.2 Criteria for data protection

Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its authorisation.

1.3 Guideline study

CEB Method No.002: Méthode d'essai d'efficacité pratique de raticides. J. Giban

EPPO Guidelines PP 1/114(2): Efficacy evaluation of rodenticides. Field tests against synanthropic rodents

1.4 Deviations

Yes.
The test was conducted regarding the CEB census baiting method which was validated for rats but not for mice. Anyhow, this method can be considered suitable for any rodents.
Regarding EPPO, no replicates were tested but the assessment was made in an entire building on 59 bait stations.

2 Method

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10,	
Pt. III-Ch. 6	

2.1 Test Substance (Biocidal Product)	Brodifacoum
2.1.1 Trade name/ proposed trade name	Brodifacoum paste 40 ppm, equivalent to Saphir Paste (see the attestation for the different product names used in efficacy trials reports)
2.1.2 Composition of Product tested	Paste bait containing 40 mg/kg of brodifacoum Batch No. 030711 Nominal concentration: 40.0 mg a.s. / kg Measured concentration: 38.4 mg a.s./kg (within the acceptable decision criteria fixed to 40.0 ± 25%) (see the Doc. IV-B5.10/06 - Appendix 1)
2.1.3 Physical state and nature	Ready-to-use paste bait (RB)
2.1.4 Monitoring of active substance concentration	Not applicable
2.1.5 Method of analysis	Not applicable.
2.2 Reference substance	None
2.2.1 Method of analysis for reference substance	Not applicable
2.3 Testing procedure	

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10,	
Pt. III-Ch. 6	

2.3.1 Test population / inoculum / test organism	Wild house mouse (*Mus musculus*). See Table 1.2
2.3.2 Test system	The test was carried out on a farm infested with *Mus musculus* (see Table 1.3).
2.3.3 Application of Test Substance	See table 1.4 When the pre-baiting consumption reached the plateau (day 31), the non-poisoned baits were replaced by the product to be tested (day 32). After the baiting period, the residual consumption was determined to be compared with the initial consumption. During the baiting period, bait stations received 30 g baits (40 mg/kg of Brodifacoum). Baits were replaced daily.
2.3.4 Test conditions	Natural conditions (see table 1.5).
2.3.5 Duration of the test / Exposure time	Duration of the whole test: 46 days The practical efficacy trial included three consecutive periods: - first period: determination of the consumption plateau of the initial population to measure initial daily consumption (31 days). - second period: rodenticide application (8 days). - third period: establishment of the consumption plateau of the surviving population to measure residual consumption (7 days). The comparison of the two consumption plateaus obtained experimentally before and after the rodenticide treatment enables the calculation, as a relative value, of the treatment efficacy.
2.3.6 Number of replicates performed	None (field test).
2.3.7 Controls	No control as the test is a field efficacy trial.

2.4 Examination

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10,	
Pt. III-Ch. 6	

2.4.1 Effect investigated

Percentage of bait consumed after the control operation compared to the amount of bait consumed before the control operation as an index of population size.

2.4.2 Method for recording / scoring of the effect

Bait consumption was recorded on a daily basis and for each bait point. The bait stations were emptied of their content every day, around the same hour, and then refilled with the initial quantity of bait. Remaining uneaten baits were collected in separate bags and weighted with a laboratory balance at the laboratory.

2.4.3 Intervals of examination

Daily.

2.4.4 Statistics

The treatment efficacy, as a relative value, was calculated as follows:

$$E = \left[\frac{C_i - C_r}{C_i} \right] * 100$$

Where:

E = efficacy;

C_i = initial consumption, average consumption before the treatment (when the plateau is reached);

C_r = residual consumption, average consumption after the treatment (when the plateau is reached).

A graph showing the variation of total daily consumption (consumption in all the bait stations of the experimental site) was completed every day.

2.4.5 Post monitoring of the test organism

Post-baiting residual consumption was determined for 7 days

6 3 Results

3.1 Efficacy

Both initial consumption and residual consumption were calculated by averaging the consumption of the last three consecutive days (on the plateau). The efficacy measured was 89.9%.

3.1.1 Dose/Efficacy

Not applicable

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10,	
Pt. III-Ch. 6	

curve

3.1.2 Begin and duration of effects

Once the total daily consumption is considered to be stabilized, as a plateau is reached for three consecutive days during the pre-baiting period, the non-poisoned baits were replaced by the product to be tested. The graph of the total daily bait consumption is given in section 3.5.

3.1.3 Observed effects in the post monitoring phase

Total daily consumption was measured for 7 days after the baiting period to assess the level of the survival rodent population, with the same methods than those employed to measure pre-treatment activity. The consumption reached a plateau (about 26 g/day) and was lower than during the pre-baiting period (about 253 g/day).

No adverse effects were reported.

3.2 Effects against organisms or objects to be protected

3.3 Other effects

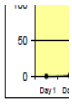
Not applicable.

3.4 Efficacy of the reference substance

Not applicable.

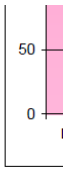
3.5 Tabular and/or graphical presentation of the summarised results

Daily consumption during the prebaiting period (g/day):

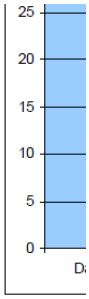


Daily consumption during the baiting phase (g/day):

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	



Daily consumption during the post-baiting period (g/day):



3.6 Efficacy limiting factors

Not applicable

3.6.1 Occurrences of resistances

Not applicable

3.6.2 Other limiting factors

4 Relevance of the results compared to field conditions

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10,	
Pt. III-Ch. 6	

4.1 Reasons for laboratory testing	Not applicable.
4.2 Intended actual scale of biocide application	
4.3 Relevance compared to field conditions	
4.3.1 Application method	
4.3.2 Test organism	
4.3.3 Observed effect	
4.4 Relevance for read-across	

5 Applicant's Summary and conclusion

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10,	
Pt. III-Ch. 6	

5.1 Materials and methods	The field assay, appropriate to the geographic regions in which the product will be used, was conducted in an experimentation station infested with wild *Mus musculus* to assess under actual in-use conditions the palatability of the bait and the mortality it causes. A pre-baiting period (31 days) allowed to place bait points correctly and to determine a plateau of food consumption by the wild mice population. Rodent activity on the site before and after treatment was determined. During the baiting period, 59 bait points were used with 30 g of bait (40 mg/kg of Brodifacoum) replaced daily for 8 days. The location of the bait points and the amount of bait consumed each day were recorded. During the post-baiting period (7 days), the food consumption was recorded up to reach a plateau. The total amount of census bait consumed give an index of the population size. The level of control is expressed as a percentage reduction in the pre-treatment index.
5.2 Reliability	1
5.3 Assessment of efficacy, data analysis and interpretation	The percentage of bait consumed after the control operation compared to the amount of bait consumed before the control operation was ≤ 10%, satisfying the criteria proposed for a good rodenticide efficacy in the field trials
5.4 Conclusion	With an efficacy of 89.9% and a control restricted to *Mus musculus* only (dead rodents found during and after the baiting and the post-baiting phases were only *Mus musculus*), the field assay showed a good efficacy with a fast decrease of the population.
5.5 Proposed efficacy specification	Efficacy of more than 89%

Section B5.10/06 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, field test

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	March 2013.
Materials and Methods	Agree with applicant's version.
Results and discussion	The efficacy measured was 89.9%.
Conclusion	Agree with applicant's version.
Reliability	1
Acceptability	Acceptable.
Remarks	None.
	COMMENTS FROM ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	*Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section B5.10/06 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, field test

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.2 Test organism

Criteria	Details
Species	*Mus musculus*
Strain	Wild
Source	Not applicable
Laboratory culture	Not applicable
Stage of life cycle and stage of stadia	Not applicable
Mixed age population	Yes
Other specification	None
Number of organisms tested	About 72, estimated by pre-treatment bait census
Method of cultivation	Not applicable
Pre-treatment of test organisms before exposure	The rodents were fed with grain baits (non-poisoned cereals) with negligible variations of weight due to the desiccation or hygrometry. Baits were placed in bait stations from which uneaten bait can be collected. The map of the site indicating the location of bait points is provided. Baits were placed where mice are regularly seen by the owner of the farm, where mice have been recently seen, where mice signs have been seen (holes, droppings…), where mice are liable to walk away and all around the station in order to surround the infestation. At Day 17, some bait points were removed if the consumption was too weak (< 1 g). On the contrary, the bait point showing a too high consumption has been duplicated.
Initial density/number of test organisms in the test system	The initial consumption calculated as the average of the consumption of the last three days of the pre-baiting period is 253.2 g/day. The average consumption per mice is estimated to be 3.5 g/day (ESD for biocides used as rodenticides). Therefore, the number of mice

	with a continuous supply of non-poisoned baits could be estimated ≥ 72 mice.

Section B5.10/06 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, field test

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.3 Test system

Criteria		Details
6.1.1	**Culturing apparatus / test chamber**	The test was carried out in a farm in France (La Masserie, F- 35470 Bain de Bretagne). The station map and the locations of the bait points on the plan are provided. The owner of the farm told that there was no current rodenticide treatment.
6.1.2	**Number of vessels / concentration**	Not applicable
6.1.3	**Test culture media and/or carrier material**	The Brodifacoum-based paste baits are ready-to-use. Paste baits were placed in bait stations.
6.1.4	**Nutrient supply**	During the baiting period, the non-poisoned baits were replaced by the rodenticide. The bait stations were refilled with a quantity of rodenticide equal to the bait quantity initially placed into the bait stations.
6.1.5	**Measuring equipment**	The uneaten baits were collected in separate bags and the weighing was carried out at the laboratory, using a laboratory balance.

Section B5.10/06 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, field test

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.4 Application of test substance

Criteria	Details
Application procedure	During the baiting period, bait stations were refilled with a quantity of rodenticide equal to the non-poisoned bait quantity placed during the pre-baiting period. In the same way as during the pre-baiting period, the bait stations were emptied of their contents every day, around the same hour (± 1h), then refilled with the initial quantity of rodenticide. The uneaten rodenticides of each bait station were collected in separate bags. The weighing was carried out at the laboratory. The baiting period lasted for 8 days.
Delivery method	During the baiting period, 30 g of bait (40 mg/kg of Brodifacoum) are placed into receptacles (bait stations).
Dosage rate	The bait stations received 30 g of bait each and are emptied then refilled every day.
Carrier	None (ready-to-use product)
Concentration of liquid carrier	Not applicable
Liquid carrier control	Not applicable
Other procedures	Not relevant.

Section B5.10/06 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, field test

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.5 Test conditions

Criteria	Details
6.1.6 Substrate	Not applicable
6.1.7 Incubation temperature	Not applicable
6.1.8 Moisture	Natural conditions
6.1.9 Aeration	Natural conditions
6.1.10 Method of exposure	The baits are placed in feeding trays (bait stations).
6.1.11 Aging of samples	No
6.1.12 Other conditions	Natural conditions

Please refer to the “Saphir Paste PAR – MS addendum for Tox – 70286, 70287” as Lodi received a LoA to toxicological data owned by Pelgar International Ltd.

Annex IV: List of studies reviewed

List of new data[24] submitted in support of the evaluation of the active substance (IIIA)

Not applicable

24 Data which have not been already submitted for the purpose of the Annex I inclusion.

List of new data submitted in support of the evaluation of the biocidal product (IIIB)

Section No in IUCLID/ IIIB / Non key study / Published	Author(s)	Year	Title/testing company	Report No	GLP study (Y/N)	Published (Y/N)	Data protection claimed (Y/N)	Data Owner
B3.2	S. Richerioux	2011	Explosive properties of Brodifacoum paste bait / LODIGROUP	LODI.66/2011, 25 November 2011	Y	N	Y	LODI S.A.S.
B3.3	S. Richerioux	2011	Oxidising properties of Brodifacoum paste bait / LODIGROUP	LODI.65/2011, 08 November 2011	Y	N	Y	LODI S.A.S.
B3.4.1	E. Meriadec	2011	Flammability of Brodifacoum paste bait / LODIGROUP	LODI.58/2011, 27 June 2011	Y	N	Y	LODI S.A.S.
B3.4.2	B. Demangel	2012	Self Ignition temperature of solids on Brodifacoum Paste Bait / ANADIAG-DEFITRACES	11-912011-010, 23 January 2012	Y	N	Y	LODI S.A.S.
B3.5	S. Richerioux	2011	pH of Brodifacoum paste bait / LODIGROUP	LODI.64/2011, 07 October 2011	Y	N	Y	LODI S.A.S.
B3.6	S. Richerioux	2011	Relative density of Brodifacoum paste bait / LODIGROUP	LODI.52/2011, 09 September 2011	Y	N	Y	LODI S.A.S.
B3.7.1	S. Richerioux	2011	Chemical stability of Brodifacoum paste bait after accelerated storage / LODIGROUP	LODI.59/2011, 15 November 2011	Y	N	Y	LODI S.A.S.
B3.7.2	S. Richerioux	2011	Chemical stability of Brodifacoum paste bait after 1 year storage at 20°C / LODIGROUP	(Study Plan) LODI.60/2011	Y	N	Y	LODI S.A.S.
B3.7.3	S. Richerioux	2011	Chemical stability of Brodifacoum paste bait after 2 years storage at 20°C / LODIGROUP	(Study Plan) LODI.61/2011	Y	N	Y	LODI S.A.S.
B3.7.4	S.	2011	Chemical and packaging	(Study Plan)	Y	N	Y	LODI

Section No in IUCLID/ IIIB / Non key study / Published	Author(s)	Year	Title/testing company	Report No	GLP study (Y/N)	Published (Y/N)	Data protection claimed (Y/N)	Data Owner
	Richerioux		stability of Brodifacoum paste bait after 3 years storage at 20°C / LODIGROUP	LODI.62/2011				S.A.S.
B4	S. Richerioux	2012	Analytical validation for determination of Brodifacoum by HPLC / LODIGROUP	LODI.51/2011, 23 January 2012	Y	N	Y	LODI S.A.S.
B5.10	A. Doyen	2011	Attestation – Product names in efficacy trials report	13 December 2011	N	N	Y	LODI S.A.S.
B5.10/01	T. Mahaut, Dr. M. Cavelier	2003	Evaluation of the effectiveness of Brodipasta, a ready-to-use rodenticide paste bait containing 0.004% brodifacoum, against the Norway rat (*Rattus norvegicus* Berkenhout) and the house mouse (*Mus musculus* L.), Wallon Agricultural Research Centre, Gembloux	Contract No. 2003-03-Belgagri, 20 April 2003	N	N	Y	Belgagri SA
B5.10/01 – Appendix 1	Centre de Recherches agronomiques de Gembloux	1994	Lignes directrices pour l'évaluation de l'efficacité des rodenticides et critères de décision, Stations de Zoologie appliquée et de Phytopharmacie	Deuxième édition, octobre 1994	N	N	Y	Belgagri SA
B5.10/02	Dr. M. De Proft, Dr. P. Meeùs	2005	Study of ageing behaviour of Brodipasta, a ready-to-use bait containing 0.004% brodifacoum, Wallon Agricultural Research Centre, Gembloux	Report No. 11595, Experiment ROD 2003-03, 01 June 2005	N	N	Y	Belgagri SA
B5.10/01 –			Please refer to IIIB5.10/01 – Appendix 1					

Section No in IUCLID/ IIIB / Non key study / Published	Author(s)	Year	Title/testing company	Report No	GLP study (Y/N)	Published (Y/N)	Data protection claimed (Y/N)	Data Owner
Appendix 2								
IIIB5.10/03	M. Loiseau	2012	Choice feeding trial for Brodifacoum paste bait (aged product) against rat, Biotrial Pharmacology	Study code 0BSIX2, 11 January 2012	N	N	Y	Bio 6 SA
IIIB5.10/03 – Appendix 1	H. Ricau	2011	Analytical Certificate, Anadiag – Defitraces	14 October 2011	N	N	Y	Bio 6 SA
B5.10/04	M. Loiseau	2012	Choice feeding trial for Brodifacoum paste bait (aged product) against albino house mice, Biotrial Pharmacology	Study code 0BSIX1, 11 January 2012	N	N	Y	Bio 6 SA
B5.10/04 – Appendix 1			Please refer to IIIB5.10/03 – Appendix 1					
B5.10/05	L. Lecomte, A. Doyen	2011	Assessment of the efficacy of a rodenticide, in natural conditions, LODIGROUP	Assay Number LODI.03/2011, 27 October 2011	N	N	Y	LODI S.A.S.
B5.10/05 – Appendix 1	Lodi	2011	Certificate of Analysis, LODIGROUP	19 August 2011	N	N	Y	LODI S.A.S.
B5.10/06	L. Lecomte, A. Doyen	2001	Assessment of the efficacy of a rodenticide, in natural conditions, LODIGROUP	Assay Number LODI.04/2011, 27 October 2011	N	N	Y	LODI S.A.S.
B5.10/06 – Appendi			Please refer to IIIB5.10/05 – Appendix 1					

Section No in IUCLID/ IIIB / Non key study / Published	Author(s)	Year	Title/testing company	Report No	GLP study (Y/N)	Published (Y/N)	Data protection claimed (Y/N)	Data Owner
x 1								
B6.1.1	[redacted]	2007 a	Brodifacoum Paste: Acute Oral Toxicity in the Rat – Fixed Dose Method [redacted]	Report number 2254/0025	Y	N	Y	Pelgar International PCL
B6.1.2	[redacted]	2007 b	Brodifacoum Paste: Acute Dermal Toxicity (Limit Test) in the Rat, [redacted]	Report No 2254/0026	Y	N	Y	Pelgar International PCL
B6.2 (1)	[redacted]	2007 c	Brodifacoum Paste: Acute Dermal Irritation in the Rabbit, [redacted]	Report No 2254/0027	Y	N	Y	Pelgar International PCL
B6.2 ([redacted]	[redacted]	2007 d	Brodifacoum Paste: Acute Eye Irritation in the Rabbit, [redacted]	Report No 2254/0028	Y	N	Y	Pelgar International PCL
B6.4	[redacted]	2011	Determination of the dermal absorption of chloralose from a paste bait in human skin *in vitro* [redacted]	NOTOX project 496707 NOTOX Substance 202689/A	Y	N	Y	LODI S.A.S.

ANNEX V: Toxicology Calculations

Insert relevant exposure/effect calculations undertaken, if applicable.

ANNEX VI: Environmental Calculations

Environmental exposure assessment

The product contains the anticoagulant active substance brodifacoum (CAS No. 56073-10-0) at a concentration of 0.005% w/w (50 mg/kg). The product is designed to be used by professionals and amateurs in and around buildings infested by rats or mice. Furthermore, professional use of the product is envisaged in the area of rodent control in sewer systems.

For rat abatement (by amateurs and professionals), bait points containing 1-3 wax blocks (each of 20 g weight) are established, at distances of 5-10 m apart. For mouse control, bait points consist of 1 wax block, which are placed, at distances of 2-5 m apart. The label gives instruction to place the baits securely, i.e., in a way minimizing the risk of consumption by other animals or children. For amateur use the label prescribes to use tamper resistant bait stations for rat control. Baits for amateur mouse control have to be placed into/at a covered or protected bait station. For professional rodent control the use of tamper resistant bait stations is not compulsory however, if tamper resistant bait stations are not employed, the wax blocks must be fixed by strings or wire to avoid uptake by non target animals/humans, or uncontrolled dispersal.

Since non-target animals and the general public have no entrance to sewer infrastructure, a risk for primary poisoning does not arise due to rodent control in this compartment. The product can be applied by the 'pulsed-baiting' technique. At heavily infested sites bait points have to be replenished after 3-4 days and after 1 week. Thereafter, bait points should be checked weekly for curative treatment and every month for preventive treatment. Clearance of the rodent infestation will be achieved in 7-35 days.

In accordance with the TGD on Risk Assessment (EC, 2003[25]) and with the aid of the Emission Scenario Document for PT 14 (J. Larsen, 2003[26], in the following referred to as ESD PT 14), a quantitative approach is performed in order to estimate potential brodifacoum residues in environmental compartments, arising from its use as rodenticide, and local Predicted Environmental Concentrations (PECs) are calculated. These PECs will be compared with the Predicted No Effect Concentrations (PNEC), i.e., the concentrations below which unacceptable effects on organisms will most likely not occur. In the following environmental exposure assessment the active substance is exclusively taken into consideration as no further environmentally relevant substance is formed in the course of brodifacoum release into environmental compartments (*cf.* CA Report for brodifacoum). Besides denatonium benzoate (Bitrex®) none of the other ingredients in the product is classified with an environmentally relevant R-phrase. Bitrex® is classified with R52/R53. However, due to its significantly lower aquatic toxicity compared to brodifacoum (most sensitive species for Bitrex® is *Daphnia magna* with an EC_{50} of 13 mg/L, compared to brodifacoum with a lowest LC_{50}/EbC_{50} of 40 mg/L for fish and algae, respectively), and its very low content in the product (0.001% w/w), Bitrex® does not have to be contemplated in this context.

25 Technical Guidance Document in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances and Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market. EUR 20418 EN/2. Italy, April 2003

26 Larsen, 2003: Emission scenario document for biocides used as rodenticides. EUBEES 2 report ENV.C3/SER/2001/0058.

Regional and continental PECs have not been calculated as they are not considered relevant for rodenticide use because the low consumption of rodenticide products leads to a negligible regional contribution (*cf.* Section 2.2, ESD PT 14).

Emissions to the environment from the use of brodifacoum in the product

Exposure during the production and formulation of brodifacoum should be addressed under other EU legislation (e.g. REACh) and not repeated under Directive 98/8/EC. The Biocides Technical Meeting (TMI06) agreed that a risk assessment for production and formulation of the active substance was not required, unless the active substance was totally new to the EU market and manufactured in the EU. This is not the case for brodifacoum which is an existing biocidal active substance within the EU.

Hence, the environmental exposure assessment focuses on the use and disposal of the rodenticide, which is in line with the scenarios proposed by the ESD.

Fate and distribution of brodifacoum in the environment

Details on the environmental fate and behaviour of brodifacoum are given in the CA Report for the active substance with regard to its inclusion in Annex I of Directive 98/8/EC.

Brodifacoum is very poorly soluble in water at an environmentally relevant pH (0.24 mg/L at pH 7 and 20°C), however measured solubility varies with pH (in the range of pH 5.2–9.3), indicating that dissociation occurs in this pH range. The estimated pKa is 4.5, therefore the compound is weakly acidic and can be expected to be mostly dissociated at pH 7. The compound has a low vapour pressure ($<<10^{-6}$ Pa at 20°C) and Henry's Law constant ($<<2.18*10^{-3}$ Pa*m3*mol^{-1}). Brodifacoum is hydrolysed relatively slowly under environmentally relevant conditions (DT_{50} = 300 d at pH 7 and 25°C) and degrades slowly in soil with a half life of 157 days (laboratory study, approx. 20°C). Photolysis in water is rapid (DT_{50} < 1 day). K_{oc} values calculated from absorption/desorption studies with three soils give a range of 4395-12603 L/kg (mean 9155 L/kg) at environmentally relevant pH values (6.6-7.6). Further experimental evidence (*cf*. IIIB, Doc. 7.1: Column leaching test with a pellet product containing 0.005% difenacoum, which is a related active substance to brodifacoum) shows that the compound is not mobile in soil, as concentrations in leachate from column leaching studies were non-determinable and no residues were found below the top 10 cm soil depth. Hence, there is evidence that brodifacoum is not mobile in soil.

PEC calculation

The ESD PT 14 categorises scenarios according to the application surrounding of the rodenticide and the application type. The PECs for the scenarios relevant to this product are presented below. It must be noted that the ESD PT 14 does not provide a scenario for the indoor use of rodenticides even though it is possible for a product to reach the sewer system due to cleaning processes following indoor use. However, these environmental emissions are considered negligible compared to emissions from outdoor use around buildings or sewer applications. Therefore, environmental emissions arising from the indoor use can be regarded to be covered by allowance for outdoor applications, as a conservative assumption. Since rat abatement requires higher application amounts compared to mouse control, the assessment includes application amounts and distances for placing the bait for the former target organisms.

Emissions to the environment have been calculated in a two-tiered approach. In a first tier, the default values of the ESD PT 14 regarding application amounts and mode of use are used to calculate the

worst-case PECs (first column in the tables). For refinement (Tier 2), product-specific application amounts and mode of use are used to derive PEC values that more closely reflect the realistic usage. The applicant also used data on the metabolism of brodifacoum to lower the exposure levels further; however the evaluator for the RMS removed this as no exposure assessment on the brodifacoum metabolites was included.

Sewer system

The product is used in sewer systems solely by professionals. Detailed usage instructions are provided on the label.

The ESD PT 14 proposes the scenario of pulsed baiting as a realistic worst case for rodenticide use in a city having a serious rat problem. A campaign of 21 days is assumed, with control operations at days 7 and 14. The revisit at day 7 requires the highest refill of wax blocks (1/3 of the rodenticide has been consumed and must be replaced) so only the first 7 days of the campaign are observed. This scenario has been taken for the current risk assessment, with the modification of assuming a first revisit already after 3.5 days with reference to the label instruction, recommending a first inspection after 3-4 days.

As outlined above, a two-tiered approach is conducted, comprising the following assumptions:

Tier 1:

In an area corresponding to 10,000 inhabitants 300 portions of wax blocks (300 g of bait per portion) are applied to 300 cesspools (in total 90 kg product in the catchment of one STP). During the first 7 days of control operation 1/3 of the wax blocks being placed is lost. Hence, the amount of product either being consumed by rodents or spilled (Q_{prod}) accounts for 30 kg. The fraction of the active released to the sewer system ($F_{released}$) is set to 0.9 by default.

Tier 2:

The applicant recommends a dosage rate of 3 wax blocks (20 g per block) to be placed at the 300 cesspools. This corresponds to a total mass of product of 18 kg. However in this instance the first revisit is performed after 3.5 days, at which stage one third of the bait (6 kg) has been eaten.

Regarding the fate and behaviour of brodifacoum in a STP, the SimpleTreat model distribution was adopted. Accordingly, the bulk of the active substance when entering a STP is translocated into sewage sludge (85%) with only minor amounts (15%) being present in the STP effluent after wastewater treatment. The evaluator for the RMS checked these figures using EUSES 2.1 and obtained a figure of 51.1% adsorption to sludge. Therefore the calculations presented below were repeated and corrected as per this parameter.

The input parameters for EUSES 2.1 are summarized in the following table. They have been adopted from the list of endpoints of the CA Report for brodifacoum.

Table 0-1: Input parameter for EUSES calculation

Parameter	Unit	Value	Condition
Molar mass	g/mol	523.4	
Melting point	°C	232	
Boiling point	°C	Not applicable	
Vapour pressure	Pa	10^{-6}	20°C
Henry's constant	Pa*m^3*mol	2.18*10^{-3}	pH 7
Water solubility	mg/L	0.24	pH 7, 20°C
Log P_{ow}		6.12	
DT_{50} in soil	d	157	20°C
		298	12°C
K_{oc} (soil)	L/kg	9155	average value from an adsorption/desorption study with three soils
Distribution in STP		48.9% water	SimpleTreat distribution
		51.1% sludge	
BCF fish		35134	Calculated according to the TGD
BCF earthworm		15820	

Using these input parameters and the Tier 1 and Tier 2 approaches explained above environmental concentrations have been assessed and are presented in the following tables. A PEC for sediment has not been calculated. According to the TGD, for substances with a log P_{ow} of > 5 and a determination of the PNEC in sediment with the equilibrium partition method (EPM), the PEC/PNEC ratio for sediment is by a factor of 10 higher than the PEC/PNEC ratio for surface water. Since for brodifacoum no studies on ecotoxicity towards sediment dwellers are available, the EPM method applies. Therefore, the risk characterization for sediment will be conducted in Document IIC on the basis of the PEC/PNEC ratios obtained for the water phase.

Table 0-2: Brodifacoum concentrations in environmental compartments for the scenario 'sewer system'

		Tier 1[a]	Tier 2[b]
Input			
Q_{prod}	Amount of product used in control operation (kg)	30	6
$Fc_{product}$	Fraction of active substance in product	0.00005	0.00005
$T_{emission}$	Number of emission days	7	3.5
$F_{released}$	Fraction of active ingredient released	0.9	0.9
Output			
$Elocal_{water}$[c]	Mean local emission of active substance to waste water during episode (g/d)	0.193	0.077
C_{infl}[d]	Concentration in sewage water to local STP (mg/L)	9.64×10^{-5}	3.86×10^{-5}
Local concentrations in different compartments after elimination processes in STP according to TGD (2003) calculated by EUSES 2.1.1			
PEC_{stp}	PEC for microorganisms in the STP (mg/L)	4.71×10^{-5}	1.89×10^{-5}
$PEClocal_{water}$	Local PEC in surface water during emission episode (mg/L)	4.65×10^{-6}	1.86×10^{-6}
$PEClocal_{soil}$	Through application of sewage sludge (mg/kg)	3.09×10^{-4}	1.24×10^{-4}
$PEClocal_{soil, porew}$	Concentration in porewater/groundwater of agricultural soil (mg/L)	1.62×10^{-6}	6.46×10^{-7}

[a] ESD default application data

[b] Product specific application data

[c] $Elocal_{water} = (Q_{prod} \times Fc_{product} / T_{emission}) \times F_{released}$

[d] $C_{influent}$ = $Elocal_{water}$ / total volume of sewage water per day (related to standard STP scenario in TGD with 200 L per person per day and 10000 inhabitants per STP)

In and around buildings

As mentioned above, in the ESD PT 14 emissions to the environment from the indoor use of rodenticides are considered to be insignificant compared to those arising from the outdoor use. Hence, the emission pathway: indoor use → disposal or cleaning operation → STP will not be contemplated.

The current risk assessment focuses on rat control because rat abatement with the product requires higher application amounts related to an area compared to mice control. The product can be applied by amateurs and professionals with the same maximum application amounts (3 blocks at maximum at a minimum distance of 5 m) however the modes of application may be slightly different for the two user groups. Amateurs are instructed to always use tamper resistant bait stations, reducing the risk for unintended uptake by humans and non-target vertebrates as well as leading to a decrease in exposure of soils if applied around buildings. The use of tamper resistant bait stations is not obligatory for professionals. However, if professionals do not employ tamper resistant bait stations they are instructed to secure wax blocks by strings or wire in order to limit access to the baits, and dispersal.

In conjunction with rodenticide applications around buildings the main exposed environmental compartment is soil contaminated by spills during the application, refilling and disposal (1% direct release) as well as from indirect release via urine and faeces (90% per default).

The environmental risk assessment for brodifacoum, a.i. of the product, is performed in a two steps approach:

Tier 1:

Tier 1 comprises the ESD PT 14 default values regarding dosages and emissions to the environment. Ten bait stations, each containing 250 g, are assumed to be placed within an area 55 m long and 10 m wide (550 m^2). The distance between the bait stations is 5 m. The ESD PT 14 assumes that during a campaign (21 days) a complete refill of the bait stations of 5 times (day 1, 3, 7, 14, 21) is necessary.

Tier 2:

Tier 2 comprises the product specific application mode and the ESD PT 14 default values regarding emissions to the environment (*cf.* Tier 1). In this case 3 x 20 g bait are placed at each bait point (60 g each). The placement of the bait is as described under Tier 1. The ESD recommends a total of 2.6 replenishments (as opposed to 5 for Tier 1). However, according to the label instruction for the product, a complete clearance of the rodent infestation will be achieved within 7-35 days. Hence the maximum duration of a campaign is longer than proposed in the ESD PT 14. According to the label a significant uptake of wax blocks in a highly infested area will occur during the first week, requiring two complete replenishments at maximum besides the initial application (replenishments at day 3-4 and day 7). Thereafter bait points only have to be inspected weekly with limited replenishment of the bait stations due to the decrease of the rat population. The applicant believes that this is difficult to quantify so the ESD PT 14 scenario of 5 complete refills within 21 days will be adopted here. The evaluator for the RMS agrees.

Table 0-3: Brodifacoum concentrations in environmental compartments for the scenario 'in and around buildings'

Input		**Tier 1[a]**	**Tier 2[b]**
Q_{prod}	Amount of product used in control operation (g) per site	250	60
$Fc_{product}$	Fraction of active substance in product	0.00005	0.00005
N_{sites}	Number of application sites	10	10
N_{refill}	Number of refilling times	5	5
$F_{releaseD, soil}$	Fraction of product released directly to soil	0.01	0.01
$F_{releaseID, soil}$	Fraction of unmetabolised active ingredient released indirectly to soil	0.9	0.9
Output			
$Elocal_{soil\text{-}D\text{-}campaign}$	Local direct emission of active substance to soil from a campaign (g/camp)	0.006	0.0015
$Elocal_{soil\text{-}ID\text{-}campaign}$	Local indirect emission of active substance to soil from a campaign (g/camp)	0.557	0.134
$Elocal_{soilcampaign}$	Local emission of active substance to soil from a campaign (g/camp)	0.563	0.135
$Clocal_{soil\text{-}D}$[c]	Local concentration in soil due to direct release after a campaign (mg/kg)	0.041	0.0098
$Clocal_{soil\text{-}ID}$[d]	Concentration in soil due to indirect release after a campaign (mg/kg)	0.006	0.0014
$Clocal_{soil} = Clocal_{soil\text{-}D} + Clocal_{soil\text{-}ID}$	Total concentration in soil (mg/kg)	0.047	0.011
$PEClocal_{soil, porew}$ (acc. to TGD, eq.67)	Concentration in porewater resulting from total concentration in soil (mg/L)	2.9×10^{-4}	6.94×10^{-5}

[a] Default application data and values for release

[b] Product specific application data

[c] $Clocal_{soil-D} = (Elocal_{soil-D-campaign} \times 1000) / (AREA_{exposed-D} \times DEPTH_{soil} \times RHO_{soil} \times N_{sites})$ according to ESD: $AREA_{exposed-D}$ = 0.09 m², $DEPTH_{soil}$ = 0.1 m, RHO_{soil} = 1700 kg/m³ soil,

$Elocal_{soil-D-campaign} = Q_{prod} \times Fc_{prod} \times N_{sites} \times N_{refil} \times F_{release-D,soil}$

[d] $Clocal_{soil-ID} = (Q_{prod} \times Fc_{prod} \times N_{sites} \times N_{refil} \times 1000 \times F_{releaseID,soil} \times (1-F_{releaseD,soil})) / (AREA_{exposed-ID} \times DEPTH_{soil} \times RHO_{soil})$, according to the ESD $AREA_{exposed-ID}$ = 550 m², $DEPTH_{soil}$ = 0.1 m, RHO_{soil} = 1700 kg/m³ soil.

$Elocal_{soil-ID-campaign} = Q_{prod} \times Fc_{prod} \times N_{sites} \times N_{refil} \times F_{releaseID,soil} \times (1- F_{releaseD,soil})$

PEC in surface water, sewage treatment plant, groundwater and sediment

Using the relevant scenarios outlined in the ESD PT 14, the modes of calculation of the TGD, and the assumptions laid down above, the following PEClocal have been derived for aquatic compartments.

Table 0-4: Summary of brodifacoum PEC values obtained in the aquatic environment

Compartment/Scenario	Tier 1[a]	Tier 2[b]
SEWER SYSTEM		
PEC_{stp} (mg/L)	4.71×10^{-5}	1.89×10^{-5}
$PEClocal_{water}$ (mg/L)	4.65×10^{-6}	1.86×10^{-6}
$PEClocal_{sediment}$	Not relevant	Not relevant
$PEClocal_{soil,porewater}$ (mg/L)	1.62×10^{-6}	6.46×10^{-7}
IN AND AROUND BUILDINGS		
$PEClocal_{soil,porewater}$ (mg/L)	2.9×10^{-4}	6.94×10^{-5}

[a] ESD default application data and values for release

[b] Product specific application data

PEC in air

Brodifacoum has a vapour pressure of less than 10^{-6} Pa at 20°C and a Henry's Law constant of less than 2.18×10^{-3} Pa x m^3 x mol^{-1} at pH 7. In the Assessment Report for brodifacoum it has been concluded that releases to air from manufacturing, formulating, use or disposal phases are not to be expected. An exposure assessment for air is therefore not required.

PEC in soil

The following table contains a summary of the $PEClocal_{soil}$ derived from the different exposure scenarios.

Table 0-5: Summary of brodifacoum PEC values for soils

Compartment/Scenario	Tier 1[a]	Tier 2[b]
SEWER SYSTEM		
$PEClocal_{soil}$ (mg/kg) (via sewage sludge)	3.09×10^{-4}	1.24×10^{-4}
IN AND AROUND BUILDINGS		
$PEClocal_{soil}$ (mg/kg)	0.047	0.011

[a] ESD default application data and values for release

[b] Product specific application data

Primary poisoning

Referring to rodenticide applications in sewer systems, there is no primary poisoning hazard to non-target mammals or birds because this is no habitat for them (*cf.* ESD PT 14).

Regarding the possible primary hazard to non-target animals following applications around buildings, the label claim of The product contains precautious measures to be undertaken in order to minimise the risk for bait uptake by non-target vertebrates. Amateurs are given instruction to use tamper resistant bait boxes for wax block application. Professionals are directed to place the baits inaccessible for non-target animals and children. Wax blocks have to be put in tamper resistant stations, or fixed by strings or wire.

Hence, when using the product according to the label claim a risk for primary poisoning exists only for birds and mammals of the same size as the target rodents that may be able to enter the protected baits (*cf.* ESD PT 14). Domestic animals like dogs and pigs are therefore no relevant species for primary poisoning. The ESD PT 14 proposes several non-target species to be taken for primary poisoning risk assessments. The mammalian species proposed are pigs and dogs, which are, as indicated above, not relevant for The product applications. Several bird species are proposed (tree sparrow, chaffinch, woodpigeon and pheasant), all species will be taken into account in the current risk assessment. Although the pheasant is considerably larger than a rat, the species is included because of its association with the domestic hen.

Therefore, values for the estimated daily intake (ETE) are calculated for non-target birds consuming The product. The calculation is in a first step conducted according to the following equation, using the default values given in the ESD:

ETE = (FIR/BW)*C*AV*PT*PD (mg/kg bw/d) (eq 19, ESD).

Where, FIR is the food intake of indicator species (g fresh weight/d), BW is body weight (g), C is concentration of active compound in fresh diet (bait, mg/kg), PT is fraction of diet obtained in treated area (1 by default) and PD is fraction of food type in diet (1 by default). AV is the avoidance factor (1 by default).

In a second step expected concentrations are calculated, assuming a default excretion factor of 0.3. In a third step, the avoidance factor (AV) is set to 0.9 and the fraction of the diet obtained in the treated area (PT) is set to 0.8.

Table 0-1: Brodifacoum concentrations in non-target birds following a single uptake of The product

Species		Body weight (g)	Daily food intake (FIR) (g/d)[a]	Conc. of a.i. after single meal (mg/kg bw/d) (ETE)	Expected conc. after elimination[b] (mg/kg bw/d) (EC)	Expected conc. after elimination + reduced AV and PT[c] (mg/kg bw/d) (EC)
Tree sparrow	*Passer montanus*	22	7.6	17.27	12.09	8.71
Chaffinch	*Fringilla coelebs*	21.4	6.42	15.00	10.50	7.56
Wood pigeon	*Columba palumbus*	490	53.1	5.42	3.79	2.73
Pheasant	*Phasianus colchicus*	953	102.7	5.39	3.77	2.72

[a] *cf.* Table 3.1 of ESD PT 14
[b] Default excretion factor = 0.3
[c] AV = 0.9, PT = 0.8

For assessing the primary long-term situation, 5 days of exposure are assumed, considering excretion (30%). As a worst-case the parameter AV, PT and PD are all set to 1. In a second step, AV is set to 0.9 and PT is set to 0.8.

Table 0-2: Brodifacoum concentrations in non-target birds following 5 days of uptake of The product (AV = avoidance factor, PT = fraction of diet obtained in treated area)

Species	Expected concentration after 5 days of exposure with excretion factor = 0.3, AV = 1, PT = 1 (mg/kg bw)[a]	Expected concentration after 5 days of exposure with excretion factor = 0.3, AV = 0.9, PT = 0.8 (mg/kg bw)[a]
Tree sparrow	33.53	24.14
Chaffinch	29.12	20.96
Wood pigeon	10.52	7.57
Pheasant	10.46	7.53

[a] calculation according to equation 21 in the ESD

Non compartment specific exposure relevant to the food chain (secondary poisoning)

According to the ESD PT 14, the secondary poisoning hazard following sewage system applications is relevant only if poisoned rats or cockroaches move to the surface. However, since cockroaches are predominately nocturnal and the species found in sewers will remain underground, they are no significant prey for birds.

Secondary poisoning hazard can also be ruled out when the rodenticide is used in fully enclosed spaces. If buildings are not fully closed, predators may occur inside buildings or hunt in the vicinity of a building, and are potential targets for secondary poisoning.

Calculations for secondary poisoning are undertaken according to the ESD PT 14 for predators eating the rodent carcasses and earthworms which have ingested the active substance absorbed to soil. Also consideration is required for predators eating fish which have been exposed to the active substance.

Calculation of concentration in rodents

According to the ESD PT 14, a feeding period of the rodents of 5 days has been taken into account. Concentrations in contaminated rodents have been calculated for the time point immediately after the last meal. The factor PD (fraction of food type in diet) is set to 0.2 (minimum factor for normal case), 0.5 (normal use situation), and 1.0 (worst case situation).

Regarding the elimination rate, the default of 0.3 supported by the ESD is adopted, which is in line with the procedure in the Assessment Report for brodifacoum. The concentrations in rodents have been assessed according to equation 19 of the ESD (for explanation of the parameter see above):

ETE = (FIR/BW)*C*AV*PT*PD (mg/kg bw/d) (eq. 19, ESD)

The value for FIR/BW is set to a default of 0.1, i.e., the food intake is 10% of the body weight.

The calculation of the concentration in rodents after 5 days of bait consumption, immediately after the last meal, follows the procedure:

Total daily consumption is 100% (PD =1.0, worst case situation). After the first meal on day 1 the rodenticide in the rat accounts for:

ETE = 0.1 * 50 * 1* 1* 1 = 5 mg/kg

The concentration for day 2 just before the second meal is assessed, using a value of 0.3 for elimination (El).

EC_2 = 5 * (1 - 0.3) = 3.5 mg/kg (eq. 20, ESD)

For the following days the concentrations are:

EC_3 = (EC2 +ETE) * (1-0.3) = (3.5 +5) * 0.7 = 5.95 mg/kg

EC_4 = (EC3 +ETE) * (1-0.3) = (5.95 +5) * 0.7 = 7.665 mg/kg

EC_5 = (EC4 +ETE) * (1-0.3) = (7.665 +5) * 0.7 = 8.866 mg/kg

So the concentration in the rat before its last meal on the 5th day is 8.866 mg/kg. Once the ETE is added this results in **13.87 mg/kg**, i.e., this is the concentration **after** the last meal on the 5th day. The following table gives a summary of the expected brodifacoum concentrations in the rodents, using PD values of 1.0, 0.5 and 0.2.

Table 0-1: Brodifacoum concentrations in rodents after 5 days of The product uptake, immediately after the last meal (PD = fraction of food type in diet)

	PD = 1.0	PD = 0.5	PD = 0.2
Expected concentration in rodents immediately after a last meal on day 5 (mg a.i./kg rat, value corresponds to PEC_{oral} mg/kg food)	13.87	6.93	2.77

In the following table, concentrations in weasel, kestrel, and some other birds and mammals have been calculated after a single day of exposure for PD = 1 (rodents diet consisted entirely of The product). The parameter F_{rodent} (fraction of poisoned rodents in predator's diet) is set to 0.5.

Table 0-2: Brodifacoum concentrations in non-target mammals and birds consuming contaminated rodents

Species	Body weight [g]	Daily mean food intake [g]	Rodents caught on day 5 after their last meal	
			Brodifacoum consumed by non-target animal [mg]	Concentration in the non-target animal [mg/kg bw]
Barn owl (*Tyto alba*)	294	72.9	0.51	1.72
Kestrel (*Falco tinnunculus*)	209	78.7	0.55	2.61
Little owl (*Athene noctua*)	164	46.4	0.32	1.96
Tawny owl (*Strix aluco*)	426	97.1	0.67	1.58
Fox (*Vulpes vulpes*)	5700	520.2	3.61	0.63
Polecat (*Mustela putorius*)	689	130.9	0.91	1.32
Stoat (*Mustela erminea*)	205	55.7	0.39	1.88
Weasel (*Mustela nivalis*)	63	24.7	0.17	2.72

Calculation of the concentration in fish

The concentration of brodifacoum in fish (food) of fish-eating predators ($PEC_{oral,\ predator}$) is only relevant for the application of The product in the sewer system since only this scenario results in emissions to surface water (via STP). The $PEC_{oral,\ predator}$ (mg/kg wet fish) is calculated from the annual average PEC for surface water, divided by a factor of 2 since it is assumed, that only 50% of the diet comes from the local area (*cf.* TGD, 2003).

$PEC_{oral,\ predator} = PEC_{water} * BCF_{fish} * BMF$ (eq. 76, TGD, 2003)

The bioconcentration factor (BCF_{fish}) is calculated with the aid of equation 75 of the TGD, using a log P_{ow} of 6.12. The biomagnification factor is set to 10 according to the TGD.

The following table summarises the $PEC_{oral, fish}$ for the scenario 'sewage system'.

Table 0-3: Predicted brodifacoum concentrations in fish

		Tier 1[a]	Tier 2[b]
Input			
PEC_{water}	Annual average local PEC in surface (mg/l) divided by 2	2.74×10^{-9}	1.17×10^{-9}
BCF_{fish}	Bioconcentration factor in fish (l/kg wet fish)	36134	36134
BMF	Biomagnification factor	10	10
Output			
$PEC_{oral, fish}$	Predicted environmental concentration in fish (mg/kg wet fish)	$9.89 * 10^{-4}$	$4.22 * 10^{-4}$

[a] Product specific application data and default value for release

[b] Product specific application data and refined metabolism

Calculation of concentration in earthworms

The $PEC_{oral,predator}$ is calculated according to the TGD:

$PEC_{oral,predator} = C_{earthworm}$ (eq 80, TGD, 2003)

$C_{earthworm} = (BCF_{earthworm}*C_{porewater}+ C_{soil}*F_{gut}*CONV_{soil})/ (1+F_{gut}*CONV_{soil})$ (eq 82c, TGD 2003)

$BCF_{earthworm} = (0.84 + 0.012Kow)/RHO_{earthworm}$ (eq 82d, TGD, 2003)

Where $RHO_{earthworm}$ is 1 by default.

So, $BCF_{earthworm} = (0.84 + 0.012*1318257)/1 = 15820$ $l/kg_{wwtearthworm}$

For PEC_{soil} the PEClocal is used with respect to sludge applications. The concentration in soil is averaged over a period of 180 days. As for the aquatic food chain it is assumed, that just 50% of the diet comes from the affected region. Hence, the PEC_{soil} averaged over 180 days as well as the $PEC_{porewater}$ are divided by 2.

According to the TGD soil concentrations due to sewage sludge (indirect emissions) are the basis for calculating potential concentrations in earthworms. However, in the current risk assessment a direct intake of brodifacoum in soils is applicable for the scenario 'in and around buildings'. EUSES 2.1.1 does not give a result for potential concentrations in earthworms for this scenario and it becomes obvious, that the required input parameter for calculating the $PEC_{oral,earthworm}$ according to equation 81 of the TGD can not be assessed for the respective scenarios. Anyway, the attempt is made to calculate $PEC_{oral,earthworm}$ for the direct soil intake, however, figures should be interpreted with care. Soil concentrations taken for the calculation represent a brodifacoum intake within a soil mixing depth of

just 10 cm. Degradation has not been considered. However, concentrations are halved since the TGD assumes only 50% of the soil uptake by earthworm to origin from the contaminated area.

The parameter F_{gut} is set to 0.1 (kg dwt/kg wwt) and the conversion factor for soil concentration wet-dry weight ($CONV_{soil}$) is set to 1.13 kg wwt/kg dwt.

The $PEC_{oral,earthworm}$ are summarized in the following table.

Table 0-4: Brodifacoum concentrations in earthworms

		Tier 1[a]	Tier 2[b]
Input			
C_{soil} sewer system	Concentration in soil averaged over a period of 180 days and divided by 2 (mg/kg wwt)	8.70×10^{-5}	3.70×10^{-5}
C_{soil} building	Concentration in soil immediately after intake divided by 2 (mg/kg wwt)	0.0056	0.0050
$BCF_{earthworm}$	Bioconcentration factor in earthworm (L/kg wet fish)	15820	15820
$C_{porewater}$ sewer system	Concentration in porewater (mg/L) divided by 2	5.35×10^{-7}	2.29×10^{-7}
$C_{porewater}$ building	Concentration in porewater (mg/L) divided by 2	3.48×10^{-5}	3.10×10^{-5}
F_{gut}	Fraction of gut loading in worm (kg dwt/kg wwt)	0.1	0.1
$CONV_{soil}$	Conversion factor for soil concentration wet-dry weight soil (kg wwt/kg dwt)	1.13	1.13
Output			
$PEC_{oral, earthworm}$ sewer	Predicted environmental concentration in earthworm (mg/kg wet earthworm)	0.00763	0.00326
$PEC_{oral, earthworm}$ building	Predicted environmental concentration in earthworm (mg/kg wet earthworm)	0.495	0.441

[a] Product specific application data and default value for release

[b] Product specific application data and refined metabolism

Environmental effects assessment

Aquatic compartment

Ecotoxicological studies with The product on aquatic organisms are not required as the toxicity of the product is expected to be entirely driven by that of the active substance.

As no substances of concern or active substances other than brodifacoum have been identified in The product, the toxicity of product can be derived from the data available from the active substance. This is in line with the conclusion drawn in Document IIB of the Assessment Report.

Atmosphere

Not applicable.

Terrestrial compartment

According to the TNsG on data requirements (Ch. 2.5, Part B), additional data is required with the formulation if this is intended for outdoor use in form of baits, granulates or powder. However, as no substances of concern or active substances other than brodifacoum have been identified in The product, the toxicity of product can be derived from the data available from the active substance. This is in line with the conclusion drawn in Document IIB of the Assessment Report.

Non compartment specific effects relevant to the food chain (secondary poisoning)

In frame of the Annex I inclusion of brodifacoum, the applicant had submitted several studies, dealing with secondary poisoning of non target vertebrates. The studies have been discussed in detail in Section 4.2.4 of Doc. IIA of the CA Report. The studies indicate that secondary toxicity is dependent on a variety of factors, related to exposure (like dose and treatment levels, habitat of the non-targets) and effect (species and condition of the animal).

ANNEX VII: Residue Calculations

No residue calculations are required as Saphir Paste is a ready to use bait, which is used to kill rats and mice. Saphir Paste will not come into contact with the human food chain. The bait may be used indoors, outdoors, in open areas and dumps when used by professionals and indoors and outdoors around buildings when used by amatuers. The bait will be placed at protected bait points in dry locations, protected from the weather to help prevent access by non target animals.

Annex 4 – PAR v1.1 – 13 February 2014

Product Assessment Report
Saphir Paste

Active substance:	**Brodifacoum**
Product-type:	**PT 14**
Type of application:	**Authorisation**
Authorisation No:	**IE/BPA 70286 (Professional)** **IE/BPA 70287 (Non-professional)**
Date:	**13 February 2014**
Version:	**1.1**

Biocidal Product Assessment Report (PAR) related to Product Authorisation under Directive 98/8/EC.

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

Pesticide Registration and Control Division
Department of Agriculture, Food and the Marine
Backweston Campus
Young's Cross
Celbridge
Co. Kildare
Ireland

CONTENTS

2. General information about the product application

This application for product authorisation is for:

Trade name:	Saphir Paste
Authorisation No.:	IE/BPA 70286 (Professional and Trained Professional) IE/BPA 70287 (General public / Non-professional)

Saphir Paste trade names in other Member States (based on R4BP data):

Trade name	Member State
Brodipesce Pate	Estonia, France, Latvia
Raco Force Paste	Ireland, UK
Saphir (Pasta)	Italy
Rodistar	Italy
Biosnap Rat and Mouse Killer	UK
Doff Prebaited Mouse Station	UK
Ratta Extra Brodifacoum Paste	UK

6.2 Applicant/ Authorization Holder

Company Name:	Lodi S.A.S.
Address:	Parc d'Activités des 4 Routes F-35390 Grand Fougeray, France
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

6.3 Marketing/Distributing Company (where applicable)

Company Name:	N/A
Address:	N/A
Tel:	N/A
E-mail:	N/A
Contact:	N/A

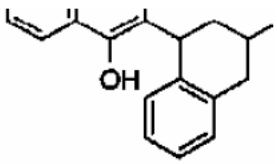
6.4 General Information on the Biocidal Product

Trade name:	Saphir Paste
Manufacturer's development code number(s):	N/A
Active substance content:	0.004% w/w Brodifacoum
Main group:	MG03 Pest Control
Product type:	PT14 (Rodenticides)
Product Specification:	See Confidential Annex
Site of product formulation:	See Confidential Annex
Frame formulation (yes/no):	No
Formulation type:	Paste Bait

Ready to use product (yes/no):	Yes
Chemical/micro-organism:	Chemical Substance
Contain or consist of GMOs[27] (yes/no):	N/A
Is the product already notified/authorised (Directive 98/8/EC) (yes/no); **If yes:** **product name:**	No N/A
Is the biocidal product equivalent to the product assessed for the purpose of Annex I inclusion to 98/8/EC (yes/no):	No.

Manufacturer of Formulated Product	
Company Name:	Company CGB (Compagnie Générale des Biocides)
Address:	Parc d'Activités des 4 Routes – F-35390 Grand Fougeray, France
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

6.5 Information on active substance(s)[28]

Active substance chemical name:	Brodifacoum
IUPAC name:	*3-[3-(4'-bromobiphenyl-4-yl)-1,2,3,4-tetrahydro-1-naphthyl]-4-hydroxycoumarin*
CAS No:	56073-10-0
EC No:	259-980-5
Purity (minimum, g/kg or g/l):	950 g/kg
Molecular formula:	$C_{31}H_{23}BrO_3$
Structural Formula:	
Manufacturing site:	See Confidential Annex
Specification of pure active substance:	See Confidential Annex

[27] A copy of any written consent(s) of the competent authorities to the deliberate release into the environment of the GMOs for research and development purposes where provided for by Part B of the above-mentioned Directive was provided.

[28] Please insert additional columns as necessary

Is a new active substance data package (source) supplied (yes/no):	No
If yes, Is the active substance equivalent to the active substance listed in Annex I to 98/8/EC (yes/no):	N/A
If no, does the applicant have a LoA to the active substance data packaged used to support Annex I inclusion (yes/no):	Yes (Pelgar International Ltd.)

Manufacturer of active substance(s)	
Company Name:	Pelgar International Ltd.
Address:	Unit 13 Newman Lane Industrial Estate Alton. Hants. GU34 2 QR UK
Tel:	[redacted]
E-mail:	[redacted]
[redacted]	[redacted]

6.6 Information on the intended use(s) of the biocidal product

Main Group:	MG03 (Pest control)
Product-type:	PT14 (Rodenticide)
Intended use:	Brodifacoum paste bait to control rodents indoors, outdoors around buildings (amateur use) and outdoors in open areas and waste dumps (professionals only) for the protection of public health, stored products and materials.
Target organisms:	(I.1) Rodents (I.1.1) Murids (I.1.1.1) Brown rats (*Rattus Norvegicus*) (I.1.1.3) House mouse (*Mus musculus*)
Development stage:	(II.1) Juveniles (II.2) Adults
Function:	Rodenticide
Mode of action:	Anticoagulant III.2 long-term action III.2.1 anticoagulant III.2.1.1 ingestion toxin III.2.1.1.1 ingestion by eating
Application aim:	VII.1 Stored product protection/food protection VII.2 Health protection VII.3 Material protection (e.g. historical buildings, technical objects)
Category of users:	V.1 Non Professional/General public V.2 Professional V.3 Trained/specialised professional
Area of use (indoors/outdoors):	IV.1 Indoors (warehouses, houses, outbuildings) IV.2 Outdoors (in and around buildings), IV.2 Outdoors (open areas and waste dumps) IE/BPA 70286 only

Application method:	VI.2 Covered applications VI.2.1 In bait stations(product can only be applied in bait stations for waste dump and open area applications) VI.2.2 Other coverings (this does not include application down rat holes)
Directions for use including minimum and maximum application rates, typical size of application area:	**IE/BPA 70286, IE/BPA 70287** Indoors and outdoors (in and around buildings) Rats (Adult and Juvenile): Secure 60g of bait in covered, tamper resistant baiting stations spaced 10m apart (3m apart in areas of high infestation) in areas where rats are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings). Mice (Adult and Juvenile): Secure 10g of bait, in covered, tamper resistant baiting stations spaced 5m apart (3m apart in high infestation areas) in areas where mice are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings). **IE/BPA 70286 (Professional Use Only)** Outdoors (open areas and waste dumps) Rats: Secure 60g of baits in covered tamper resistant baiting stations or covered bait points spaced 10m apart (5m apart in areas of high infestation) in areas where rats are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings). Mice: Secure 10g bait in covered tamper resistant baiting stations or covered bait points spaced 5m apart (3m apart in high infestation areas) in areas where mice are active. Regularly

	check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings).
Potential for release into the environment (yes/no):	Yes
Potential for contamination of food/feedingstuff (yes/no):	No

6.7 Documentation

5.1.1 Data submitted in relation to product application

A full new product dossier was submitted by Lodi S.A.S in support of the product Saphir Paste containing brodifacoum. Please see the attached reference list in Annex IV:

[redacted]

4. Classification, labelling and packaging

Under this heading the assessment of the classification, labelling and packaging should be summarised. Further, any result of the assessments made under the following headings that require recommendations or restrictions appearing on the label should be summarised here.

4.1. Harmonised classification of the active substance

Brodifacoum is not currently classified in Annex I of Council Directive 67/548/EEC or according to Annex VI of Regulation (EC) no 1907/2006 (REACH). The following classification and labelling is proposed on the basis of available data resulting from the review programme for brodifacoum and is provided in the table below according to Directive 67/548/EEC/Regulation (EC) 1272/2008. Additionally, the extrapolation of these proposals using the BG RCI converter tool (http://www.gischem.de/ghs/konverter) is also provided in the table below in accordance with Regulation (EC) 1272/2008.

Classification of the active substance, brodifacoum, according to Directive 67/548/EEC and CLP Regulation (EC) 1272/2008:

Symbol(s):	 	**Pictogram(s):**	
Indication(s) of danger:	T+ Very Toxic N Dangerous for the Environment	**Signal word(s):**	Danger
Risk phrases:	R26/27/28: Very toxic by inhalation, in contact with skin and if swallowed. R43: May cause sensitisation by skin contact R48/23/24/25: Toxic: Danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed. R61: May cause harm to the unborn child. R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.	**Hazard statements:**	H300: Fatal if swallowed. H310: Fatal in contact with skin. H317: May cause an allergic skin reaction H330: Fatal if inhaled. H360D: May damage the unborn child. H372: Causes damage to organs through prolonged or repeated exposure through inhalation. H400: Very toxic to aquatic life H410: Very toxic to aquatic life with long lasting effects.
Safety phrases:	S20/21: When eating do not eat, drink or smoke S35: The material and its container must be disposed of in a safe way S36/37: Wear suitable protective clothing and gloves S45: In case of accident or if you feel unwell seek medical advice immediately (show the label where possible) S60: This material and its container must be disposed of as hazardous waste. S61: Avoid release to the environment. Refer to special instructions/safety data sheet.	**Precautionary statements:**	P101: If medical advice ist needed, have product container or label at hand. P103: Read label before use. P270: Do not eat, drink or smoke when using this product. P273: Avoid release to the environment. P280: Wear protective gloves and clothing P281: Use personal protective equipment as required. P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P308 + P313: IF exposed or concerned: Get medical advice/attention.

			P314: Get medical advice/attention if you feel unwell. P501: Dispose of contents/container to hazardous waste facilities in accordance with national regulations.

Specific concentration limits for brodifacoum are proved below in accordance with Directive 67/548/EEC:

Specific concentration limits:	C≥2.5% 1%≤C<2.5% 0.5%≤C<1% 0.25%≤C<0.5% 0.025%≤C<0.25% 0.0025%≤C<0.025%	T+, N; R26/27/28-48/23/24/25-43-61-50/53 T+, N; R26/27/28-48/23/24/25-43-61-51/53 T+, N; R26/27/28-48/23/24/25-61-51/53 T+, N; R26/27/28-48/23/24/25-51/53 T ; R23/24/25-48/20/21/22-52/53 Xn; R20/21/22

Additionally, brodifacoum does not exhibit hazardous physical-chemical properties. Brodifacoum is thermally stable at 52°C. It is not classified as highly flammable and does not undergo self ignition below its melting point. It is not considered to be explosive or to have oxidising properties. There is no record that it has reacted with any storage container during many years of industrial production. It is concluded therefore, that there are no hazards associated with its physico-chemical properties under normal conditions of use.

4.2. Harmonised classification and labelling of the biocidal product

The current classification and labelling, based on the biocidal product evaluation for Saphir Paste, is provided in the tables below according to Directive 99/45/EC and Regulation (EC) 1272/2008, Annex VI, Part 3.

Classification and Labelling of the biocidal product according to Directive 99/45/EC:

Symbol(s):	Not applicable
Indication(s) of danger:	Not applicable
Risk phrases:	Not applicable
Safety phrases:	S1+S2: Keep locked up and out of reach of children S13: Keep away from food, drink and animal feeding stuffs. S20 + S21: When using do not eat, drink or smoke. S24: Avoid contact with skin S35: This material and its container must be disposed of in a safe way. S37: Wear suitable gloves (Professional only) S46: If swallowed, seek medical advice immediately and show this container or label. S49: Keep only in the original container S61: Avoid release to the environment. Refer to special instructions/safety data sheet

Classification and Labelling of the biocidal product according to the CLP Regulation (EC) 1272/2008:

Pictogram(s):	Not applicable
Signal word(s):	Not applicable
Hazard statements:	Not applicable
Precautionary statements	P102: Keep out of reach of children. P103: Read label before use. P220: Keep/Store away from food, drink and animal feedingstuffs. P262: Do not get on skin P270: Do not eat, drink or smoke when using this product. P273: Avoid release to the environment P280: Wear protective gloves (Professional only) P301+310: IF SWALLOWED: Immediately call a poison centre or doctor/physician. P404+405: Store locked up in a closed container. P501: Dispose of contents/container in accordance with national regulations.

Physical-chemical properties:
Not explosive, oxidising or highly flammable and therefore does not classify from a physical-chemical point of view.

Toxicology:
There is no toxicology classification for the product under the Directive 99/45.

There is no toxicology classification for the product under the CLP Regulation 1272/2008.

Environment:
There is no environmental classification for the product under the Directive 99/45.

There is no environmental classification for the product under the CLP Regulation 1272/2008.

Other:
Further, the content of the label should be updated to comply with the labelling requirements established (for biocidal products) where the labelling requirements in Article 20(3) of Directive 98/8/EC has been implemented. The safety data sheet should comply with the requirements in Regulation (EC) 1907/2006.

Additional Labelling Requirements:

Addition safety Information:	To avoid risks to human health and the environment, comply with the instructions for use. Harmful to wildlife Use bait containers clearly marked “poison” at all surface baiting points. Remove all remains of bait, dead rodents during and after treatment and dispose of safely. Apply only in positions inaccessible to children and pets.
Special labelling provisions for Ireland:	Use Biocides Safely and Sustainably (IE/BPA 70286) Not For Amateur Sale It is illegal to use this product for uses or in a manner other than that prescribed on this label.
If a separate leaflet is attached to or supplied with the product, add the following information to the front label:	Read attached instructions before use

4.3. Packaging

The packaging details for the biocidal product, Saphir Paste, as presented by the applicant, are outlined below for amateur and professional users.

Nomenclature: PP = polypropylene, PS = polystyrene, PE = polyethylene, HDPE = high-density polyethylene, PVC = polyvinylchloride, AL = Aluminium

Amateur product packaging:
On the basis of the packaging details presented, it is considered appropriate to limit aspects of the packaging for amateur users as a risk mitigation measure. Packaging restrictions are to be limited to pre-baited bait stations and refill packs with a **maximum pack-size of 500g**. Additionally, the pasta bait should be supplied to the amateur market in sachets/wrapped in order to reduce exposure risks to amateur operators during application to bait stations.

Amateur product packaging:

Amateur product packaging: cardboard case

Container description:	Cardboard case			
Pack size(s):	50g	100g	120g	200g
Baits per pack:	5x 10g	10x 10g	12x 10g	20x 10g
Pack dimensions (LxWxH):	50 x 24 x 80	100 x 48 x 160	100 x 48 x 160	140 x 55 x 180
Inner packaging materials:	PE or PP sachet			
Outer packaging materials:	Cardboard + PE liner			
Ready-to-use (yes/no)	Yes			
Child safety features (yes/no):	No			
If yes, please specify:	N/A			
Shelf-life:	2 years			
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.			

Amateur product packaging: cardboard case

Container description:	Cardboard case			
Pack size(s):	240g	250g	480g	500g
Baits per pack:	24x 10g	25x 10g	48x 10g	50x 10g

Pack dimensions (LxWxH):	140 x 55 x 180	140 x 55 x 180	140 x 70 x 210	140 x 70 x 210
Inner packaging materials:	PE or PP sachet			
Outer packaging materials:	Cardboard + PE liner			
Ready-to-use (yes/no)	Yes			
Child safety features (yes/no):	No			
If yes, please specify:	N/A			
Shelf-life:	2 years			
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.			

Amateur product packaging: SACHETS

Container description:	Sachets			
Pack size(s):	200 g	250 g	480 g	500 g
Baits per pack:	20*10g	25*10g	48*10g	50*10g
Pack dimensions (LxWxH):	180 x 50 x 190	190 x 50 x 190	190 x 50 x 250	190 x 50 x 250
Inner packaging materials:	PE or PP sachet			
Outer packaging materials	PE	PE sachet (zip pouch)	PE	PE
Ready-to-use (yes/no)	Yes			
Child safety features (yes/no):	No			
If yes, please specify:	N/A			
Shelf-life:	2 years			
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.			

Amateur product packaging: PREBAITED BAIT STATIONS

Container description:	Pre-baited bait stations in cardboard outer		
Pack size(s):	10 g	20 g	60 g
Baits per pack:	1*10g	2*10g	6*10g
Pack dimensions (LxWxH):	135 x 43 x 80	135 x 43 x 80	240 x 105x x190
Packaging materials:	PP pre-baited station into Cardboard case		
Ready-to-use (yes/no)	Yes		
Child safety features (yes/no):	No		
If yes, please specify:	N/A		
Shelf-life:	2 years		
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.		

Professional product packaging

Professional Product packaging: Buckets

Container description:	Buckets				
Pack size(s):	1 kg	2 kg	2.5 kg	3 kg	4 kg
Baits per pack:	100*10g	200*10g	250*10g	300*10g	400*10g
Pack dimensions (LxWxH):	250 x 170 x 120	290 x 205 x 215	290 x 205 x 215	290 x 205 x 215	290 x 200 x 270
Inner Packaging materials:	PE or PP sachet or loose bait				
Outer Packaging materials:	PE or PP bucket				
Ready-to-use (yes/no)	Yes				
Child safety features (yes/no):	No				
If yes, please specify:	N/A				
Shelf-life:	2 years				

Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional Product packaging: Buckets

Container description:	Buckets				
Pack size(s):	5 kg	10 kg	15 kg	20 kg	25 kg
Baits per pack:	500*10g	1000*10g	1500*10g	2000*10g	2500*10g
Pack dimensions (LxWxH):	290 x 200 x 270	390 x 300 x 350	380 x 285 x 450	380 x 285 x 450	380 x 285 x 450
Inner Packaging materials:	PE or PP sachet or loose bait				
Outer Packaging materials:	PE or PP bucket				
Ready-to-use (yes/no)	Yes				
Child safety features (yes/no):	No				
If yes, please specify:	N/A				
Shelf-life:	2 years				
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.				

Professional product packaging: cardboard boxes

Container description:	Cardboard boxes					
Pack size(s):	3 kg	5 kg	10 kg	15 kg	20 kg	25 kg
Baits per pack:	300*10g	500*10g	1000*10g	1500*10g	2000*10g	2500*10g
Pack dimensions (LxWxH):	150 x 100 x 150	290 x 200 x 270	390 x 290 x 240	390 x 390 x 245	400 x 400 x 370	400 x 400 x 370
Inner Packaging materials:	PE or PP sachet or loose bait					
Outer Packaging materials:	Cardboard + PE liner					
Ready-to-use (yes/no)	Yes					
Child safety features (yes/no):	No					
If yes, please specify:	N/A					
Shelf-life:	2 years					
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.					

Professional product packaging: cardboard cases

Container description:	Cardboard cases				
Pack size(s):	50 g	100 g	120 g	200 g	240 g
Baits per pack:	5*10g	10*10g	12*10g	20*10g	24*10g
Pack dimensions (LxWxH):	70 x 50 x 105	100 x 48 x 160	100 x 48 x 160	140 x 55 x 190	140 x 55 x 190
Inner Packaging materials:	PE or PP sachet or loose bait				
Packaging materials:	Cardboard + PE liner				
Ready-to-use (yes/no)	Yes				

Child safety features (yes/no):	No
If yes, please specify:	N/A
Shelf-life:	2 years
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional product packaging: cardboard cases

Container description:	Cardboard cases				
Pack size(s):	250g	480g	500g	520g	720g
Baits per pack:	25*10g	48*10g	50*10g	52*10g	72*10g
Pack dimensions (LxWxH):	140 x 55 x 190	140 x 70 x 210	140 x 70 x 210	140 x 70 x 210	183 x 72 x 263
Inner Packaging materials:	PE + PP sachet or loose bait				
Packaging materials:	Cardboard + PE liner				
Ready-to-use (yes/no)	Yes				
Child safety features (yes/no):	No				
If yes, please specify:	N/A				
Shelf-life:	2 years				
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.				

Professional product packaging: cardboard cases

Container description:	Cardboard cases		
Pack size(s):	750 g	1 kg	2 kg
Baits per pack:	75*10g	100*10g	200*10g
Pack dimensions (LxWxH):	183 x 72 x 263	183 x 72 x 263	320 x 210 x 170
Inner Packaging materials:	PE + PP sachet or loose bait		
Packaging materials:	Cardboard + PE liner		
Ready-to-use (yes/no)	Yes		
Child safety features (yes/no):	No		
If yes, please specify:	N/A		
Shelf-life:	2 years		

Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional product packaging: Zip pouch

Container description:	Zip pouch
Pack size(s):	250 g
Baits per pack:	25*10g
Pack dimensions (LxWxH):	195 x 150 x 40
Outer packaging materials:	PE + PP sachet or loose bait
Inner packaging materials:	PE sachet (zip pouch)
Ready-to-use (yes/no)	Yes
Child safety features (yes/no):	No
If yes, please specify:	N/A
Shelf-life:	2 years
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional product packaging: Prebaited bait stations

Container description:	Prebaited bait stations	
Pack size(s):	240 g	480 g
Baits per pack:	24*10g	48*10g
Pack dimensions (LxWxH):	240 x 115 x 190	240 x 115 x 190
Outer packaging materials:	cardboard case	
Inner packaging materials:	PP + PP pre-baited station	
Ready-to-use (yes/no)	Yes	

Child safety features (yes/no):	No
If yes, please specify:	N/A
Shelf-life:	2 years
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Container materials[29]: Case – cardboard with PE liner

Bag – PE

Sachets – PE + PP

Pre-baited bait stations – PP

Bucket – PP or PE

Box – Cardboard with PE liner

Safety features: Covered bait stations (tamper resistant)

Wrapped bait (sachets)

[29] PP = polypropylene, PS = polystyrene, PE = polyethylene, HDPE = high-density polyethylene, PVC = polyvinylchloride

4. Summary of the product assessment

4.1. Physico/chemical properties and analytical methods

Active substance (taken from the Activa/PelGar Brodifacoum and Difenacoum Task Force CAR):
Brodifacoum is an off-white powder at 20°C and atmospheric pressure, with a relative density of 1.53. It was observed to darken and decompose at 235.8°C, whereas no decomposition or transformation occurred below 150°C. Brodifacoum is non-volatile, with a Henry's Law Constant value of 2.35E-18 $Pa.m^3.mol^{-1}$. It is essentially insoluble in water at pH 5, but its solubility proved to increase with pH, due to the variation of the ionisation degree of the 4-*hydroxycoumarin* group in pH range under investigation (5-9). Brodifacoum also turned out to be soluble in organic solvents; results showed that solubility did not vary with temperature, except for dichloromethane.

Brodifacoum dissociation constant was estimated to be 4.50. Log P_{ow} was found to be 4.92 at pH 7 and 20°C. As expected, Log P_{ow} decreased with higher temperature and pH. Brodifacoum is not highly flammable. Besides, it does not show explosive or oxidising properties. Reaction with container materials (mild steel) has not been observed, either. All results considered, it can be concluded that Brodifacoum does not exhibit hazardous physical-chemical properties.

Biocidal product:
Saphir Paste is not explosive, oxidising or highly flammable and therefore does not classify from a physical and chemical point of view. The paste bait is stable when stored for 2 weeks at 54°C and when stored at ambient temperatures (20°C) for 2 years. The paste bait is stable when stored in various different packaging materials (with the exception of the coextruded bag with cardboard box) for 2 years at ambient temperature (20°C). The test item is a ready-to-use paste bait and is not intended to be added or mixed with any other product.

3.1.1. Identity related issues

An equivalence check was carried out by Italy that showed that the PelGar source of Brodifacoum active substance was equivalent to the source of Brodifacoum active substance listed in Annex I of 98/8/EC (see Annex I: Confidential Information and Data).

Composition of the biocidal product Saphir Paste

Component	% w/w	g/kg	Chemical name	CAS no	Function
Brodifacoum	0.005	0.05	3-[3-(4'-bromobiphenyl-4-yl)-1,2,3,4-tetrahydro-1-naphthyl]-4-hydroxycoumarin	56073-10-0	Active substance
Co-formulants	See Confidential Data and Information (Annex I)				

Note: The biocidal product Saphir Paste is not the same as the representative biocidal product accompanying the Annex I inclusion. See confidential information and data for details of the composition of Saphir Paste.

5.1.3 3.1.2. Physico-chemical properties

LODI S.A.S. have a letter of access from PelGar International Limited which covers the all the data for the Annex I listing of the active ingredient Brodifacoum. PelGar International Limited is a member of the Activa/PelGar Difenacoum and Brodifacoum Task Force and as such has access to the complete Annex I listing documentation submitted by this group. LODI do not have access to any of PelGar's product studies (Annex III) data for the purpose of product authorisation at the Member State level.

3.1.3. Physical, Chemical and Technical Properties of the Biocidal Product

Summary of the Physical and Chemical Properties of the Biocidal Product Saphir Paste

Section	Study	Method	Results	Comment	Reference
1.1	Appearance	Observation.	Aspect: Malleable blue paste in individual sachet Colour: 2.5PB5/6 Odour: No characteristic odour	Carried out to GLP. The results are acceptable.	"Chemical stability of Brodifacoum paste bait after accelerated storage". Study no. LODI.59/2011. 15th November 2011. Richerioux, Sandra.
1.2.1	Explosive properties	Justification (examination of the components of the formulation)	"Based on the structural formula of the components, Brodifacoum paste bait has no potential of explosivity and the test according to OECD A14 method is not required."	Carried out to GLP. The components do not contain any group that might act as an explosive agent. The RefMS accepts the Applicant's justification. Saphir Paste is not explosive.	"Explosive properties of Brodifacoum paste bait". Study no. LODI.66/2011. 25th September 2011. Richerioux, Sandra.
1.2.2	Oxidising properties	Justification (examination of the components of the formulation)	"Based on the structural formula of the components, the product have no potential for oxidising properties and the test according to OECD A17 method is not required."	Carried out to GLP. The components do not contain any group that might act as an oxidising agent. The RefMS accepts the Applicant's justification. Saphir Paste is not oxidising.	"Oxidising properties of Brodifacoum paste bait". Study no. LODI.65/2011. 8th November 2011. Richerioux, Sandra.
1.3.1	Flash point			Not required. The test item is not a liquid.	
1.3.2	Flammability	EEC method A 10	Preliminary test: The flame of a gas burner ignited the test substance pile. The test substance glowed, burned with a little flame and turned into a charred residue. A light white smoke was observed. After removal of the ignition source, the flame doesn't spread and extinguished immediately. No more propagation of combustion was observed.	Carried out to GLP. Propagation of combustion of the test item is less than 200mm length of the pile within 4 minutes. Therefore, the main test is not required. The test item is not highly	"Flammability of Brodifacoum paste bait". Study no. LODI.58/2011. 27th June 2011. Meriadec, Elodie.

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td></td><td>flammable.</td><td></td></tr>
<tr><td>1.3.3</td><td>Auto-flammability</td><td>EEC method A 16.</td><td>No self ignition temperature of the test item was recorded up to 400^{o}C (corrected value).</td><td>Carried out to GLP. The result is acceptable.
The test item is not auto-flammable.</td><td>“Self ignition temperature of solids on Brodifacoum paste bait”. Report no. 11-912011-010. 23rd January 2012. Demangel, Benjamin.</td></tr>
<tr><td>1.4.1</td><td>Free acidity/ Alkalinity</td><td></td><td>Determination is not required because pH of a 1% (m/v) aqueous dilution of Brodifacoum Paste Bait is >4 and < 10 (FAO guideline).</td><td>Not required.</td><td></td></tr>
<tr><td>1.4.2</td><td>pH (1 %)</td><td>CIPAC MT 75.3</td><td>The pH in distilled water is 6.3 after 10 minutes.</td><td>Carried out to GLP. The result is acceptable.</td><td>“pH of Brodifacoum paste bait”. Study no. LODI.64/2011. 7th October 2011. Richerioux, Sandra.</td></tr>
<tr><td>1.5.1</td><td>Viscosity</td><td></td><td></td><td>Not applicable as the product is a ready to use paste.</td><td></td></tr>
<tr><td>1.5.2</td><td>Surface tension</td><td></td><td></td><td>Not applicable as the product is a ready to use paste.</td><td></td></tr>
<tr><td>1.6</td><td>Relative density</td><td>OECD 109 and NF T20-053 method.</td><td>1.142</td><td>Carried out to GLP. A pycnometer was used to determine the relative density. The result is acceptable.</td><td>“Relative density of Brodifacoum paste bait”. Study no. LODI.52/2011. 9th September 2011. Richerioux, Sandra.</td></tr>
<tr><td>1.7.1</td><td>Storage stability
(accelerated storage)</td><td>CIPAC MT 46.
GIFAP Monograph no.17</td><td>Aspect:
<table><tr><th></th><th>Aspect</th><th>Colour</th><th>Odour</th></tr><tr><td>T_0</td><td>Malleable blue paste in individual sachet</td><td>2.5PB5/6</td><td>No characteristic odour</td></tr><tr><td>T_{14days}</td><td>Still malleable blue</td><td>10B4/4</td><td>No</td></tr></table></td><td>Carried out to GLP. The test item is stable for 2 and 3 weeks at 54^{o}C. The results indicate that the test item will be stable for 2 and 3 years at ambient temperatures. The results are acceptable.</td><td>“Chemical stability of Brodifacoum paste bait after accelerated storage”. Study no. LODI.59/2011. 15th November 2011. Richerioux, Sandra.</td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td></td><td>paste but slightly friable, in individual sachet</td><td></td><td>characteristic odour</td></tr>
<tr><td>T_{21days}</td><td>Still malleable blue paste but slightly friable, in individual sachet</td><td>10B4/4</td><td>No characteristic odour</td></tr>
</table>
Active substance content:
<table>
<tr><th></th><th>Concentration (ppm)</th><th>Deviation with declared value (%)</th><th>Deviation between T_0 and T_{14} and T_{21} (%)</th></tr>
<tr><td>T_0</td><td>45.12</td><td>+12.80</td><td>-</td></tr>
<tr><td>T_{14days}</td><td>43.62</td><td>+9.05</td><td>-3.32</td></tr>
<tr><td>T_{21days}</td><td>42.64</td><td>+6.60</td><td>-5.50</td></tr>
</table>
The declared active substance content was 40 ppm.
</td><td></td><td></td></tr>
<tr><td>1.7.2</td><td>Shelf life (storage ambient temperatures)</td><td>GIFAP Monograph no.17.</td><td>
Aspect:
T_0 = Malleable blue paste in individual bag
$T_{6months}$ = Malleable blue paste in individual bag
T_{1year} = Malleable blue paste in individual bag
$T_{17months}$ = Malleable blue paste in individual bag
$T_{2\ years}$ = Malleable blue paste in individual bag

Colour:
T_0 = 2.5PB5/6
$T_{6months}$ = 2.5PB5/6
T_{1year} = 2.5PB5/6
$T_{17months}$ = 2.5PB5/6
T_{2years} = 2.5PB5/6
</td><td>Carried out to GLP. Carried out at $20^oC \pm 2^oC$. The paste bait is stable for 2 years storage at ambient temperatures. The results are acceptable.</td><td>“Chemical stability of Brodifacoum Paste Bait after 1 year storage at 20^oC.” Study no. LODI.60/2011. 26th October 2012. Richerioux, Sandra.
&
“Chemical stability of Brodifacoum Paste Bait after 2 years storage at 20^oC.” Study no. LODI.61/2011. 19th November 2013. Richerioux, Sandra.</td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
Odour:
T_0 = No characteristic odour
$T_{6months}$ = No characteristic odour
T_{1year} = No characteristic odour
$T_{17months}$ = No characteristic odour
T_{2years} = No characteristic odour

Active substance content:
<table>
<tr><th></th><th>Conc. (ppm)</th><th>Deviation with declared value (%)</th><th>Deviation between T_0 and T_x (%)</th></tr>
<tr><td>T_0</td><td>45.1</td><td>+12.75</td><td>-</td></tr>
<tr><td>T_{6month}</td><td>41.7</td><td>+4.25</td><td>-7.54</td></tr>
<tr><td>T_{1year}</td><td>41.6</td><td>+4.00</td><td>-7.76</td></tr>
<tr><td>$T_{17months}$</td><td>43.9</td><td>+9.75</td><td>-2.66</td></tr>
<tr><td>T_{2years}</td><td>42.4</td><td>+6.00</td><td>-5.99</td></tr>
</table>
The declared value is 40 ppm.
</td><td></td><td></td></tr>
<tr><td>1.7.3</td><td>Packaging stability
(20°C)</td><td></td><td>
Physical properties (for all types of packaging):
T_0 = Blue and malleable paste in individual bag. Presence of grease on individual bag.
$T_{6months}$ = Blue and malleable paste in individual bag. Presence of grease on individual bag.
T_{1year} = Blue and malleable paste in individual bag. Presence of grease on individual bag.
T_{2years} = Blue and malleable paste in individual bag. Presence of grease on individual bag.

PP Bucket:
<table>
<tr><th></th><th colspan="3">Weight</th></tr>
<tr><th></th><th>Bucket (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
</table>
</td><td>Carried out to GLP.
The deviation weights (packaging weights and test item weights) after 2 years at 20 ± 2°C are lower than 5% for the following packaging: PP bucket, PP and PE bag with cardboard box, Doypack, PS and PP prebaited baitbox. Moreover, no significant changes were observed on these packaging and on the test item.
For the coextruded bag with</td><td>“Chemical and packagings stability of Brodifacoum paste bait after 3 years storage at 20°C (Analysis at T = 1year)”. Study no. LODI.62/2011.B. 30th October 2012. Richerioux, Sandra.
&
“Chemical and packagings stability of Brodifacoum paste bait after 3 years storage at 20°C (Analysis at T = 2years)”. Study no. LODI.62/2011.C. 6th</td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr>
<td></td><td></td><td></td>
<td>
<table>
<tr><td>T_0</td><td>44.134</td><td>293.21</td><td>337.35</td></tr>
<tr><td>$T_{6months}$</td><td>44.428</td><td>292.67</td><td>337.11</td></tr>
<tr><td>Deviation</td><td>0.67%</td><td>-0.18%</td><td>-0.07%</td></tr>
<tr><td>T_{1year}</td><td>44.436</td><td>291.58</td><td>336.01</td></tr>
<tr><td>Deviation</td><td>0.68%</td><td>-0.56%</td><td>-0.40%</td></tr>
<tr><td>T_{2years}</td><td>44.430</td><td>290.19</td><td>334.63</td></tr>
<tr><td>Deviation</td><td>0.67%</td><td>-1.03%</td><td>-0.81%</td></tr>
</table>
T_0 = Bucket with white and non-porous internal wall
$T_{6months}$ = Bucket with white and non-porous internal wall. Presence of grease on internal wall of the bucket
T_{1year} = Bucket with white and non-porous internal wall. Presence of grease on internal wall of the bucket
T_{2years} = Bucket with white and non-porous internal wall. Presence of grease on internal wall of the bucket

PE bag with cardboard box:
<table>
<tr><th></th><th colspan="4">Weight</th></tr>
<tr><th></th><th>PE bag (g)</th><th>Cardboard box (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
<tr><td>T_0</td><td>3.420</td><td>23.410</td><td>122.75</td><td>149.57</td></tr>
<tr><td>$T_{6months}$</td><td>3.512</td><td>23.690</td><td>120.47</td><td>147.64</td></tr>
<tr><td>Deviation</td><td>2.69%</td><td>1.20%</td><td>-1.86%</td><td>-1.29%</td></tr>
<tr><td>T_{1year}</td><td>3.484</td><td>23.998</td><td>121.18</td><td>148.66</td></tr>
<tr><td>Deviation</td><td>1.87%</td><td>2.51%</td><td>-1.28%</td><td>-0.61%</td></tr>
<tr><td>T_{2years}</td><td>3.485</td><td>23.931</td><td>120.70</td><td>148.12</td></tr>
<tr><td>Deviation</td><td>1.90%</td><td>2.23%</td><td>-1.67%</td><td>-0.97%</td></tr>
</table>
T_0 = Transparent bag without hole – cardboard box with grey and dry internal wall
$T_{6months}$ = Transparent bag, without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.
T_{1year} = Transparent bag, without hole. Presence of grease within
</td>
<td>cardboard box, the deviation weight is higher than 5% (-8.29%) and grease was observed at the bottom of the box.
The packaging is stable for 2 years at ambient temperature with the exception of the coextruded bag with cardboard box.
The results are acceptable.</td>
<td>November 2013. Richerioux, Sandra.</td>
</tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
bag – cardboard box with grey and dry internal wall.
T_{2years} = Transparent bag, without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

PP bag with cardboard box:
<table>
<tr><th></th><th colspan="4">Weight</th></tr>
<tr><th></th><th>PP bag (g)</th><th>Cardboard box (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
<tr><td>T_0</td><td>6.972</td><td>23.503</td><td>111.36</td><td>141.83</td></tr>
<tr><td>$T_{6months}$</td><td>7.042</td><td>23.776</td><td>110.18</td><td>141.01</td></tr>
<tr><td>Deviation</td><td>1.00%</td><td>1.16%</td><td>-1.06%</td><td>-0.58%</td></tr>
<tr><td>T_{1year}</td><td>7.037</td><td>24.094</td><td>110.22</td><td>141.36</td></tr>
<tr><td>Deviation</td><td>0.93%</td><td>2.51%</td><td>-1.02%</td><td>-0.33%</td></tr>
<tr><td>T_{2years}</td><td>7.053</td><td>24.005</td><td>109.55</td><td>140.61</td></tr>
<tr><td>Deviation</td><td>1.16%</td><td>2.14%</td><td>-1.63%</td><td>-0.86%</td></tr>
</table>
T_0 = Transparent bag with one hole – cardboard box with grey and dry internal wall
$T_{6months}$ = Transparent bag with one hole. Presence of grease within bag – cardboard box with grey and dry internal wall.
T_{1year} = Transparent bag with one hole. Presence of grease within bag – cardboard box with grey and dry internal wall.
T_{2years} = Transparent bag with one hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

Coextruded bag with cardboard box:
<table>
<tr><th></th><th colspan="4">Weight</th></tr>
<tr><th></th><th>Coextruded bag (g)</th><th>Cardboard box (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
<tr><td>T_0</td><td>5.016</td><td>23.386</td><td>82.638</td><td>111.04</td></tr>
<tr><td>$T_{6months}$</td><td>4.600</td><td>23.950</td><td>79.887</td><td>108.91</td></tr>
<tr><td>Deviation</td><td>-8.29%</td><td>2.41%</td><td>-3.33%</td><td>-1.92%</td></tr>
</table>
</td><td></td><td></td></tr>
</table>

Section	Study	Method	Results	Comment	Reference

T_{1year}	4.652	24.269	80.954	110.20
Deviation	-7.76%	3.78%	-2.04%	-0.76%
T_{2years}	4.942	24.479	80.534	109.96
Deviation	-1.48%	4.67%	-2.55%	-0.97%

T_0 = Transparent and non-porous bag without hole – cardboard box with grey and dry internal wall

$T_{6months}$ = Transparent and non-porous bag without hole. Presence of grease within bag – cardboard box with grey internal wall. Presence of grease at the bottom of the box.

T_{1year} = Transparent and non-porous bag without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

T_{2years} = Transparent and non-porous bag. Holes in the weld. Presence of grease within bag – presence of grease on the wall of the box.

Doypack:

	Weight		
	Doypack (g)	**Test item (g)**	**Total (g)**
T_0	11.803	154.86	166.66
$T_{6months}$	12.118	154.21	166.33
Deviation	2.67%	-0.42%	-0.20%
T_{1year}	12.126	154.15	166.27
Deviation	2.74%	-0.46%	-0.23%
T_{2years}	12.131	153.61	165.74
Deviation	2.78%	-0.81%	-0.55%

T_0 = Internal wall in aluminium, without porosity and hole

$T_{6months}$ = Internal wall in aluminium, without porosity and hole. Presence of grease on internal wall of the doypack

T_{1year} = Internal wall in aluminium, without porosity and hole. Presence of grease on internal wall of the doypack

T_{2years} = Internal wall in aluminium, without porosity and hole.

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
Presence of grease on internal wall of the doypack

PP prebaited baitbox:
<table>
<tr><td></td><td colspan="4">Weight (g)</td></tr>
<tr><td></td><td>Bait station</td><td>Sample 1</td><td>Sample 2</td><td>Total</td></tr>
<tr><td>T_0</td><td>47.465</td><td>10.942</td><td>10.177</td><td>68.583</td></tr>
<tr><td>$T_{6months}$</td><td>47.725</td><td>10.616</td><td>9.849</td><td>68.191</td></tr>
<tr><td>Deviation</td><td>0.55%</td><td>-2.98%</td><td>-3.22%</td><td>-0.57%</td></tr>
<tr><td>T_{1year}</td><td>47.735</td><td>10.770</td><td>9.980</td><td>68.487</td></tr>
<tr><td>Deviation</td><td>0.57%</td><td>-1.57%</td><td>-1.94%</td><td>-0.14%</td></tr>
<tr><td>T_{2years}</td><td>47.738</td><td>10.742</td><td>10.001</td><td>68.484</td></tr>
<tr><td>Deviation</td><td>0.58%</td><td>-1.83%</td><td>-1.73%</td><td>-0.14%</td></tr>
</table>
T_0 = Black box with smooth internal wall, without porosity.
$T_{6months}$ = Black box with smooth internal wall, without porosity. Presence of grease at the location of the paste.
T_{1year} = Black box with smooth internal wall, without porosity. Presence of grease at the location of the paste.
T_{2years} = Black box with smooth internal wall, without porosity. Presence of grease at the location of the paste.

PS prebaited baitbox:
<table>
<tr><td></td><td colspan="4">Weight (g)</td></tr>
<tr><td></td><td>Bait station</td><td>Sample 1</td><td>Sample 2</td><td>Total</td></tr>
<tr><td>T_0</td><td>11.992</td><td>10.258</td><td>10.374</td><td>32.625</td></tr>
<tr><td>$T_{6months}$</td><td>12.259</td><td>9.955</td><td>10.047</td><td>32.263</td></tr>
<tr><td>Deviation</td><td>2.23%</td><td>-2.95%</td><td>-3.15%</td><td>-1.11%</td></tr>
<tr><td>T_{1year}</td><td>12.268</td><td>10.072</td><td>10.215</td><td>32.559</td></tr>
<tr><td>Deviation</td><td>2.30%</td><td>-1.81%</td><td>-1.53%</td><td>-0.20%</td></tr>
<tr><td>T_{2years}</td><td>12.265</td><td>10.101</td><td>10.189</td><td>32.556</td></tr>
</table>
</td><td></td><td></td></tr>
</table>

Section	Study	Method	Results	Comment	Reference
			<table><tr><td>Deviation</td><td>2.28%</td><td>-1.53%</td><td>-1.78%</td><td>-0.21%</td></tr></table> T_0 = Black box with smooth internal wall at the location of the paste $T_{6months}$ = Black box with smooth internal wall at the location of the paste. Presence of grease at location of the paste. T_{1year} = Black box with smooth internal wall at the location of the paste. Presence of grease at location of the paste. T_{2years} = Black box with smooth internal wall at the location of the paste. Presence of grease at location of the paste.		
1.8.1	Wettability			Not applicable as the product is a ready to use paste.	
1.8.2	Persistent foaming			Not applicable as the product is a ready to use paste.	
1.8.3.1	Suspensibility			Not applicable as the product is a ready to use paste.	
1.8.3.2	Dispersibility			Not applicable as the product is a ready to use paste.	
1.8.4	Wet/dry sieving test			Not applicable as the product is a ready to use paste.	
1.8.5	Particle size distribution			Not applicable as the product is a ready to use paste.	
1.8.6	Water content			Not applicable as the product is a ready to use paste.	
1.8.7	Emulsion stability			Not applicable as the product is a ready to use paste.	

Section	Study	Method	Results	Comment	Reference
1.8.8	Flowability, pourability and dustability			Not applicable as the product is a ready to use paste.	
1.9	Physical compatibility			Not applicable. The product is ready-to-use. It is not intended to be mixed with any other product.	

Conclusions:

Saphir Paste is not explosive, oxidising or highly flammable and therefore does not classify from a physical and chemical point of view. The paste bait is stable when stored for 2 weeks at 54^{o}C and when stored at ambient temperatures (20^{o}C) for 2 years. The paste bait is stable when stored in various different packaging materials (with the exception of the coextruded bag with cardboard box) for 2 years at ambient temperature (20^{o}C). The test item is a ready-to-use paste bait and is not intended to be added or mixed with any other product.

Data requirements:

1. The provisional dates for the submission of the packaging stability data for the 3 year time-point is week 45, 2014.

The paste bait is compatible with the following packaging:

PP bucket, PP and PE bag with cardboard box, Doypack, PS and PP prebaited baitbox.

The paste bait is incompatible with the following packaging:

Coextruded bag with cardboard box.

Proposed shelf life for the grain bait:

2-years.

5.1.4 3.1.4. Analytical methods

Saphir Paste was not assessed as part of the Annex I inclusion process therefore the Applicant has submitted the following method of analysis to cover the outstanding data gap.

<table>
<tr><td>Report:</td><td>LODI.51/2011</td></tr>
<tr><td>Title:</td><td>“Brodifacoum paste bait, Brodifacoum grain bait”</td></tr>
<tr><td>Author(s):</td><td>Richerioux, Sandra.</td></tr>
<tr><td>Date:</td><td>23rd January 2012</td></tr>
<tr><td>GLP: Yes/No</td><td>Yes</td></tr>
<tr><td>Principle of the Method:</td><td>Brodifacoum was quantified by liquid chromatography using a reverse phase column and a UV detector at 310 nm.</td></tr>
<tr><td>Linearity:</td><td>The operator prepared five solutions containing 80%, 90%, 100%, 110% and 120% of the concentration of the test item. Three injections were carried out for each solution. The concentrations used were 1.61, 1.81, 2.01, 2.21 and 2.41 mg/L.
For Brodifacoum peak 1 the r^2 was 0.9949. A calibration curve was provided and was linear.
For Brodifacoum peak 2 the r^2 was 0.9923. A calibration curve was provided and was linear.</td></tr>
<tr><td>Precision/repeatability:</td><td>Three solutions were prepared of a concentration C (~ 2.00586 mg/l) of the product. Three injections of each solution were carried out and the RSD was calculated.

Intermediary fidelity (mg/l):
<table>
<tr><th></th><th>1st Injection</th><th>2nd Injection</th><th>3rd Injection</th></tr>
<tr><td>Solution a</td><td>2.23</td><td>2.21</td><td>2.25</td></tr>
<tr><td>Solution b</td><td>2.25</td><td>2.19</td><td>2.25</td></tr>
<tr><td>Solution c</td><td>2.26</td><td>2.21</td><td>2.22</td></tr>
</table>
% RSD = 0.949

Intralaboratory fidelity (mg/l):
<table>
<tr><th></th><th>1st Injection</th><th>2nd Injection</th><th>3rd Injection</th></tr>
<tr><td>Solution a</td><td>2.21</td><td>2.28</td><td>2.23</td></tr>
<tr><td>Solution b</td><td>2.25</td><td>2.19</td><td>2.25</td></tr>
<tr><td>Solution c</td><td>2.26</td><td>2.21</td><td>2.22</td></tr>
</table>
% RSD = 1.188</td></tr>
<tr><td>Accuracy:</td><td>Recovery results:
<table>
<tr><td>Paste bait</td><td>50% doped placebo</td><td>100% doped placebo</td><td>150% doped placebo</td><td>Overall MR</td></tr>
<tr><td>Theoretical content (ppm)</td><td>22.38</td><td>41.12</td><td>59.06</td><td rowspan="2">99.28%</td></tr>
<tr><td>Experimental content</td><td>23.98</td><td>40.68</td><td>54.20</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td>(ppm) – mean of 3 injections</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Mean recovery (MR)</td><td>107.15%</td><td>98.93%</td><td>91.77%</td><td></td></tr>
</table>
The operator doped a placebo with 50, 100 and 150% of the theoretical concentration of test item. Three injections were carried out per solution. The mean recovery (MR) was calculated for each solution.
</td></tr>
<tr><td>Specificity:</td><td>The operator injected a placebo. If an adjacent peak appeared, the resolution must be higher than 2. The operator then stresses the sample by adding 5 ml of acetic acid and injects the solution. If a peak appeared, the resolution must be higher than 2.

No peak other than internal standard was found for the placebo paste.
No peak appeared for the paste bait that was stressed with acetic acid.
Chromatograms were provided and were acceptable.</td></tr>
<tr><td>Limit of detection:</td><td>The operator injected a solution containing 10 ppm of active substance and calculated the ratio S/N between the intensity of the peak and the intensity of the background noise. The operator divided by 10 then by 2 the concentration of the active substance until obtaining a ratio lower than 3. The LOD is the last concentration for which S/N is higher than 3.

LOD = 0.1254 ppm</td></tr>
<tr><td>Limit of quantification:</td><td>The operator injected a solution containing 50 ppm of active substance and calculated the ratio S/N between the intensity of the peak and the intensity of the background noise. The operator divided by 10 then by 2 the concentration of the active substance to obtain a ratio lower than 10. The LOQ is the last concentration for which S/N is higher than 10.

LOQ = 0.6270 ppm</td></tr>
</table>

Conclusion:
The method is acceptable for the determination of Brodifacoum in the paste bait.

Data requirements:
None.

5.1.5 3.1.5. Analytical method for the relevant impurities, isomers and co-formulants in the biocidal product

Not applicable.

5.2. Efficacy of the Biocidal Product

5.2.1. Function/Field of use

PT14: Rodenticide

5.2.2. Organisms to be controlled

Saphir Paste (containing 40 mg/kg brodifacoum) is a ready-to-use paste bait (RB) intended to control the brown rat (*Rattus norvegicus*) and the house mouse mice (*Mus musculus*). Lodi has proposed the use area as indoors and outdoors (in and around buildings, waste disposal sites, open areas) for the protection of public health stored products and materials. The use scenario encompassing waste disposal sites and open areas is intended for professional users only.
For rats, each bait point will contain 60g of bait; a mouse bait point will contain 10g bait. Bait points are placed typically every 5-10m (rats) or 2-5 m (mice) with the distances adapted to the infestation level.

Advice concerning application frequency should be included on the draft label.
The label should contain wording to the effect that effective control should be expected from bait stored up to two years under suitable storage conditions.

5.2.3. Dose/Mode of action

Anticoagulant rodenticides are vitamin K antagonists. The main site of their action is the liver, where several of the blood coagulation precursors undergo vitamin K dependent post translation processing before they are converted into the respective procoagulant zymogens. The specific point of action is thought to be the inhibition of K_1 epoxide reductase. The anticoagulants accumulate and are stored in the liver until broken down. The plasma prothrombin (procoagulant factor II) concentration provides a suitable guide to the severity of acute intoxication and to the effectiveness and required duration of the antidoting therapy (vitamin K_1).

5.2.4. Effects on the target organisms (efficacy)

Data from trials using the paste formulation were provided in the form of laboratory and field studies to verify the proposed label claims.

Laboratory palatability and efficacy studies:
One laboratory palatability and efficacy (choice) test conducted on rats (lab reared and wild) and wild mice with fresh bait.
One laboratory palatability and efficacy (choice) test conducted on rats and mice with fresh and aged bait (6, 12 & 24 month storage).
One laboratory palatability and efficacy (choice) test conducted on rats with bait with aged bait (accelerated storage).
One laboratory palatability and efficacy (choice) test conducted on mice with with aged bait (accelerated storage).

Field efficacy studies:
One field studies conducted on rats (*Rattus norvegicus*).
One field studies conducted on mice (*Mus musculus*).

The applicant provided the study reports from four laboratory studies conducted on Brodipasta which is equivalent to Saphir paste. The experiments were all choice studies conducted to high standard according to relevant in-house methods, CEB methods, EPPO guideline or in accordance with the TNsG on Product Evaluation Appendices to Chapter 7 - Product Type 14 - Efficacy Evaluation of Rodenticidal Biocidal Products endorsed at the 32nd meeting of representatives of Members States Competent Authorities.
The results from the studies are summarised in **Table 3.2**. The results achieved demonstrated that Saphir paste is palatable to the house mouse and the brown rat according to the criteria given in TNsG on Product Evaluation as the bait intake was greater than 20% of the total food consumption in all the studies. The storage treatment (even up to 24 month storage) was found not to adversely affect the

palatability or effectiveness of the product. The treated bait achieved 100% mortality across all the laboratory tests.

Results from two field studies using Saphir paste were also provided. The field trial programme demonstrated an overall efficacy based on post baiting consumption figures of 89.9% for the mouse field trial and efficacy of >95% for the brown rat field trial. The field trial programme demonstrated high effectiveness against wild populations of the brown rat (*Rattus norvegicus*) and for the mouse (*Mus musculus*) under normal use situations.

Table 3.2: Experimental data on the effectiveness of Saphir Paste containing 40 mg/kg brodifacoum.

Test organisms	Test system / Concentrations applied / exposure time	Test conditions	Test results: effects, mode of action, resistance	Reference
Norway rats (*Rattus norvegicus* Berkenhout). 10 wild animals. House mice (*Mus musculus* L.). 10 wild animals. Albino laboratory Norway rats (*Rattus norvegicus*) 22 animals (11 males and 11 females, 10 to 20 weeks old, including one control pair).	Laboratory test. Choice feeding test: fresh baits. 5-day pre-test control diet intake assessment and 21-day bait feeding period. During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 40 g of ground wheat grains and 45 g of the test item per day for rat and about 10 g of ground wheat grains and 15 g of the test item per day for mice) Brodipasta, equivalent to Saphir Paste, freshly manufactured	The animals were individually caged. The wild animals were acclimatised to test conditions for at least 3 weeks in order to discard pregnant females or sick individuals. The laboratory rats were acclimatised to test conditions for at least 5 days. Normal laboratory requirements.	The mean acceptance of the test item was 38.7% (s.d. 28.4%) for wild Norway rats, 43.4% (s.d. 9.5%) for wild house mice and 43.8% (s.d. 18.9%) for albino Norway rats. The efficacy was excellent. Mortality was total (100%) in all test groups after a 21-day choice between this test substance and the challenge diet. The mean time to death ranged from 3 to 19 days after the first intake of treated baits.	B5.10/01
Albino laboratory Norway rats (*Rattus norvegicus*) 22 animals (11 males and 11 females, 10 to 20 weeks old, including one control pair) for each test group. Laboratory House mice (*Mus musculus*) 22 animals (11 males and 11 females, including one control pair) for each test group.	Laboratory test. Choice feeding test: fresh and aged baits. 5-day pre-test control diet intake assessment and 21-day bait feeding period. During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 30 g of ground wheat grains, in competition with the test item) Brodipasta, equivalent to Saphir Paste, stored at 20°C for respectively 6, 12 and 24 months	The animals were individually caged. The laboratory rodents were acclimatised to test conditions for 8 days. Normal laboratory requirements.	For rats, the mean acceptance of the test item was 43.8% (s.d. 18.9%) for the fresh bait, 42.0% (s.d. 16.2%) for the 6-month aged bait, 33.7% (s.d. 13.0%) for the 12-month aged bait and 37.5% (s.d. 15.9%) for the 24-month aged bait. For mice, the mean acceptance of the test item was 46.9% (s.d. 15.1%) for the 12-month aged bait and 36.0% (s.d. 14.2%) for the 24-month aged bait. The efficacy was excellent. Mortality was total (100%) in all test groups after a 21-day choice between this test substance and the challenge diet. The mean time to death ranged from 3 to 20 days after the first intake of treated baits.	B5.10/02

Test organisms	Test system / Concentrations applied / exposure time	Test conditions	Test results: effects, mode of action, resistance	Reference
Norway rat (*Rattus norvegicus*). 20 animals (10 males, 10 females)	Laboratory test. Choice feeding test: fresh baits. 4-day pre-test control diet intake assessment, 4-day bait feeding period and 15-day control bait period. Unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during the pre-test period. During the 4-day test period, the quantity of food placed in each pot was sufficient to meet each animal's daily needs (approximately 50 g of aged rodenticide paste bait and approximately 50 g of challenged diet, in each corresponding pot) Brodifacoum paste bait, similar to Saphir Paste, aged for 3 weeks at 54°C	The animals were individually caged. Normal laboratory requirements: 20 - 24°C, a relative humidity range of 45% to 65%, with between 15 and 20 air changes per hour, and with a 12-hour light-dark cycle	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.9% (s.d. 9.89%). The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 4.7 days (3 to 7 days) after the first intake of treated baits.	B5.10/03
House mouse (*Mus musculus*). 20 animals (10 males, 10 females)	Laboratory test. Choice feeding test: fresh baits. 4-day pre-test control diet intake assessment, 4-day bait feeding period and 15-day control bait period. Unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during the pre-test period. During the 4-day test period, the quantity of food placed in each pot was sufficient to meet each animal's daily needs (approximately 10 g of aged rodenticide paste bait and approximately 20 g of challenged diet in each corresponding pot) Brodifacoum paste bait, similar to Saphir Paste, aged for 3 weeks at 54°C	The animals were individually caged. Normal laboratory requirements: 20 - 24°C, a relative humidity range of 45% to 65%, with between 15 and 20 air changes per hour, and with a 12-hour light-dark cycle	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.8% (s.d. 10.2%). The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 5.8 days (4 to 7 days) after the first intake of treated baits.	B5.10/04
Wild Norway Rats (*Rattus norvegicus*). At least 41 animals estimated by pre-treatment bait census	Field test carried out in a farm raising cows. After a pre-bait until the rats were feeding readily on the bait (25 days), baiting were carried out. The non-poisoned baits were replaced by the product to be tested for 10 days. At each day's treatment, the bait stations were emptied then refilled. Post-baiting (8 days) is done to assess the level of the survival rodent population. The quantity of food placed in each bait station was sufficient to meet each animal's daily needs (approximately 150 g of bait in each bait station). Brodifacoum paste 0.004%, equivalent to Saphir Paste	Natural conditions.	The efficacy measured was 95.18%. Dead rodents found during and after the baiting and the post-baiting phases were only *Rattus norvegicus.* The field assay showed a very good efficacy with a fast decrease of the population.	B5.10/05

Test organisms	Test system / Concentrations applied / exposure time	Test conditions	Test results: effects, mode of action, resistance	Reference
Wild house mouse (*Mus musculus*) At least 72 animals estimated by pre-treatment bait census	Field test carried out in a farm. After a pre-bait until the mice were feeding readily on the bait (31 days), baiting were carried out. The non-poisoned baits were replaced by the product to be tested for 8 days. At each day's treatment, the bait stations were emptied then refilled. Post-baiting (7 days) is done to assess the level of the survival rodent population. The quantity of food placed in each bait station was sufficient to meet each animal's daily needs (approximately 30 g of bait in each bait station). Brodifacoum paste 0.004%, equivalent to Saphir Paste	Natural conditions.	The efficacy measured was 89.9%. Dead rodents found during and after the baiting and the post-baiting phases were only *Mus musculus.* The field assay showed a very good efficacy with a fast decrease of the population.	B5.10/06

5.2.5. Known limitations (e.g. resistance)

Resistance is exclusively related to the active substance Brodifacoum and is discussed in Doc. II-A (please see Brodifacoum Assessment Report – 17/09/2009, revised 16/12/2010 and refer to Letter of Access from Pelgar International Limited). The resistance to Brodifacoum is not regarded as unacceptable and only few events are referred as “suspected” resistance to Brodifacoum products. In conclusion there is no reason to suspect a lack of efficacy of Brodifacoum-based products and it is possible to state that Brodifacoum is fully active against rodents' populations that developed resistance to Warfarin.

Where resistance to Brodifacoum is suspected or has been shown, resistant management strategies should be employed and products containing an alternative active substance should be used or a professional pest control operator be consulted.

Moreover, the following measures from Codes of Good Practice in Rodent control[30] (EPPO standards - Guidelines on Good Plant Protection Practice – Rodent control for crop protection and on farms- PP 2/5) are recommended and usually respected by the applicators:
- The population size of the target rodent should be evaluated before a control campaign. The number of baits and the timing of the control campaign should be in proportion to the size of the infestation.
- A complete elimination of rodents in the infested area should be achieved.
- The use instruction of products should contain guidance on resistance management for rodenticides.
- Resistant management strategies should be developed, and Brodifacoum should not be used in an area where resistance to this substance is suspected.
- The authorisation holder shall report any observed resistance incidents to the Competent Authorities or other appointed bodies involved in resistance management.
- When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary or secondary poisoning by the anticoagulant as well as indicating the first measures to be taken in case of poisoning must be made available alongside the baits.

In addition, the IE CA recommends the following in relation to resistance management:
The immediate aim of resistance management is to prevent or retard the development of resistance to a given anticoagulant while, as far as is not counterproductive, permitting its continued use. The ultimate aim is to reduce or eliminate the adverse consequences of resistance.

CropLife International has published a strategy for resistant management of rodenticides (RRAC 2003). The habitat management is addressed in the strategy in addition to chemical control. The access of rodents should be restricted by physical barriers and no food should be available for rodents. Rotation between different anticoagulants is not a reliable means of managing the

30 EPPO standards - Guidelines on Good Plant Protection Practice – Rodent control for crop protection and on farms- PP 2/5

anticoagulant resistance, as all anticoagulants have the same mode of action and the nature of resistance is also similar. The resistant individuals can be identified by conducting a blood clotting response (BCR) test (Gill et al. 1993, RRAC 2003).

Resistance management strategies

The immediate aim of resistance management is to prevent or retard the development of resistance to a given anticoagulant while, as far as is not counterproductive, permitting its continued use.

To this extent the applicant suggests the following measures to aid in the prevention of resistance:

- Maximum use of non-chemical control techniques.
- Preferential use of rodenticides and formulations to which resistance rarely develops.
- Ensure the complete eradication of the target population whenever a rodenticide is used.
- Avoid the use of first generation anticoagulants, to which resistance develops relatively easily.
- Maintain uncontrolled, susceptible populations in refugia from which emigration can occur.

It is recommended that the label states that any instances of resistance are referred to the manufacturer of the a.s.

In order to prevent the development and spreading of resistance, some resistance management strategies measures such as those from the Codes of Good Practices in rodent control are recommended:

- The population size of the target rodent should be evaluated before a control campaign. The number of baits and the timing of the control campaign should be in proportion to the infestation level.
- A complete elimination of rodents in the infested area should be achieved.
- The use instruction of products should contain guidance on resistance management for rodenticides.
- The authorisation holder shall report any observed resistance incident to the Competent Authorities or other appointed bodies involved in resistance management.

The proposed labels contain detailed instructions for use.

- The population size of the target rodent should be evaluated before a control campaign.
- The number of baits and the timing of the control campaign must be in proportion to the infestation level.
- Baits must be placed in a safe manner inaccessible to children and non-target species and not be applied to areas where food/feed, food utensils or food processing surfaces may come into contact with, or be contaminated by the product.
- Bait consumption should be regularly checked and consumed or spoilt bait replaced until consumption has stopped. The remaining baits and material must be removed and disposed of safely at the end of the treatment according to local/national wastes disposal regulation.
- Water must not be contaminated with the product or its container.
- The rodents' bodies all along the treatment must be disposed of according to local/national regulation.

In addition to the above applicant and label recommendations the RMS advocates the adoption of the following advice to avoid the development of resistance in susceptible rodent populations.

Details of treatment should be recorded.

- Apply effective Integrated Pest Management measures (remove alternative food sources, remove water sources, remove harbourage and proof susceptible areas against rodent access).
- Inspected baiting points weekly and replace old bait where necessary.
- Do not routinely use anticoagulant rodenticides as permanent baits. Use permanent baits only where there is a clear and identified risk of immigration or introduction or where protection is afforded to high-risk areas. (The RMS view is that routine use of anticoagulant baits should not be recommended in above described situations.) .
- Where rodent activity persists due to problems other than resistance, use alternative baits or baiting strategies, extend the baiting programme or apply alternative control techniques to eliminate the residual infestation (acute or sub-acute rodenticides, gassing or trapping).

Treatment of rodent infestations containing resistant individuals

- Where rodent infestations containing resistant individuals are identified, immediately use an alternative anticoagulant of higher potency. If in doubt, seek expert advice on the local circumstances.
- Alternatively use an acute or sub-acute but non-anticoagulant rodenticide.
- In both cases it is essential that complete elimination of the rodent population is achieved. Where residual activity is identified apply intensive trapping to eliminate remaining rodents. Gassing or fumigation may be useful in specific situations.
- Apply thorough Integrated Pest Management procedures (environmental hygiene, proofing and exclusion).

Application of area or block rodent control to eliminate resistance

- Where individual infestations are found to be resistant or contain resistant individuals it is possible that the resistance extends further to neighbouring properties.
- Where there are indications that resistance may be more extensive than a single infestation, apply area or block control rodent programmes.
- The area under such management should extend at least to the boundaries of the area known resistance and ideally beyond.
- These programmes must be effectively coordinated and should encompass the procedures identified above.

5.2.6. Humaneness

The use of Brodifacoum as a rodenticide could cause suffering of vertebrate target organisms. The use of anti-coagulant rodenticides is necessary as there are at present no other valuable measures available to control the rodent population in the European Union. Rodent control is needed to prevent disease transmission, contamination of food and feeding stuffs and structural damage. It is recognised that such substances do cause pain in rodents but it is considered that this is not in conflict with the requirements of Article 5.1 of Directive 98/8/EC ‘to avoid unnecessary pain and suffering of vertebrates’, as long as effective, but comparable less painful alternative biocidal substances or biocidal products or even non-biocidal alternatives are not available.

Conclusion:

The IE CA considers that the palatability and efficacy data provided is adequate to support the recommendation for the use of the product against rats and mice, even when stored for up to two years.
The treatment frequency is 2-4 applications per year, 3-6 months apart, when re-infestation occurs.

Issues identified:
Advice concerning application frequency should be included on the draft label.
The label should contain wording to the effect that effective control should be expected from bait stored up to two years under suitable storage conditions.

3.3 Biocidal Product Risk Assessment (Human Health and the Environment)

5.1.6 3.3.1 Description of the intended use(s)

The product is a paste rodenticide. It is a ready-to-use paste or pasta which contains 50 ppm (0.005% w/w) brodifacoum (56073-10-0) used by professional and amateur users. The bait is used in and around buildings and in sewer systems. The target organisms to be controlled are Brown rat, Roof rat or House rat, House mouse and Field mouse.

5.1.7 3.3.2 Hazard Assessment for Human Health

No new exposure studies have been submitted for evaluation. Signs of poisoning in rodents and other mammals are those associated with an increased tendency to bleed, leading ultimately to profuse haemorrhage. Non-target organisms are most at risk from secondary poisoning, i.e. consumption of rodent carcasses by predators such as raptors.

5.1.7.1 3.3.2.1 Toxicology of the active substance

Brodifacoum is a second-generation single-dose anticoagulant rodenticide. It disrupts the normal blood clotting mechanisms resulting in increased bleeding tendency and, eventually, profuse haemorrhage and death. Like all anticoagulant rodenticides, brodifacoum is structurally similar to vitamin K. Blood forms a clot at the site of injury by virtue of a complicated 'clotting cascade', involving numerous clotting factors. The clotting factors are made in the liver as inactive precursors, converted to active form and allowed to circulate in the bloodstream. Vitamin K is employed in the liver in the activation process, and is used in a continuous cyclic process involving several enzymes. The anticoagulant rodenticides block these enzymes, preventing regeneration of the vitamin K and preventing activation of the clotting factors.

Brodifacoum requires labelling with the symbol T+ and the risk phrases R 28 'Very toxic if swallowed'; R27 'Very toxic in contact with the skin' and R26 'Very toxic by inhalation'. Brodifacoum is not classified as a skin irritant or eye irritant.
Repeated dosing studies show effects on blood coagulation and death at low doses (µg/kg bw/day), and therefore labelling with R48/23/24/25 is warranted.

Under the GHS scheme Acute tox. 1, H310, Acute tox. 2 H300 and STOT RE 1 H372.
The Commission Working Group of Specialised Experts on Reproductive Toxicity has unanimously recommended that all AVK rodenticides should collectively be regarded as human teratogens due to the structural similarity to and the same mode of action as the known developmental toxicant warfarin (meeting in Ispra, 19-20 September 2006). Therefore based on read across data from warfarin, brodifacoum is considered to be a possible developmental toxicant and requires the classification as Reprotoxic with the labelling R61, may cause harm to the unborn child.

An almost complete oral absorption can be considered, on the basis of amount of radioactivity recovered in the excreta and retained in the tissues. *Brodifacoum* is widely distributed and bioaccumulates mainly in the liver with lower concentrations in the kidney. Hepatic bioaccumulation of *Brodifacoum* is a non-linear *vs* dose and time. The elimination kinetic from the liver was biphasic, with

an half-life in the range of 282-350 days. The excretion after oral administration is very slow (11 – 14% in 10 days), occurring via the urine and the bile, both as polar metabolites (glucuronide) and parent compound. The metabolism of *Brodifacoum* is limited and the toxicologically relevant chemical species is the parent compound.

As long as dermal absorption is concerned, on the basis of the available study and reading acroos from data on other 2nd generation anticoagulant rodenticides, two different values could be used for risk characterisation depending on the type of formulation, that is 3% (pellets and grains) or 0.047% (wax block bait).

Brodifacoum is very toxic after oral administration and also via the dermal and inhalation routes. Death was the result of internal haemorrhage. Classification with T+; R26/27/28; 'Very toxic by inhalation, in contact with skin and if swallowed' is warranted.
Brodifacoum does not fulfil the EU criteria for classification as a skin or eye irritant. Although showed no sensitizing potential in a LLNA study in mice, it was able to cause skin sensitization in guinea pig and fulfils the EU criteria for classification as a skin sensitizer.

Summary of brodifacoum subchronic, chronic, mutagenic and reproductive toxicity.

Repeated oral exposure to *Brodifacoum* resulted in clinical signs and toxicity consistent with the mode of action of the rodenticide and its properties of anti-coagulant agent (lethal haemorrhages). The NOEL for subchronic oral toxicity is in the range 0.04 -0.001 mg/kg/day (the lowest values identified with sensitive end-points, such as increases in both the kaolin-cephalin time and the prothrombin time). Based on results from the acute dermal and inhalation toxicity studies, route-to-route extrapolation, consistently with the decision adopted for *Difenacoum*, it is justified to assume serious damages associated to prolonged exposure through dermal and inhalation routes also. Therefore, classification with T; R48/23/24/25 "Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed" is warranted.

Genotoxicity and Carcinogenicity

Brodifacoum displayed no mutagenic activity in a standard range of genotoxicity tests. No long-term carcinogenicity study was submitted. In fact, chronic toxicity studies were not considered to be technically feasible due to the specific action of the active substance on the test/target species. However, the anticoagulant action is apparently the only pharmacological action of Brodifacoum. The active substance has no structural alerts for carcinogenicity and no concern about possible non-genotoxic carcinogenic potential can be derived from the toxicological studies. Therefore the justifications for non-submission of carcinogenicity data was considered acceptable.

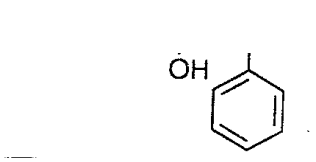
Conclusion on Reproductive toxicity

Reproductive and developmental toxicity studies on *Brodifacoum* did not reveal any specific effects. General toxicity effects were consistent with the mode of action of the rodenticide and its properties of anti-coagulant agent. The lowest NOAELs for rabbits and rats were 0.002 and 0.001 mg/kg bw.
In spite of these findings, a provisional decision has been made at the Technical Meeting of Classification and Labelling that [R61] should be applied to all anticoagulant active substances on the basis of analogy to *Warfarin*. None of the acute or subchronic performed tests gave any indication for a potential neurotoxic effect of *Brodifacoum.*

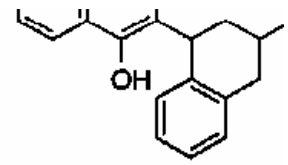
Medical data

Routine monitoring of workers (industrial users) producing *Brodifacoum* and formulating products has been carried out for the last forty years. Between June 1981 and September 1982, three poisoning incidents occurred with successful recovery. With the exception of these incidents, routine monitoring has shown no clinical effects in any workers. During this time there has been no evidence of allergenicity, sensitisation or any other abnormal effects induced by repeated and continual exposure to these anticoagulant rodenticides.

The molecules both have significant structural similarity to vitamin K. This structural similarity is responsible for the ability to interfere with i.e. block the enzymes used to regenerate vitamin K. The major differences in the active substances lie in their 'tails', which have varying degree of lipophilicity. There is long term experience with warfarin, widely used in anti-clotting therapy in humans for over forty years, with no association with increased incidence of cancer. The absence of adverse effects in millions of humans following four decades of long term warfarin therapy is considered sufficient evidence that warfarin is not carcinogenic. The structural similarity of brodifacoum to warfarin (see below), together with the negative results in the guideline mutagenicity tests, indicates that brodifacoum is not carcinogenic.



Warfarin



Brodifacoum

TMIII09 agreed to derive $AEL_{medium\ term}$ consistently with what decided for the other AVK rodenticides. Therefore, $AEL_{medium\ term}$ was calculated from the NOAEL of 0.002 mg/kg bw/day (developmental oral toxicity study in rabbit) divided by an Assessment Factor of 300 (10 for interspecies x 10 for intraspecies x 3 additional factor for severity of effects). The $AEL_{medium\ term}$ results to be of 6.7×10^{-6} mg/kg bw/day.

Conclusions:
The following AELs should be considered in the risk characterization for *Brodifacoum*:

- AEL_{acute} of 0.0000033 mg/kg/day based on the maternal NOEL from a teratogenicity study of 0.001 mg/kg bw/day (rat, maternal effect)
- $AEL_{medium\ term}$ of 6.7×10^{-6} mg/kg bw/day based on the NOAEL from a developmental study (female rabbit) of 0.002 mg/kg bw/day

- AEL_{chr} of 3.3 x 10^{-6} mg/kg bw/day based on the NOAEL for females from the reproductive 2-generation study in rat of 0.001 mg/kg bw/day

Data requirements: (List if applicable)
None.

5.1.7.2 3.3.2.2 Toxicology of the biocidal product

The toxicology of the biocidal product was examined appropriately according to standard requirements. The product was not a dummy product in the EU- review program for inclusion of the active substance in Annex I of Directive 98/8/EC.

Summary of acute toxicity data for the biocidal product Ruby Block

Parameter	Test material	Species	Result	Classification	Ref.
Acute Oral Toxicity	Brodifacoum Pasta Bait. Batch: 61509601	See comments below	See comments below	none.	[redacted] (2007a). study number: 2254/0025
	Acceptable (Y/N): Yes		**Method:** OECD 420 (2001)		**GLP (Y/N): Yes**
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Acute Dermal Toxicity	Brodifacoum Pasta Bait. Batch: 61509601	See comments below	See comments below	none.	[redacted] (2007b). study number: 2254/0026
	Acceptable (Y/N): Yes		**Method:** OECD 402 (1987)		**GLP (Y/N): Yes**
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Acute Inhalation Toxicity	none	none	none	none	none
	Acceptable (Y/N):		**Method:**		**GLP (Y/N):**
	Comments: Inhalation exposure is not appropriate for Pasta Bait formulation. Active substance has very low volatility and is only present at 0.005% (w/w) in the semi solid, wax product. Company justification accepted.				
Information on mixture of biocidal products	none	none	none	none	none
	Acceptable (Y/N): Yes		**Method:**		**GLP (Y/N):**
	Not applicable since following the proposed uses of Pasta Bait and the label claims, the rodenticide Pasta Bait is not intended to be used in a mix with other biocidal products. Company justification accepted.				
Acute Skin Irritation	Brodifacoum Pasta Bait. Batch: 61509601	See comments below	See comments below	none	[redacted] (2007c). study number: 2254/0027
	Acceptable (Y/N): Yes		**Method:** OECD 404 (2002)		**GLP (Y/N): Yes**
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Acute Eye Irritation	Brodifacoum wax block bait. Batch: 61509601	See comments below	See comments below	none	[redacted] (2007d). study number: 2254/0028
	Acceptable (Y/N): Yes		**Method:** OECD 405 (2002)		**GLP (Y/N):**

Parameter	Test material	Species	Result	Classification	Ref.
					Yes
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Skin Sensitisation	none	none	none	none	none
	Acceptable (Y/N):		**Method:**		**GLP (Y/N): Yes**
	Comments: A skin sensitisation study is not available for the product so active substance data has been used to derive a classification. Brodifacoum showed no sensitizing potential in a LLNA study in mice, it was able to cause skin sensitization in guinea pig and fulfils the EU criteria for classification as a skin sensitizer (CAR IT). However, based on the generic concentration limits for mixtures at a Brodifacoum concentration of 0.005% w/w classification is not required by Directive 1999/45/EC or Regulation (EC) No 1272/2008.				

Conclusion:
According to the results of the toxicological studies, Brodifacoum paste does not classify with respect to Directive 1999/45/EC or Regulation (EC) No 1272/2008. However, safety phrases and precautionary statements are proposed by the Rapporteur.

Data requirements:
None.

5.1.7.3 3.3.2.3 Toxicology of the co-formulants (substances of concern)

The biocidal product contains no other substances in quantities that would be of toxicological concern. The majority of these components are food grade materials and are not classified.

Please refer to consolidated Annexes (include. Confid Annex) for product specification and list of co-formulants.

5.1.8 3.3.3 Exposure Assessment for Human Health

The contact gel is used as a gel in plastic bait boxes or covered/protected gel points or contact gel can be placed on strips of insulation tape or paper tape fixed to, for example, overhead pipe-ways and ductwork. The product is applied by professional pest controllers, only.

Single-use pre-treated 'gel tubes' (plastic tube containing gel - analogous to single-use pre-treated bait boxes) are also sold. As the amount of gel in a single gel point is enclosed in a sealed tube and there is no exposure to the user, the standard risk assessment for professionals applying bait from other packs is protective of this use.

The application of Block bait is regarded as a suitable worst case scenario for Paste bait. In the Chambers study operators secured 5 compressed wax blocks (each of 20g, in total 100g bait per box this value was then doubled for 200g boxes) into a bait station by pushing bait mounting pegs in the stations through holes in wax blocks.

The most relevant route of exposure to the active substance is the dermal route. For exposure assessment only active substance from wax blocks has been modelled. The block product typically takes the form of a solid waxy block with a strong sweet smell containing 0.005% w/w Brodifacoum.

In the final CAR for brodifacoum dermal absorption values were derived from read across from data on Difenacoum. The values chosen were 0.047% for wax formulations and 3% for grain/pellet formulations. These values were deemed appropriate in the absence of product specific data.

The active substance has a low vapour pressure, therefore the potential for evaporation is low, and hence the potential for inhalation exposure is low. Inhalation exposure is only of concern during the formulation process where the active substance has a potential for becoming airborne when mixed with dry bait ingredients. In the case of wax blocks, inhalation exposure is irrelevant. Inhalation exposure from handling grain bait during loading/application and cleaning is also proposed as negligible. The only relevant inhalation exposure is assumed to be that from the decanting of loose grain, pellets and granules due to the potential release of airborne dusts.

Any potential oral exposure will be indirect exposure via possible release to the environment. Other possible exposure scenarios include dermal contact with dead animals and accidental ingestion of poison baits by children.

Key Endpoints for Exposure Assessment

The following AELs should be considered in the risk characterization for *Brodifacoum*:

- AEL_{acute} of 0.0000033 mg/kg/day based on the maternal NOEL from a teratogenicity study of 0.001 mg/kg bw/day (rat, maternal effect)
- $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day based on the NOAEL from a developmental study (female rabbit) of 0.002 mg/kg bw/day
- AEL_{chr} of 3.3 x 10^{-6} mg/kg bw/day based on the NOAEL for females from the reproductive 2-generation study in rat of 0.001 mg/kg bw/day

Data requirements:
None.

5.1.8.1 Exposure to professional users

MG/PT	Field of uses envisaged	Likely concentrations at which a.s. will be used
Main group 03; PT 14	**Professional uses**	
	Rodenticide used in and around buildings Use in sewerage (only against rats)	0.005% w/w
	Non-professional uses	
	Rodenticide used in and around buildings	0.005% w/w

There are two groups of humans which may be potentially exposed to the rodenticide baits : those who handle, apply and dispose of the product or other residues such as carcasses or faeces (direct exposure) and those who may be incidentally exposed while the product is in use (incidental exposure).

5.1.9 Method of application

Block bait is made of paraffinic blocks to which the active substance has been added. These Brodifacoum baits are used indoors and outdoors to kill mice and rats: they are placed at the appropriate places in bait stations or covered under a curved tile, a wooden board or in a piece of tube; the animals eat some of the product and die.
Baits must be deposited in a way to minimize the risk for non-target animals and for children. Where possible, baits are secured so that they cannot be dragged away by the rodents. Preferably bait stations will be used where the bait can't be hidden, fixed or locked up.
The common strategy is to explore the site, locate runs, burrows, droppings or signs of damage and place the bait boxes at entry points into buildings and around areas where rats are known to feed. For

the mice control, as mice are sporadic feeders, many bait points are placed throughout the areas where mice are known to feed.
In sewers, the bait is eaten *in situ* by target rodents. The brown rat is the only mammal able to live in sewers.
For house and field mice control, the recommended dose is 20 to 30 g of bait every 2 to 5 meters.
For rat control, the recommended dose is 60 to 100 g of bait every 5 to 10 meters.
In sewers, place 200 to 300 g every 30-50m (never more than 300 g at each manhole).

There are three phases for the human exposure:

- Application phase: application of rodenticides by professionals and non-professionals.
In and around domestic, industrial and commercial buildings, the product is applied manually, at measured amounts in bait boxes or covered. Professional users are assumed to wear protective gloves when handling the product unlike amateur users.
In sewerage, the bait is applied only by professionals, typically hanged to a wire tied up to the wall a few centimetres above the bottom of manholes.
Bait points are controlled regularly. Any bait eaten or damaged has to be replaced. Depending on infestation rate, an advised frequency of inspection is 3 to 5 days. During the bait inspections, also a search in the zone will be done for dead rodents.

- Use phase: Post-application, *i.e.* from the use of rodenticide products and from contact with the product (*e.g*. residential exposure including indoor air contamination, contact with the product during use). The use phase is the period when the biocidal product is waiting to be consumed by the target organism. This means that no primary exposure of humans is intended and should not take place (please refer to point 3.2.4 Secondary exposure).

- Disposal phase: Disposal (including handling of surplus formulated product, burning/incineration, dumping, empty containers, dead rodents (carcasses) disposal).
When no further bait take is observed, bait stations must not be left in place. All bait stations must be removed from the site, cleaned up and the bait and bait remainders must be disposed of in accordance with local requirements.
For sewer systems no specific removal disposal is instructed.

Human exposure assessment

5.1.9.1 3.3.3.1 Identification of main paths of human exposure towards active substance from its use in biocidal product

Exposure path	Industrial use[1)]	Professional use[2)]	General public[3)]	*via* the environment[4)]
Inhalation[5)]	Not appropriate	Yes	Yes	No
Dermal[6)]	Not appropriate	Yes	Yes	No
Oral	Not appropriate	No	Yes	No

[1)] Industrial use (manufacture of active substance and formulation of products) is not covered by BPD. Workers in formulation manufacture are not exposed to levels of a.s. that would affect blood clotting.
[2)] Includes non-trained professionals.
[3)] Indirect exposure due to transient mouthing by infants is included in the scenarios for the general public.
[4)] According to the TNsG, indirect exposure *via* the environment is considered to be of minor importance as the release of rodenticides to the environment is limited.
[5)] The skin is the main exposure route with a small proportion of inhalation exposure to dust when grain-based baits are mechanically handled by professionals. The active substance is of low volatility and it is incorporated at very low concentrations into a solid, non-volatile matrix. Therefore inhalation exposure is considered as negligible.
[6)] Except for the grain block bait which is always packed in individual sachets for both professionals and general public and for grain bait only for the amateurs, dermal contact with the product is a realistic scenario.

The magnitude of human exposure to block bait can be assessed by applying standard exposure models of TNsG[31] for human exposure (2007) or the Harmonised approach for the assessment of rodenticides (anticoagulants) endorsed at TM II 2011 for professionals and amateurs users. Moreover, CONSEXPO 4.1 model can be used to assess the exposure to the biocidal product used by non-professionals.

The following basic primary exposure pathways have to be considered for a risk assessment in order to sum up the exposure of humans to Brodifacoum. The main exposure path is direct skin contact during the use of the biocidal product.
Ingestion is a secondary pathway or an accidental primary exposure during the use of the biocidal product.
Inhalation is considered as negligible.
According to the various pathways, the following absorptions will be applied in the assessment:
- Inhalatory uptake fraction: 1 (default value of 100%);
  Inhalation rate: 1.25 m^3/h (default value)

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- Dermal uptake: 0.047% for wax formulations and 3 % for and grain/pellet.
- Oral uptake fraction 100%

5.1.10 3.3.3.2 Professional exposure

For professional use, the operator is trained in the correct use of the bait, *i.e.* placement, number of bait points/boxes required based on the infestation rate area, the amount of bait or number of bait place packs per bait point/box and safe handling procedures.

The use of PPE - disposable gloves and a dust mask may be employed when decanting bait and disposable gloves may be employed when loading bait boxes and disposing of remaining bait and carcasses. However, when the bait is contained within a bait box there will be no exposure of the operator to the product.

PPE (coverall, boots and gloves) is required as standard when the bait is used in sewage systems.

Exposure calculations – professionals

The CEFIC/EBPF Rodenticides Data Development Group conducted an operator exposure study using flocoumafen (which may be considered a suitable surrogate for all other second generation anti-coagulants) to determine exposure during simulated use of rodenticide baits (*Chambers* 2004, unpublished, confidential). This study examined exposure to wax blocks (20g wax block baits, 5 blocks/bait box) and grain bait. Guidance is also taken from a confidential paper entitled "Harmonised Approach for Rodenticides" by the German Competent Authority, Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (BAuA).

The daily exposure frequency and its division between different tasks are based on a survey organised by CEFIC (and based on a questionnaire answered by selected pest control companies in several EU countries), and on an agreement between Member States on the common approach for exposure assessment and ECB guidelines.

The application of Block bait is regarded as a suitable worst case scenario for Paste and Cluster Baits. In the Chambers study operators secured 5 compressed wax blocks (each of 20g, in total 100g bait per box) into a bait station by pushing bait mounting pegs in the stations through holes in wax blocks.

The Chambers study determined exposure from the application phase from the following scenario: 5 operators secured 5 compressed wax blocks (each of 20g, in total 100g bait per box) into a bait station by pushing bait mounting pegs in the stations through holes in wax blocks. Three trials were conducted with 1, 5 and 10 times securing of these wax blocks. Since the results of 1, 5 and 10 securing are similar all trials were included in the calculation of the 75th percentile by the RMS. The proposed value of **28mg (of wax bait) per manipulation** is valid for loading of one bait box with 100g of wax blocks (a single manipulation constitutes the placement of a single bait station). Since the recommended amount for rat control is up to 200g bait per bait point, this exposure value is multiplied by a factor of 2 because only 100g was used in the Chambers Study. The proposed value of **56mg (of wax bait) per manipulation** is valid for loading of one bait box with 200g of wax blocks.

For professional operators the potential total daily dermal exposure (assuming the previously agreed number of 60 manipulations from TM III/10 is applied) from the application-phase is **3360mg** wax block product (i.e. 56mg × 60 bait sites).

The Chambers study determined exposure from the disposal or post-application phase from the following scenario: 5 operators emptied a loaded bait station by sliding the wax block off the mounting pegs into a 10 L plastic bucket. This is done 1, 5 and 10 times. The proposed value of **5.75 mg per manipulation (determined by the RMS, Difenacoum CAR 2009)** is valid for cleaning of one bait box. For the resulting potential dermal exposure of post-application-phase the agreed number of 15 manipulations (TM III/10) should be taken into account. For the post-application phase the potential total daily dermal exposure is **86 mg** wax block product (i.e. 5.75mg x 15 disposal manipulations). The size of one bait block is ignored and the figure is valid for different sized blocks (e.g. 10g, 100 g).

The calculation of PCO (pest control operator) and amateur dermal exposure in placing and clean-up of rodenticidal wax blocks, taking into account measured values (75th percentiles), defaults according to ECB guidelines and the common agreement on daily exposure frequencies (TM III/10) is presented in the following table.

Pest Control Operator, No PPE:

Amount of exposure to product (75th percentile) during securing of 10 20g wax blocks (200g). Value is for placement of 1 bait station.	56.0 mg
Amount of Brodifacoum on fingers/hands (0.005% in wax block, 20 x 10g blocks sewer maximum application worst case)	112 mg × (0.005 / 100) = 5.6×10^{-3} mg
Systemic dose per application at 1 bait station: (dermal absorption 0.047%, bw 60kg)	(5.6×10^{-3} mg) × (0.047 / 100)) / 60kg = 4.39×10^{-8} mg/kg
Amount of exposure to product (75th percentile) during clean-up and disposal per bait station	5.75 mg
Systemic dose (Brodifacoum concentration 0.005%, dermal absorption 0.047%, bw 60 kg) per clean-up of one bait station.	2.25×10^{-9} mg/kg
Assuming 'reasonable worst case' scenario of 60 bait sites and 15 clean-ups, systemic dose per day	((4.39×10^{-8} mg/kg × 60) + (2.25×10^{-9} mg/kg × 15)) = **2.6×10^{-6} mg/kg/day** **0.0026 µg/kg/day**
Expressed as a % of the AEL: $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**39% of the AEL**

Pest Control Operator, With PPE (gloves)

Default 10-fold reduction of exposure.	**2.6×10^{-7} mg/kg/day** **0.00026 µg/kg/day**
Expressed as a % of the AEL: $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**3.9% of the AEL**

Non-Trained Professional (e.g. farmer), No PPE:

Systemic dose resulting from application of product to five bait sites plus five bait sites cleaned per day, no PPE (difenacoum concentration 0.005%, dermal absorption 0.047%, bw 60 kg).	((2.19×10^{-8} mg/kg × 5) + (2.25×10^{-9} mg/kg × 5)) = **1.2×10^{-7} mg/kg/day**
Expressed as a % of the AEL: $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**0.0001 µg/kg/day** **1.5%**

Non-Trained Professional (e.g. farmer), With PPE (gloves):

Default 10-fold reduction of exposure.	**1.2×10^{-8} mg/kg/day** **0.00001 µg/kg/day**
Expressed as a % of the AEL: $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**0.15%**

Application by spatula and caulking gun

This calculation covers the exposure of a professional user when applying rodenticide bait via a caulking gun or spatula. The calculation is based on the information from the worked examples database, based on bridging to the paste application of wood preservative using a trowel (reverse-reference approach). The worked examples data are ADE values inside gloves so the calculation assumes that gloves are worn.

From the wood preservative example, which addresses application of pastes by brush, trowel, caulking gun and gloved hand, a good case for bridging can be made for the contact gel application by spatula (vs trowel) and by caulking gun.

The wood preservative example assumes that the application process leads to a maximum of 30 minutes' exposure per day and we must assess whether this is a reasonable exposure time for a professional pest controller using contact gel.

Time Required to Apply and Clean up Contact Gel Points

In the case of contact gel applied by caulking gun, a case could be made that this is covered by the 14 manipulations listed for paste bait. The text in the HEEG document states:
For the handling of paste bait the following was agreed: The paste bait described in the report by Vetter and Sendor was paste bait deployed using prefilled cartridges. Dermal exposure was considered possible only at removal and re-attachment of the nozzle's protection cap and was assumed to occur only before the first and after the last bait placing on a given site. Hence, the number of sites visited per day (multiplied with 2) was considered to be the relevant exposure determinant.

If a user were filling a number of gel points in a small area, the same would be true for use of our contact gel caulking gun product - the user may not find it necessary to put the cap on between filling each bait station on that site.

For spatula application, an alternative way of thinking of this is again to assume that, given the contact gel is applied by spatula in the same way as wax blocks are placed in bait points, the number of manipulations would be at a maximum the same as the number for a wax block. ie. 60+15.

The applicants experts think that to apply bait, either by spatula or by caulking gun, a maximum time of 15 seconds per bait point would be plenty of time. Clean up probably takes about half a minute per bait point at most. (this time estimate agrees with UK Toban pasta bait which is applied in the same manner)

For application by caulking gun using the figure of 11 loadings and 3 clean ups, exposure is far lower than the 30 minutes used in the model.

Loading: 11 bait stations x 15 seconds = 2.75 minutes
Clean up: 3 bait stations x 30 seconds = 1.5 minutes
This gives a total handling time of 4.25 minutes.

For application by spatula and assuming the number of bait stations is the same as for wax blocks, this would give a total handling time of :

Loading: 60 bait stations x 15 seconds = 15 minutes
Clean up: 15 bait stations x 30 seconds = 7.5 minutes
Total time = 22.5 minutes

Therefore in both cases, the figure used in the modelling of 30 minutes is sufficient to cover a professional user.

Acceptable Exposure Level

The maximum level of exposure to the active substance has already been calculated in the AS review and is listed in the Assessment Report List of End Points as follows:

	VALUE	STUDY	SAFETY FACTOR
AEL_{acute}	0.0000033mg/kg/day	Rat developmental tox	300

Therefore maximum amount of AS = 0.0000033 mg/kg/day

Reverse-reference Calculation
For a non-volatile paste (such as this brodifacoum product), inhalation exposure is assumed to be negligible and so, using the dermal absorption data for this formulation (0.047%), to exceed the acceptable exposure level, active substance contamination to the skin would need to exceed:

0.0000033 x 2128
= 7.00×10^{-3} mg/kg/day

If the operator weights 60 kg then the AS contamination would have to exceed:
$7.00 \times 10^{-3} \times 60$ kg
= 0.42 mg/day

As the maximum concentration of AS in the ready-for-use paste formulation is 0.005%, then the weight of paste product containing 0.42 mg AS will be:
0.25/0.005 x 100
= 8400 mg

Assuming that dermal exposure will be predominantly to the hands and in this case, based on the worked examples database, gloves are assumed to be worn since professionals are expected to wear gloves, then the rate of actual hand exposure to the hands is required to exceed:
8400 mg / 30 min
= 280 mg/min

If it is considered that the penetration of brodifacoum through protective gloves is 10%, the operator would need to get about 84 g of product on the outside of the gloves and this would have to remain on the surface until the active had migrated through the paste and penetrated the glove.
Part 2 of the TNsG (2002) states that “in an HSE survey of pest controllers (1994) it was estimated that the median duration "using pesticides" was 120 minutes.” It expands to say that treatment time is up to 100 minutes for pastes. If the 100 minutes is applied rather than 30 as suggested by the company

84g / 100 min
= 0.84 g/min

To put this exposure in context. To recieve an exposure of paste product in excess of the AEL the operator would be required to have almost the same quanity of gel on his protective glove as would load a 100g bait station. This level of exposure is considered very unlikely.

5.1.10.1 3.3.3.3 Exposure to non-professional users

Contact gels applied by gun or syringe are professional use only and are not modelled for armature use. Block baits are considered a suitable worst case for paste bait delivered in a closed sachet.

Bait boxes for use by the general public may be supplied as sealed units or as lockable, tamper-proof units that may be refilled by the user. Bait may be used in covered/protected bait points, rather than bait boxes, where appropriate.

Calculations for non-professional exposure are presented below; the first scenario assumes no exposure during application phase while the second scenario assumes that the bait boxes would have to be loaded by the user. As for the non-trained professionals, it is assumed that a non-professional user places ten bait blocks per site (200g) on five bait sites and cleans five bait sites per day.

Product type	Exposure scenario	PPE	Inhalation uptake	Dermal uptake

14	Non-professional (amateur)	None	Not relevant	1.12×10^{-8} mg/kg/day[1)]
14	Non- professional (amateur)	None	Not relevant	1.2×10^{-7} mg/kg/day[2)]

1) scenario 1, 2) scenario 2.

Scenario 1: No dermal contact during placing of baits due to sealed bait boxes. Potential exposure is only during clean-up. Default exposure value for cleanup is 5.75mg product per bait site, bromadialone present at a concentration of 0.005% (w/w), 60kg body mass, 0.047% dermal absorption value. The value is calculated from the cleanup exposure per bait station of ((2.25×10^{-8} mg/kg) × 5).

Scenario 2: Assuming that conventional bait boxes are loaded then the exposure is equal to that of the non-trained professional (e.g. farmer) with no PPE. As a worst case scenario, scenario 2 can be taken forward to risk assessment.

5.1.10.2 3.3.3.4 Exposure to children/workers/general public

Bait points should be covered or protected in such a way to prevent access to the bait. However, the ingestion of wax block bait by infants has been assessed as a potential secondary exposure route associated with the use of Brodifacoum in rodenticide products. Secondary exposure is anticipated to be acute in nature. Two different scenarios of secondary exposure are available, the 'handling of dead rodents' scenario and the 'transient mouthing of poison bait' scenario. The former is excluded from the risk assessment due to unrealistic assumptions. The estimated exposure for the 'transient mouthing of poison bait' scenario is either $2.5\times10^{-}2$ mg/kg or 5.0×10^{-5} mg/kg, depending on the default assumptions. This results in Margin of Exposure (MOE) values of 0.01 or 6.6, respectively. It shows that infants are at significant risk for secondary exposure, i.e. there is no safe use for children.
For the 'transient mouthing of poison bait' scenario, either 5g (User Guidance) or 10 mg (TNsG, with bittering agent) of the product is assumed to be swallowed by an infant per poisoning event.

Oral exposure infant. TNsG Assumptions: Transient mouthing of poison bait (10mg) treated with repellent: (10mg × 0.00005) / 10kg bw

Transient mouthing infant. User Guidance Assumptions: Transient mouthing of poison bait (5000mg) without repellent; (5000mg × 0.00005) / 10kg bw

	Total dose (mg/kg b.w./day)	% AELacute (0.0033 µg/kg b.w.)
Oral exposure infant	0.00005	1515%
Transient mouthing infant	0.025	757575%

The RMS considered that in connection with transient mouthing of poison baits, infants are also exposed via the dermal route while handling the bait. This however is assumed to play a minor role relative to the amount that could be ingested. It is therefore not included in the overall exposure scenario.

5.1.10.3 3.3.3.5 Exposure to consumers from residues in food

Not applicable.

5.1.10.4 3.3.3.6 Overall Summary

The exposure data based on measurements in simulated use conditions are acceptable and should be used in risk assessment. The models assume that inhalation exposure is of minor importance compared with dermal exposure. The calculations have been made with the assumptions of rat control, and there are no separate calculations to assess exposure in mice control in which smaller bait sizes are used.

5.1.11 3.3.4 Risk Characterisation for Human Health

5.1.11.1 3.3.4.1 Professional users

Caulking gun or spatula

Calculation of the exposure of a professional user when applying rodenticide bait via a caulking gun or spatula was assessed via reverse reference scenario. Assuming that dermal exposure will be predominantly to the hands and in this case, based on the worked examples database, gloves are assumed to be worn since professionals are expected to wear gloves, then the rate of actual hand exposure to the hands is required to exceed:

8400 mg / 30 min
= 280 mg/min

If it is considered that the penetration of brodifacoum through protective gloves is 10%, the operator would need to get about 84 g of product on the outside of the gloves and this would have to remain on the surface until the active had migrated through the paste and penetrated the glove.

84g / 100 min
= 0.84 g/min

Using a reverse reference scenarios for caulking and or spatula application it was calculated that a professional operator would require exposure to 84g per day on his gloves. To recieve an exposure of paste product in excess of the AEL the operator would be required to have almost the same quanity of gel on his protective glove as would load a 100g bait station. This level of exposure is considered very unlikely.

Wrapped sachet or blocks

The exposure assessment for professional pest control operators (PCOs) under reasonable worst case assumptions (60 loadings and 15 clean-ups/day), as presented above, yielded a potential dermal exposure leading to a systemic dose 0.0026µg/kg/day day for an unprotected operator during bait handling operations. Comparison to calculated NOAEL for MOE shows that the use of rodenticide baits containing 0.005% brodifacoum results in a margin of exposure of 257.

Since pest control operators wear protective gloves by default during pest control operations, a refined assessment is conducted. The resulting margin of exposure (MOE = 2570) indicates that the use of rodenticide baits containing 0.005% brodifacoum does not cause a risk for PCOs if gloves are worn.
Likewise, the exposure assessment for non-trained professionals (e. g., farmers) under reasonable worst case assumptions (five loadings and five clean-ups/day), yielded a potential dermal exposure leading to a systemic dose of 1.2×10^{-7} mg/kg/day for an unprotected person. Even without PPE, the resulting margin of exposure (MOE = 6700) indicates that use of rodenticide baits containing 0.005 %

brodifacoum is not a risk at the stated exposure frequency. A refined assessment was, nevertheless, conducted since wearing of protective gloves is recommended in the instructions for use. The resulting margin of exposure (MOE = 67000) indicates a high level of protection for non-trained professional users when gloves are worn.

The result of the risk assessment concerning use of brodifacoum in bait blocks/sachets indicates that the acceptable exposure level is not exceeded for trained professionals (PCOs) without PPE (gloves). In addition, the risk is at an acceptable level without gloves for non-trained professionals. However, use of protective gloves is recommended in all cases for hygiene reasons. In the case of application for caulking gun or spatula it was concluded that exposure to 84g of bait by a PCO on a glove was exceedingly unlikely and this application method was expected to yield safe exposure levels for trained operators.

5.1.11.2 3.3.4.2 Non-professional users

Blocks/sachets are supplied either in pre-sealed units or as loose blocks for use in covered/protected bait points or refillable bait boxes. An exposure assessment has been performed taking into account potential exposure both from application and post-application tasks as a worst-case scenario. In the calculations, amateurs were assumed to load five bait points and clean five bait points per day without PPE. The estimated daily systemic dose, 1.2×10^{-7} mg/kg/day, results in an MOE value of 6700 showing that there is also little risk to amateurs.

5.1.11.3 3.3.4.3 Children/Workers/general public

As a potential secondary exposure route, associated with the use of difenacoum in rodenticide products, ingestion of wax block bait by infants has been assessed. Secondary exposure is anticipated to be acute in nature. The estimated exposure for the scenario, 2.5×10^{-2} mg/kg/day or 5.0×10^{-5} mg/kg/day, depending on the default assumptions, results in MOE values of 0.01 or 6.6, respectively indicating that infants are at risk of poisoning. This should be addressed by ensuring all bromodialone products targeted for amateur use are provided in sealed packs and tamper resistant bait boxes with a bittering agent. The potential exposure due to dermal contact with poisoned rodents is not included in the risk assessment because the available scenarios are unrealistic.

5.1.11.4 3.3.4.4 Consumers from residues in food

Not applicable, product is not used to treat food stuffs.

5.1.11.5 3.3.4.5 Overall Summary

The calculations presented have been made with the assumptions of rat control, and there are no separate calculations to assess exposure for mice control in which smaller bait sizes are used.

Using both the MOE and AEL approaches for risk assessment indicates that there is a satisfactory margin between the predicted exposure and the NOAEL (LOAEL) as well as exposures below the

threshold value for the AEL for all intended uses by trained professionals with PPE, untrained professionals and amateurs (with and without PPE). The product is deemed suitable for authorisation and appropriate personal protective equipment is advised.

Secondary exposure from transient mouthing of the product exceeds the AEL reference value (0.0023µg/kg/day), both with the assumption of 0.01 g and 5 g of product ingested by infants. This is of concern. There is no margin of safety using the existing data and models. There is no safe scenario for indirect exposure if estimated according to TNsG and User Guidance. Mitigation and protection measures such as the inclusion of bittering agents and the enclosure of product in sealed packs and tamper resistant bait boxes are essential to reducing the risk of secondary exposure. Baits should not be placed where food, feeding stuffs or drinking water could be contaminated.

Workplace operation	**PPE**	**Exposure path**	**Dose (µg/kg/day)**	**MOE**	**%AEL**
Trained Professional: Placing of wax block baits and clean-up	None	Dermal, hands	0.0026	257	39
Trained Professional: Placing of wax block baits and clean-up	Protective gloves	Dermal, hands	0.00026	2570	3.9
Trained Professional: Application via caulking gun/spatula and clean-up	None	Excess of 8.4g on hands to exceed AEL			
Trained Professional: Placing of wax block baits and clean-up	Protective Glove	Excess of 84g on hands to exceed AEL			
Non-Trained Professional: Placing of wax block baits and clean-up	None	Dermal, hands	0.0001	6700	15
Non-Trained Professional: Placing of wax block baits and clean-up	Protective gloves	Dermal, hands	0.00001	6700	1.5
Amateur: Placing of wax block baits and clean-up	None	Dermal, hands	0.0001	6700	15
Secondary Exposure Transient Mouthing of bait by infants	--	Oral	5.0×10^{-5} (TNsG)	6.6	--
			2.5×10^{-2} (User Guidance)	0.35	--

5.1.12 3.3.5 Effect and Exposure Assessment for the Environment

An overview of the EU review of environmental fate and behaviour and ecotoxicology for the active substance is presented below in conjunction with the exposure assessment and environmental effects for the biocidal product.

5.1.12.1 Environmental fate and behaviour of the active substance

5.1.12.1.1

5.1.12.1.2 Degradation

5.1.12.1.2.1 Biodegradation

Brodifacoum is not readily or inherently biodegradable.
The overall conclusion on biodegradation is that Brodifacoum is not readily or inherently biodegradable.

5.1.12.1.2.2 Abiotic Degradation

Brodifacoum is stable to hydrolysis (t½ > 1 year). It is however predicted to undergo rapid indirect photolysis with OH radicals and ozone (t½ = approximately 2 hours) and undergoes rapid direct photodegradation (t½ = 0.217 days). There are no predicted effects on the atmosphere.
The overall conclusion on abiotic degradation is that Brodifacoum is hydrolytically stable to hydrolysis (t½ > 1 year).

5.1.12.1.2.3 Distribution

Brodifacoum is a large aromatic organic compound of low volatility with two polar groups, which can potentially ionise at environmental pH. The active substance has a Log Pow (4.92), and is of low solubility in water (5.8 x 10-5 g/l at pH 7 and 20°C).
The DT50 value of 157 days (The Pesticide Manual 13th ed) and the Koc of 50000 (The Pesticide Manual 13th ed) indicate that Brodifacoum would be persistent and immobile in soil. The exposure to the groundwater is unlikely.
On the basis of its low volatility (vapour pressure of 2.6 10^{-22} Pa at 20°C) the exposure to the atmosphere is highly unlikely.
The overall conclusion on distribution is as follows: Brodifacoum is persistent (DT50 157 days) and immobile in soil (Koc > 9155 l/kg). Under basic conditions (high pH), Brodifacoum is not likely to be adsorbed onto soils or sewage sludge due to the ionisation of the molecule; whereas under acidic conditions (low pH), Brodifacoum is likely to be adsorbed onto soils or sewage sludge as the molecule is in its neutral or non-ionised form.

Mobility in soil
The Koc value (50000 The Pesticide Manual 13th Edition) indicates that the active substance would not be mobile in soil and is not expected to contaminate groundwater (PEC < 0.1 μg/l).

The overall conclusion on mobility in soil is as follows *Brodifacoum* is immobile in soil (Koc > 9155 l/kg). *Brodifacoum* is not expected to contaminate groundwater.

5.1.12.1.3 Accumulation

Based on a measured Log Kow = 4.92 it is considered that Brodifacoum has a potential for bioaccumulation. The BCFfish (3034) was calculated using the equation 74 of TGD (part II); the BCFearthworm (999) was calculated according to the equation 82d of TGD

The overall conclusion on bioaccumulation potential is as follows: No reliable bioaccumulation study is available. The measured log Kow = 4.92 (retrieved from CAR B) indicates that Brodifacoum can be potentially bioaccumulative and provides a calculated BCFfish = 3034. The experimental Kow confirms the adequacy of using, in CAR A, the calculated log Kow of 6.12 (rather than 8.5) and indicates that this value still overestimated the actual lipophilicity and, consequently, the BCF values estimated herein. The measured log Kow = 4.92 and a BCFfish = 3034 and BCFearthworm = 999, are considered therefore more reliable endpoints to be used in risk assessment.

5.1.12.2 3.3.5.1 Environmental effects (hazard) of the active substance (ecotoxicology)

Table 3.3.5.2-1: Summary of the eco-toxicological data for the active substance Brodifacoum

Parameter	Test material	Species	Result	Classification	Ref.
Short term toxicity testing on fish	ECO120140	Oncorhynchus mykiss	96-hour LC50 = 0.042 mg/L	Yes - R50/R53	W J Craig - March 2003. Chemex Environmental International Ltd report ENV5803/120140 (2003)
	Acceptability (Y/N): Yes		**Method:** OECD 203		**GLP (Y/N):** Yes
	Comments: None				
	Acceptability (Y/N): Yes		**Method:** OECD 202		**GLP (Y/N):** Yes
	Comments: Recorded under semi-static conditions.				
Toxicity to aquatic invertebrates	ECO120140	Daphnia magna	48 hour - EC50 = 0.25mg/l	Yes - R51 /R53	W J Craig - March 2003. Chemex Environmental International Ltd report - ENV5802/120140
	Acceptability (Y/N): Yes		**Method:** OECD 202		**GLP (Y/N):** Yes
	Comments: Recorded under semi-static conditions.				
Growth inhibition study on	ECO120140	Selenastrum capricornutum (Pseudokirkneriella	72h ErC50 = 0.04 mg/l	Yes - R50 /R53	W J Craig - March 2003. Chemex

algae		subcapitata)			Environmental International Ltd. Report - ENV5801/120140
	Acceptability (Y/N): Yes		**Method:** OECD 201		**GLP (Y/N):** Yes
	Comments: None				
Inhibition of microbial activity	7909101	3h respiration inhibition test with activated sludge from a sewage treatment plant treating predominantly domestic sewage	EC10 was set > water solubility limit of 0.058 mg/l measured at pH=7 and T=20°C	No acute toxicity	Staniland, J. (2004) Chemex Environmental International Ltd. Ref: ENV7009/120140
	Acceptability (Y/N): Yes		**Method:** OECD 209		**GLP (Y/N):** Yes
	Comments: Although the results of the study (EC50 >1003mg/l) are not reliable, the study can be used to derive the NOECmicroorganisms on the basis of the brodifacoum water solubility (EC50 > 0.058 mg/l).				
Studies on sediment dwelling organisms	-	No experimental data available for sediment dwelling organisms.	-	-	-
	Acceptability (Y/N): -		**Method: -**		**GLP (Y/N): -**
	Comments: The risk for the sediment compartment will be covered by the risk for the aquatic compartment.				
Growth inhibition of aquatic plants	-	No study submitted	-	-	-
	Acceptability (Y/N): -		**Method: -**		**GLP (Y/N): -**
	Comments: The evaluation concluded that there is no need for a study as there is no evidence that brodifacoum would be toxic to aquatic plants to a greater extent than to other aquatic organisms.				
Toxicity to earthworms	Chemex reference: ECO120140	14-day LC50	> 994 mg/kg dw	No acute or chronic toxicity	Staniland, J (2005) Environmental International Ltd. Ref:ENV7010/120140
	Acceptability (Y/N): Yes		**Method:** Static test conditions according to SOP E260 based on OECD 207.		**GLP (Y/N):** Yes
	Comments: 14-day LC50 was greater than 994 mg/kg dry soil (the highest concentration applied) corresponding to a 14-d LC50 > 879.6 mg/kg wwt.				
Toxicity to birds	Difenacoum	LD50 (Japanese quail)	19 mg/kg bw	Acute toxicity	Szabolcs Gaty (2005) LAB International. Study code: 04/903-115FU
	Acceptability (Y/N): Yes		**Method:** OPPTS 850.2100		**GLP (Y/N):** Yes
	Comments: An extrapolation factor of 8.05 was applied to correct for differences in toxicity based on the acute test results for Difenacoum (LD50 = 66 mg/kg, male and females) and Brodifacoum (LD50 = 19 mg/kg bw), both related to Japanese quail. The				

	Brodifacoum results indicate it is very toxic to birds, with an NOEC = 0.012 mg Brodifacoum/kg diet and an NOEL = 0.0012 mg Brodifacoum/kg bw/d.				
Toxicity to mammals	04359	Two-generation fertility study (rat, parent females)	NOAEL (0.001mg/kg bw/day)	Yes	Toxicological Research Centre Ltd. report 03/737-202P.
	Acceptability (Y/N): Yes		**Method:** OECD 416		**GLP (Y/N):** Yes
	Comments: Although a two-generation study is not normally required for anticoagulant rodenticides, the study is relevant for the establishment of an overall NOAEL for anticoagulant effects in rodents.				

5.1.12.2.1 Effects on Aquatic Organisms including the determination of PNECs:

Toxicity data are available for aquatic organisms exposed in an acute test. In a test performed under semi-static conditions, the 96-hour LC50 was 0.042mg/L for Oncorhynchus mykiss, based on measured concentrations. Daphnia magna was less sensitive than fish, with a 48-hour EC50 of 250 µg/L recorded under semi-static conditions. The endpoint was based on immobilisation and on measured concentrations of Brodifacoum in the test media. In a 72-hour algal growth inhibition test with Selenastrum capricornutum (Pseudokirkneriella subcapitata) the ErC50was 40 µg/l. The NOEC was 10µg/l with respect to specific growth rate. Results are based on measured concentrations. The outcome is that Brodifacoum is considered very toxic to aquatic organisms. The PNEC is derived from the algae 72h ErC50 = 0.04 mg/l (or fish 72h LC50 = 0.042 mg/l), and the application of an assessment factor of 1000. Therefore the **PNEC = 0.00004 mg/l**.

No experimental data are available for sediment dwelling organisms. A PNECsediment (0.043 mg/kg wwt) was derived through the Equilibrium Partitioning Method described in the TGD. However, due to the absence of measured data for the determination of a PECsed, according to TGD a quantitative risk characterization cannot be carried out. Therefore the risk for the sediment compartment will be covered by the risk for the aquatic compartment.

Based on the result of a 3h respiration inhibition test with activated sludge from a sewage treatment plant treating predominantly domestic sewage, no effects of Brodifacoum on aerobic biological sewage treatment processes are expected. As the test was carried out at nominal concentration much higher than the water solubility of Brodifacoum, the EC10 was set as greater than the water solubility limit of 0.058 mg/l measured at pH=7 and T=20°C. According to TGD, PNEC is derived applying an AF=10 to the NOEC from the respiration inhibition test. Therefore, the **PNECmicro-organisms > 0.0058 mg/l.**

No degradation or transformation products of Brodifacoum in water were detected. Toxicity of metabolites is not of concern.

PNECaquatic organisms = 0.00004 mg/l
PNECsediment organisms = 0.00004 mg/l

PNECmicro-organisms = > 0.0058 mg/l

Conclusion on hazard to the aquatic organisms:

PNEC	Task Force
PNECaquatic organisms	0.00004 mg/l
PNECsediment organisms	0.00004 mg/l
PNECmicro-organisms	> 0.0058 mg/l

The Brodifacoum a.s. results in the classification of toxic to aquatic organisms.

5.1.12.2.23.3.5.2 Effects on the Atmosphere including the determination of PNECs

Brodifacoum has a low vapour pressure (1 x 10^{-6} Pa) and a Henry's Law constant of 2.18 x 10^{-3} Pa.m3mol^{-1} (pH 7). Release to air via water is expected to be negligible. This is also supported by calculations using the TGD on risk assessment for percent release to air from a sewage treatment plant where a default of 0 is given (i.e., no release to air). The manufacture of the active substance is in a closed system. There are no releases to air of Brodifacoum from manufacturing, formulating, use or disposal phases.

5.1.12.2.3 Effects on Terrestrial Organisms including the determination of PNECs:

The effect of Brodifacoum on earthworms was assessed in an acute toxicity test in which E. fetida in artificial soil was exposed to concentrations of Brodifacoum up to 994 mg/kg dw. The 14-day LC50 was greater than 994 mg/kg dry soil (the highest concentration applied) corresponding to a 14-d LC50 > 879.6 mg/kg wwt. The PNEC for terrestrial organisms is derived from the LC50 with an AF of 1000 used. Therefore, **the PNECsoil ≥ 0.88 mg/kg wwt soil**.

Conclusion on hazard to terrestrial organisms:

PNEC	Task Force
PNECsoil	> 0.88 mg/kg wwt

Earthworms were not affected after acute exposure to Brodifacoum at concentration closed to 1 g/kg dw. It is concluded that Brodifacoum is of low toxicity to earthworms. **The PNECsoil ≥ 0.88 mg/kg wwt soil.**

5.1.12.2.3.1

5.1.12.2.3.2 Effects on Birds including the determination of PNECs:

Brodifacoum is moderately toxic to birds upon acute oral exposure with a LD50 value of 19 mg/kg bw in the Japanese quail.

No studies are available on the avian short term dietary toxicity.

A 6 weeks reproduction test on the Japanese quail exposure to Brodifacoum in drinking water was submitted but it was judged not adequate for risk assessment purposes. Therefore, acknowledging the decision taken at the Biocides TMIII09, the NOEC for Brodifacoum is based on the results of the chronic toxicity study with Difenacoum (with Japanese Quail), chosen as reference chemical for second generation anticoagulants. An extrapolation factor of 8.05 was applied to correct for differences in toxicity based on the acute test results for Difenacoum (LD50 = 66 mg/kg, male and females) and Brodifacoum (LD50 = 19 mg/kg bw), both related to Japanese quail. The Brodifacoum results indicate it is very toxic to birds, with an NOEC = 0.012 mg Brodifacoum/kg diet and an NOEL = 0.0012 mg Brodifacoum/kg bw/d. According to the TGD, an assessment factor of 30 is applied to derive the PNEC. Therefore the **PNECoral-birds = 0.012 mg Brodifacoum/kg diet/30 = 0.0004 mg Brodifacoum/kg diet.** In relation to dose the **PNECoral-birds = 0.0012 mg Brodifacoum/kg bw/d/30 = 0.00004 mg Brodifacoum /kg bw/d**.

Conclusion on hazard to birds:

PNEC	PNECoral bird diet	PNECoral bird
Task Force	0.0004 mg/kg	0.00004 mg/kg bw/d

5.1.12.2.3.3 Effects on Mammals including the determination of PNECs:

The lowest mammalian NOAEL (0.001mg/kg bw/day) comes from a two-generation fertility study with rats and refers to parent females. This endpoint was converted, according to TGD, to NOEC mammal, food = 0.02 mg/kg food. As the exposure lasted 90 days as a minimum, for PNEC derivation an AF oral of 90 is applied (table 23 of TGD). Therefore, the **PNECoral-mammals = 0.02/90 = 2.22E-04 mg/kg food**, corresponding to **PNECoral-mammals = 0.001 mg/kg bw day/90 = 1.1 E-05 mg/kg bw**.

Conclusion on hazard to mammals:

PNEC	Task Force
PNECoral mammals food	2.22E-04 mg/kg
PNECoral mammals	1.1 E-05 mg/kg bw

Brodifacoum is very toxic to mammals.

5.1.12.2.3.4 Metabolites

No significant amounts of metabolites are expected to be formed in soil. In rats, no toxicologically relevant metabolites have been identified which could be introduced in soil via urine or faeces.

5.1.12.3 Environmental effects (hazard) of the biocidal product

The example products in the EU-review program for approval of the active substance for inclusion in Annex I of Directive 98/8/EC were pellet bait and wax block mixtures (formulations) containing Brodifacoum.

The aquatic, terrestrial, avian and mammalian toxicity data used for the assessment of the Annex I representative biocidal product was based on data determined in the Brodifacoum active substance studies. This included the following studies.

7.8.7.1 (1)	Kaukeinen DE	1982	A Review of the Secondary Poisoning Hazard to Wildlife from the use of Anticoagulant Rodenticides Proceedings of the 10th Vertebrate Pest Conference (1982). Published	N	Public Domain
7.8.7.1 (2)	Newton I and Wyllie I	-	Effects of New Rodenticides on Owls, Institute of Terrestrial Ecology, Monks Wood Experimental Station, Abbots Ripton, Huntingdon, Cambs PE17 2LS Published	N	Public Domain
7.8.7.1 (3)	Gray A, Eadsforth CV and Dutton AJ	1994	The Toxicity of Three Second-Generation Rodenticides to Barn Owls, Pesticide Science, 42, 179-184. Published	N	Public Domain
7.8.7.1 (4)	Wyllie I, Newton, I and Freestone P	-	The Toxicity of Three Second-Generation Rodenticides to Barn Owls, Institute of Terrestrial Ecology, Monks Wood, Abbots Ripton, Huntingdon, Cambs PE17 2LS Published	N	Public Domain

There were no additional ecotoxicology studies provided for authorisation of the biocidal product in this process.

5.1.12.4 Environmental effects (hazard) of the co-formulants (substances of concern)

Please refer to Annex I of the consolidated Annexes I-IV which contains the confidential information on the co-formulants that are used in this product along with the active substance.

None of the co-formulants that carry an environmental classification are present at a sufficient concentration to trigger the classification of the product.

Product Classification & Labelling:

There is no requirement for classification and labelling with regard to the co-formulants used in the product.

There is no environmental classification for the product under the Directive 99/45.
There is no environmental classification for the product under the CLP Regulation 1272/2008.

5.1.13 Exposure Assessment for the Environment

The environmental exposure was assessed during the EU active substance review process and the current intended uses are similar.

The rodenticide product is used by professional and amateur users. The product is intended for indoors use, in and around buildings and for outdoors uses in non-agricultural open areas and waste dumps. It is not supported for use in sewers; however the applicant has included this scenario in their application as a worst case scenario.

It is always used in the same manner for all these purposes. Bait points are placed throughout the infested areas with 20g per bait point for mice and 20 to 60 g per bait point for rats. Application sites are located 2-5 m apart for mice and 5-10 m apart for rats. A shorter distance is used in severe infestations. The number of baits and the distances should be adapted to the infestation level. Bait points are inspected frequently and replenished when bait has been eaten.

Bait points are placed securely to help prevent access to non-target animals. For amateur use, the label prescribes to use tamper resistant bait stations for rat control. Baits for amateur mouse control have to be placed into/at a covered or protected bait station. For professional rodent control the use of tamper resistant bait stations is not compulsory however, if tamper resistant bait stations are not employed, the wax blocks must be fixed by strings or wire to avoid uptake by non target animals/humans, or uncontrolled dispersal.

Based on the environmental fate and behaviour of Brodifacoum, as outlined in the detailed calculations provided in Annex VI of this Product Authorisation Report, the environmental exposure assessment was conducted.

5.1.13.1 Aquatic compartment

As mentioned previously the product is not supported for use in sewers but the scenario has been included as part of the risk assessment for the other scenarios. Therefore exposure to the aquatic compartment has been assessed through the STP route also. Based on worst case ESD assumptions the maximum predicted environmental concentration (PEC) of the active substance for microorganisms in the STP is 1.93×10^{-5} mg/L. The corresponding amount in surface water is 1.77×10^{-6} mg/L. The maximum permissible concentration by directive 80/778/EEC (amended by 98/83/EC) of 0.1 µg/L is not exceeded in surface waters. Full details of the calculations are contained in Annex VI.

5.1.13.2 Atmospheric compartment

Brodifacoum has a vapour pressure of less than 10^{-6} Pa at 20^{o}C and a Henry's Law constant of less than 2.18×10^{-3} $Pa.m^3.mol^{-1}$ at pH 7. In the Assessment Report for brodifacoum it has been concluded that releases to air from manufacturing, formulating, use or disposal phases are not to be expected. An exposure assessment for air is therefore not required.

5.1.13.3 Terrestrial compartment

Exposures of soil to the active substance occurs via direct (spillages) and disperse release (deposition by urine and faeces) after the use of the product in and around buildings, open areas and waste dumps. As mentioned previously the product is not supported for use in sewers however exposure to agricultural soil via spreading of sludge from an STP has been included as part of the worst case risk assessment.

Using ESD worst-case assumptions of the typical usage patterns and release mechanisms, the maximum concentration in agricultural soil (averaged over 30 d) after 10 years of sludge application from STP is 4.86 x 10^{-4} mg/kg wwt. When the applicant's dosage rates are used as inputs the figure for agricultural soil is 3.24 x 10^{-4} mg/kg wwt. No information on the metabolism of brodifacoum was used to lower the exposure levels further.
The highest concentration of Brodifacoum in soil following use in and around buildings is 0.047 mg/kg wwt under ESD realistic worst case conditions (see table below). For a normal use pattern the ESD recommends a total of 2.6 replenishments (as opposed to 5 for the worst case). This usage pattern leads to an estimated soil concentration of 0.006 mg/kg wwt.

For the open areas scenario ESD realistic worst-case conditions assume one application site is treated twice with the product. The fraction released during use and application is 0.25. The exposed soil area is assumed to be the lower half of the burrow wall surrounding an 8 cm diameter tunnel, with a soil mixing depth of 10 cm and up to 30 cm from the entrance hole. The amount of product used at each refilling in the control operation is not specified by the ESD. However, the Reviewer notes the ESD states "A typical initial dose for a rat hole in the Nordic countries is 100-200 g grain.hole^{-1}. However, in e.g. France a typical dose for a rat hole is about 50-100 g product." The applicant supports a dosage of 60 g bait per refill but bearing in mind the ESD statements the reviewer feels that a dosage value of 100 g is a sufficiently worst case value to use in the exposure assessment.. The local concentration arising in soil after a campaign is predicted to be 0.173 mg/kg wwt.

The default area for a waste dump defined in the ESD is 1 ha. If bait points are placed at distances of 5 m apart in a grid covering the entire dump this would yield a total of 441 points (21 x 21). 100 g in each bait point corresponds to a total loading of 44.1 kg of bait. This is higher than the default value considered in the ESD under realistic worst-case conditions (40 kg). Consequently the applicant's exposure calculation is not sufficient to support this use. The Reviewer generated new exposure calculations for this use. The local concentration arising in soil after such a campaign is predicted to be 0.00817 mg/kg wwt. A more realistic campaign would use a total of 11 kg of bait resulting in a local concentration of 0.00204 mg/kg wwt.

In and around buildings	Open areas	Waste dumps
Amount of product used in control operation for each bait point: 0.25 kg (ESD), 0.06 kg (applicant). Realistic worst-case: 21 day campaign Bait stations: 10 No. of replenishments: 5 (2.6 realistic) Bait stations are 5 m apart. Fraction released due to spillage: 0.01 Fraction ingested: 0.99 Spillage area: 0.09 m^2 (0.1 m around station) Frequented area: 550 m^2 (10 m around building)	Amount of product used at each refilling in the control operation: 100 g Realistic worst-case: 6 day campaign Bait stations: 1 No. of replenishments: 2 Fraction of product released to soil during application: 0.05 Fraction of product released to soil during use: 0.2	Area of waste dump: 1 ha Amount of product per station: 100 g Spacing between blocks: 5 m (worst case), 10 m (realistic) Total mass of product used: 21 x 21 x 100 g = 44.1 kg (worst case) 11 x 10 x 100 g = 11 kg (realistic) No. of replenishments: 7 Fraction of active ingredient released to soil through urine, faeces and dead animals: 0.9

5.1.13.4 Groundwater

Exposure of groundwater may occur as a result of soil exposure which occurs via residues present in sewage sludge after using the product in sewers and via direct (spillages) and disperse release (urine and faeces) after the use of the product in the scenarios in and around buildings, open areas and waste dumps. As an indication for potential groundwater levels, the concentration in soil porewater in the various scenarios was examined. It should be noted that this is a worst-case assumption, neglecting transformation and dilution in deeper soil layers. A summary of the PECs obtained are presented in the table below. The calculated value for the open areas scenario exceeds the EU trigger value of 0.1 µg/L. However this figure is derived from a soil concentration value in a small localised area in the immediate vicinity of the baiting point. When taken in the context of a larger area (field, park, etc.) this figure would be several orders of magnitude lower. In addition it must be noted that these

two scenarios give a value for groundwater under industrial soil – not agricultural soil as specified by the ESD.

Scenario	In and around buildings		Open area	Waste dump		Sewer system
	Worst case	Realistic		Worst case	Realistic	
PEC groundwater (mg/l)	5.3×10^{-5}	6.62×10^{-6}	1.96×10^{-4}	9.26×10^{-6}	2.31×10^{-6}	1.93×10^{-5}

5.1.13.5 Primary & Secondary Poisoning Exposure Assessment

Non-target vertebrates may be exposed to rodenticides primarily through consumption of bait and secondarily from consumption of poisoned rodents and for predators eating earthworms which have ingested the active substance absorbed to soil. Small pellets and whole grain baits are highly attractive to birds.

In and around buildings:
Primary Poisoning:

Regarding the possible primary hazard to non-target animals this is assessed for birds and mammals.

Acute:

In the first tier scenario, PECoral is the concentration of the rodenticide in the food of a non-target organism. The PECoral is **50 mg/kg** (Brodifacoum present at 0.005% w/w in the product) and is used in the quantitative risk assessment for the acute and long-term situation.

In the second tier (refined) risk assessment the daily uptake (ETE) for birds and mammals is considered. This risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes and takes into account avoidance factor (AV), the fraction of the diet obtained in the treated area (PT) and a a default excretion factor.

Table-1 Brodifacoum concentrations in non-target birds following a single uptake of the product

Species	Body weight (g)	Daily food intake (FIR) (g/d)[a]	Conc. of a.i. after single meal (mg/kg bw/d) (ETE)	Expected conc. after elimination[b] (mg/kg bw/d) (EC)
Tree sparrow	22	7.6	17.27	12.43
Chaffinch	21.4	6.42	15.00	10.80
Wood pigeon	490	53.1	5.42	3.90
Pheasant	953	102.7	5.39	3.88
Dog	10 000	456[d]	2.28	1.64
Pig	80 000	600[e]	0.375	0.270

Pig, young	25 000	600[e]	1.20	0.864

Long-term:

In the first tier scenario, the risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes and takes into account avoidance factor (AV), the fraction of the diet obtained in the treated area (PT) and a default excretion factor.

Expected concentration of Brodifacoum in the animal after one meal followed by a 24-hour elimination period

Species	Estimated daily uptake of a compound (ETE) (mg/kg b.w./d)		Fraction of daily uptake eliminated (number between 0 and 1) (EI)	Expected concentration of active substance in the animal (EC) (mg/kg b.w./d)	
	Step 1	Step 2		Step 1	Step 2
Tree sparrow	17.27	12.43	0.3	12.09	8.71
Chaffinch	15.00	10.80	0.3	10.50	7.56
Wood pigeon	5.42	3.90	0.3	3.79	2.73
Pheasant	5.39	3.88	0.3	3.77	2.72
Dog	2.28	1.64	0.3	1.596	1.149
Pig	0.375	0.270	0.3	0.2625	0.189
Pig, young	1.20	0.864	0.3	0.864	0.6048

In the second tier scenario for primary poisoning long-term exposure according to the guidance agreed at the 23rd Biocides CA meeting, EC5 values are used for quantitative risk assessment of primary poisoning in the long-term situation.

EC_{oral} for different relevant species

Days	EC_{oral} (mg/kg b.w./d)						
Species	Tree sparrow	Chaffinch	Wood pigeon	Pheasant	Dog	Pig	Young pig
Day 1 after first meal	17.27	15.00	5.42	5.39	2.28	0.375	1.20
Day 2 before new meal	12.1	10.5	3.79	3.77	1.60	0.266	0.840
Day 3 before new meal	20.6	17.9	6.45	6.41	2.72	0.449	1.43
Day 4 before new meal	26.5	23.0	8.31	8.26	3.50	0.577	1.84

Day 5 before new meal	30.7	26.6	9.61	9.56	4.05	0.666	2.13

Secondary Poisoning:

Secondary poisoning hazard can only be ruled out completely when the rodenticide is used in fully enclosed spaces so that rodents cannot move to outdoor areas or to (parts of) buildings where predators may have access. Predators among mammals and birds may occur inside buildings or they may hunt in the immediate vicinity of buildings, e.g. parks and gardens. Scavengers may also search for food close to buildings.

Tier 1 exposure assessment:

According to the ESD PT 14, a normal susceptible rodent may eat anticoagulant rodenticide for a number of days before it stops eating. The feeding period has been set to a default value of 5-days, which corresponds to the feeding pattern observed in laboratory experiments. The mean time until death has been set to a default value of 7-days. Concentrations in contaminated rodents have been calculated for the time point immediately after the last meal. The factor PD (fraction of food type in diet) is set to 0.2 (minimum factor for normal case), 0.5 (normal use situation), and 1.0 (worst case situation). Regarding the elimination rate, the default of 0.3 supported by the ESD is adopted. The assessment also takes into account the concentration in resistant rodents.

	Residues of rodenticide in target animal, mg a.s./kg b.w. with bait consumption expressed as PD		
	0.2	**0.5**	**1.0**
A normal non-resistant target rodent stops eating on day 5			
Day 1 after the first meal*	1.00	2.50	5.00
Day 2 before new meal**	0.70	1.75	3.50
Day 3 before new meal	1.19	2.97	5.95
Day 4 after the last meal	1.53	3.83	7.66
Day 5**	1.77	4.43	8.86
Day 7 (mean time to death)**	1.36	3.39	6.79
A target rodent continues eating due to resistance			
Day 14 after the meal	2.31	5.79	11.58

Tier 2 Exposure Assessment:

The refined tier 2 considers exposure of relevant species of predators, based on their bodyweights and food intakes and takes into account avoidance factor (AV), the fraction of the diet obtained in the treated area (PT) and a default excretion factor. Food intake of non-target animals can vary significantly, depending on the metabolic rates of species, the nature of their food, weather conditions, time of year, etc.

Brodifacoum concentrations in non-target mammals and birds consuming contaminated rodents

				Normal susceptible rodents caught on day 5, before their last meal.	**Normal susceptible rodents caught on day 5 just after their last meal**	**Resistant rodents caught on day 14 just after their last meal**

Species		Body weight *)	Daily mean food intake*)	Amount a.s. consumed by the non-target animal**	Concentration in non-target animal	Amount a.s. consumed by the non-target animal***	Concentration in non-target animal	Amount a.s. consumed by the non-target animals****	Concentration in non-target animal
		(g)	(g)	(mg)	(mg a.s./kg b.w.)	(mg)	(mg a.s./kg b.w.)	(mg)	(mg a.s./kg b.w.)
Barn Owl	*Tyto alba*	294	72.9	0.32	1.10	0.51	1.72	0.61	2.06
Kestrel	*Falco tinnunculi.*	209	78.7	0.35	1.68	0.55	2.62	0.65	3.13
Little owl	*Athene noctua*	164	46.4	0.21	1.26	0.32	1.97	0.39	2.35
Tawny Owl	*Strix aluco*	426	97.1	0.43	1.01	0.67	1.58	0.81	1.89
Fox	*Vulpes vulpes*	5 700	520.2	2.31	0.41	3.62	0.63	4.32	0.76
Polecat	*Mustela putorius*	689	130.9	0.58	0.85	0.91	1.32	1.09	1.58
Stoat	*Mustela erminea*	205	55.7	0.25	1.21	0.39	1.89	0.46	2.26
Weasel	*Mustela nivalis*	63	24.7	0.11	1.74	0.17	2.72	0.21	3.25

Calculation of concentration in earthworms:
Calculations for secondary poisoning are undertaken according to the ESD PT 14 for predators eating earthworms which have ingested the active substance absorbed to soil.

Brodifacoum concentrations in earthworms

		Tier 1[a]	Tier 2[b]
Input			
C_{soil} sewer system	Concentration in soil averaged over a period of 180 days and divided by 2 (mg/kg wwt)	8.70×10^{-5}	3.70×10^{-5}
C_{soil} building	Concentration in soil immediately after intake divided by 2 (mg/kg wwt)	0.0056	0.0050
$BCF_{earthworm}$	Bioconcentration factor in earthworm (L/kg wet fish)	15820	15820
$C_{porewater}$ sewer system	Concentration in porewater (mg/L) divided by 2	5.35×10^{-7}	2.29×10^{-7}
$C_{porewater}$ building	Concentration in porewater (mg/L) divided by 2	3.48×10^{-5}	3.10×10^{-5}
F_{gut}	Fraction of gut loading in worm (kg dwt/kg wwt)	0.1	0.1
$CONV_{soil}$	Conversion factor for soil concentration wet-dry weight soil (kg wwt/kg dwt)	1.13	1.13
Output			
$PEC_{oral, earthworm}$ building	Predicted environmental concentration in earthworm (mg/kg wet earthworm)	0.495	0.441

5.1.13.6 Overall Summary of exposure assessment

The biocidal product is a ready-to-use bait containing 0.005% Brodifacoum as the active substance. Brodifacoum is a second-generation single-dose anticoagulant rodenticide. It is used against rat at the maximal rate of 60 g of product equivalent to 3 mg a.s. per baiting post and against mouse at 20 g product equivalent to 1 mg a.s. by baiting post. This formulation is intended for indoor and outdoor uses.

PECs were calculated in accordance with the ESD for PT14. These calculations are outlined in the previous sections. Based on environmental fate and behaviour of Brodifacoum the following PEC values were determined:

Scenario	In and around buildings		Sewer system		Open Areas		Waste Dumps	
	Worst case	Realistic	Worst case	Realistic	Worst case	Realistic	Worst case	Realistic
PEC soil (mg/kg wwt)	0.047	0.006			0.173	N/a	0.00817	0.00204
PEC groundwater (mg/l)	5.3×10^{-5}	6.62×10^{-6}			1.96×10^{-4}	n/a	9.26×10^{-6}	2.31×10^{-6}
PEC microorganisms (mg/l)			1.93×10^{-5}	1.27×10^{-5}				
PEC surface water (mg/l)			1.77×10^{-6}	1.18×10^{-6}				
PEC agricultural soil (mg/kg wwt)			4.86×10^{-4}	3.24×10^{-4}				
PEC groundwater (ag) (mg/l)			4.66×10^{-7}	3.11×10^{-7}				
PECsediment (mg/kg)			1.92×10^{-3}	1.28×10^{-3}				

No new data related to the environment fate and behaviour or the ecotoxicology of the active substance or the biocidal product has been submitted by the applicant. There were three studies submitted related to secondary poisoning to dogs and foxes and the hazard/risk to barn owls which are considered only supplementary data and not considered further in the risk assessment.

PNECs were calculated based on the studies submitted for the EU approval of the active substance. PECS for assessment of primary and secondary poisoning were determined based on the ESD for PT14 and the TGD (2003).

5.1.14 Risk Characterisation for the Environment

Brodifacoum products are non-selective and can pose a risk of primary and secondary poisoning to non-target animals.

Product containing brodifacoum are placed at secured bait points. To maximise exposure of the target rodents and minimise unintended exposure of other non-target vertebrates, the products are placed where they are most likely to be encountered by the target organisms (e.g. on habitual rat-runs).

The type of secured bait point suitable for a given situation is determined on a case-by-case basis, taking into account such factors as shielding from sunlight and moisture necessary to maintain bait integrity and the level of security required to prevent access to and/or interference by non-target animals etc.

The risks posed by products containing 50 mg Brodifacoum/kg are characterised for the following scenarios:

1. **In and around buildings (houses, animal houses, commercial and industrial sites)**
2. **Open areas**
3. **Dumps**

5.1.14.1 Aquatic compartment

A contamination of surface water with Brodifacoum from the placing of product in and around buildings is highly unlikely. A lack of exposure to surface water is also stated in the EUBEES 2 emission scenario document. Contamination of surface waters is however expected to arise following use of bait in sewers.

The most sensitive organism in the aquatic tests was alga with a nominal 72 hr ErC50 of 0.04 mg/L. This **$PNEC_{water}$** of 0.04/1000 AF**= 0.00004 mg/L**.

The test with micro-organisms in inhibition of microbial activity showed that concentrations that it is not likely that Brodifacoum will have a negative impact on the microbial processes in a sewage treatment plant at solubility limits. This gives a **$PNEC_{STP}$** of **= 0.0058 mg/L.**

As no specific data are available, the toxicity of Brodifacoum to sediment-dwelling organisms is covered by the risk to aquatic compartment. The application of an additional factor of 10, as done in CAR A, is considered not necessary as an experimental log Kow = 4.92 (i.e. lower than 5) is available. **Therefore, the PNECsediment organisms = 0.00004 mg/l**.

The risk characterisation for the aquatic compartment is presented in the following table applying the relevant PEC values as indicated in the table in the overall summary of the exposure assessment in the previous section.

Aquatic PEC/PNEC ratios using the realistic and worst case scenario

Exposed compartment	Endpoint	PNEC mg/L	PEC Worst case	PEC Realistic	Risk quotient PEC/PNEC
Surface water	Algae	0.00004	1.77E-06	1.18E-06	0.044
Sediment	Based on aquatic data and equilibrium partitioning method	4.348E-02	1.92E-03	1.28E-03	0.044

STP	Inhibition of microbial activity	0.0058	1.93E-05	1.27E-05	0.003

The PEC/PNEC risk quotient in all compartments are below the trigger value of 1 indicating Brodifacoum following the recommended use of the product does not cause an unacceptable risk to aquatic organisms.
Brodifacoum is not readily biodegradable under environmentally relevant conditions or during sewage treatment processes. Accordingly, the degradation of Brodifacoum in sediment is also anticipated to be low. However, it has limited exposure to the aquatic compartment and this is confirmed by the PEC calculations. The PEC/PNEC ratio is below the level that leads to an unacceptable risk, thus the risk for unacceptable accumulation in sediment can be regarded as low.

For an indication of the risk in relation to surface water and groundwater/porewater used for drinking refer to the section on the aquatic compartment and groundwater in the exposure assessment.

Since the potential for metabolites formation is negligible, risk characterisation is not required.

Summary: No risk is identified

5.1.14.2 Atmospheric compartment

There are no releases of brodifacoum to air from manufacturing, formulating, use or disposal phases. Based on this and the physical and chemical properties of brodifacoum, the compound is not expected to contribute to global warming, ozone depletions in the stratosphere, or acidification.

Summary: No risk is identified

5.1.14.3 Terrestrial compartment

Exposure of the terrestrial compartment (soil) will also occur when product is deployed outdoors. Exposure is assumed to arise through a combination of transfer (direct release) and deposition via urine and faeces (disperse release) onto soil.

As there is only one test result available with soil dwelling organisms the risk assessment is performed on the basis of this result using an AF and on the basis of the equilibrium partition method. For the EPM the PNEC is calculated from the aquatic toxicity data **PNECaquatic**= **0.00004 mg/kg**.

PEC/PNEC ratios using the realistic worst case scenario

Exposed compartment	Endpoint	PNEC	PEC Worst case	Risk quotient PEC/PNEC Worst case
In and around buildings	Based on aquatic data and equilibrium partitioning method Based on the availability of test result with soil dwelling organisms and AF	1. 4.348 x E-02 2. 14-d LC50 > 879.6 mg/kg wwt/1000 = 0.8796 mg/kg	0.047	1. 1.08 2. 0.053
Open areas	Based on aquatic data and equilibrium partitioning method Based on the availability of test result with soil dwelling organisms and	1. 4.348 x E-02 2. 14-d LC50 > 879.6 mg/kg wwt/1000 = 0.8796 mg/kg	0.173	1. 3.97 2. 0.196

	AF			
Waste dump	Based on aquatic data and equilibrium partitioning method Based on the availability of test result with soil dwelling organisms and AF	1. 4.348 x E-02 2. 14-d LC50 > 879.6 mg/kg wwt/1000 = 0.8796 mg/kg	0.00817	1. 1.87 2. 9.29 x 10^{-3}

The PEC/PNEC ratio was greater than 1 when used **in and around buildings and in open areas** when applying the EPM indicating for this calculation method that Brodifacoum, following recommended use of the product, causes an unacceptable risk to organisms in this terrestrial compartment. However, this PNEC value based in and around buildings and in open areas **represents only a screening value** of contamination and is superseded by the PNEC value determined from the 14-day earthworm toxicity study.

Summary: No risk is identified

Non compartment specific effects relevant to the food chain

5.1.14.4 Primary poisoning

Referring to rodenticide applications **in sewer systems**, there is no primary poisoning hazard to non-target mammals or birds because this is not a habitat for them (*cf.* ESD PT 14).

Regarding the possible primary hazard to non-target animals following applications **in and around buildings**, several non-target species are assessed for primary poisoning risk assessments.

Acute exposure:
Non-target mammals and birds are unlikely to enter sewers and feed on product in sewage systems. Therefore, there will be no significant exposure following the use of product in sewers. Rats that live underground in sewers are also unlikely to take bait and deposit significant quantities in accessible places above ground, thus preventing exposure to non-target animals living above sewers. In conclusion, the risks to non-target mammals and birds following the use of bait containing Brodifacoum in sewers are considered to be very low.

Following applications in and around buildings, the empirical risk assumes direct or indirect consumption of the deployed baits. For primary poisoning the initial PEC_{oral} values assume that there is no bait avoidance by the non-target animals and that they obtain 100% of their diet in the treated area and have access to the product.
The concentration in the final product is 0.005% for the active substance Brodifacoum. The PECoral is 50 mg/kg (Brodifacoum present at 0.005% w/w in the product) and is used in quantitative risk assessment for the acute and long-term situation.

Tier I risk assessment: $PEC_{oral}/PNEC_{oral}$ ratio for birds and mammals exposed to Brodifacoum

	PEC_{oral} (concentration in food, mg/kg)	**$PNEC_{oral}$ (concentration in food, mg/kg)**	**PEC / PNEC**
Acute			
Bird	50	19	2.63
Mammal	50	-	-
Long-term			
Bird	50	0.0004	125000
Mammal	50	0.000011	4545454

The ratios PEC/PNEC are above 1 indicating a potential risk.

Therefore, a refined tier 2 assessment is set out below, based on representative species. The refined tier 2 risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes. Food intake of non-target animals can vary significantly, depending on the metabolic rates of species, the nature of their food, weather conditions, time of year, etc.

Tier 2 acute risk assessment: $PEC_{oral}/PNEC_{oral}$ for non-target animals accidentally exposed to bait containing Brodifacoum after one meal

Non-target animals	ETE, concentration of Brodifacoum after one meal (one day) (mg/kg b.w.)		$PNEC_{oral}$ (dose, mg/kg b.w./d)	PEC/PNEC	
	Step 1	Step 2		Step 1	Step 2
Tree sparrow	17.27	12.09	0.0004	43175	30225
Chaffinch	15.00	10.50	0.0004	37500	26250
Wood pigeon	5.42	3.79	0.0004	13550	9475
Pheasant	5.39	3.77	0.0004	13475	9425
Dog	2.28	1.596	0.000011	207272	159600
Pig	0.375	0.2625	0.000011	34090	26250
Pig, young	1.20	0.864	0.000011	109090	78545

In Tier 2, Step 1 (worst case) AV, PT and PD are all set to 1, whilst in the realistic worst case (Step 2) these AV and PT are refined to 0.9 and 0.8, respectively.

The ratios PEC/PNEC are above 1 indicating a potential risk even after refinement.

Long -term exposure:
In this assessment, long-term exposure also has to be taken into account in the evaluation of primary poisoning of rodenticides.

Tier 2 long-term risk assessment: $EC_{oral}/PNEC_{oral}$ ratio after 1-day elimination of Brodifacoum

Species	EC_{oral} (mg/kg b.w./d) after 1 day		$PNEC_{oral}$ (mg/kg b.w./d)	Ratio $PEC_{oral}/PNEC_{oral}$	
	Step 1	Step 2		Step 1	Step 2
Tree sparrow	12.09	8.71	0.0004	30225	21775
Chaffinch	10.5	7.56	0.0004	26250	18900
Wood pigeon	3.79	2.73	0.0004	9475	6825
Pheasant	3.77	2.72	0.0004	9425	6800
Dog	1.596	1.149	1.1E-05	145091	104455
Pig	0.2625	0.189	1.1E-05	23864	17182
Pig, young	0.864	0.6048	1.1E-05	78545	54982

The ratios PEC/PNEC are above 1 indicating a potential risk.

According to the guidance agreed at the 23rd Biocides CA meeting, EC_5 values are used for quantitative risk assessment of primary poisoning in the long-term situation.

Tier 2 long-term risk assessment: $EC_{oral}/PNEC_{oral}$ ratio after 5-day elimination

Species	EC_{oral} after 5 days (mg/kg b.w./d) with excretion factor = 0.3, AV = 1, PT = 1 (mg/kg bw)[a]	EC_{oral} after 5 days (mg/kg b.w./d) with excretion factor = 0.3, AV = 0.9, PT = 0.8 (mg/kg bw)[a]	$PNEC_{oral}$ (mg/kg b.w./d)	Ratio $EC_{oral}/PNEC_{oral}$
Tree sparrow	30.7	22	0.0004	55260
Chaffinch	26.6	19	0.0004	47880
Wood pigeon	9.61	7	0.0004	17298
Pheasant	9.56	7	0.0004	17208
Dog	4.05	3	0.000011	265091
Pig	0.666	0.480	0.000011	43593
Pig, young	2.13	2	0.000011	139418

The ratios PEC/PNEC are above 1 indicating a potential risk even after refinement.

Summary: Risk is identified
Overall, for primary poisoning all acute and long-term $PEC_{oral}/PNEC_{oral}$ ratios are still above the trigger value of 1 indicating acute and long-term unacceptable risks

5.1.14.5 Secondary poisoning

It is unlikely that target rodents that have ingested bait containing Brodifacoum will leave the sewer system and be exposed, in significant numbers, to predators or scavengers. Therefore, the secondary poisoning risks from the use of bait in sewers are considered to be very low.

For the first tier assessment of secondary poisoning in and around buildings the maximum residue levels in target rodents that arise on day-5 after the last meal ($ETE_{oral\ predator}$) are compared to the PNEC values for concentration in food. The first tier assessment also assumes the following three levels of Brodifacoum bait consumption: 20%, 50% and 100% of the daily food intake of the target rodents. For long-term exposure, it is assumed that the rodents have fed entirely on rodenticide and that the non-target animals consume 50% of their daily intake on poisoned rodents.

Tier 1 risk assessment of secondary poisoning at day 5 (non-resistant rodents)

Organism group	$PNEC_{oral}$ (mg a.s./kg b.w.)	$ETE_{oral,\ predator}$ (mg a.s./kg b.w.)			$PEC_{oral}/PNEC_{oral}$ – day 5		
PD values		0.2	0.5	1.0	0.2	0.5	1.0
Acute							
Birds	19	2.77	6.93	13.87	3.84	9.62	19.26
Mammals	-				-	-	-
Long-term							
Birds	0.0004	1.39	3.47	6.93	10692	26692	53307
Mammals	0.000011				6261	15630	31216

Tier 1 risk assessment of secondary poisoning at day 14 (resistant rodents)

Organism group	$PNEC_{oral}$ (mg a.s./kg b.w.)	$ETE_{oral, predator}$ (mg a.s./kg b.w.)			$PEC_{oral}/PNEC_{oral}$ – day 14		
PD values	-	0.2	0.5	1.0	0.2	0.5	1.0
Acute							
Birds	19	2.31	5.79	11.58	0.121	0.30	0.60
Mammals	-				-	-	-
Long-term							
Birds	0.0004	1.15	2.31	5.79	287	5775	14475
Mammals	0.000011				104545	231000	526363

According to the tier 1 assessment the risk for secondary poisoning of non-target predator birds and mammals during long-term exposure via rodents poisoned with Brodifacoum is very high as indicated by the trigger value of 1 being exceeded in all cases. Therefore, a refined tier 2 assessment is set out below, based on representative species.

The refined tier 2 risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes. Food intake of non-target animals can vary significantly, depending on the metabolic rates of species, the nature of their food, weather conditions, time of year, etc.

Tier 2 risk assessment of secondary poisoning (non resistant and resistant rodents)

Species	Exposure	$ETE_{oral\ predators}$ (mg a.s./kg/d)	$PNEC_{oral}$ (mg a.s./kg/d)	Ratio $ETE_{oral\ predators}$ / $PNEC_{oral}$
Barn owl	Day 5 before the last meal	1.10	0.0004	2750
	Day 5 after the last meal	1.72		4300
	Day 14 after the last meal	2.06		5150
Kestrel	Day 5 before the last meal	1.68	0.0004	4200
	Day 5 after the last meal	2.62		6550
	Day 14 after the last meal	3.13		7825
Little owl	Day 5 before the last meal	1.26	0.0004	3150
	Day 5 after the last meal	1.97		4925
	Day 14 after the last meal	2.35		5875
Tawny owl	Day 5 before the last meal	1.01	0.0004	2525
	Day 5 after the last meal	1.58		3950
	Day 14 after the last meal	1.89		4725
Fox	Day 5 before the last meal	0.41	0.000011	41000
	Day 5 after the last meal	0.63		63000
	Day 14 after the last meal	0.76		76000
Polecat	Day 5 before the last meal	0.85	0.000011	77272
	Day 5 after the last meal	1.32		132000
	Day 14 after the last meal	1.58		143636
Stoat	Day 5 before the last meal	1.21	0.000011	121000
	Day 5 after the last meal	1.89		189000
	Day 14 after the last meal	2.26		226000
Weasel	Day 5 before the last meal	1.74	0.000011	174000
	Day 5 after the last meal	2.72		272000
	Day 14 after the last meal	3.25		325000

Summary: Risk is identified

The ratios PEC/PNEC are all above 1 indicating a potential risk even after refinement.

5.1.14.6 Secondary poisoning via the terrestrial food chain

Emissions of brodifacoum to soil take place in two scenarios. In the scenario **in and around buildings** the uptake to soil proceeds directly (when considering outdoor applications as proposed in the ESD PT 14), whereas in the scenario for the **sewer** is not applicable in this PAR.

However, the TGD gives advice to take the 180 days averaged PEClocal for soil with respect to sewage sludge when calculating the PEC in earthworms. Hence, the mode of application given in the TGD is in fact not applicable for direct intake of substances.

In the product dossier $PEC_{oral,earthworm}$ for the direct soil intake has been calculated. The applicant advises that these figures be interpreted with care as concentrations in earthworm due to direct soil intake are not dealt with in the TGD. Soil concentrations used for the calculation represent a brodifacoum intake within a soil mixing depth of just 10 cm. Degradation has not been considered. Soil concentrations are halved since the TGD assumes only 50% of the soil uptake by earthworm to origin from the contaminated area.

Table-2: Secondary poisoning risk to earthworm-eating birds and mammals

Scenario	$PEC_{oral,earthworm}$ (mg/kg wet earthworm)		PNEC (mg/kg food)	PEC/PNEC	
	Tier 1[a]	Tier 2[b]		Tier 1[a]	Tier 2[b]
Birds					
Sewer system	N/a	N/a	4.0×10^{-4}	N/a	N/a
In and around buildings	0.495	0.441		1237	1102
Mammals					
Sewer system	N/a	N/a	2.22×10^{-4}	N/a	N/a
In and around buildings	0.495	0.441		2229	2004

[a] Product specific application data and default value for release (90% direct +indirect release)

[b] Product specific application data and refined metabolism

Summary: Risk is identified but is likely to have been overestimated

The results for the **in and around buildings** scenario indicate a risk of secondary poisoning for birds and mammals consuming contaminated earthworms.

5.1.14.7 Overall Summary

Based on toxicity data Brodifacoum presents a hazard to birds and non-target mammals. Non-target vertebrate animals may be exposed to the product containing Brodifacoum, either directly by ingestion of exposed product (primary poisoning) or indirectly by ingestion of the carcasses of target rodents that contain Brodifacoum residues (secondary poisoning). Brodifacoum products are non-selective and can pose a risk of primary and secondary poisoning to non-target animals. There are many uncertainties associated with quantification of the risk associated with the use of Brodifacoum products. Overall, because of the toxic nature of rodenticides and the over-riding public health requirement it is more appropriate to develop and validate risk management measures than to refine the risk assessment procedures further. It is noted that the product contains a bittering agent and this may deter some non-target animals. It is also noted that the attractiveness of the product may be impacted by the use of dye.

5.1.14.7.1 Primary poisoning:

Overall, all acute and long-term PECoral/PNECoral ratios are above the trigger value of 1 indicating acute and long-term unacceptable risks. Even when avoidance and elimination are taken into account the empirical exposure levels result in unacceptable risks to birds and mammals.

5.1.14.7.1.1 Secondary poisoning:

Via ingestion of target rodents by non-target vertebrates
All ratios of PECoral/PNECoral are above the trigger value of 1 indicating an unacceptable risk of secondary poisoning. Even when avoidance and elimination are taken into account the empirical exposure levels result in unacceptable risks to birds and mammals. Studies are submitted in the product dossier that indicate that the realistic risk for secondary poisoning is significantly lower than that using the PEC/PNEC approach. These studies are only considered as supplementary information.

Via the aquatic food chain
Only one of the proposed four use scenarios, namely use in sewers, will lead to exposure of surface water. It is concluded that risk to fish-eating birds and mammals in a real situation cannot be excluded it potentially is overestimated.

Via the terrestrial food chain
The results for the **in sewer** and **in and around buildings** scenario indicate a risk of secondary poisoning for birds and mammals consuming contaminated earthworms.

5.1.14.7.2 Conclusion for primary and secondary poisoning:

Due to the risk assessment results for primary and secondary poisoning and the uncertainty associated with quantification of this risk, risk mitigation measures must be taken into account to lead to an acceptable use of the rodenticide product.

5.1.14.7.3 The following risk mitigation measures are proposed to mitigate the primary and secondary poisoning risk to non-target mammals and lead to an acceptable use of this rodenticide:

- Use of an integrated management strategy and precautionary systems
- Unless under the supervision of a pest control operator use or other competent person do not use anticoagulants as permanent baits

- There should be proper and secure placing of baits so as to minimise the risk of consumption by other animals or children. Where possible secure baits so they cannot be dragged away.
- Users should select tamper-resistant bait boxes, secured bait boxes, covered applications or burrow baiting (placing of bait in appropriate containers or under a curved tile or in a piece of tube) to minimize exposure of non-target animals
- Monitor and replenish bait stations as appropriate
- Frequent visits to bait stations to ensure that any bait that is split or dragged out of bait stations is removed
- Unconsumed baits must be collected after termination of the control campaign and dispose of them in accordance with local requirements
- Remove dead and moribund rodents at frequent intervals, at least as often as baits are checked or replenished during a baiting campaign
- Baits should be deployed in accordance with the product labelling
- Baits should be deployed in accordance with other approved guidance on good practice.
- Restrict the use of the product to treatment campaigns of limited duration
- To minimise the likelihood of target rodents developing resistance to second-generation anticoagulant rodenticides, long-term deployment of baits as a preventative control measure is not recommended
- The resistance status of the population should be taken into account when considering the choice of rodenticide to be used.
- When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary and secondary poisoning by the anticoagulant as well as indicating the first measure to be taken in case of poisoning must be made available alongside the baits

8.4 Measures to protect man, animals and the environment

The information submitted covering the requirements as described in the TNsG on Data Requirements, common core data for the product, section 8, points 8.1 to 8.8 is provided below.

3.4.9. Methods and precautions concerning handling, use, storage, transport or fire

Methods and precautions concerning handling and use:

- Always read the label before use and follow the instructions provided.
- Do not decant product into unlabelled containers.
- Product must be handled in a safe manner.
- Avoid all unnecessary exposure, in particular avoid ingestion.
- A thorough survey of the infested area is essential, particularly in secluded and sheltered places, to determine the extent of the infestation.
- Baits must be securely deposited in baiting stations or other coverings so as to minimise the risk of consumption by companion animals, other non-target animals and children. Where possible, secure baits so that they cannot be dragged away.
- PUBLIC AREA USE: When the product is being used in public areas and tamper-resistant bait stations are not used, the following must be implemented. When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary or secondary poisoning by the anticoagulant as well as indicating the first measures to be taken in case of poisoning must be made available alongside the baits. When tamper-resistant bait stations are used, they should be clearly marked to show that they contain rodenticides and that they should not be disturbed.
- Dead rodent bodies, remains of unused bait or any fragments of bait found away from the bait station must be collected during all control operations to minimize the risk of consumption and poisoning to children, companion animals and other non-target animals.
- It is illegal to use this product for the intentional poisoning of non-target, beneficial and protected animals.
- Wash hands and face after application and use of the product, and before eating, drinking or smoking.
- For professional users the use of appropriate personal protective equipment (PPE) is advised.

Methods and precautions concerning storage:

- Store in a cool, dry, well-ventilated secure (lockable) place
- Store locked up in the original container
- Store original container tightly closed
- Keep/store out of reach of children and companion animals
- Keep/store away from food, drink and animal feedstuffs and products which may have an odour.

Methods and precautions concerning transport:

Hazard classification for transport: TOXIC, MARINE POLLUTANT

UN-No Coumarin derivative pesticide, solid, toxic, n.o.s (BRODIFACOUM)

Class 6.1 Hazard ID 66

Proper Shipping name Coumarin derivative pesticide, solid, toxic (contains brodifacoum)

UN-No 3027 Packing Group 1

Class 6.1

Methods and precautions concerning fire:

Suitable Extinguishing Media:

Keep fire exposed containers cool by spraying with water if exposed to fire. Fight surrounding fire with foam, water fog, or dry powder.

Extinguishing media which must not be used for safety reasons:

DO NOT USE WATER JETS

Specific hazards:

This product is not flammable but is combustible. Avoid run-off into water courses. Self-contained breathing apparatus should be won by fire-fighting personnel.

Special protective equipment for fire-fighters:

In the event of fire, wear self contained breathing apparatus, a chemical protection suit, suitable gloves and boots.

Residues:

Dispose of residues to certified waste disposal operator for incineration and licensed waste disposal site.

3.4.10. Specific precautions and treatment in case of an accident

Personal precautions

Wear suitable protective clothing, gloves and eye/face protection, if applicable and where appropriate.

- Respiratory Protection: No special respiratory protection equipment is recommended under normal conditions of use with adequate ventilation.
- Hand protection: Wear gloves for professional products.
- Skin protection: No special clothing/skin protection equipment is recommended under normal conditions of use.
- Eye protection: Not required.
- Ingestion: When using this product, do not eat, drink or smoke

Personal treatment

- General advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible and report the authorisation number).
- Skin contact: Obtain medical advice immediately. Remove contaminated clothing. After contact with skin, wash immediately with plenty of water, followed by soap and water in order to minimise skin contact.
- Contaminated clothing should be washed and dried before re-use.
- Eye contact: Obtain medical advice immediately. Rinse eyes immediately with copious amounts of water.
- Inhalation: Unlikely to present an inhalation hazard unless excessive dust is present. Remove person to fresh air. Obtain medical advice immediately.
- Ingestion: Do no induce vomiting. If swallowed, obtain medical advice immediately. Wash out mouth with water.

ADVICE FOR DOCTORS:

Brodifacoum is an indirect anti-coagulant. Phytomenadione, Vitamin K1, is antidotal. In the case of suspected poisoning, determine prothrombin times not less than 18 hours after consumption. If elevated, administer vitamin K1 and continue until prothrombin times normalise. Continue determination of prothrombin time for three days after withdrawal of antidote and resume reatment if elevation recurs in that time.

Report all incidents of poisonings to the relevant national poisons centre; include information on the product authorisation number, product trade name and active substance. In Ireland, this is the National Poisons Information Centre, Beaumont Hospital, Dublin (01-8092166)

Environmental precautions

- Prevent accidental exposure of the product to the environment.
- Keep un-used bait locked-up and in secure storage containers
- Bait must be secured in tamper resistant bait boxes in areas away from drains, water courses and non-target organisms.

Environmental treatment

- Clean up accidental spillages promptly by sweeping or vacuum.
- If the product gets into water or soil, it should be removed mechanically. In the event of a significant accidental release, inform the appropriate authority.
- Transfer to a suitably labelled container and dispose of to a certified waste disposal operator for incineration and licensed waste disposal site.
- Subsequently, wash the contaminated area with water, taking care to prevent the washings entering sewers or drains.
- For further instructions, see section 3.4.6 below.

3.4.11. Procedures for cleaning application equipment

No application equipment is required, therefore, no specific cleaning for equipment is required

If necessary, following use, bait boxes should be washed with detergent and water. The bait box should be washed out 3 times (triple rinsed).

3.4.12. Identity of relevant combustion products in cases of fire

This product contains paraffin wax.

3.4.13. Procedures for waste management of the biocidal product and its packaging

The best means of disposal of any product is through proper use according to the label. For the product incinerate under controlled conditions. For the pack, do not dispose of the pack in domestic refuse. Empty completely, puncture or crush and dispose of safely to Local Authority and National requirements. Dispose of packaging, remains of unused product and dead rodents to a certified waste disposal operator for incineration and licensed waste disposal site.

3.4.14. Possibility of destruction or decontamination following accidental release

Air:

Brodifacoum has a low vapour pressure, therefore the potential for evaporation is low The vapour pressure is 5 x 10^{-5} Pa. As a rodenticide, this material is not intentionally aerosolised. Therefore, destruction in air is not a concern.

Water (including drinking water):
Prevent further leakage or spillage if safe to do so. Prevent entry into watercourses, sewers.

Soil:
Direct and/or intentional release to soil is not anticipated for the use of the product as a rodenticide. In the event of a significant accidental release, inform the appropriate authority.

3.4.15. Undesirable or unintended side-effects

Toxic to mammalian and avian species, including domesticated animals, wildlife and humans. Therefore the risk to these non-target species should be considered when using bait.

3.4.16. Poison control measures

The paste baits are dyed (e.g. red or blue) to make them unattractive to wildlife, and birds in particular. In addition, in case of accidental ingestion, the presence of a dye may help to confirm that there has been ingestion and thus facilitate antidote treatment.

The product contains a human taste deterrent (adversive agent – Bitrex).

To report human poisoning incidents call the relevant national poison information centre. Include information on the product authorisation number, product trade name and active substance. Where possible provide a copy of the label or safety data sheet (SDS).

In Ireland to report a poisoning incident, call: 01 (8092566 / 8379964) The Poisons Information Centre of Ireland, Beaumont Hospital, Beaumont Road, Dublin 9.

ADVICE FOR DOCTORS:

Brodifacoum is an indirect anti-coagulant. Phytomenadione, Vitamin K1, is antidotal. In the case of suspected poisoning, determine prothrombin times not less than 18 hours after consumption. If elevated, administer vitamin K1 and continue until prothrombin times normalise. Continue determination of prothrombin time for three days after withdrawal of antidote and resume reatment if elevation recurs in that time.

Report all incidents of poisonings to the relevant national poisons centre (include information on the product authorisation number, product trade name and active substance)

4. Proposal for Decision

The assessment presented in this report has shown that the ready-to-use product, Saphir Paste, formulated by Lodi S.A.S. with the active substance Brodifacoum, at a level of 0.005% w/w, may be authorised for use as a rodenticide (product-type 14) for the control of rodents (rats and mice).

Physical-Chemical Properties:
Saphir Paste has been shown not to present a physical-chemical hazard to end users and does not classify as highly flammable, oxidising or explosive. The bait is stable when stored at 54^{o}C for two weeks and when stored at ambient temperatures (20^{o}C) for two years. A shelf life of two years is proposed. A suitable method of analysis for the determination of Brodifacoum in the bait was provided.

The source of active substance used in the biocidal product Saphir Paste is the same source of active substance that is listed in Annex I of 98/8/EC. Syngenta initially supported the source, then the task force (Pelgar International Ltd and Activa) also supported the source, Italy carried out an equivalence check on the Task force source of Brodifacoum and found it to be equivalent to the Syngenta source. The RefMS accepted Italy's assessment.

Efficacy:
Saphir Paste (containing 40 mg/kg brodifacoum) is a ready-to-use paste bait (RB) intended to control the brown rat (*Rattus norvegicus*) and the house mouse mice (*Mus musculus*) indoors and outdoors (in and around buildings, open areas and waste disposal sites). The use scenario encompassing waste disposal sites and open areas is intended for professional users only. Effectiveness data has confirmed that Saphir Paste is effective in the proposed areas for use, at the recommended dose rate. Effective control should be expected from bait stored up to two years under suitable storage conditions.

Human Health:
The calculations presented have been made with the assumptions of rat control, and there are no separate calculations to assess exposure for mice control in which smaller bait sizes are used.

Using both the MOE and AEL approaches for risk assessment indicates that there is a satisfactory margin between the predicted exposure and the NOAEL (LOAEL) as well as exposures below the threshold value for the AEL for all intended uses by trained professionals with PPE, untrained professionals and amateurs (with and without PPE). The product is deemed suitable for authorisation and appropriate personal protective equipment is advised.

Secondary exposure from transient mouthing of the product exceeds the AEL reference value (0.0033µg/kg/day), both with the assumption of 0.01 g and 5 g of product ingested by infants. This is of concern. There is no margin of safety using the existing data and models. There is no safe scenario for indirect exposure if estimated according to TNsG and User Guidance. Mitigation and protection measures such as the inclusion of bittering agents and the enclosure of product in sealed packs and tamper resistant bait boxes are essential to reducing the risk of secondary exposure. Baits should not be placed where food, feeding stuffs or drinking water could be contaminated.

Environment:
The applicant did not submit any new environmental fate and behaviour studies with this product. Therefore the conclusions made at the Annex I inclusion stage for the active substance stand. The uses of this product were assessed here under the TGD and the PT14 ESD and all PEC/PNEC ratios were <1. However there is a risk for primary and secondary poisoning for non-target vertebrates. These identified risks are mitigated by applying all appropriate and available risk mitigation measures.

Conclusion:

During the active substance review of Brodifacoum by Italy, primary and secondary poisoning risks were identified for non-target organisms and for potential accidental poisoning incidents involving children. The assessment of those EU identified risks during the product authorisation evaluation of Brodifacoum have also indicated a potential risk of primary and secondary poisoning to non-target animals and the potential for the accidental primary poisoning of children. Due to these findings risk mitigation measures are applied to product authorisation.

Additionally, as the target rodents are vermin and are both direct transmitters of disease (such as through biting or contamination of food/feed by urine or faeces) or indirect carriers of disease (such as disease vectors, where fleas move from rat to humans) to humans and other animals. Transmitted diseases can include leptospirosis (or Weil's disease), trichinosis and salmonella. Authorisation of this product is considered necessary on the basis of public health grounds, since rodent populations are considered to constitute a danger to public health through the transmission of disease. However, risk mitigation measures and restrictions are required to prevent the possibility of the identified risks to non-target animals, companion animals and children.

Conditions of authorisation

Two authorisations should be issued. The first authorisation covers professional and trained professional use product. The second authorisation covers amateur use product.

This authorisation of Saphir Paste is for a period of 5-years with an annual renewal.

The concentration of the active substance, Brodifacoum, in Saphir Paste shall **not** exceed 0.05 g/kg (0.005% w/w).

Only ready-to-use Saphir Paste product is authorised.

As a poison control measure, the authorisation requires that the product shall contain an aversive, bittering agent.

The authorisation requires that the product be dyed with a colour to make them unattractive to wildlife, and birds in particular.

This product shall **not** be used as a tracking poison.

The product is authorised only for use against rats and mice (for example brown rats and house mice). Authorisation of this product does **not** allow use against non-target organisms.

The authorisation of this product for professionals and trained professionals only allows for use indoors and outdoors in the following areas: Indoors, including areas such as houses, warehouses, outbuildings and commercial premises. Outdoors uses only includes in-and-around buildings. The product can also be utilised in sewers. Brodifacoum baits must not be placed where food, feeding stuffs or drinking water can become contaminated.

The authorisation of this product for amateurs allows for use of this product indoors and outdoors around buildings in the following areas: Indoors, including only privates houses and outbuildings. Outdoors uses, including only around private building premises and private gardens and waste dumps. Brodifacoum baits should not be placed where food, feeding stuffs or drinking water can become contaminated.

The product should be used for rodent control in tamper resistant, secured bait stations or other secure coverings.

Bait stations should be clearly marked to show that they contain rodenticides and that they should not be disturbed.

Baits shall be secured to the bait station(s) so that rodents cannot remove bait from the bait box.

For amateur use products placed on the market in Ireland packaging restrictions are to be limited to pre-baited bait stations and refill packs with a maximum pack-size of 500g. Refill packs for amateurs must contain bait that is wrapped. Loose baits or grain (without wrapping) shall not be packaged for amateurs.

All product placed on the Irish market after the date of authorisation must be in compliance with the conditions of this authorisation and shall carry the approved label with the IE/BPA authorisation number and be packaged in the approved packaging.

Prior to any amendment relating to this authorised product, such as specification, use, labelling or administrative changes, application must be made to this Authority to do so

Upon annual renewal of the biocidal product, the authorisation holder shall provide statistics to PRCD on the import and export from Ireland and also manufacture statistics where appropriate for the product for the given full annual period or part thereof.

Authorisation of the biocidal product may be subject to review, following a detailed assessment of the risks involved, in accordance with the European Communities (Authorisation, Placing on the Market, Use and Control of Biocidal Products) Regulations, 2001, as amended. This review may lead to changes in or revocation of this authorisation.

Note (April 2018) The Annexes to PAR v1.1 are identical to those of V1.0

Annex 5 – PAR v1.2 – 24 February 2014

Product Assessment Report
Saphir Paste

Active substance:	**Brodifacoum**
Product-type:	**PT 14**
Type of application:	**Authorisation**
Authorisation No:	**IE/BPA 70286 (Professional)** **IE/BPA 70287 (Non-professional)**
Date:	**24 February 2014**
Version:	**1.2**

Biocidal Product Assessment Report (PAR) related to Product Authorisation under Directive 98/8/EC.

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

Pesticide Registration and Control Division
Department of Agriculture, Food and the Marine
Backweston Campus
Young's Cross
Celbridge
Co. Kildare
Ireland

CONTENTS

3. General information about the product application

This application for product authorisation is for:

Trade name:	Saphir Paste
Authorisation No.:	IE/BPA 70286 (Professional and Trained Professional) IE/BPA 70287 (General public / Non-professional)

Saphir Paste trade names in other Member States (based on R4BP data):

Trade name	Member State
Brodipesce Pate	Estonia, France, Latvia
Raco Force Paste	Ireland, UK
Saphir (Pasta)	Italy
Rodistar	Italy
Biosnap Rat and Mouse Killer	UK
Doff Prebaited Mouse Station	UK
Ratta Extra Brodifacoum Paste	UK

8.5 Applicant/ Authorization Holder

Company Name:	Lodi S.A.S.
Address:	Parc d'Activités des 4 Routes F-35390 Grand Fougeray, France
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

8.6 Marketing/Distributing Company (where applicable)

Company Name:	N/A
Address:	N/A
Tel:	N/A
E-mail:	N/A
Contact:	N/A

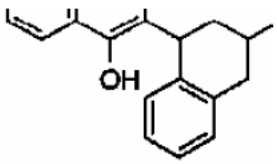
8.7 General Information on the Biocidal Product

Trade name:	Saphir Paste
Manufacturer's development code number(s):	N/A
Active substance content:	0.004% w/w Brodifacoum
Main group:	MG03 Pest Control
Product type:	PT14 (Rodenticides)
Product Specification:	See Confidential Annex
Site of product formulation:	See Confidential Annex
Frame formulation (yes/no):	No
Formulation type:	Paste Bait

Ready to use product (yes/no):	Yes
Chemical/micro-organism:	Chemical Substance
Contain or consist of GMOs[32] (yes/no):	N/A
Is the product already notified/authorised (Directive 98/8/EC) (yes/no); **If yes:** **product name:**	No N/A
Is the biocidal product equivalent to the product assessed for the purpose of Annex I inclusion to 98/8/EC (yes/no):	No.

Manufacturer of Formulated Product	
Company Name:	Company CGB (Compagnie Générale des Biocides)
Address:	Parc d'Activités des 4 Routes – F-35390 Grand Fougeray, France
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

8.8 Information on active substance(s)[33]

Active substance chemical name:	Brodifacoum
IUPAC name:	*3-[3-(4'-bromobiphenyl-4-yl)-1,2,3,4-tetrahydro-1-naphthyl]-4-hydroxycoumarin*
CAS No:	56073-10-0
EC No:	259-980-5
Purity (minimum, g/kg or g/l):	950 g/kg
Molecular formula:	$C_{31}H_{23}BrO_3$
Structural Formula:	
Manufacturing site:	See Confidential Annex
Specification of pure active substance:	See Confidential Annex

32 A copy of any written consent(s) of the competent authorities to the del berate release into the environment of the GMOs for research and development purposes where provided for by Part B of the above-mentioned Directive was provided.

33 Please insert additional columns as necessary

Is a new active substance data package (source) supplied (yes/no):	No
If yes, Is the active substance equivalent to the active substance listed in Annex I to 98/8/EC (yes/no):	N/A
If no, does the applicant have a LoA to the active substance data packaged used to support Annex I inclusion (yes/no):	Yes (Pelgar International Ltd.)

Manufacturer of active substance(s)	
Company Name:	Pelgar International Ltd.
Address:	Unit 13 Newman Lane Industrial Estate Alton. Hants. GU34 2 QR UK
Tel:	[redacted]
[redacted]	[redacted]
Contact:	[redacted]

8.9 Information on the intended use(s) of the biocidal product

Main Group:	MG03 (Pest control)
Product-type:	PT14 (Rodenticide)
Intended use:	Brodifacoum paste bait to control rodents indoors, outdoors around buildings (amateur use) and outdoors in open areas and waste dumps (professionals only) for the protection of public health, stored products and materials.
Target organisms:	(I.1) Rodents (I.1.1) Murids (I.1.1.1) Brown rats (*Rattus Norvegicus*) (I.1.1.3) House mouse (*Mus musculus*)
Development stage:	(II.1) Juveniles (II.2) Adults
Function:	Rodenticide
Mode of action:	Anticoagulant III.2 long-term action III.2.1 anticoagulant III.2.1.1 ingestion toxin III.2.1.1.1 ingestion by eating
Application aim:	VII.1 Stored product protection/food protection VII.2 Health protection VII.3 Material protection (e.g. historical buildings, technical objects)
Category of users:	V.1 Non Professional/General public V.2 Professional V.3 Trained/specialised professional
Area of use (indoors/outdoors):	IV.1 Indoors (warehouses, houses, outbuildings) IV.2 Outdoors (in and around buildings), IV.2 Outdoors (open areas and waste dumps) IE/BPA 70286 only

Application method:	VI.2 Covered applications VI.2.1 In bait stations(product can only be applied in bait stations for waste dump and open area applications) VI.2.2 Other coverings (this does not include application down rat holes)
Directions for use including minimum and maximum application rates, typical size of application area:	**IE/BPA 70286, IE/BPA 70287** Indoors and outdoors (in and around buildings) Rats (Adult and Juvenile): Secure 60g of bait in covered, tamper resistant baiting stations spaced 10m apart (3m apart in areas of high infestation) in areas where rats are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings). Mice (Adult and Juvenile): Secure 10g of bait, in covered, tamper resistant baiting stations spaced 5m apart (3m apart in high infestation areas) in areas where mice are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings). **IE/BPA 70286 (Professional Use Only)** Outdoors (open areas and waste dumps) Rats: Secure 60g of baits in covered tamper resistant baiting stations or covered bait points spaced 10m apart (5m apart in areas of high infestation) in areas where rats are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings). Mice: Secure 10g bait in covered tamper resistant baiting stations or covered bait points spaced 5m apart (3m apart in high infestation areas) in areas where mice are active. Regularly

	check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings).
Potential for release into the environment (yes/no):	Yes
Potential for contamination of food/feedingstuff (yes/no):	No

8.10 Documentation

5.1.15 Data submitted in relation to product application

A full new product dossier was submitted by Lodi S.A.S in support of the product Saphir Paste containing brodifacoum. Please see the attached reference list in Annex IV:

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

6. *Classification, labelling and packaging*

Under this heading the assessment of the classification, labelling and packaging should be summarised. Further, any result of the assessments made under the following headings that require recommendations or restrictions appearing on the label should be summarised here.

6.1. Harmonised classification of the active substance

Brodifacoum is not currently classified in Annex I of Council Directive 67/548/EEC or according to Annex VI of Regulation (EC) no 1907/2006 (REACH). The following classification and labelling is proposed on the basis of available data resulting from the review programme for brodifacoum and is provided in the table below according to Directive 67/548/EEC/Regulation (EC) 1272/2008. Additionally, the extrapolation of these proposals using the BG RCI converter tool (http://www.gischem.de/ghs/konverter) is also provided in the table below in accordance with Regulation (EC) 1272/2008.

Classification of the active substance, brodifacoum, according to Directive 67/548/EEC and CLP Regulation (EC) 1272/2008:

Symbol(s):	 	**Pictogram(s):**	
Indication(s) of danger:	T+ Very Toxic N Dangerous for the Environment	**Signal word(s):**	Danger
Risk phrases:	R26/27/28: Very toxic by inhalation, in contact with skin and if swallowed. R43: May cause sensitisation by skin contact R48/23/24/25: Toxic: Danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed. R61: May cause harm to the unborn child. R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.	**Hazard statements:**	H300: Fatal if swallowed. H310: Fatal in contact with skin. H317: May cause an allergic skin reaction H330: Fatal if inhaled. H360D: May damage the unborn child. H372: Causes damage to organs through prolonged or repeated exposure through inhalation. H400: Very toxic to aquatic life H410: Very toxic to aquatic life with long lasting effects.
Safety phrases:	S20/21: When eating do not eat, drink or smoke S35: The material and its container must be disposed of in a safe way S36/37: Wear suitable protective clothing and gloves S45: In case of accident or if you feel unwell seek medical advice immediately (show the label where possible) S60: This material and its container must be disposed of as hazardous waste. S61: Avoid release to the environment. Refer to special instructions/safety data sheet.	**Precautionary statements:**	P101: If medical advice ist needed, have product container or label at hand. P103: Read label before use. P270: Do not eat, drink or smoke when using this product. P273: Avoid release to the environment. P280: Wear protective gloves and clothing P281: Use personal protective equipment as required. P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P308 + P313: IF exposed or concerned: Get medical advice/attention.

			P314: Get medical advice/attention if you feel unwell. P501: Dispose of contents/container to hazardous waste facilities in accordance with national regulations.

Specific concentration limits for brodifacoum are proved below in accordance with Directive 67/548/EEC:

Specific concentration limits:	C≥2.5% 1%≤C<2.5% 0.5%≤C<1% 0.25%≤C<0.5% 0.025%≤C<0.25% 0.0025%≤C<0.025%	T+, N; R26/27/28-48/23/24/25-43-61-50/53 T+, N; R26/27/28-48/23/24/25-43-61-51/53 T+, N; R26/27/28-48/23/24/25-61-51/53 T+, N; R26/27/28-48/23/24/25-51/53 T ; R23/24/25-48/20/21/22-52/53 Xn; R20/21/22

Additionally, brodifacoum does not exhibit hazardous physical-chemical properties. Brodifacoum is thermally stable at 52°C. It is not classified as highly flammable and does not undergo self ignition below its melting point. It is not considered to be explosive or to have oxidising properties. There is no record that it has reacted with any storage container during many years of industrial production. It is concluded therefore, that there are no hazards associated with its physico-chemical properties under normal conditions of use.

6.2. Harmonised classification and labelling of the biocidal product

The current classification and labelling, based on the biocidal product evaluation for Saphir Paste, is provided in the tables below according to Directive 99/45/EC and Regulation (EC) 1272/2008, Annex VI, Part 3.

Classification and Labelling of the biocidal product according to Directive 99/45/EC:

Symbol(s):	Not applicable
Indication(s) of danger:	Not applicable
Risk phrases:	Not applicable
Safety phrases:	S1+S2: Keep locked up and out of reach of children S13: Keep away from food, drink and animal feeding stuffs. S20 + S21: When using do not eat, drink or smoke. S24: Avoid contact with skin S35: This material and its container must be disposed of in a safe way. S37: Wear suitable gloves (Professional only) S46: If swallowed, seek medical advice immediately and show this container or label. S49: Keep only in the original container S61: Avoid release to the environment. Refer to special instructions/safety data sheet

Classification and Labelling of the biocidal product according to the CLP Regulation (EC) 1272/2008:

Pictogram(s):	Not applicable
Signal word(s):	Not applicable
Hazard statements:	Not applicable
Precautionary statements	P102: Keep out of reach of children. P103: Read label before use. P220: Keep/Store away from food, drink and animal feedingstuffs. P262: Do not get on skin P270: Do not eat, drink or smoke when using this product. P273: Avoid release to the environment P280: Wear protective gloves (Professional only) P301+310: IF SWALLOWED: Immediately call a poison centre or doctor/physician. P404+405: Store locked up in a closed container. P501: Dispose of contents/container in accordance with national regulations.

Physical-chemical properties:
Not explosive, oxidising or highly flammable and therefore does not classify from a physical-chemical point of view.

Toxicology:
There is no toxicology classification for the product under the Directive 99/45.

There is no toxicology classification for the product under the CLP Regulation 1272/2008.

Environment:
There is no environmental classification for the product under the Directive 99/45.

There is no environmental classification for the product under the CLP Regulation 1272/2008.

Other:
Further, the content of the label should be updated to comply with the labelling requirements established (for biocidal products) where the labelling requirements in Article 20(3) of Directive 98/8/EC has been implemented. The safety data sheet should comply with the requirements in Regulation (EC) 1907/2006.

Additional Labelling Requirements:

Addition safety Information:	To avoid risks to human health and the environment, comply with the instructions for use. Harmful to wildlife Use bait containers clearly marked “poison” at all surface baiting points. Remove all remains of bait, dead rodents during and after treatment and dispose of safely. Apply only in positions inaccessible to children and pets.
Special labelling provisions for Ireland:	Use Biocides Safely and Sustainably (IE/BPA 70286) Not For Amateur Sale It is illegal to use this product for uses or in a manner other than that prescribed on this label.
If a separate leaflet is attached to or supplied with the product, add the following information to the front label:	Read attached instructions before use

6.3. Packaging

The packaging details for the biocidal product, Saphir Paste, as presented by the applicant, are outlined below for amateur and professional users.

Nomenclature: PP = polypropylene, PS = polystyrene, PE = polyethylene, HDPE = high-density polyethylene, PVC = polyvinylchloride, AL = Aluminium

Amateur product packaging:
On the basis of the packaging details presented, it is considered appropriate to limit aspects of the packaging for amateur users as a risk mitigation measure. Packaging restrictions are to be limited to pre-baited bait stations and refill packs with a **maximum pack-size of 500g**. Additionally, the pasta bait should be supplied to the amateur market in sachets/wrapped in order to reduce exposure risks to amateur operators during application to bait stations.

Amateur product packaging:

Amateur product packaging: cardboard case

Container description:	Cardboard case			
Pack size(s):	50g	100g	120g	200g
Baits per pack:	5x 10g	10x 10g	12x 10g	20x 10g
Pack dimensions (LxWxH):	50 x 24 x 80	100 x 48 x 160	100 x 48 x 160	140 x 55 x 180
Inner packaging materials:	PE or PP sachet			
Outer packaging materials:	Cardboard + PE liner			
Ready-to-use (yes/no)	Yes			
Child safety features (yes/no):	No			
If yes, please specify:	N/A			
Shelf-life:	2 years			
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.			

Amateur product packaging: cardboard case

Container description:	Cardboard case			
Pack size(s):	240g	250g	480g	500g
Baits per pack:	24x 10g	25x 10g	48x 10g	50x 10g

Pack dimensions (LxWxH):	140 x 55 x 180	140 x 55 x 180	140 x 70 x 210	140 x 70 x 210
Inner packaging materials:	PE or PP sachet			
Outer packaging materials:	Cardboard + PE liner			
Ready-to-use (yes/no)	Yes			
Child safety features (yes/no):	No			
If yes, please specify:	N/A			
Shelf-life:	2 years			
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.			

Amateur product packaging: SACHETS

Container description:	Sachets			
Pack size(s):	200 g	250 g	480 g	500 g
Baits per pack:	20*10g	25*10g	48*10g	50*10g
Pack dimensions (LxWxH):	180 x 50 x 190	190 x 50 x 190	190 x 50 x 250	190 x 50 x 250
Inner packaging materials:	PE or PP sachet			
Outer packaging materials	PE	PE sachet (zip pouch)	PE	PE
Ready-to-use (yes/no)	Yes			
Child safety features (yes/no):	No			
If yes, please specify:	N/A			
Shelf-life:	2 years			
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.			

Amateur product packaging: PREBAITED BAIT STATIONS

Container description:	Pre-baited bait stations in cardboard outer		
Pack size(s):	10 g	20 g	60 g
Baits per pack:	1*10g	2*10g	6*10g
Pack dimensions (LxWxH):	135 x 43 x 80	135 x 43 x 80	240 x 105x x190
Packaging materials:	PP pre-baited station into Cardboard case		
Ready-to-use (yes/no)	Yes		
Child safety features (yes/no):	No		
If yes, please specify:	N/A		
Shelf-life:	2 years		
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.		

Professional product packaging

Professional Product packaging: Buckets

Container description:	Buckets				
Pack size(s):	1 kg	2 kg	2.5 kg	3 kg	4 kg
Baits per pack:	100*10g	200*10g	250*10g	300*10g	400*10g
Pack dimensions (LxWxH):	250 x 170 x 120	290 x 205 x 215	290 x 205 x 215	290 x 205 x 215	290 x 200 x 270
Inner Packaging materials:	PE or PP sachet or loose bait				
Outer Packaging materials:	PE or PP bucket				
Ready-to-use (yes/no)	Yes				
Child safety features (yes/no):	No				
If yes, please specify:	N/A				
Shelf-life:	2 years				

Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional Product packaging: Buckets

Container description:	Buckets				
Pack size(s):	5 kg	10 kg	15 kg	20 kg	25 kg
Baits per pack:	500*10g	1000*10g	1500*10g	2000*10g	2500*10g
Pack dimensions (LxWxH):	290 x 200 x 270	390 x 300 x 350	380 x 285 x 450	380 x 285 x 450	380 x 285 x 450
Inner Packaging materials:	PE or PP sachet or loose bait				
Outer Packaging materials:	PE or PP bucket				
Ready-to-use (yes/no)	Yes				
Child safety features (yes/no):	No				
If yes, please specify:	N/A				
Shelf-life:	2 years				
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.				

Professional product packaging: cardboard boxes

Container description:	Cardboard boxes					
Pack size(s):	3 kg	5 kg	10 kg	15 kg	20 kg	25 kg
Baits per pack:	300*10g	500*10g	1000*10g	1500*10g	2000*10g	2500*10g
Pack dimensions (LxWxH):	150 x 100 x 150	290 x 200 x 270	390 x 290 x 240	390 x 390 x 245	400 x 400 x 370	400 x 400 x 370
Inner Packaging materials:	PE or PP sachet or loose bait					
Outer Packaging materials:	Cardboard + PE liner					
Ready-to-use (yes/no)	Yes					
Child safety features (yes/no):	No					
If yes, please specify:	N/A					
Shelf-life:	2 years					
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.					

Professional product packaging: cardboard cases

Container description:	Cardboard cases				
Pack size(s):	50 g	100 g	120 g	200 g	240 g
Baits per pack:	5*10g	10*10g	12*10g	20*10g	24*10g
Pack dimensions (LxWxH):	70 x 50 x 105	100 x 48 x 160	100 x 48 x 160	140 x 55 x 190	140 x 55 x 190
Inner Packaging materials:	PE or PP sachet or loose bait				
Packaging materials:	Cardboard + PE liner				
Ready-to-use (yes/no)	Yes				

Child safety features (yes/no):	No
If yes, please specify:	N/A
Shelf-life:	2 years
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional product packaging: cardboard cases

Container description:	Cardboard cases				
Pack size(s):	250g	480g	500g	520g	720g
Baits per pack:	25*10g	48*10g	50*10g	52*10g	72*10g
Pack dimensions (LxWxH):	140 x 55 x 190	140 x 70 x 210	140 x 70 x 210	140 x 70 x 210	183 x 72 x 263
Inner Packaging materials:	PE + PP sachet or loose bait				
Packaging materials:	Cardboard + PE liner				
Ready-to-use (yes/no)	Yes				
Child safety features (yes/no):	No				
If yes, please specify:	N/A				
Shelf-life:	2 years				
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.				

Professional product packaging: cardboard cases

Container description:	Cardboard cases		
Pack size(s):	750 g	1 kg	2 kg
Baits per pack:	75*10g	100*10g	200*10g
Pack dimensions (LxWxH):	183 x 72 x 263	183 x 72 x 263	320 x 210 x 170
Inner Packaging materials:	PE + PP sachet or loose bait		
Packaging materials:	Cardboard + PE liner		
Ready-to-use (yes/no)	Yes		
Child safety features (yes/no):	No		
If yes, please specify:	N/A		
Shelf-life:	2 years		

Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional product packaging: Zip pouch

Container description:	Zip pouch
Pack size(s):	250 g
Baits per pack:	25*10g
Pack dimensions (LxWxH):	195 x 150 x 40
Outer packaging materials:	PE + PP sachet or loose bait
Inner packaging materials:	PE sachet (zip pouch)
Ready-to-use (yes/no)	Yes
Child safety features (yes/no):	No
If yes, please specify:	N/A
Shelf-life:	2 years
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional product packaging: Prebaited bait stations

Container description:	Prebaited bait stations	
Pack size(s):	240 g	480 g
Baits per pack:	24*10g	48*10g
Pack dimensions (LxWxH):	240 x 115 x 190	240 x 115 x 190
Outer packaging materials:	cardboard case	
Inner packaging materials:	PP + PP pre-baited station	
Ready-to-use (yes/no)	Yes	

Child safety features (yes/no):	No
If yes, please specify:	N/A
Shelf-life:	2 years
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Container materials[34]: Case – cardboard with PE liner

Bag – PE

Sachets – PE + PP

Pre-baited bait stations – PP

Bucket – PP or PE

Box – Cardboard with PE liner

Safety features: Covered bait stations (tamper resistant)

Wrapped bait (sachets)

[34] PP = polypropylene, PS = polystyrene, PE = polyethylene, HDPE = high-density polyethylene, PVC = polyvinylchloride

5. Summary of the product assessment

5.1. Physico/chemical properties and analytical methods

Active substance (taken from the Activa/PelGar Brodifacoum and Difenacoum Task Force CAR):
Brodifacoum is an off-white powder at 20°C and atmospheric pressure, with a relative density of 1.53. It was observed to darken and decompose at 235.8°C, whereas no decomposition or transformation occurred below 150°C. Brodifacoum is non-volatile, with a Henry's Law Constant value of 2.35E-18 $Pa.m^3.mol^{-1}$. It is essentially insoluble in water at pH 5, but its solubility proved to increase with pH, due to the variation of the ionisation degree of the 4-*hydroxycoumarin* group in pH range under investigation (5-9). Brodifacoum also turned out to be soluble in organic solvents; results showed that solubility did not vary with temperature, except for dichloromethane.

Brodifacoum dissociation constant was estimated to be 4.50. Log P_{ow} was found to be 4.92 at pH 7 and 20°C. As expected, Log P_{ow} decreased with higher temperature and pH. Brodifacoum is not highly flammable. Besides, it does not show explosive or oxidising properties. Reaction with container materials (mild steel) has not been observed, either. All results considered, it can be concluded that Brodifacoum does not exhibit hazardous physical-chemical properties.

Biocidal product:
Saphir Paste is not explosive, oxidising or highly flammable and therefore does not classify from a physical and chemical point of view. The paste bait is stable when stored for 2 weeks at 54°C and when stored at ambient temperatures (20°C) for 2 years. The paste bait is stable when stored in various different packaging materials (with the exception of the coextruded bag with cardboard box) for 2 years at ambient temperature (20°C). The test item is a ready-to-use paste bait and is not intended to be added or mixed with any other product.

3.1.1. Identity related issues

An equivalence check was carried out by Italy that showed that the PelGar source of Brodifacoum active substance was equivalent to the source of Brodifacoum active substance listed in Annex I of 98/8/EC (see Annex I: Confidential Information and Data).

Composition of the biocidal product Saphir Paste

Component	% w/w	g/kg	Chemical name	CAS no	Function
Brodifacoum	0.005	0.05	3-[3-(4'-bromobiphenyl-4-yl)-1,2,3,4-tetrahydro-1-naphthyl]-4-hydroxycoumarin	56073-10-0	Active substance
Co-formulants	See Confidential Data and Information (Annex I)				

Note: The biocidal product Saphir Paste is not the same as the representative biocidal product accompanying the Annex I inclusion. See confidential information and data for details of the composition of Saphir Paste.

5.1.17 3.1.2. Physico-chemical properties

LODI S.A.S. have a letter of access from PelGar International Limited which covers the all the data for the Annex I listing of the active ingredient Brodifacoum. PelGar International Limited is a member of the Activa/PelGar Difenacoum and Brodifacoum Task Force and as such has access to the complete Annex I listing documentation submitted by this group. LODI do not have access to any of PelGar's product studies (Annex III) data for the purpose of product authorisation at the Member State level.

3.1.3. Physical, Chemical and Technical Properties of the Biocidal Product

Summary of the Physical and Chemical Properties of the Biocidal Product Saphir Paste

Section	Study	Method	Results	Comment	Reference
1.1	Appearance	Observation.	Aspect: Malleable blue paste in individual sachet Colour: 2.5PB5/6 Odour: No characteristic odour	Carried out to GLP. The results are acceptable.	"Chemical stability of Brodifacoum paste bait after accelerated storage". Study no. LODI.59/2011. 15th November 2011. Richerioux, Sandra.
1.2.1	Explosive properties	Justification (examination of the components of the formulation)	"Based on the structural formula of the components, Brodifacoum paste bait has no potential of explosivity and the test according to OECD A14 method is not required."	Carried out to GLP. The components do not contain any group that might act as an explosive agent. The RefMS accepts the Applicant's justification. Saphir Paste is not explosive.	"Explosive properties of Brodifacoum paste bait". Study no. LODI.66/2011. 25th September 2011. Richerioux, Sandra.
1.2.2	Oxidising properties	Justification (examination of the components of the formulation)	"Based on the structural formula of the components, the product have no potential for oxidising properties and the test according to OECD A17 method is not required."	Carried out to GLP. The components do not contain any group that might act as an oxidising agent. The RefMS accepts the Applicant's justification. Saphir Paste is not oxidising.	"Oxidising properties of Brodifacoum paste bait". Study no. LODI.65/2011. 8th November 2011. Richerioux, Sandra.
1.3.1	Flash point			Not required. The test item is not a liquid.	
1.3.2	Flammability	EEC method A 10	Preliminary test: The flame of a gas burner ignited the test substance pile. The test substance glowed, burned with a little flame and turned into a charred residue. A light white smoke was observed. After removal of the ignition source, the flame doesn't spread and extinguished immediately. No more propagation of combustion was observed.	Carried out to GLP. Propagation of combustion of the test item is less than 200mm length of the pile within 4 minutes. Therefore, the main test is not required. The test item is not highly	"Flammability of Brodifacoum paste bait". Study no. LODI.58/2011. 27th June 2011. Meriadec, Elodie.

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td></td><td>flammable.</td><td></td></tr>
<tr><td>1.3.3</td><td>Auto-flammability</td><td>EEC method A 16.</td><td>No self ignition temperature of the test item was recorded up to 400^{o}C (corrected value).</td><td>Carried out to GLP. The result is acceptable.
The test item is not auto-flammable.</td><td>“Self ignition temperature of solids on Brodifacoum paste bait”. Report no. 11-912011-010. 23rd January 2012. Demangel, Benjamin.</td></tr>
<tr><td>1.4.1</td><td>Free acidity/ Alkalinity</td><td></td><td>Determination is not required because pH of a 1% (m/v) aqueous dilution of Brodifacoum Paste Bait is >4 and < 10 (FAO guideline).</td><td>Not required.</td><td></td></tr>
<tr><td>1.4.2</td><td>pH (1 %)</td><td>CIPAC MT 75.3</td><td>The pH in distilled water is 6.3 after 10 minutes.</td><td>Carried out to GLP. The result is acceptable.</td><td>“pH of Brodifacoum paste bait”. Study no. LODI.64/2011. 7th October 2011. Richerioux, Sandra.</td></tr>
<tr><td>1.5.1</td><td>Viscosity</td><td></td><td></td><td>Not applicable as the product is a ready to use paste.</td><td></td></tr>
<tr><td>1.5.2</td><td>Surface tension</td><td></td><td></td><td>Not applicable as the product is a ready to use paste.</td><td></td></tr>
<tr><td>1.6</td><td>Relative density</td><td>OECD 109 and NF T20-053 method.</td><td>1.142</td><td>Carried out to GLP. A pycnometer was used to determine the relative density. The result is acceptable.</td><td>“Relative density of Brodifacoum paste bait”. Study no. LODI.52/2011. 9th September 2011. Richerioux, Sandra.</td></tr>
<tr><td>1.7.1</td><td>Storage stability
(accelerated storage)</td><td>CIPAC MT 46.
GIFAP Monograph no.17</td><td>Aspect:
<table><tr><th></th><th>Aspect</th><th>Colour</th><th>Odour</th></tr><tr><td>T_0</td><td>Malleable blue paste in individual sachet</td><td>2.5PB5/6</td><td>No characteristic odour</td></tr><tr><td>T_{14days}</td><td>Still malleable blue</td><td>10B4/4</td><td>No</td></tr></table></td><td>Carried out to GLP. The test item is stable for 2 and 3 weeks at 54^{o}C. The results indicate that the test item will be stable for 2 and 3 years at ambient temperatures. The results are acceptable.</td><td>“Chemical stability of Brodifacoum paste bait after accelerated storage”. Study no. LODI.59/2011. 15th November 2011. Richerioux, Sandra.</td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td></td><td>paste but slightly friable, in individual sachet</td><td></td><td>characteristic odour</td></tr>
<tr><td>T_{21days}</td><td>Still malleable blue paste but slightly friable, in individual sachet</td><td>10B4/4</td><td>No characteristic odour</td></tr>
</table>
Active substance content:
<table>
<tr><th></th><th>Concentration (ppm)</th><th>Deviation with declared value (%)</th><th>Deviation between T_0 and T_{14} and T_{21} (%)</th></tr>
<tr><td>T_0</td><td>45.12</td><td>+12.80</td><td>-</td></tr>
<tr><td>T_{14days}</td><td>43.62</td><td>+9.05</td><td>-3.32</td></tr>
<tr><td>T_{21days}</td><td>42.64</td><td>+6.60</td><td>-5.50</td></tr>
</table>
The declared active substance content was 40 ppm.
</td><td></td><td></td></tr>
<tr><td>1.7.2</td><td>Shelf life (storage ambient temperatures)</td><td>GIFAP Monograph no.17.</td><td>
Aspect:
T_0 = Malleable blue paste in individual bag
$T_{6months}$ = Malleable blue paste in individual bag
T_{1year} = Malleable blue paste in individual bag
$T_{17months}$ = Malleable blue paste in individual bag
$T_{2\ years}$ = Malleable blue paste in individual bag

Colour:
T_0 = 2.5PB5/6
$T_{6months}$ = 2.5PB5/6
T_{1year} = 2.5PB5/6
$T_{17months}$ = 2.5PB5/6
T_{2years} = 2.5PB5/6
</td><td>Carried out to GLP. Carried out at $20^oC \pm 2^oC$. The paste bait is stable for 2 years storage at ambient temperatures. The results are acceptable.</td><td>“Chemical stability of Brodifacoum Paste Bait after 1 year storage at 20^oC.” Study no. LODI.60/2011. 26th October 2012. Richerioux, Sandra.
&
“Chemical stability of Brodifacoum Paste Bait after 2 years storage at 20^oC.” Study no. LODI.61/2011. 19th November 2013. Richerioux, Sandra.</td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
Odour:
T_0 = No characteristic odour
$T_{6months}$ = No characteristic odour
T_{1year} = No characteristic odour
$T_{17months}$ = No characteristic odour
T_{2years} = No characteristic odour

Active substance content:
<table>
<tr><th></th><th>Conc. (ppm)</th><th>Deviation with declared value (%)</th><th>Deviation between T_0 and T_x (%)</th></tr>
<tr><td>T_0</td><td>45.1</td><td>+12.75</td><td>-</td></tr>
<tr><td>T_{6month}</td><td>41.7</td><td>+4.25</td><td>-7.54</td></tr>
<tr><td>T_{1year}</td><td>41.6</td><td>+4.00</td><td>-7.76</td></tr>
<tr><td>$T_{17months}$</td><td>43.9</td><td>+9.75</td><td>-2.66</td></tr>
<tr><td>T_{2years}</td><td>42.4</td><td>+6.00</td><td>-5.99</td></tr>
</table>
The declared value is 40 ppm.
</td><td></td><td></td></tr>
<tr><td>1.7.3</td><td>Packaging stability
(20°C)</td><td></td><td>
Physical properties (for all types of packaging):
T_0 = Blue and malleable paste in individual bag. Presence of grease on individual bag.
$T_{6months}$ = Blue and malleable paste in individual bag. Presence of grease on individual bag.
T_{1year} = Blue and malleable paste in individual bag. Presence of grease on individual bag.
T_{2years} = Blue and malleable paste in individual bag. Presence of grease on individual bag.

PP Bucket:
<table>
<tr><th></th><th colspan="3">Weight</th></tr>
<tr><th></th><th>Bucket (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
</table>
</td><td>Carried out to GLP.
The deviation weights (packaging weights and test item weights) after 2 years at 20 ± 2°C are lower than 5% for the following packaging: paper teabag, PP bucket, PP and PE bag with cardboard box, Doypack, PS and PP prebaited baitbox. Moreover, no significant changes were observed on these packaging and on the test item.</td><td>“Chemical and packagings stability of Brodifacoum paste bait after 3 years storage at 20°C (Analysis at T = 1year)”. Study no. LODI.62/2011.B. 30th October 2012. Richerioux, Sandra.
&
“Chemical and packagings stability of Brodifacoum paste bait after 3 years storage at 20°C (Analysis at T = 2years)”. Study no. LODI.62/2011.C. 6th</td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>
<table>
<tr><td>T_0</td><td>44.134</td><td>293.21</td><td>337.35</td></tr>
<tr><td>$T_{6months}$</td><td>44.428</td><td>292.67</td><td>337.11</td></tr>
<tr><td>Deviation</td><td>0.67%</td><td>-0.18%</td><td>-0.07%</td></tr>
<tr><td>T_{1year}</td><td>44.436</td><td>291.58</td><td>336.01</td></tr>
<tr><td>Deviation</td><td>0.68%</td><td>-0.56%</td><td>-0.40%</td></tr>
<tr><td>T_{2years}</td><td>44.430</td><td>290.19</td><td>334.63</td></tr>
<tr><td>Deviation</td><td>0.67%</td><td>-1.03%</td><td>-0.81%</td></tr>
</table>
T_0 = Bucket with white and non-porous internal wall
$T_{6months}$ = Bucket with white and non-porous internal wall. Presence of grease on internal wall of the bucket
T_{1year} = Bucket with white and non-porous internal wall. Presence of grease on internal wall of the bucket
T_{2years} = Bucket with white and non-porous internal wall. Presence of grease on internal wall of the bucket

PE bag with cardboard box:
<table>
<tr><th></th><th colspan="4">Weight</th></tr>
<tr><th></th><th>PE bag (g)</th><th>Cardboard box (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
<tr><td>T_0</td><td>3.420</td><td>23.410</td><td>122.75</td><td>149.57</td></tr>
<tr><td>$T_{6months}$</td><td>3.512</td><td>23.690</td><td>120.47</td><td>147.64</td></tr>
<tr><td>Deviation</td><td>2.69%</td><td>1.20%</td><td>-1.86%</td><td>-1.29%</td></tr>
<tr><td>T_{1year}</td><td>3.484</td><td>23.998</td><td>121.18</td><td>148.66</td></tr>
<tr><td>Deviation</td><td>1.87%</td><td>2.51%</td><td>-1.28%</td><td>-0.61%</td></tr>
<tr><td>T_{2years}</td><td>3.485</td><td>23.931</td><td>120.70</td><td>148.12</td></tr>
<tr><td>Deviation</td><td>1.90%</td><td>2.23%</td><td>-1.67%</td><td>-0.97%</td></tr>
</table>
T_0 = Transparent bag without hole – cardboard box with grey and dry internal wall
$T_{6months}$ = Transparent bag, without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.
T_{1year} = Transparent bag, without hole. Presence of grease within
</td>
<td>For the coextruded bag with cardboard box, the deviation weight is higher than 5% (-8.29%) and grease was observed at the bottom of the box.
The packaging is stable for 2 years at ambient temperature with the exception of the coextruded bag with cardboard box.
The results are acceptable.</td>
<td>November 2013. Richerioux, Sandra.</td>
</tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
bag – cardboard box with grey and dry internal wall.
T_{2years} = Transparent bag, without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

PP bag with cardboard box:
<table>
<tr><th></th><th colspan="4">Weight</th></tr>
<tr><th></th><th>PP bag (g)</th><th>Cardboard box (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
<tr><td>T_0</td><td>6.972</td><td>23.503</td><td>111.36</td><td>141.83</td></tr>
<tr><td>$T_{6months}$</td><td>7.042</td><td>23.776</td><td>110.18</td><td>141.01</td></tr>
<tr><td>Deviation</td><td>1.00%</td><td>1.16%</td><td>-1.06%</td><td>-0.58%</td></tr>
<tr><td>T_{1year}</td><td>7.037</td><td>24.094</td><td>110.22</td><td>141.36</td></tr>
<tr><td>Deviation</td><td>0.93%</td><td>2.51%</td><td>-1.02%</td><td>-0.33%</td></tr>
<tr><td>T_{2years}</td><td>7.053</td><td>24.005</td><td>109.55</td><td>140.61</td></tr>
<tr><td>Deviation</td><td>1.16%</td><td>2.14%</td><td>-1.63%</td><td>-0.86%</td></tr>
</table>
T_0 = Transparent bag with one hole – cardboard box with grey and dry internal wall
$T_{6months}$ = Transparent bag with one hole. Presence of grease within bag – cardboard box with grey and dry internal wall.
T_{1year} = Transparent bag with one hole. Presence of grease within bag – cardboard box with grey and dry internal wall.
T_{2years} = Transparent bag with one hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

Coextruded bag with cardboard box:
<table>
<tr><th></th><th colspan="4">Weight</th></tr>
<tr><th></th><th>Coextruded bag (g)</th><th>Cardboard box (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
<tr><td>T_0</td><td>5.016</td><td>23.386</td><td>82.638</td><td>111.04</td></tr>
<tr><td>$T_{6months}$</td><td>4.600</td><td>23.950</td><td>79.887</td><td>108.91</td></tr>
<tr><td>Deviation</td><td>-8.29%</td><td>2.41%</td><td>-3.33%</td><td>-1.92%</td></tr>
</table>
</td><td></td><td></td></tr>
</table>

Section	Study	Method	Results	Comment	Reference

T_{1year}	4.652	24.269	80.954	110.20
Deviation	-7.76%	3.78%	-2.04%	-0.76%
T_{2years}	4.942	24.479	80.534	109.96
Deviation	-1.48%	4.67%	-2.55%	-0.97%

T_0 = Transparent and non-porous bag without hole – cardboard box with grey and dry internal wall

$T_{6months}$ = Transparent and non-porous bag without hole. Presence of grease within bag – cardboard box with grey internal wall. Presence of grease at the bottom of the box.

T_{1year} = Transparent and non-porous bag without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

T_{2years} = Transparent and non-porous bag. Holes in the weld. Presence of grease within bag – presence of grease on the wall of the box.

Doypack:

	Weight		
	Doypack (g)	**Test item (g)**	**Total (g)**
T_0	11.803	154.86	166.66
$T_{6months}$	12.118	154.21	166.33
Deviation	2.67%	-0.42%	-0.20%
T_{1year}	12.126	154.15	166.27
Deviation	2.74%	-0.46%	-0.23%
T_{2years}	12.131	153.61	165.74
Deviation	2.78%	-0.81%	-0.55%

T_0 = Internal wall in aluminium, without porosity and hole

$T_{6months}$ = Internal wall in aluminium, without porosity and hole. Presence of grease on internal wall of the doypack

T_{1year} = Internal wall in aluminium, without porosity and hole. Presence of grease on internal wall of the doypack

T_{2years} = Internal wall in aluminium, without porosity and hole.

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
Presence of grease on internal wall of the doypack

PP prebaited baitbox:
<table>
<tr><td></td><td colspan="4">Weight (g)</td></tr>
<tr><td></td><td>Bait station</td><td>Sample 1</td><td>Sample 2</td><td>Total</td></tr>
<tr><td>T_0</td><td>47.465</td><td>10.942</td><td>10.177</td><td>68.583</td></tr>
<tr><td>$T_{6months}$</td><td>47.725</td><td>10.616</td><td>9.849</td><td>68.191</td></tr>
<tr><td>Deviation</td><td>0.55%</td><td>-2.98%</td><td>-3.22%</td><td>-0.57%</td></tr>
<tr><td>T_{1year}</td><td>47.735</td><td>10.770</td><td>9.980</td><td>68.487</td></tr>
<tr><td>Deviation</td><td>0.57%</td><td>-1.57%</td><td>-1.94%</td><td>-0.14%</td></tr>
<tr><td>T_{2years}</td><td>47.738</td><td>10.742</td><td>10.001</td><td>68.484</td></tr>
<tr><td>Deviation</td><td>0.58%</td><td>-1.83%</td><td>-1.73%</td><td>-0.14%</td></tr>
</table>
T_0 = Black box with smooth internal wall, without porosity.
$T_{6months}$ = Black box with smooth internal wall, without porosity. Presence of grease at the location of the paste.
T_{1year} = Black box with smooth internal wall, without porosity. Presence of grease at the location of the paste.
T_{2years} = Black box with smooth internal wall, without porosity. Presence of grease at the location of the paste.

PS prebaited baitbox:
<table>
<tr><td></td><td colspan="4">Weight (g)</td></tr>
<tr><td></td><td>Bait station</td><td>Sample 1</td><td>Sample 2</td><td>Total</td></tr>
<tr><td>T_0</td><td>11.992</td><td>10.258</td><td>10.374</td><td>32.625</td></tr>
<tr><td>$T_{6months}$</td><td>12.259</td><td>9.955</td><td>10.047</td><td>32.263</td></tr>
<tr><td>Deviation</td><td>2.23%</td><td>-2.95%</td><td>-3.15%</td><td>-1.11%</td></tr>
<tr><td>T_{1year}</td><td>12.268</td><td>10.072</td><td>10.215</td><td>32.559</td></tr>
<tr><td>Deviation</td><td>2.30%</td><td>-1.81%</td><td>-1.53%</td><td>-0.20%</td></tr>
<tr><td>T_{2years}</td><td>12.265</td><td>10.101</td><td>10.189</td><td>32.556</td></tr>
</table>
</td><td></td><td></td></tr>
</table>

Section	Study	Method	Results	Comment	Reference
			<table><tr><td>Deviation</td><td>2.28%</td><td>-1.53%</td><td>-1.78%</td><td>-0.21%</td></tr></table> T_0 = Black box with smooth internal wall at the location of the paste $T_{6months}$ = Black box with smooth internal wall at the location of the paste. Presence of grease at location of the paste. T_{1year} = Black box with smooth internal wall at the location of the paste. Presence of grease at location of the paste. T_{2years} = Black box with smooth internal wall at the location of the paste. Presence of grease at location of the paste.		
1.8.1	Wettability			Not applicable as the product is a ready to use paste.	
1.8.2	Persistent foaming			Not applicable as the product is a ready to use paste.	
1.8.3.1	Suspensibility			Not applicable as the product is a ready to use paste.	
1.8.3.2	Dispersibility			Not applicable as the product is a ready to use paste.	
1.8.4	Wet/dry sieving test			Not applicable as the product is a ready to use paste.	
1.8.5	Particle size distribution			Not applicable as the product is a ready to use paste.	
1.8.6	Water content			Not applicable as the product is a ready to use paste.	
1.8.7	Emulsion stability			Not applicable as the product is a ready to use paste.	

Section	Study	Method	Results	Comment	Reference
1.8.8	Flowability, pourability and dustability			Not applicable as the product is a ready to use paste.	
1.9	Physical compatibility			Not applicable. The product is ready-to-use. It is not intended to be mixed with any other product.	

Conclusions:

Saphir Paste is not explosive, oxidising or highly flammable and therefore does not classify from a physical and chemical point of view. The paste bait is stable when stored for 2 weeks at 54^{o}C and when stored at ambient temperatures (20^{o}C) for 2 years. The paste bait is stable when stored in various different packaging materials (with the exception of the coextruded bag with cardboard box) for 2 years at ambient temperature (20^{o}C). The test item is a ready-to-use paste bait and is not intended to be added or mixed with any other product.

Data requirements:

1. The provisional dates for the submission of the packaging stability data for the 3 year time-point is week 45, 2014.

The paste bait is compatible with the following packaging:

paper teabag, PP bucket, PP and PE bag with cardboard box, Doypack, PS and PP prebaited baitbox.

The paste bait is incompatible with the following packaging:

Coextruded bag with cardboard box.

Proposed shelf life for the grain bait:

2-years.

5.1.18 3.1.4. Analytical methods

Saphir Paste was not assessed as part of the Annex I inclusion process therefore the Applicant has submitted the following method of analysis to cover the outstanding data gap.

<table>
<tr><td>Report:</td><td>LODI.51/2011</td></tr>
<tr><td>Title:</td><td>“Brodifacoum paste bait, Brodifacoum grain bait”</td></tr>
<tr><td>Author(s):</td><td>Richerioux, Sandra.</td></tr>
<tr><td>Date:</td><td>23rd January 2012</td></tr>
<tr><td>GLP: Yes/No</td><td>Yes</td></tr>
<tr><td>Principle of the Method:</td><td>Brodifacoum was quantified by liquid chromatography using a reverse phase column and a UV detector at 310 nm.</td></tr>
<tr><td>Linearity:</td><td>The operator prepared five solutions containing 80%, 90%, 100%, 110% and 120% of the concentration of the test item. Three injections were carried out for each solution. The concentrations used were 1.61, 1.81, 2.01, 2.21 and 2.41 mg/L.
For Brodifacoum peak 1 the r^2 was 0.9949. A calibration curve was provided and was linear.
For Brodifacoum peak 2 the r^2 was 0.9923. A calibration curve was provided and was linear.</td></tr>
<tr><td>Precision/repeatability:</td><td>Three solutions were prepared of a concentration C (~ 2.00586 mg/l) of the product. Three injections of each solution were carried out and the RSD was calculated.

Intermediary fidelity (mg/l):
<table>
<tr><th></th><th>1st Injection</th><th>2nd Injection</th><th>3rd Injection</th></tr>
<tr><td>Solution a</td><td>2.23</td><td>2.21</td><td>2.25</td></tr>
<tr><td>Solution b</td><td>2.25</td><td>2.19</td><td>2.25</td></tr>
<tr><td>Solution c</td><td>2.26</td><td>2.21</td><td>2.22</td></tr>
</table>
% RSD = 0.949

Intralaboratory fidelity (mg/l):
<table>
<tr><th></th><th>1st Injection</th><th>2nd Injection</th><th>3rd Injection</th></tr>
<tr><td>Solution a</td><td>2.21</td><td>2.28</td><td>2.23</td></tr>
<tr><td>Solution b</td><td>2.25</td><td>2.19</td><td>2.25</td></tr>
<tr><td>Solution c</td><td>2.26</td><td>2.21</td><td>2.22</td></tr>
</table>
% RSD = 1.188</td></tr>
<tr><td>Accuracy:</td><td>Recovery results:
<table>
<tr><td>Paste bait</td><td>50% doped placebo</td><td>100% doped placebo</td><td>150% doped placebo</td><td>Overall MR</td></tr>
<tr><td>Theoretical content (ppm)</td><td>22.38</td><td>41.12</td><td>59.06</td><td rowspan="2">99.28%</td></tr>
<tr><td>Experimental content</td><td>23.98</td><td>40.68</td><td>54.20</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td>(ppm) – mean of 3 injections</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Mean recovery (MR)</td><td>107.15%</td><td>98.93%</td><td>91.77%</td><td></td></tr>
</table>
The operator doped a placebo with 50, 100 and 150% of the theoretical concentration of test item. Three injections were carried out per solution. The mean recovery (MR) was calculated for each solution.
</td></tr>
<tr><td>Specificity:</td><td>The operator injected a placebo. If an adjacent peak appeared, the resolution must be higher than 2. The operator then stresses the sample by adding 5 ml of acetic acid and injects the solution. If a peak appeared, the resolution must be higher than 2.

No peak other than internal standard was found for the placebo paste.
No peak appeared for the paste bait that was stressed with acetic acid.
Chromatograms were provided and were acceptable.</td></tr>
<tr><td>Limit of detection:</td><td>The operator injected a solution containing 10 ppm of active substance and calculated the ratio S/N between the intensity of the peak and the intensity of the background noise. The operator divided by 10 then by 2 the concentration of the active substance until obtaining a ratio lower than 3. The LOD is the last concentration for which S/N is higher than 3.

LOD = 0.1254 ppm</td></tr>
<tr><td>Limit of quantification:</td><td>The operator injected a solution containing 50 ppm of active substance and calculated the ratio S/N between the intensity of the peak and the intensity of the background noise. The operator divided by 10 then by 2 the concentration of the active substance to obtain a ratio lower than 10. The LOQ is the last concentration for which S/N is higher than 10.

LOQ = 0.6270 ppm</td></tr>
</table>

Conclusion:
The method is acceptable for the determination of Brodifacoum in the paste bait.

Data requirements:
None.

5.1.19 3.1.5. Analytical method for the relevant impurities, isomers and co-formulants in the biocidal product

Not applicable.

7.2. Efficacy of the Biocidal Product

7.2.1. Function/Field of use

PT14: Rodenticide

7.2.2. Organisms to be controlled

Saphir Paste (containing 40 mg/kg brodifacoum) is a ready-to-use paste bait (RB) intended to control the brown rat (*Rattus norvegicus*) and the house mouse mice (*Mus musculus*). Lodi has proposed the use area as indoors and outdoors (in and around buildings, waste disposal sites, open areas) for the protection of public health stored products and materials. The use scenario encompassing waste disposal sites and open areas is intended for professional users only.
For rats, each bait point will contain 60g of bait; a mouse bait point will contain 10g bait. Bait points are placed typically every 5-10m (rats) or 2-5 m (mice) with the distances adapted to the infestation level.

Advice concerning application frequency should be included on the draft label.
The label should contain wording to the effect that effective control should be expected from bait stored up to two years under suitable storage conditions.

7.2.3. Dose/Mode of action

Anticoagulant rodenticides are vitamin K antagonists. The main site of their action is the liver, where several of the blood coagulation precursors undergo vitamin K dependent post translation processing before they are converted into the respective procoagulant zymogens. The specific point of action is thought to be the inhibition of K_1 epoxide reductase. The anticoagulants accumulate and are stored in the liver until broken down. The plasma prothrombin (procoagulant factor II) concentration provides a suitable guide to the severity of acute intoxication and to the effectiveness and required duration of the antidoting therapy (vitamin K_1).

7.2.4. Effects on the target organisms (efficacy)

Data from trials using the paste formulation were provided in the form of laboratory and field studies to verify the proposed label claims.

Laboratory palatability and efficacy studies:
One laboratory palatability and efficacy (choice) test conducted on rats (lab reared and wild) and wild mice with fresh bait.
One laboratory palatability and efficacy (choice) test conducted on rats and mice with fresh and aged bait (6, 12 & 24 month storage).
One laboratory palatability and efficacy (choice) test conducted on rats with bait with aged bait (accelerated storage).
One laboratory palatability and efficacy (choice) test conducted on mice with with aged bait (accelerated storage).

Field efficacy studies:
One field studies conducted on rats (*Rattus norvegicus*).
One field studies conducted on mice (*Mus musculus*).

The applicant provided the study reports from four laboratory studies conducted on Brodipasta which is equivalent to Saphir paste. The experiments were all choice studies conducted to high standard according to relevant in-house methods, CEB methods, EPPO guideline or in accordance with the TNsG on Product Evaluation Appendices to Chapter 7 - Product Type 14 - Efficacy Evaluation of Rodenticidal Biocidal Products endorsed at the 32nd meeting of representatives of Members States Competent Authorities.
The results from the studies are summarised in **Table 3.2**. The results achieved demonstrated that Saphir paste is palatable to the house mouse and the brown rat according to the criteria given in TNsG on Product Evaluation as the bait intake was greater than 20% of the total food consumption in all the studies. The storage treatment (even up to 24 month storage) was found not to adversely affect the

palatability or effectiveness of the product. The treated bait achieved 100% mortality across all the laboratory tests.

Results from two field studies using Saphir paste were also provided. The field trial programme demonstrated an overall efficacy based on post baiting consumption figures of 89.9% for the mouse field trial and efficacy of >95% for the brown rat field trial. The field trial programme demonstrated high effectiveness against wild populations of the brown rat (*Rattus norvegicus*) and for the mouse (*Mus musculus*) under normal use situations.

Table 3.2: Experimental data on the effectiveness of Saphir Paste containing 40 mg/kg brodifacoum.

Test organisms	Test system / Concentrations applied / exposure time	Test conditions	Test results: effects, mode of action, resistance	Reference
Norway rats (*Rattus norvegicus* Berkenhout). 10 wild animals. House mice (*Mus musculus* L.). 10 wild animals. Albino laboratory Norway rats (*Rattus norvegicus*) 22 animals (11 males and 11 females, 10 to 20 weeks old, including one control pair).	Laboratory test. Choice feeding test: fresh baits. 5-day pre-test control diet intake assessment and 21-day bait feeding period. During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 40 g of ground wheat grains and 45 g of the test item per day for rat and about 10 g of ground wheat grains and 15 g of the test item per day for mice) Brodipasta, equivalent to Saphir Paste, freshly manufactured	The animals were individually caged. The wild animals were acclimatised to test conditions for at least 3 weeks in order to discard pregnant females or sick individuals. The laboratory rats were acclimatised to test conditions for at least 5 days. Normal laboratory requirements.	The mean acceptance of the test item was 38.7% (s.d. 28.4%) for wild Norway rats, 43.4% (s.d. 9.5%) for wild house mice and 43.8% (s.d. 18.9%) for albino Norway rats. The efficacy was excellent. Mortality was total (100%) in all test groups after a 21-day choice between this test substance and the challenge diet. The mean time to death ranged from 3 to 19 days after the first intake of treated baits.	B5.10/01
Albino laboratory Norway rats (*Rattus norvegicus*) 22 animals (11 males and 11 females, 10 to 20 weeks old, including one control pair) for each test group. Laboratory House mice (*Mus musculus*) 22 animals (11 males and 11 females, including one control pair) for each test group.	Laboratory test. Choice feeding test: fresh and aged baits. 5-day pre-test control diet intake assessment and 21-day bait feeding period. During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 30 g of ground wheat grains, in competition with the test item) Brodipasta, equivalent to Saphir Paste, stored at 20°C for respectively 6, 12 and 24 months	The animals were individually caged. The laboratory rodents were acclimatised to test conditions for 8 days. Normal laboratory requirements.	For rats, the mean acceptance of the test item was 43.8% (s.d. 18.9%) for the fresh bait, 42.0% (s.d. 16.2%) for the 6-month aged bait, 33.7% (s.d. 13.0%) for the 12-month aged bait and 37.5% (s.d. 15.9%) for the 24-month aged bait. For mice, the mean acceptance of the test item was 46.9% (s.d. 15.1%) for the 12-month aged bait and 36.0% (s.d. 14.2%) for the 24-month aged bait. The efficacy was excellent. Mortality was total (100%) in all test groups after a 21-day choice between this test substance and the challenge diet. The mean time to death ranged from 3 to 20 days after the first intake of treated baits.	B5.10/02

Test organisms	Test system / Concentrations applied / exposure time	Test conditions	Test results: effects, mode of action, resistance	Reference
Norway rat (*Rattus norvegicus*). 20 animals (10 males, 10 females)	Laboratory test. Choice feeding test: fresh baits. 4-day pre-test control diet intake assessment, 4-day bait feeding period and 15-day control bait period. Unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during the pre-test period. During the 4-day test period, the quantity of food placed in each pot was sufficient to meet each animal's daily needs (approximately 50 g of aged rodenticide paste bait and approximately 50 g of challenged diet, in each corresponding pot) Brodifacoum paste bait, similar to Saphir Paste, aged for 3 weeks at 54°C	The animals were individually caged. Normal laboratory requirements: 20 - 24°C, a relative humidity range of 45% to 65%, with between 15 and 20 air changes per hour, and with a 12-hour light-dark cycle	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.9% (s.d. 9.89%). The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 4.7 days (3 to 7 days) after the first intake of treated baits.	B5.10/03
House mouse (*Mus musculus*). 20 animals (10 males, 10 females)	Laboratory test. Choice feeding test: fresh baits. 4-day pre-test control diet intake assessment, 4-day bait feeding period and 15-day control bait period. Unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during the pre-test period. During the 4-day test period, the quantity of food placed in each pot was sufficient to meet each animal's daily needs (approximately 10 g of aged rodenticide paste bait and approximately 20 g of challenged diet in each corresponding pot) Brodifacoum paste bait, similar to Saphir Paste, aged for 3 weeks at 54°C	The animals were individually caged. Normal laboratory requirements: 20 - 24°C, a relative humidity range of 45% to 65%, with between 15 and 20 air changes per hour, and with a 12-hour light-dark cycle	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.8% (s.d. 10.2%). The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 5.8 days (4 to 7 days) after the first intake of treated baits.	B5.10/04
Wild Norway Rats (*Rattus norvegicus*). At least 41 animals estimated by pre-treatment bait census	Field test carried out in a farm raising cows. After a pre-bait until the rats were feeding readily on the bait (25 days), baiting were carried out. The non-poisoned baits were replaced by the product to be tested for 10 days. At each day's treatment, the bait stations were emptied then refilled. Post-baiting (8 days) is done to assess the level of the survival rodent population. The quantity of food placed in each bait station was sufficient to meet each animal's daily needs (approximately 150 g of bait in each bait station). Brodifacoum paste 0.004%, equivalent to Saphir Paste	Natural conditions.	The efficacy measured was 95.18%. Dead rodents found during and after the baiting and the post-baiting phases were only *Rattus norvegicus.* The field assay showed a very good efficacy with a fast decrease of the population.	B5.10/05

Test organisms	Test system / Concentrations applied / exposure time	Test conditions	Test results: effects, mode of action, resistance	Reference
Wild house mouse (*Mus musculus*) At least 72 animals estimated by pre-treatment bait census	Field test carried out in a farm. After a pre-bait until the mice were feeding readily on the bait (31 days), baiting were carried out. The non-poisoned baits were replaced by the product to be tested for 8 days. At each day's treatment, the bait stations were emptied then refilled. Post-baiting (7 days) is done to assess the level of the survival rodent population. The quantity of food placed in each bait station was sufficient to meet each animal's daily needs (approximately 30 g of bait in each bait station). Brodifacoum paste 0.004%, equivalent to Saphir Paste	Natural conditions.	The efficacy measured was 89.9%. Dead rodents found during and after the baiting and the post-baiting phases were only *Mus musculus.* The field assay showed a very good efficacy with a fast decrease of the population.	B5.10/06

7.2.5. Known limitations (e.g. resistance)

Resistance is exclusively related to the active substance Brodifacoum and is discussed in Doc. II-A (please see Brodifacoum Assessment Report – 17/09/2009, revised 16/12/2010 and refer to Letter of Access from Pelgar International Limited). The resistance to Brodifacoum is not regarded as unacceptable and only few events are referred as “suspected” resistance to Brodifacoum products. In conclusion there is no reason to suspect a lack of efficacy of Brodifacoum-based products and it is possible to state that Brodifacoum is fully active against rodents' populations that developed resistance to Warfarin.

Where resistance to Brodifacoum is suspected or has been shown, resistant management strategies should be employed and products containing an alternative active substance should be used or a professional pest control operator be consulted.

Moreover, the following measures from Codes of Good Practice in Rodent control[35] (EPPO standards - Guidelines on Good Plant Protection Practice – Rodent control for crop protection and on farms- PP 2/5) are recommended and usually respected by the applicators:
- The population size of the target rodent should be evaluated before a control campaign. The number of baits and the timing of the control campaign should be in proportion to the size of the infestation.
- A complete elimination of rodents in the infested area should be achieved.
- The use instruction of products should contain guidance on resistance management for rodenticides.
- Resistant management strategies should be developed, and Brodifacoum should not be used in an area where resistance to this substance is suspected.
- The authorisation holder shall report any observed resistance incidents to the Competent Authorities or other appointed bodies involved in resistance management.
- When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary or secondary poisoning by the anticoagulant as well as indicating the first measures to be taken in case of poisoning must be made available alongside the baits.

In addition, the IE CA recommends the following in relation to resistance management:
The immediate aim of resistance management is to prevent or retard the development of resistance to a given anticoagulant while, as far as is not counterproductive, permitting its continued use. The ultimate aim is to reduce or eliminate the adverse consequences of resistance.

CropLife International has published a strategy for resistant management of rodenticides (RRAC 2003). The habitat management is addressed in the strategy in addition to chemical control. The access of rodents should be restricted by physical barriers and no food should be available for rodents. Rotation between different anticoagulants is not a reliable means of managing the

35 EPPO standards - Guidelines on Good Plant Protection Practice – Rodent control for crop protection and on farms- PP 2/5

anticoagulant resistance, as all anticoagulants have the same mode of action and the nature of resistance is also similar. The resistant individuals can be identified by conducting a blood clotting response (BCR) test (Gill et al. 1993, RRAC 2003).

Resistance management strategies

The immediate aim of resistance management is to prevent or retard the development of resistance to a given anticoagulant while, as far as is not counterproductive, permitting its continued use.

To this extent the applicant suggests the following measures to aid in the prevention of resistance:

- Maximum use of non-chemical control techniques.
- Preferential use of rodenticides and formulations to which resistance rarely develops.
- Ensure the complete eradication of the target population whenever a rodenticide is used.
- Avoid the use of first generation anticoagulants, to which resistance develops relatively easily.
- Maintain uncontrolled, susceptible populations in refugia from which emigration can occur.

It is recommended that the label states that any instances of resistance are referred to the manufacturer of the a.s.

In order to prevent the development and spreading of resistance, some resistance management strategies measures such as those from the Codes of Good Practices in rodent control are recommended:

- The population size of the target rodent should be evaluated before a control campaign. The number of baits and the timing of the control campaign should be in proportion to the infestation level.
- A complete elimination of rodents in the infested area should be achieved.
- The use instruction of products should contain guidance on resistance management for rodenticides.
- The authorisation holder shall report any observed resistance incident to the Competent Authorities or other appointed bodies involved in resistance management.

The proposed labels contain detailed instructions for use.

- The population size of the target rodent should be evaluated before a control campaign.
- The number of baits and the timing of the control campaign must be in proportion to the infestation level.
- Baits must be placed in a safe manner inaccessible to children and non-target species and not be applied to areas where food/feed, food utensils or food processing surfaces may come into contact with, or be contaminated by the product.
- Bait consumption should be regularly checked and consumed or spoilt bait replaced until consumption has stopped. The remaining baits and material must be removed and disposed of safely at the end of the treatment according to local/national wastes disposal regulation.
- Water must not be contaminated with the product or its container.
- The rodents' bodies all along the treatment must be disposed of according to local/national regulation.

In addition to the above applicant and label recommendations the RMS advocates the adoption of the following advice to avoid the development of resistance in susceptible rodent populations.

Details of treatment should be recorded.

- Apply effective Integrated Pest Management measures (remove alternative food sources, remove water sources, remove harbourage and proof susceptible areas against rodent access).
- Inspected baiting points weekly and replace old bait where necessary.
- Do not routinely use anticoagulant rodenticides as permanent baits. Use permanent baits only where there is a clear and identified risk of immigration or introduction or where protection is afforded to high-risk areas. (The RMS view is that routine use of anticoagulant baits should not be recommended in above described situations.) .
- Where rodent activity persists due to problems other than resistance, use alternative baits or baiting strategies, extend the baiting programme or apply alternative control techniques to eliminate the residual infestation (acute or sub-acute rodenticides, gassing or trapping).

Treatment of rodent infestations containing resistant individuals

- Where rodent infestations containing resistant individuals are identified, immediately use an alternative anticoagulant of higher potency. If in doubt, seek expert advice on the local circumstances.
- Alternatively use an acute or sub-acute but non-anticoagulant rodenticide.
- In both cases it is essential that complete elimination of the rodent population is achieved. Where residual activity is identified apply intensive trapping to eliminate remaining rodents. Gassing or fumigation may be useful in specific situations.
- Apply thorough Integrated Pest Management procedures (environmental hygiene, proofing and exclusion).

Application of area or block rodent control to eliminate resistance

- Where individual infestations are found to be resistant or contain resistant individuals it is possible that the resistance extends further to neighbouring properties.
- Where there are indications that resistance may be more extensive than a single infestation, apply area or block control rodent programmes.
- The area under such management should extend at least to the boundaries of the area known resistance and ideally beyond.
- These programmes must be effectively coordinated and should encompass the procedures identified above.

7.2.6. Humaneness

The use of Brodifacoum as a rodenticide could cause suffering of vertebrate target organisms. The use of anti-coagulant rodenticides is necessary as there are at present no other valuable measures available to control the rodent population in the European Union. Rodent control is needed to prevent disease transmission, contamination of food and feeding stuffs and structural damage. It is recognised that such substances do cause pain in rodents but it is considered that this is not in conflict with the requirements of Article 5.1 of Directive 98/8/EC ‘to avoid unnecessary pain and suffering of vertebrates’, as long as effective, but comparable less painful alternative biocidal substances or biocidal products or even non-biocidal alternatives are not available.

Conclusion:

The IE CA considers that the palatability and efficacy data provided is adequate to support the recommendation for the use of the product against rats and mice, even when stored for up to two years.
The treatment frequency is 2-4 applications per year, 3-6 months apart, when re-infestation occurs.

Issues identified:
Advice concerning application frequency should be included on the draft label.
The label should contain wording to the effect that effective control should be expected from bait stored up to two years under suitable storage conditions.

3.3 Biocidal Product Risk Assessment (Human Health and the Environment)

5.1.20 3.3.1 Description of the intended use(s)

The product is a paste rodenticide. It is a ready-to-use paste or pasta which contains 50 ppm (0.005% w/w) brodifacoum (56073-10-0) used by professional and amateur users. The bait is used in and around buildings and in sewer systems. The target organisms to be controlled are Brown rat, Roof rat or House rat, House mouse and Field mouse.

5.1.21 3.3.2 Hazard Assessment for Human Health

No new exposure studies have been submitted for evaluation. Signs of poisoning in rodents and other mammals are those associated with an increased tendency to bleed, leading ultimately to profuse haemorrhage. Non-target organisms are most at risk from secondary poisoning, i.e. consumption of rodent carcasses by predators such as raptors.

5.1.21.1 3.3.2.1 Toxicology of the active substance

Brodifacoum is a second-generation single-dose anticoagulant rodenticide. It disrupts the normal blood clotting mechanisms resulting in increased bleeding tendency and, eventually, profuse haemorrhage and death. Like all anticoagulant rodenticides, brodifacoum is structurally similar to vitamin K. Blood forms a clot at the site of injury by virtue of a complicated 'clotting cascade', involving numerous clotting factors. The clotting factors are made in the liver as inactive precursors, converted to active form and allowed to circulate in the bloodstream. Vitamin K is employed in the liver in the activation process, and is used in a continuous cyclic process involving several enzymes. The anticoagulant rodenticides block these enzymes, preventing regeneration of the vitamin K and preventing activation of the clotting factors.

Brodifacoum requires labelling with the symbol T+ and the risk phrases R 28 'Very toxic if swallowed'; R27 'Very toxic in contact with the skin' and R26 'Very toxic by inhalation'. Brodifacoum is not classified as a skin irritant or eye irritant.
Repeated dosing studies show effects on blood coagulation and death at low doses (µg/kg bw/day), and therefore labelling with R48/23/24/25 is warranted.

Under the GHS scheme Acute tox. 1, H310, Acute tox. 2 H300 and STOT RE 1 H372.
The Commission Working Group of Specialised Experts on Reproductive Toxicity has unanimously recommended that all AVK rodenticides should collectively be regarded as human teratogens due to the structural similarity to and the same mode of action as the known developmental toxicant warfarin (meeting in Ispra, 19-20 September 2006). Therefore based on read across data from warfarin, brodifacoum is considered to be a possible developmental toxicant and requires the classification as Reprotoxic with the labelling R61, may cause harm to the unborn child.

An almost complete oral absorption can be considered, on the basis of amount of radioactivity recovered in the excreta and retained in the tissues. *Brodifacoum* is widely distributed and bioaccumulates mainly in the liver with lower concentrations in the kidney. Hepatic bioaccumulation of *Brodifacoum* is a non-linear *vs* dose and time. The elimination kinetic from the liver was biphasic, with

an half-life in the range of 282-350 days. The excretion after oral administration is very slow (11 – 14% in 10 days), occurring via the urine and the bile, both as polar metabolites (glucuronide) and parent compound. The metabolism of *Brodifacoum* is limited and the toxicologically relevant chemical species is the parent compound.

As long as dermal absorption is concerned, on the basis of the available study and reading acroos from data on other 2nd generation anticoagulant rodenticides, two different values could be used for risk characterisation depending on the type of formulation, that is 3% (pellets and grains) or 0.047% (wax block bait).

Brodifacoum is very toxic after oral administration and also via the dermal and inhalation routes. Death was the result of internal haemorrhage. Classification with T+; R26/27/28; 'Very toxic by inhalation, in contact with skin and if swallowed' is warranted.
Brodifacoum does not fulfil the EU criteria for classification as a skin or eye irritant. Although showed no sensitizing potential in a LLNA study in mice, it was able to cause skin sensitization in guinea pig and fulfils the EU criteria for classification as a skin sensitizer.

Summary of brodifacoum subchronic, chronic, mutagenic and reproductive toxicity.

Repeated oral exposure to *Brodifacoum* resulted in clinical signs and toxicity consistent with the mode of action of the rodenticide and its properties of anti-coagulant agent (lethal haemorrhages). The NOEL for subchronic oral toxicity is in the range 0.04 -0.001 mg/kg/day (the lowest values identified with sensitive end-points, such as increases in both the kaolin-cephalin time and the prothrombin time). Based on results from the acute dermal and inhalation toxicity studies, route-to-route extrapolation, consistently with the decision adopted for *Difenacoum*, it is justified to assume serious damages associated to prolonged exposure through dermal and inhalation routes also. Therefore, classification with T; R48/23/24/25 "Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed" is warranted.

Genotoxicity and Carcinogenicity

Brodifacoum displayed no mutagenic activity in a standard range of genotoxicity tests. No long-term carcinogenicity study was submitted. In fact, chronic toxicity studies were not considered to be technically feasible due to the specific action of the active substance on the test/target species. However, the anticoagulant action is apparently the only pharmacological action of Brodifacoum. The active substance has no structural alerts for carcinogenicity and no concern about possible non-genotoxic carcinogenic potential can be derived from the toxicological studies. Therefore the justifications for non-submission of carcinogenicity data was considered acceptable.

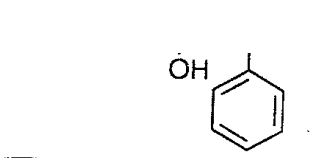
Conclusion on Reproductive toxicity

Reproductive and developmental toxicity studies on *Brodifacoum* did not reveal any specific effects. General toxicity effects were consistent with the mode of action of the rodenticide and its properties of anti-coagulant agent. The lowest NOAELs for rabbits and rats were 0.002 and 0.001 mg/kg bw.
In spite of these findings, a provisional decision has been made at the Technical Meeting of Classification and Labelling that [R61] should be applied to all anticoagulant active substances on the basis of analogy to *Warfarin*. None of the acute or subchronic performed tests gave any indication for a potential neurotoxic effect of *Brodifacoum.*

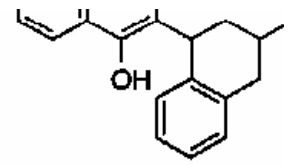
Medical data

Routine monitoring of workers (industrial users) producing *Brodifacoum* and formulating products has been carried out for the last forty years. Between June 1981 and September 1982, three poisoning incidents occurred with successful recovery. With the exception of these incidents, routine monitoring has shown no clinical effects in any workers. During this time there has been no evidence of allergenicity, sensitisation or any other abnormal effects induced by repeated and continual exposure to these anticoagulant rodenticides.

The molecules both have significant structural similarity to vitamin K. This structural similarity is responsible for the ability to interfere with i.e. block the enzymes used to regenerate vitamin K. The major differences in the active substances lie in their 'tails', which have varying degree of lipophilicity. There is long term experience with warfarin, widely used in anti-clotting therapy in humans for over forty years, with no association with increased incidence of cancer. The absence of adverse effects in millions of humans following four decades of long term warfarin therapy is considered sufficient evidence that warfarin is not carcinogenic. The structural similarity of brodifacoum to warfarin (see below), together with the negative results in the guideline mutagenicity tests, indicates that brodifacoum is not carcinogenic.



Warfarin



Brodifacoum

TMIII09 agreed to derive $AEL_{medium\ term}$ consistently with what decided for the other AVK rodenticides. Therefore, $AEL_{medium\ term}$ was calculated from the NOAEL of 0.002 mg/kg bw/day (developmental oral toxicity study in rabbit) divided by an Assessment Factor of 300 (10 for interspecies x 10 for intraspecies x 3 additional factor for severity of effects). The $AEL_{medium\ term}$ results to be of 6.7×10^{-6} mg/kg bw/day.

Conclusions:
The following AELs should be considered in the risk characterization for *Brodifacoum*:

- AEL_{acute} of 0.0000033 mg/kg/day based on the maternal NOEL from a teratogenicity study of 0.001 mg/kg bw/day (rat, maternal effect)
- $AEL_{medium\ term}$ of 6.7×10^{-6} mg/kg bw/day based on the NOAEL from a developmental study (female rabbit) of 0.002 mg/kg bw/day

- AEL_{chr} of 3.3 x 10^{-6} mg/kg bw/day based on the NOAEL for females from the reproductive 2-generation study in rat of 0.001 mg/kg bw/day

Data requirements: (List if applicable)
None.

5.1.21.2 3.3.2.2 Toxicology of the biocidal product

The toxicology of the biocidal product was examined appropriately according to standard requirements. The product was not a dummy product in the EU- review program for inclusion of the active substance in Annex I of Directive 98/8/EC.

Summary of acute toxicity data for the biocidal product Ruby Block

Parameter	Test material	Species	Result	Classification	Ref.
Acute Oral Toxicity	Brodifacoum Pasta Bait. Batch: 61509601	See comments below	See comments below	none.	[redacted] number: 2254/0025
	Acceptable (Y/N): Yes		**Method:** OECD 420 (2001)		**GLP (Y/N): Yes**
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Acute Dermal Toxicity	Brodifacoum Pasta Bait. Batch: 61509601	See comments below	See comments below	none.	[redacted] (2007b). study number: 2254/0026
	Acceptable (Y/N): Yes		**Method:** OECD 402 (1987)		**GLP (Y/N): Yes**
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Acute Inhalation Toxicity	none	none	none	none	none
	Acceptable (Y/N):		**Method:**		**GLP (Y/N):**
	Comments: Inhalation exposure is not appropriate for Pasta Bait formulation. Active substance has very low volatility and is only present at 0.005% (w/w) in the semi solid, wax product. Company justification accepted.				
Information on mixture of biocidal products	none	none	none	none	none
	Acceptable (Y/N): Yes		**Method:**		**GLP (Y/N):**
	Not applicable since following the proposed uses of Pasta Bait and the label claims, the rodenticide Pasta Bait is not intended to be used in a mix with other biocidal products. Company justification accepted.				
Acute Skin Irritation	Brodifacoum Pasta Bait. Batch: 61509601	See comments below	See comments below	none	[redacted] number: 2254/0027
	Acceptable (Y/N): Yes		**Method:** OECD 404 (2002)		**GLP (Y/N): Yes**
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Acute Eye Irritation	Brodifacoum wax block bait. Batch: 61509601	See comments below	See comments below	none	[redacted] (2007d). study number: 2254/0028
	Acceptable (Y/N): Yes		**Method:** OECD 405 (2002)		**GLP (Y/N):**

Parameter	Test material	Species	Result	Classification	Ref.
					Yes
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Skin Sensitisation	none	none	none	none	none
	Acceptable (Y/N):		**Method:**		**GLP (Y/N): Yes**
	Comments: A skin sensitisation study is not available for the product so active substance data has been used to derive a classification. Brodifacoum showed no sensitizing potential in a LLNA study in mice, it was able to cause skin sensitization in guinea pig and fulfils the EU criteria for classification as a skin sensitizer (CAR IT). However, based on the generic concentration limits for mixtures at a Brodifacoum concentration of 0.005% w/w classification is not required by Directive 1999/45/EC or Regulation (EC) No 1272/2008.				

Conclusion:
According to the results of the toxicological studies, Brodifacoum paste does not classify with respect to Directive 1999/45/EC or Regulation (EC) No 1272/2008. However, safety phrases and precautionary statements are proposed by the Rapporteur.

Data requirements:
None.

5.1.21.3 3.3.2.3 Toxicology of the co-formulants (substances of concern)

The biocidal product contains no other substances in quantities that would be of toxicological concern. The majority of these components are food grade materials and are not classified.

Please refer to consolidated Annexes (include. Confid Annex) for product specification and list of co-formulants.

5.1.22 3.3.3 Exposure Assessment for Human Health

The contact gel is used as a gel in plastic bait boxes or covered/protected gel points or contact gel can be placed on strips of insulation tape or paper tape fixed to, for example, overhead pipe-ways and ductwork. The product is applied by professional pest controllers, only.

Single-use pre-treated 'gel tubes' (plastic tube containing gel - analogous to single-use pre-treated bait boxes) are also sold. As the amount of gel in a single gel point is enclosed in a sealed tube and there is no exposure to the user, the standard risk assessment for professionals applying bait from other packs is protective of this use.

The application of Block bait is regarded as a suitable worst case scenario for Paste bait. In the Chambers study operators secured 5 compressed wax blocks (each of 20g, in total 100g bait per box this value was then doubled for 200g boxes) into a bait station by pushing bait mounting pegs in the stations through holes in wax blocks.

The most relevant route of exposure to the active substance is the dermal route. For exposure assessment only active substance from wax blocks has been modelled. The block product typically takes the form of a solid waxy block with a strong sweet smell containing 0.005% w/w Brodifacoum.

In the final CAR for brodifacoum dermal absorption values were derived from read across from data on Difenacoum. The values chosen were 0.047% for wax formulations and 3% for grain/pellet formulations. These values were deemed appropriate in the absence of product specific data.

The active substance has a low vapour pressure, therefore the potential for evaporation is low, and hence the potential for inhalation exposure is low. Inhalation exposure is only of concern during the formulation process where the active substance has a potential for becoming airborne when mixed with dry bait ingredients. In the case of wax blocks, inhalation exposure is irrelevant. Inhalation exposure from handling grain bait during loading/application and cleaning is also proposed as negligible. The only relevant inhalation exposure is assumed to be that from the decanting of loose grain, pellets and granules due to the potential release of airborne dusts.

Any potential oral exposure will be indirect exposure via possible release to the environment. Other possible exposure scenarios include dermal contact with dead animals and accidental ingestion of poison baits by children.

Key Endpoints for Exposure Assessment

The following AELs should be considered in the risk characterization for *Brodifacoum*:

- AEL_{acute} of 0.0000033 mg/kg/day based on the maternal NOEL from a teratogenicity study of 0.001 mg/kg bw/day (rat, maternal effect)
- $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day based on the NOAEL from a developmental study (female rabbit) of 0.002 mg/kg bw/day
- AEL_{chr} of 3.3 x 10^{-6} mg/kg bw/day based on the NOAEL for females from the reproductive 2-generation study in rat of 0.001 mg/kg bw/day

Data requirements:
None.

5.1.22.1 Exposure to professional users

MG/PT	Field of uses envisaged	Likely concentrations at which a.s. will be used
Main group 03; PT 14	**Professional uses**	
	Rodenticide used in and around buildings Use in sewerage (only against rats)	0.005% w/w
	Non-professional uses	
	Rodenticide used in and around buildings	0.005% w/w

There are two groups of humans which may be potentially exposed to the rodenticide baits : those who handle, apply and dispose of the product or other residues such as carcasses or faeces (direct exposure) and those who may be incidentally exposed while the product is in use (incidental exposure).

5.1.23 Method of application

Block bait is made of paraffinic blocks to which the active substance has been added. These Brodifacoum baits are used indoors and outdoors to kill mice and rats: they are placed at the appropriate places in bait stations or covered under a curved tile, a wooden board or in a piece of tube; the animals eat some of the product and die.
Baits must be deposited in a way to minimize the risk for non-target animals and for children. Where possible, baits are secured so that they cannot be dragged away by the rodents. Preferably bait stations will be used where the bait can't be hidden, fixed or locked up.
The common strategy is to explore the site, locate runs, burrows, droppings or signs of damage and place the bait boxes at entry points into buildings and around areas where rats are known to feed. For

the mice control, as mice are sporadic feeders, many bait points are placed throughout the areas where mice are known to feed.
In sewers, the bait is eaten *in situ* by target rodents. The brown rat is the only mammal able to live in sewers.
For house and field mice control, the recommended dose is 20 to 30 g of bait every 2 to 5 meters.
For rat control, the recommended dose is 60 to 100 g of bait every 5 to 10 meters.
In sewers, place 200 to 300 g every 30-50m (never more than 300 g at each manhole).

There are three phases for the human exposure:

- Application phase: application of rodenticides by professionals and non-professionals.
In and around domestic, industrial and commercial buildings, the product is applied manually, at measured amounts in bait boxes or covered. Professional users are assumed to wear protective gloves when handling the product unlike amateur users.
In sewerage, the bait is applied only by professionals, typically hanged to a wire tied up to the wall a few centimetres above the bottom of manholes.
Bait points are controlled regularly. Any bait eaten or damaged has to be replaced. Depending on infestation rate, an advised frequency of inspection is 3 to 5 days. During the bait inspections, also a search in the zone will be done for dead rodents.

- Use phase: Post-application, *i.e.* from the use of rodenticide products and from contact with the product (*e.g*. residential exposure including indoor air contamination, contact with the product during use). The use phase is the period when the biocidal product is waiting to be consumed by the target organism. This means that no primary exposure of humans is intended and should not take place (please refer to point 3.2.4 Secondary exposure).

- Disposal phase: Disposal (including handling of surplus formulated product, burning/incineration, dumping, empty containers, dead rodents (carcasses) disposal).
When no further bait take is observed, bait stations must not be left in place. All bait stations must be removed from the site, cleaned up and the bait and bait remainders must be disposed of in accordance with local requirements.
For sewer systems no specific removal disposal is instructed.

Human exposure assessment

5.1.23.1 3.3.3.1 Identification of main paths of human exposure towards active substance from its use in biocidal product

Exposure path	Industrial use[1)]	Professional use[2)]	General public[3)]	*via* the environment[4)]
Inhalation[5)]	Not appropriate	Yes	Yes	No
Dermal[6)]	Not appropriate	Yes	Yes	No
Oral	Not appropriate	No	Yes	No

[1)] Industrial use (manufacture of active substance and formulation of products) is not covered by BPD. Workers in formulation manufacture are not exposed to levels of a.s. that would affect blood clotting.
[2)] Includes non-trained professionals.
[3)] Indirect exposure due to transient mouthing by infants is included in the scenarios for the general public.
[4)] According to the TNsG, indirect exposure *via* the environment is considered to be of minor importance as the release of rodenticides to the environment is limited.
[5)] The skin is the main exposure route with a small proportion of inhalation exposure to dust when grain-based baits are mechanically handled by professionals. The active substance is of low volatility and it is incorporated at very low concentrations into a solid, non-volatile matrix. Therefore inhalation exposure is considered as negligible.
[6)] Except for the grain block bait which is always packed in individual sachets for both professionals and general public and for grain bait only for the amateurs, dermal contact with the product is a realistic scenario.

The magnitude of human exposure to block bait can be assessed by applying standard exposure models of TNsG[36] for human exposure (2007) or the Harmonised approach for the assessment of rodenticides (anticoagulants) endorsed at TM II 2011 for professionals and amateurs users. Moreover, CONSEXPO 4.1 model can be used to assess the exposure to the biocidal product used by non-professionals.

The following basic primary exposure pathways have to be considered for a risk assessment in order to sum up the exposure of humans to Brodifacoum. The main exposure path is direct skin contact during the use of the biocidal product.
Ingestion is a secondary pathway or an accidental primary exposure during the use of the biocidal product.
Inhalation is considered as negligible.
According to the various pathways, the following absorptions will be applied in the assessment:
- Inhalatory uptake fraction: 1 (default value of 100%);
  Inhalation rate: 1.25 m^3/h (default value)

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- Dermal uptake: 0.047% for wax formulations and 3 % for and grain/pellet.
- Oral uptake fraction 100%

5.1.24 3.3.3.2 Professional exposure

For professional use, the operator is trained in the correct use of the bait, *i.e.* placement, number of bait points/boxes required based on the infestation rate area, the amount of bait or number of bait place packs per bait point/box and safe handling procedures.

The use of PPE - disposable gloves and a dust mask may be employed when decanting bait and disposable gloves may be employed when loading bait boxes and disposing of remaining bait and carcasses. However, when the bait is contained within a bait box there will be no exposure of the operator to the product.

PPE (coverall, boots and gloves) is required as standard when the bait is used in sewage systems.

Exposure calculations – professionals

The CEFIC/EBPF Rodenticides Data Development Group conducted an operator exposure study using flocoumafen (which may be considered a suitable surrogate for all other second generation anti-coagulants) to determine exposure during simulated use of rodenticide baits (*Chambers* 2004, unpublished, confidential). This study examined exposure to wax blocks (20g wax block baits, 5 blocks/bait box) and grain bait. Guidance is also taken from a confidential paper entitled "Harmonised Approach for Rodenticides" by the German Competent Authority, Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (BAuA).

The daily exposure frequency and its division between different tasks are based on a survey organised by CEFIC (and based on a questionnaire answered by selected pest control companies in several EU countries), and on an agreement between Member States on the common approach for exposure assessment and ECB guidelines.

The application of Block bait is regarded as a suitable worst case scenario for Paste and Cluster Baits. In the Chambers study operators secured 5 compressed wax blocks (each of 20g, in total 100g bait per box) into a bait station by pushing bait mounting pegs in the stations through holes in wax blocks.

The Chambers study determined exposure from the application phase from the following scenario: 5 operators secured 5 compressed wax blocks (each of 20g, in total 100g bait per box) into a bait station by pushing bait mounting pegs in the stations through holes in wax blocks. Three trials were conducted with 1, 5 and 10 times securing of these wax blocks. Since the results of 1, 5 and 10 securing are similar all trials were included in the calculation of the 75th percentile by the RMS. The proposed value of **28mg (of wax bait) per manipulation** is valid for loading of one bait box with 100g of wax blocks (a single manipulation constitutes the placement of a single bait station). Since the recommended amount for rat control is up to 200g bait per bait point, this exposure value is multiplied by a factor of 2 because only 100g was used in the Chambers Study. The proposed value of **56mg (of wax bait) per manipulation** is valid for loading of one bait box with 200g of wax blocks.

For professional operators the potential total daily dermal exposure (assuming the previously agreed number of 60 manipulations from TM III/10 is applied) from the application-phase is **3360mg** wax block product (i.e. 56mg × 60 bait sites).

The Chambers study determined exposure from the disposal or post-application phase from the following scenario: 5 operators emptied a loaded bait station by sliding the wax block off the mounting pegs into a 10 L plastic bucket. This is done 1, 5 and 10 times. The proposed value of **5.75 mg per manipulation (determined by the RMS, Difenacoum CAR 2009)** is valid for cleaning of one bait box. For the resulting potential dermal exposure of post-application-phase the agreed number of 15 manipulations (TM III/10) should be taken into account. For the post-application phase the potential total daily dermal exposure is **86 mg** wax block product (i.e. 5.75mg x 15 disposal manipulations). The size of one bait block is ignored and the figure is valid for different sized blocks (e.g. 10g, 100 g).

The calculation of PCO (pest control operator) and amateur dermal exposure in placing and clean-up of rodenticidal wax blocks, taking into account measured values (75th percentiles), defaults according to ECB guidelines and the common agreement on daily exposure frequencies (TM III/10) is presented in the following table.

Pest Control Operator, No PPE:

Amount of exposure to product (75th percentile) during securing of 10 20g wax blocks (200g). Value is for placement of 1 bait station.	56.0 mg
Amount of Brodifacoum on fingers/hands (0.005% in wax block, 20 x 10g blocks sewer maximum application worst case)	112 mg × (0.005 / 100) = 5.6×10^{-3} mg
Systemic dose per application at 1 bait station: (dermal absorption 0.047%, bw 60kg)	(5.6×10^{-3} mg) × (0.047 / 100)) / 60kg = 4.39×10^{-8} mg/kg
Amount of exposure to product (75th percentile) during clean-up and disposal per bait station	5.75 mg
Systemic dose (Brodifacoum concentration 0.005%, dermal absorption 0.047%, bw 60 kg) per clean-up of one bait station.	2.25×10^{-9} mg/kg
Assuming 'reasonable worst case' scenario of 60 bait sites and 15 clean-ups, systemic dose per day	((4.39×10^{-8} mg/kg × 60) + (2.25×10^{-9} mg/kg × 15)) = **2.6×10^{-6} mg/kg/day** **0.0026 µg/kg/day**
Expressed as a % of the AEL: $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**39% of the AEL**

Pest Control Operator, With PPE (gloves)

Default 10-fold reduction of exposure.	**2.6×10^{-7} mg/kg/day** **0.00026 µg/kg/day**
Expressed as a % of the AEL: $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**3.9% of the AEL**

Non-Trained Professional (e.g. farmer), No PPE:

Systemic dose resulting from application of product to five bait sites plus five bait sites cleaned per day, no PPE (difenacoum concentration 0.005%, dermal absorption 0.047%, bw 60 kg).	((2.19×10^{-8} mg/kg × 5) + (2.25×10^{-9} mg/kg × 5)) = **1.2×10^{-7} mg/kg/day**
Expressed as a % of the AEL: $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**0.0001 µg/kg/day** **1.5%**

Non-Trained Professional (e.g. farmer), With PPE (gloves):

Default 10-fold reduction of exposure.	**1.2×10^{-8} mg/kg/day** **0.00001 µg/kg/day**
Expressed as a % of the AEL: $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**0.15%**

Application by spatula and caulking gun

This calculation covers the exposure of a professional user when applying rodenticide bait via a caulking gun or spatula. The calculation is based on the information from the worked examples database, based on bridging to the paste application of wood preservative using a trowel (reverse-reference approach). The worked examples data are ADE values inside gloves so the calculation assumes that gloves are worn.

From the wood preservative example, which addresses application of pastes by brush, trowel, caulking gun and gloved hand, a good case for bridging can be made for the contact gel application by spatula (vs trowel) and by caulking gun.

The wood preservative example assumes that the application process leads to a maximum of 30 minutes' exposure per day and we must assess whether this is a reasonable exposure time for a professional pest controller using contact gel.

Time Required to Apply and Clean up Contact Gel Points

In the case of contact gel applied by caulking gun, a case could be made that this is covered by the 14 manipulations listed for paste bait. The text in the HEEG document states:
For the handling of paste bait the following was agreed: The paste bait described in the report by Vetter and Sendor was paste bait deployed using prefilled cartridges. Dermal exposure was considered possible only at removal and re-attachment of the nozzle's protection cap and was assumed to occur only before the first and after the last bait placing on a given site. Hence, the number of sites visited per day (multiplied with 2) was considered to be the relevant exposure determinant.

If a user were filling a number of gel points in a small area, the same would be true for use of our contact gel caulking gun product - the user may not find it necessary to put the cap on between filling each bait station on that site.

For spatula application, an alternative way of thinking of this is again to assume that, given the contact gel is applied by spatula in the same way as wax blocks are placed in bait points, the number of manipulations would be at a maximum the same as the number for a wax block. ie. 60+15.

The applicants experts think that to apply bait, either by spatula or by caulking gun, a maximum time of 15 seconds per bait point would be plenty of time. Clean up probably takes about half a minute per bait point at most. (this time estimate agrees with UK Toban pasta bait which is applied in the same manner)

For application by caulking gun using the figure of 11 loadings and 3 clean ups, exposure is far lower than the 30 minutes used in the model.

Loading: 11 bait stations x 15 seconds = 2.75 minutes
Clean up: 3 bait stations x 30 seconds = 1.5 minutes
This gives a total handling time of 4.25 minutes.

For application by spatula and assuming the number of bait stations is the same as for wax blocks, this would give a total handling time of :

Loading: 60 bait stations x 15 seconds = 15 minutes
Clean up: 15 bait stations x 30 seconds = 7.5 minutes
Total time = 22.5 minutes

Therefore in both cases, the figure used in the modelling of 30 minutes is sufficient to cover a professional user.

Acceptable Exposure Level

The maximum level of exposure to the active substance has already been calculated in the AS review and is listed in the Assessment Report List of End Points as follows:

	VALUE	STUDY	SAFETY FACTOR
AEL_{acute}	0.0000033mg/kg/day	Rat developmental tox	300

Therefore maximum amount of AS = 0.0000033 mg/kg/day

Reverse-reference Calculation
For a non-volatile paste (such as this brodifacoum product), inhalation exposure is assumed to be negligible and so, using the dermal absorption data for this formulation (0.047%), to exceed the acceptable exposure level, active substance contamination to the skin would need to exceed:

0.0000033 x 2128
= 7.00×10^{-3} mg/kg/day

If the operator weights 60 kg then the AS contamination would have to exceed:
$7.00 \times 10^{-3} \times 60$ kg
= 0.42 mg/day

As the maximum concentration of AS in the ready-for-use paste formulation is 0.005%, then the weight of paste product containing 0.42 mg AS will be:
0.25/0.005 x 100
= 8400 mg

Assuming that dermal exposure will be predominantly to the hands and in this case, based on the worked examples database, gloves are assumed to be worn since professionals are expected to wear gloves, then the rate of actual hand exposure to the hands is required to exceed:
8400 mg / 30 min
= 280 mg/min

If it is considered that the penetration of brodifacoum through protective gloves is 10%, the operator would need to get about 84 g of product on the outside of the gloves and this would have to remain on the surface until the active had migrated through the paste and penetrated the glove.
Part 2 of the TNsG (2002) states that “in an HSE survey of pest controllers (1994) it was estimated that the median duration "using pesticides" was 120 minutes.” It expands to say that treatment time is up to 100 minutes for pastes. If the 100 minutes is applied rather than 30 as suggested by the company

84g / 100 min
= 0.84 g/min

To put this exposure in context. To recieve an exposure of paste product in excess of the AEL the operator would be required to have almost the same quanity of gel on his protective glove as would load a 100g bait station. This level of exposure is considered very unlikely.

5.1.24.1 3.3.3.3 Exposure to non-professional users

Contact gels applied by gun or syringe are professional use only and are not modelled for armature use. Block baits are considered a suitable worst case for paste bait delivered in a closed sachet.

Bait boxes for use by the general public may be supplied as sealed units or as lockable, tamper-proof units that may be refilled by the user. Bait may be used in covered/protected bait points, rather than bait boxes, where appropriate.

Calculations for non-professional exposure are presented below; the first scenario assumes no exposure during application phase while the second scenario assumes that the bait boxes would have to be loaded by the user. As for the non-trained professionals, it is assumed that a non-professional user places ten bait blocks per site (200g) on five bait sites and cleans five bait sites per day.

Product type	Exposure scenario	PPE	Inhalation uptake	Dermal uptake

14	Non-professional (amateur)	None	Not relevant	1.12×10^{-8} mg/kg/day[1)]
14	Non- professional (amateur)	None	Not relevant	1.2×10^{-7} mg/kg/day[2)]

1) scenario 1, 2) scenario 2.

Scenario 1: No dermal contact during placing of baits due to sealed bait boxes. Potential exposure is only during clean-up. Default exposure value for cleanup is 5.75mg product per bait site, bromadialone present at a concentration of 0.005% (w/w), 60kg body mass, 0.047% dermal absorption value. The value is calculated from the cleanup exposure per bait station of ((2.25×10^{-8} mg/kg) × 5).

Scenario 2: Assuming that conventional bait boxes are loaded then the exposure is equal to that of the non-trained professional (e.g. farmer) with no PPE. As a worst case scenario, scenario 2 can be taken forward to risk assessment.

5.1.24.2 3.3.3.4 Exposure to children/workers/general public

Bait points should be covered or protected in such a way to prevent access to the bait. However, the ingestion of wax block bait by infants has been assessed as a potential secondary exposure route associated with the use of Brodifacoum in rodenticide products. Secondary exposure is anticipated to be acute in nature. Two different scenarios of secondary exposure are available, the 'handling of dead rodents' scenario and the 'transient mouthing of poison bait' scenario. The former is excluded from the risk assessment due to unrealistic assumptions. The estimated exposure for the 'transient mouthing of poison bait' scenario is either $2.5\times10^{-}2$ mg/kg or 5.0×10^{-5} mg/kg, depending on the default assumptions. This results in Margin of Exposure (MOE) values of 0.01 or 6.6, respectively. It shows that infants are at significant risk for secondary exposure, i.e. there is no safe use for children.
For the 'transient mouthing of poison bait' scenario, either 5g (User Guidance) or 10 mg (TNsG, with bittering agent) of the product is assumed to be swallowed by an infant per poisoning event.

Oral exposure infant. TNsG Assumptions: Transient mouthing of poison bait (10mg) treated with repellent: (10mg × 0.00005) / 10kg bw

Transient mouthing infant. User Guidance Assumptions: Transient mouthing of poison bait (5000mg) without repellent; (5000mg × 0.00005) / 10kg bw

	Total dose (mg/kg b.w./day)	% AELacute (0.0033 µg/kg b.w.)
Oral exposure infant	0.00005	1515%
Transient mouthing infant	0.025	757575%

The RMS considered that in connection with transient mouthing of poison baits, infants are also exposed via the dermal route while handling the bait. This however is assumed to play a minor role relative to the amount that could be ingested. It is therefore not included in the overall exposure scenario.

5.1.24.3 3.3.3.5 Exposure to consumers from residues in food

Not applicable.

5.1.24.4 3.3.3.6 Overall Summary

The exposure data based on measurements in simulated use conditions are acceptable and should be used in risk assessment. The models assume that inhalation exposure is of minor importance compared with dermal exposure. The calculations have been made with the assumptions of rat control, and there are no separate calculations to assess exposure in mice control in which smaller bait sizes are used.

5.1.25 3.3.4 Risk Characterisation for Human Health

5.1.25.1 3.3.4.1 Professional users

Caulking gun or spatula

Calculation of the exposure of a professional user when applying rodenticide bait via a caulking gun or spatula was assessed via reverse reference scenario. Assuming that dermal exposure will be predominantly to the hands and in this case, based on the worked examples database, gloves are assumed to be worn since professionals are expected to wear gloves, then the rate of actual hand exposure to the hands is required to exceed:

8400 mg / 30 min
= 280 mg/min

If it is considered that the penetration of brodifacoum through protective gloves is 10%, the operator would need to get about 84 g of product on the outside of the gloves and this would have to remain on the surface until the active had migrated through the paste and penetrated the glove.

84g / 100 min
= 0.84 g/min

Using a reverse reference scenarios for caulking and or spatula application it was calculated that a professional operator would require exposure to 84g per day on his gloves. To recieve an exposure of paste product in excess of the AEL the operator would be required to have almost the same quanity of gel on his protective glove as would load a 100g bait station. This level of exposure is considered very unlikely.

Wrapped sachet or blocks

The exposure assessment for professional pest control operators (PCOs) under reasonable worst case assumptions (60 loadings and 15 clean-ups/day), as presented above, yielded a potential dermal exposure leading to a systemic dose 0.0026µg/kg/day day for an unprotected operator during bait handling operations. Comparison to calculated NOAEL for MOE shows that the use of rodenticide baits containing 0.005% brodifacoum results in a margin of exposure of 257.

Since pest control operators wear protective gloves by default during pest control operations, a refined assessment is conducted. The resulting margin of exposure (MOE = 2570) indicates that the use of rodenticide baits containing 0.005% brodifacoum does not cause a risk for PCOs if gloves are worn.
Likewise, the exposure assessment for non-trained professionals (e. g., farmers) under reasonable worst case assumptions (five loadings and five clean-ups/day), yielded a potential dermal exposure leading to a systemic dose of 1.2×10^{-7} mg/kg/day for an unprotected person. Even without PPE, the resulting margin of exposure (MOE = 6700) indicates that use of rodenticide baits containing 0.005 %

brodifacoum is not a risk at the stated exposure frequency. A refined assessment was, nevertheless, conducted since wearing of protective gloves is recommended in the instructions for use. The resulting margin of exposure (MOE = 67000) indicates a high level of protection for non-trained professional users when gloves are worn.

The result of the risk assessment concerning use of brodifacoum in bait blocks/sachets indicates that the acceptable exposure level is not exceeded for trained professionals (PCOs) without PPE (gloves). In addition, the risk is at an acceptable level without gloves for non-trained professionals. However, use of protective gloves is recommended in all cases for hygiene reasons. In the case of application for caulking gun or spatula it was concluded that exposure to 84g of bait by a PCO on a glove was exceedingly unlikely and this application method was expected to yield safe exposure levels for trained operators.

5.1.25.2 3.3.4.2 Non-professional users

Blocks/sachets are supplied either in pre-sealed units or as loose blocks for use in covered/protected bait points or refillable bait boxes. An exposure assessment has been performed taking into account potential exposure both from application and post-application tasks as a worst-case scenario. In the calculations, amateurs were assumed to load five bait points and clean five bait points per day without PPE. The estimated daily systemic dose, 1.2×10^{-7} mg/kg/day, results in an MOE value of 6700 showing that there is also little risk to amateurs.

5.1.25.3 3.3.4.3 Children/Workers/general public

As a potential secondary exposure route, associated with the use of difenacoum in rodenticide products, ingestion of wax block bait by infants has been assessed. Secondary exposure is anticipated to be acute in nature. The estimated exposure for the scenario, 2.5×10^{-2} mg/kg/day or 5.0×10^{-5} mg/kg/day, depending on the default assumptions, results in MOE values of 0.01 or 6.6, respectively indicating that infants are at risk of poisoning. This should be addressed by ensuring all bromodialone products targeted for amateur use are provided in sealed packs and tamper resistant bait boxes with a bittering agent. The potential exposure due to dermal contact with poisoned rodents is not included in the risk assessment because the available scenarios are unrealistic.

5.1.25.4 3.3.4.4 Consumers from residues in food

Not applicable, product is not used to treat food stuffs.

5.1.25.5 3.3.4.5 Overall Summary

The calculations presented have been made with the assumptions of rat control, and there are no separate calculations to assess exposure for mice control in which smaller bait sizes are used.

Using both the MOE and AEL approaches for risk assessment indicates that there is a satisfactory margin between the predicted exposure and the NOAEL (LOAEL) as well as exposures below the

threshold value for the AEL for all intended uses by trained professionals with PPE, untrained professionals and amateurs (with and without PPE). The product is deemed suitable for authorisation and appropriate personal protective equipment is advised.

Secondary exposure from transient mouthing of the product exceeds the AEL reference value (0.0023µg/kg/day), both with the assumption of 0.01 g and 5 g of product ingested by infants. This is of concern. There is no margin of safety using the existing data and models. There is no safe scenario for indirect exposure if estimated according to TNsG and User Guidance. Mitigation and protection measures such as the inclusion of bittering agents and the enclosure of product in sealed packs and tamper resistant bait boxes are essential to reducing the risk of secondary exposure. Baits should not be placed where food, feeding stuffs or drinking water could be contaminated.

Workplace operation	**PPE**	**Exposure path**	**Dose (µg/kg/day)**	**MOE**	**%AEL**
Trained Professional: Placing of wax block baits and clean-up	None	Dermal, hands	0.0026	257	39
Trained Professional: Placing of wax block baits and clean-up	Protective gloves	Dermal, hands	0.00026	2570	3.9
Trained Professional: Application via caulking gun/spatula and clean-up	None	Excess of 8.4g on hands to exceed AEL			
Trained Professional: Placing of wax block baits and clean-up	Protective Glove	Excess of 84g on hands to exceed AEL			
Non-Trained Professional: Placing of wax block baits and clean-up	None	Dermal, hands	0.0001	6700	15
Non-Trained Professional: Placing of wax block baits and clean-up	Protective gloves	Dermal, hands	0.00001	6700	1.5
Amateur: Placing of wax block baits and clean-up	None	Dermal, hands	0.0001	6700	15
Secondary Exposure Transient Mouthing of bait by infants	--	Oral	5.0×10^{-5} (TNsG)	6.6	--
			2.5×10^{-2} (User Guidance)	0.35	--

5.1.26 3.3.5 Effect and Exposure Assessment for the Environment

An overview of the EU review of environmental fate and behaviour and ecotoxicology for the active substance is presented below in conjunction with the exposure assessment and environmental effects for the biocidal product.

5.1.26.1 Environmental fate and behaviour of the active substance

5.1.26.1.1

5.1.26.1.2 Degradation

5.1.26.1.2.1 Biodegradation

Brodifacoum is not readily or inherently biodegradable.
The overall conclusion on biodegradation is that Brodifacoum is not readily or inherently biodegradable.

5.1.26.1.2.2 Abiotic Degradation

Brodifacoum is stable to hydrolysis (t½ > 1 year). It is however predicted to undergo rapid indirect photolysis with OH radicals and ozone (t½ = approximately 2 hours) and undergoes rapid direct photodegradation (t½ = 0.217 days). There are no predicted effects on the atmosphere.
The overall conclusion on abiotic degradation is that Brodifacoum is hydrolytically stable to hydrolysis (t½ > 1 year).

5.1.26.1.2.3 Distribution

Brodifacoum is a large aromatic organic compound of low volatility with two polar groups, which can potentially ionise at environmental pH. The active substance has a Log Pow (4.92), and is of low solubility in water (5.8 x 10-5 g/l at pH 7 and 20°C).
The DT50 value of 157 days (The Pesticide Manual 13th ed) and the Koc of 50000 (The Pesticide Manual 13th ed) indicate that Brodifacoum would be persistent and immobile in soil. The exposure to the groundwater is unlikely.
On the basis of its low volatility (vapour pressure of 2.6 10^{-22} Pa at 20°C) the exposure to the atmosphere is highly unlikely.
The overall conclusion on distribution is as follows: Brodifacoum is persistent (DT50 157 days) and immobile in soil (Koc > 9155 l/kg). Under basic conditions (high pH), Brodifacoum is not likely to be adsorbed onto soils or sewage sludge due to the ionisation of the molecule; whereas under acidic conditions (low pH), Brodifacoum is likely to be adsorbed onto soils or sewage sludge as the molecule is in its neutral or non-ionised form.

Mobility in soil
The Koc value (50000 The Pesticide Manual 13th Edition) indicates that the active substance would not be mobile in soil and is not expected to contaminate groundwater (PEC < 0.1 μg/l).

The overall conclusion on mobility in soil is as follows *Brodifacoum* is immobile in soil (Koc > 9155 l/kg). *Brodifacoum* is not expected to contaminate groundwater.

5.1.26.1.3 Accumulation

Based on a measured Log Kow = 4.92 it is considered that Brodifacoum has a potential for bioaccumulation. The BCFfish (3034) was calculated using the equation 74 of TGD (part II); the BCFearthworm (999) was calculated according to the equation 82d of TGD

The overall conclusion on bioaccumulation potential is as follows: No reliable bioaccumulation study is available. The measured log Kow = 4.92 (retrieved from CAR B) indicates that Brodifacoum can be potentially bioaccumulative and provides a calculated BCFfish = 3034. The experimental Kow confirms the adequacy of using, in CAR A, the calculated log Kow of 6.12 (rather than 8.5) and indicates that this value still overestimated the actual lipophilicity and, consequently, the BCF values estimated herein. The measured log Kow = 4.92 and a BCFfish = 3034 and BCFearthworm = 999, are considered therefore more reliable endpoints to be used in risk assessment.

5.1.26.2 3.3.5.1 Environmental effects (hazard) of the active substance (ecotoxicology)

Table 3.3.5.2-1: Summary of the eco-toxicological data for the active substance Brodifacoum

Parameter	Test material	Species	Result	Classification	Ref.
Short term toxicity testing on fish	ECO120140	Oncorhynchus mykiss	96-hour LC50 = 0.042 mg/L	Yes - R50/R53	W J Craig - March 2003. Chemex Environmental International Ltd report ENV5803/120140 (2003)
	Acceptability (Y/N): Yes		**Method:** OECD 203		**GLP (Y/N):** Yes
	Comments: None				
	Acceptability (Y/N): Yes		**Method:** OECD 202		**GLP (Y/N):** Yes
	Comments: Recorded under semi-static conditions.				
Toxicity to aquatic invertebrates	ECO120140	Daphnia magna	48 hour - EC50 = 0.25mg/l	Yes - R51 /R53	W J Craig - March 2003. Chemex Environmental International Ltd report - ENV5802/120140
	Acceptability (Y/N): Yes		**Method:** OECD 202		**GLP (Y/N):** Yes
	Comments: Recorded under semi-static conditions.				
Growth inhibition study on	ECO120140	Selenastrum capricornutum (Pseudokirkneriella	72h ErC50 = 0.04 mg/l	Yes - R50 /R53	W J Craig - March 2003. Chemex

algae		subcapitata)			Environmental International Ltd. Report - ENV5801/120140
	Acceptability (Y/N): Yes		**Method:** OECD 201		**GLP (Y/N):** Yes
	Comments: None				
Inhibition of microbial activity	7909101	3h respiration inhibition test with activated sludge from a sewage treatment plant treating predominantly domestic sewage	EC10 was set > water solubility limit of 0.058 mg/l measured at pH=7 and T=20°C	No acute toxicity	Staniland, J. (2004) Chemex Environmental International Ltd. Ref: ENV7009/120140
	Acceptability (Y/N): Yes		**Method:** OECD 209		**GLP (Y/N):** Yes
	Comments: Although the results of the study (EC50 >1003mg/l) are not reliable, the study can be used to derive the NOECmicroorganisms on the basis of the brodifacoum water solubility (EC50 > 0.058 mg/l).				
Studies on sediment dwelling organisms	-	No experimental data available for sediment dwelling organisms.	-	-	-
	Acceptability (Y/N): -		**Method: -**		**GLP (Y/N): -**
	Comments: The risk for the sediment compartment will be covered by the risk for the aquatic compartment.				
Growth inhibition of aquatic plants	-	No study submitted	-	-	-
	Acceptability (Y/N): -		**Method: -**		**GLP (Y/N): -**
	Comments: The evaluation concluded that there is no need for a study as there is no evidence that brodifacoum would be toxic to aquatic plants to a greater extent than to other aquatic organisms.				
Toxicity to earthworms	Chemex reference: ECO120140	14-day LC50	> 994 mg/kg dw	No acute or chronic toxicity	Staniland, J (2005) Environmental International Ltd. Ref:ENV7010/120140
	Acceptability (Y/N): Yes		**Method:** Static test conditions according to SOP E260 based on OECD 207.		**GLP (Y/N):** Yes
	Comments: 14-day LC50 was greater than 994 mg/kg dry soil (the highest concentration applied) corresponding to a 14-d LC50 > 879.6 mg/kg wwt.				
Toxicity to birds	Difenacoum	LD50 (Japanese quail)	19 mg/kg bw	Acute toxicity	Szabolcs Gaty (2005) LAB International. Study code: 04/903-115FU
	Acceptability (Y/N): Yes		**Method:** OPPTS 850.2100		**GLP (Y/N):** Yes
	Comments: An extrapolation factor of 8.05 was applied to correct for differences in toxicity based on the acute test results for Difenacoum (LD50 = 66 mg/kg, male and females) and Brodifacoum (LD50 = 19 mg/kg bw), both related to Japanese quail. The				

	Brodifacoum results indicate it is very toxic to birds, with an NOEC = 0.012 mg Brodifacoum/kg diet and an NOEL = 0.0012 mg Brodifacoum/kg bw/d.				
Toxicity to mammals	04359	Two-generation fertility study (rat, parent females)	NOAEL (0.001mg/kg bw/day)	Yes	Toxicological Research Centre Ltd. report 03/737-202P.
	Acceptability (Y/N): Yes		**Method:** OECD 416		**GLP (Y/N):** Yes
	Comments: Although a two-generation study is not normally required for anticoagulant rodenticides, the study is relevant for the establishment of an overall NOAEL for anticoagulant effects in rodents.				

5.1.26.2.1 Effects on Aquatic Organisms including the determination of PNECs:

Toxicity data are available for aquatic organisms exposed in an acute test. In a test performed under semi-static conditions, the 96-hour LC50 was 0.042mg/L for Oncorhynchus mykiss, based on measured concentrations. Daphnia magna was less sensitive than fish, with a 48-hour EC50 of 250 µg/L recorded under semi-static conditions. The endpoint was based on immobilisation and on measured concentrations of Brodifacoum in the test media. In a 72-hour algal growth inhibition test with Selenastrum capricornutum (Pseudokirkneriella subcapitata) the ErC50was 40 µg/l. The NOEC was 10µg/l with respect to specific growth rate. Results are based on measured concentrations. The outcome is that Brodifacoum is considered very toxic to aquatic organisms. The PNEC is derived from the algae 72h ErC50 = 0.04 mg/l (or fish 72h LC50 = 0.042 mg/l), and the application of an assessment factor of 1000. Therefore the **PNEC = 0.00004 mg/l**.

No experimental data are available for sediment dwelling organisms. A PNECsediment (0.043 mg/kg wwt) was derived through the Equilibrium Partitioning Method described in the TGD. However, due to the absence of measured data for the determination of a PECsed, according to TGD a quantitative risk characterization cannot be carried out. Therefore the risk for the sediment compartment will be covered by the risk for the aquatic compartment.

Based on the result of a 3h respiration inhibition test with activated sludge from a sewage treatment plant treating predominantly domestic sewage, no effects of Brodifacoum on aerobic biological sewage treatment processes are expected. As the test was carried out at nominal concentration much higher than the water solubility of Brodifacoum, the EC10 was set as greater than the water solubility limit of 0.058 mg/l measured at pH=7 and T=20°C. According to TGD, PNEC is derived applying an AF=10 to the NOEC from the respiration inhibition test. Therefore, the **PNECmicro-organisms > 0.0058 mg/l.**

No degradation or transformation products of Brodifacoum in water were detected. Toxicity of metabolites is not of concern.

PNECaquatic organisms = 0.00004 mg/l
PNECsediment organisms = 0.00004 mg/l

PNECmicro-organisms = > 0.0058 mg/l

Conclusion on hazard to the aquatic organisms:

PNEC	Task Force
PNECaquatic organisms	0.00004 mg/l
PNECsediment organisms	0.00004 mg/l
PNECmicro-organisms	> 0.0058 mg/l

The Brodifacoum a.s. results in the classification of toxic to aquatic organisms.

5.1.26.2.2 3.3.5.2 Effects on the Atmosphere including the determination of PNECs

Brodifacoum has a low vapour pressure (1 x 10^{-6} Pa) and a Henry's Law constant of 2.18 x 10^{-3} Pa.m3mol^{-1} (pH 7). Release to air via water is expected to be negligible. This is also supported by calculations using the TGD on risk assessment for percent release to air from a sewage treatment plant where a default of 0 is given (i.e., no release to air). The manufacture of the active substance is in a closed system. There are no releases to air of Brodifacoum from manufacturing, formulating, use or disposal phases.

5.1.26.2.3 Effects on Terrestrial Organisms including the determination of PNECs:

The effect of Brodifacoum on earthworms was assessed in an acute toxicity test in which E. fetida in artificial soil was exposed to concentrations of Brodifacoum up to 994 mg/kg dw. The 14-day LC50 was greater than 994 mg/kg dry soil (the highest concentration applied) corresponding to a 14-d LC50 > 879.6 mg/kg wwt. The PNEC for terrestrial organisms is derived from the LC50 with an AF of 1000 used. Therefore, **the PNECsoil ≥ 0.88 mg/kg wwt soil**.

Conclusion on hazard to terrestrial organisms:

PNEC	Task Force
PNECsoil	> 0.88 mg/kg wwt

Earthworms were not affected after acute exposure to Brodifacoum at concentration closed to 1 g/kg dw. It is concluded that Brodifacoum is of low toxicity to earthworms. **The PNECsoil ≥ 0.88 mg/kg wwt soil.**

5.1.26.2.3.1

5.1.26.2.3.2 Effects on Birds including the determination of PNECs:

Brodifacoum is moderately toxic to birds upon acute oral exposure with a LD50 value of 19 mg/kg bw in the Japanese quail.

No studies are available on the avian short term dietary toxicity.

A 6 weeks reproduction test on the Japanese quail exposure to Brodifacoum in drinking water was submitted but it was judged not adequate for risk assessment purposes. Therefore, acknowledging the decision taken at the Biocides TMIII09, the NOEC for Brodifacoum is based on the results of the chronic toxicity study with Difenacoum (with Japanese Quail), chosen as reference chemical for second generation anticoagulants. An extrapolation factor of 8.05 was applied to correct for differences in toxicity based on the acute test results for Difenacoum (LD50 = 66 mg/kg, male and females) and Brodifacoum (LD50 = 19 mg/kg bw), both related to Japanese quail. The Brodifacoum results indicate it is very toxic to birds, with an NOEC = 0.012 mg Brodifacoum/kg diet and an NOEL = 0.0012 mg Brodifacoum/kg bw/d. According to the TGD, an assessment factor of 30 is applied to derive the PNEC. Therefore the **PNECoral-birds = 0.012 mg Brodifacoum/kg diet/30 = 0.0004 mg Brodifacoum/kg diet.** In relation to dose the **PNECoral-birds = 0.0012 mg Brodifacoum/kg bw/d/30 = 0.00004 mg Brodifacoum /kg bw/d**.

Conclusion on hazard to birds:

PNEC	PNECoral bird diet	PNECoral bird
Task Force	0.0004 mg/kg	0.00004 mg/kg bw/d

5.1.26.2.3.3 Effects on Mammals including the determination of PNECs:

The lowest mammalian NOAEL (0.001mg/kg bw/day) comes from a two-generation fertility study with rats and refers to parent females. This endpoint was converted, according to TGD, to NOEC mammal, food = 0.02 mg/kg food. As the exposure lasted 90 days as a minimum, for PNEC derivation an AF oral of 90 is applied (table 23 of TGD). Therefore, the **PNECoral-mammals = 0.02/90 = 2.22E-04 mg/kg food**, corresponding to **PNECoral-mammals = 0.001 mg/kg bw day/90 = 1.1 E-05 mg/kg bw**.

Conclusion on hazard to mammals:

PNEC	Task Force
PNECoral mammals food	2.22E-04 mg/kg
PNECoral mammals	1.1 E-05 mg/kg bw

Brodifacoum is very toxic to mammals.

5.1.26.2.3.4 Metabolites

No significant amounts of metabolites are expected to be formed in soil. In rats, no toxicologically relevant metabolites have been identified which could be introduced in soil via urine or faeces.

5.1.26.3 Environmental effects (hazard) of the biocidal product

The example products in the EU-review program for approval of the active substance for inclusion in Annex I of Directive 98/8/EC were pellet bait and wax block mixtures (formulations) containing Brodifacoum.

The aquatic, terrestrial, avian and mammalian toxicity data used for the assessment of the Annex I representative biocidal product was based on data determined in the Brodifacoum active substance studies. This included the following studies.

7.8.7.1 (1)	Kaukeinen DE	1982	A Review of the Secondary Poisoning Hazard to Wildlife from the use of Anticoagulant Rodenticides Proceedings of the 10th Vertebrate Pest Conference (1982). Published	N	Public Domain
7.8.7.1 (2)	Newton I and Wyllie I	-	Effects of New Rodenticides on Owls, Institute of Terrestrial Ecology, Monks Wood Experimental Station, Abbots Ripton, Huntingdon, Cambs PE17 2LS Published	N	Public Domain
7.8.7.1 (3)	Gray A, Eadsforth CV and Dutton AJ	1994	The Toxicity of Three Second-Generation Rodenticides to Barn Owls, Pesticide Science, 42, 179-184. Published	N	Public Domain
7.8.7.1 (4)	Wyllie I, Newton, I and Freestone P	-	The Toxicity of Three Second-Generation Rodenticides to Barn Owls, Institute of Terrestrial Ecology, Monks Wood, Abbots Ripton, Huntingdon, Cambs PE17 2LS Published	N	Public Domain

There were no additional ecotoxicology studies provided for authorisation of the biocidal product in this process.

5.1.26.4 Environmental effects (hazard) of the co-formulants (substances of concern)

Please refer to Annex I of the consolidated Annexes I-IV which contains the confidential information on the co-formulants that are used in this product along with the active substance.

None of the co-formulants that carry an environmental classification are present at a sufficient concentration to trigger the classification of the product.

Product Classification & Labelling:

There is no requirement for classification and labelling with regard to the co-formulants used in the product.

There is no environmental classification for the product under the Directive 99/45.
There is no environmental classification for the product under the CLP Regulation 1272/2008.

5.1.27 Exposure Assessment for the Environment

The environmental exposure was assessed during the EU active substance review process and the current intended uses are similar.

The rodenticide product is used by professional and amateur users. The product is intended for indoors use, in and around buildings and for outdoors uses in non-agricultural open areas and waste dumps. It is not supported for use in sewers; however the applicant has included this scenario in their application as a worst case scenario.

It is always used in the same manner for all these purposes. Bait points are placed throughout the infested areas with 20g per bait point for mice and 20 to 60 g per bait point for rats. Application sites are located 2-5 m apart for mice and 5-10 m apart for rats. A shorter distance is used in severe infestations. The number of baits and the distances should be adapted to the infestation level. Bait points are inspected frequently and replenished when bait has been eaten.

Bait points are placed securely to help prevent access to non-target animals. For amateur use, the label prescribes to use tamper resistant bait stations for rat control. Baits for amateur mouse control have to be placed into/at a covered or protected bait station. For professional rodent control the use of tamper resistant bait stations is not compulsory however, if tamper resistant bait stations are not employed, the wax blocks must be fixed by strings or wire to avoid uptake by non target animals/humans, or uncontrolled dispersal.

Based on the environmental fate and behaviour of Brodifacoum, as outlined in the detailed calculations provided in Annex VI of this Product Authorisation Report, the environmental exposure assessment was conducted.

5.1.27.1 Aquatic compartment

As mentioned previously the product is not supported for use in sewers but the scenario has been included as part of the risk assessment for the other scenarios. Therefore exposure to the aquatic compartment has been assessed through the STP route also. Based on worst case ESD assumptions the maximum predicted environmental concentration (PEC) of the active substance for microorganisms in the STP is 1.93×10^{-5} mg/L. The corresponding amount in surface water is 1.77×10^{-6} mg/L. The maximum permissible concentration by directive 80/778/EEC (amended by 98/83/EC) of 0.1 µg/L is not exceeded in surface waters. Full details of the calculations are contained in Annex VI.

5.1.27.2 Atmospheric compartment

Brodifacoum has a vapour pressure of less than 10^{-6} Pa at 20^{o}C and a Henry's Law constant of less than 2.18×10^{-3} $Pa.m^3.mol^{-1}$ at pH 7. In the Assessment Report for brodifacoum it has been concluded that releases to air from manufacturing, formulating, use or disposal phases are not to be expected. An exposure assessment for air is therefore not required.

5.1.27.3 Terrestrial compartment

Exposures of soil to the active substance occurs via direct (spillages) and disperse release (deposition by urine and faeces) after the use of the product in and around buildings, open areas and waste dumps. As mentioned previously the product is not supported for use in sewers however exposure to agricultural soil via spreading of sludge from an STP has been included as part of the worst case risk assessment.

Using ESD worst-case assumptions of the typical usage patterns and release mechanisms, the maximum concentration in agricultural soil (averaged over 30 d) after 10 years of sludge application from STP is 4.86 x 10^{-4} mg/kg wwt. When the applicant's dosage rates are used as inputs the figure for agricultural soil is 3.24 x 10^{-4} mg/kg wwt. No information on the metabolism of brodifacoum was used to lower the exposure levels further.
The highest concentration of Brodifacoum in soil following use in and around buildings is 0.047 mg/kg wwt under ESD realistic worst case conditions (see table below). For a normal use pattern the ESD recommends a total of 2.6 replenishments (as opposed to 5 for the worst case). This usage pattern leads to an estimated soil concentration of 0.006 mg/kg wwt.

For the open areas scenario ESD realistic worst-case conditions assume one application site is treated twice with the product. The fraction released during use and application is 0.25. The exposed soil area is assumed to be the lower half of the burrow wall surrounding an 8 cm diameter tunnel, with a soil mixing depth of 10 cm and up to 30 cm from the entrance hole. The amount of product used at each refilling in the control operation is not specified by the ESD. However, the Reviewer notes the ESD states "A typical initial dose for a rat hole in the Nordic countries is 100-200 g grain.hole^{-1}. However, in e.g. France a typical dose for a rat hole is about 50-100 g product." The applicant supports a dosage of 60 g bait per refill but bearing in mind the ESD statements the reviewer feels that a dosage value of 100 g is a sufficiently worst case value to use in the exposure assessment.. The local concentration arising in soil after a campaign is predicted to be 0.173 mg/kg wwt.

The default area for a waste dump defined in the ESD is 1 ha. If bait points are placed at distances of 5 m apart in a grid covering the entire dump this would yield a total of 441 points (21 x 21). 100 g in each bait point corresponds to a total loading of 44.1 kg of bait. This is higher than the default value considered in the ESD under realistic worst-case conditions (40 kg). Consequently the applicant's exposure calculation is not sufficient to support this use. The Reviewer generated new exposure calculations for this use. The local concentration arising in soil after such a campaign is predicted to be 0.00817 mg/kg wwt. A more realistic campaign would use a total of 11 kg of bait resulting in a local concentration of 0.00204 mg/kg wwt.

In and around buildings	Open areas	Waste dumps
Amount of product used in control operation for each bait point: 0.25 kg (ESD), 0.06 kg (applicant). Realistic worst-case: 21 day campaign Bait stations: 10 No. of replenishments: 5 (2.6 realistic) Bait stations are 5 m apart. Fraction released due to spillage: 0.01 Fraction ingested: 0.99 Spillage area: 0.09 m^2 (0.1 m around station) Frequented area: 550 m^2 (10 m around building)	Amount of product used at each refilling in the control operation: 100 g Realistic worst-case: 6 day campaign Bait stations: 1 No. of replenishments: 2 Fraction of product released to soil during application: 0.05 Fraction of product released to soil during use: 0.2	Area of waste dump: 1 ha Amount of product per station: 100 g Spacing between blocks: 5 m (worst case), 10 m (realistic) Total mass of product used: 21 x 21 x 100 g = 44.1 kg (worst case) 11 x 10 x 100 g = 11 kg (realistic) No. of replenishments: 7 Fraction of active ingredient released to soil through urine, faeces and dead animals: 0.9

5.1.27.4 Groundwater

Exposure of groundwater may occur as a result of soil exposure which occurs via residues present in sewage sludge after using the product in sewers and via direct (spillages) and disperse release (urine and faeces) after the use of the product in the scenarios in and around buildings, open areas and waste dumps. As an indication for potential groundwater levels, the concentration in soil porewater in the various scenarios was examined. It should be noted that this is a worst-case assumption, neglecting transformation and dilution in deeper soil layers. A summary of the PECs obtained are presented in the table below. The calculated value for the open areas scenario exceeds the EU trigger value of 0.1 µg/L. However this figure is derived from a soil concentration value in a small localised area in the immediate vicinity of the baiting point. When taken in the context of a larger area (field, park, etc.) this figure would be several orders of magnitude lower. In addition it must be noted that these

two scenarios give a value for groundwater under industrial soil – not agricultural soil as specified by the ESD.

Scenario	In and around buildings		Open area	Waste dump		Sewer system
	Worst case	Realistic		Worst case	Realistic	
PEC groundwater (mg/l)	5.3×10^{-5}	6.62×10^{-6}	1.96×10^{-4}	9.26×10^{-6}	2.31×10^{-6}	1.93×10^{-5}

5.1.27.5 Primary & Secondary Poisoning Exposure Assessment

Non-target vertebrates may be exposed to rodenticides primarily through consumption of bait and secondarily from consumption of poisoned rodents and for predators eating earthworms which have ingested the active substance absorbed to soil. Small pellets and whole grain baits are highly attractive to birds.

In and around buildings:
Primary Poisoning:

Regarding the possible primary hazard to non-target animals this is assessed for birds and mammals.

Acute:

In the first tier scenario, PECoral is the concentration of the rodenticide in the food of a non-target organism. The PECoral is **50 mg/kg** (Brodifacoum present at 0.005% w/w in the product) and is used in the quantitative risk assessment for the acute and long-term situation.

In the second tier (refined) risk assessment the daily uptake (ETE) for birds and mammals is considered. This risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes and takes into account avoidance factor (AV), the fraction of the diet obtained in the treated area (PT) and a a default excretion factor.

Table-1 Brodifacoum concentrations in non-target birds following a single uptake of the product

Species	Body weight (g)	Daily food intake (FIR) (g/d)[a]	Conc. of a.i. after single meal (mg/kg bw/d) (ETE)	Expected conc. after elimination[b] (mg/kg bw/d) (EC)
Tree sparrow	22	7.6	17.27	12.43
Chaffinch	21.4	6.42	15.00	10.80
Wood pigeon	490	53.1	5.42	3.90
Pheasant	953	102.7	5.39	3.88
Dog	10 000	456[d]	2.28	1.64
Pig	80 000	600[e]	0.375	0.270

Pig, young	25 000	600[e]	1.20	0.864

Long-term:

In the first tier scenario, the risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes and takes into account avoidance factor (AV), the fraction of the diet obtained in the treated area (PT) and a default excretion factor.

Expected concentration of Brodifacoum in the animal after one meal followed by a 24-hour elimination period

Species	Estimated daily uptake of a compound (ETE) (mg/kg b.w./d)		Fraction of daily uptake eliminated (number between 0 and 1) (EI)	Expected concentration of active substance in the animal (EC) (mg/kg b.w./d)	
	Step 1	Step 2		Step 1	Step 2
Tree sparrow	17.27	12.43	0.3	12.09	8.71
Chaffinch	15.00	10.80	0.3	10.50	7.56
Wood pigeon	5.42	3.90	0.3	3.79	2.73
Pheasant	5.39	3.88	0.3	3.77	2.72
Dog	2.28	1.64	0.3	1.596	1.149
Pig	0.375	0.270	0.3	0.2625	0.189
Pig, young	1.20	0.864	0.3	0.864	0.6048

In the second tier scenario for primary poisoning long-term exposure according to the guidance agreed at the 23rd Biocides CA meeting, EC5 values are used for quantitative risk assessment of primary poisoning in the long-term situation.

EC_{oral} for different relevant species

Days	EC_{oral} (mg/kg b.w./d)						
Species	Tree sparrow	Chaffinch	Wood pigeon	Pheasant	Dog	Pig	Young pig
Day 1 after first meal	17.27	15.00	5.42	5.39	2.28	0.375	1.20
Day 2 before new meal	12.1	10.5	3.79	3.77	1.60	0.266	0.840
Day 3 before new meal	20.6	17.9	6.45	6.41	2.72	0.449	1.43
Day 4 before new meal	26.5	23.0	8.31	8.26	3.50	0.577	1.84

Day 5 before new meal	30.7	26.6	9.61	9.56	4.05	0.666	2.13

Secondary Poisoning:

Secondary poisoning hazard can only be ruled out completely when the rodenticide is used in fully enclosed spaces so that rodents cannot move to outdoor areas or to (parts of) buildings where predators may have access. Predators among mammals and birds may occur inside buildings or they may hunt in the immediate vicinity of buildings, e.g. parks and gardens. Scavengers may also search for food close to buildings.

Tier 1 exposure assessment:

According to the ESD PT 14, a normal susceptible rodent may eat anticoagulant rodenticide for a number of days before it stops eating. The feeding period has been set to a default value of 5-days, which corresponds to the feeding pattern observed in laboratory experiments. The mean time until death has been set to a default value of 7-days. Concentrations in contaminated rodents have been calculated for the time point immediately after the last meal. The factor PD (fraction of food type in diet) is set to 0.2 (minimum factor for normal case), 0.5 (normal use situation), and 1.0 (worst case situation). Regarding the elimination rate, the default of 0.3 supported by the ESD is adopted. The assessment also takes into account the concentration in resistant rodents.

	Residues of rodenticide in target animal, mg a.s./kg b.w. with bait consumption expressed as PD		
	0.2	**0.5**	**1.0**
A normal non-resistant target rodent stops eating on day 5			
Day 1 after the first meal*	1.00	2.50	5.00
Day 2 before new meal**	0.70	1.75	3.50
Day 3 before new meal	1.19	2.97	5.95
Day 4 after the last meal	1.53	3.83	7.66
Day 5**	1.77	4.43	8.86
Day 7 (mean time to death)**	1.36	3.39	6.79
A target rodent continues eating due to resistance			
Day 14 after the meal	2.31	5.79	11.58

Tier 2 Exposure Assessment:

The refined tier 2 considers exposure of relevant species of predators, based on their bodyweights and food intakes and takes into account avoidance factor (AV), the fraction of the diet obtained in the treated area (PT) and a default excretion factor. Food intake of non-target animals can vary significantly, depending on the metabolic rates of species, the nature of their food, weather conditions, time of year, etc.

Brodifacoum concentrations in non-target mammals and birds consuming contaminated rodents

				Normal susceptible rodents caught on day 5, before their last meal.	**Normal susceptible rodents caught on day 5 just after their last meal**	**Resistant rodents caught on day 14 just after their last meal**

Species		Body weight *)	Daily mean food intake*)	Amount a.s. consumed by the non-target animal**	Concentration in non-target animal	Amount a.s. consumed by the non-target animal***	Concentration in non-target animal	Amount a.s. consumed by the non-target animals****	Concentration in non-target animal
		(g)	(g)	(mg)	(mg a.s./kg b.w.)	(mg)	(mg a.s./kg b.w.)	(mg)	(mg a.s./kg b.w.)
Barn Owl	*Tyto alba*	294	72.9	0.32	1.10	0.51	1.72	0.61	2.06
Kestrel	*Falco tinnunculi.*	209	78.7	0.35	1.68	0.55	2.62	0.65	3.13
Little owl	*Athene noctua*	164	46.4	0.21	1.26	0.32	1.97	0.39	2.35
Tawny Owl	*Strix aluco*	426	97.1	0.43	1.01	0.67	1.58	0.81	1.89
Fox	*Vulpes vulpes*	5 700	520.2	2.31	0.41	3.62	0.63	4.32	0.76
Polecat	*Mustela putorius*	689	130.9	0.58	0.85	0.91	1.32	1.09	1.58
Stoat	*Mustela erminea*	205	55.7	0.25	1.21	0.39	1.89	0.46	2.26
Weasel	*Mustela nivalis*	63	24.7	0.11	1.74	0.17	2.72	0.21	3.25

Calculation of concentration in earthworms:
Calculations for secondary poisoning are undertaken according to the ESD PT 14 for predators eating earthworms which have ingested the active substance absorbed to soil.

Brodifacoum concentrations in earthworms

		Tier 1[a]	Tier 2[b]
Input			
C_{soil} sewer system	Concentration in soil averaged over a period of 180 days and divided by 2 (mg/kg wwt)	8.70×10^{-5}	3.70×10^{-5}
C_{soil} building	Concentration in soil immediately after intake divided by 2 (mg/kg wwt)	0.0056	0.0050
$BCF_{earthworm}$	Bioconcentration factor in earthworm (L/kg wet fish)	15820	15820
$C_{porewater}$ sewer system	Concentration in porewater (mg/L) divided by 2	5.35×10^{-7}	2.29×10^{-7}
$C_{porewater}$ building	Concentration in porewater (mg/L) divided by 2	3.48×10^{-5}	3.10×10^{-5}
F_{gut}	Fraction of gut loading in worm (kg dwt/kg wwt)	0.1	0.1
$CONV_{soil}$	Conversion factor for soil concentration wet-dry weight soil (kg wwt/kg dwt)	1.13	1.13
Output			
$PEC_{oral,\ earthworm}$ building	Predicted environmental concentration in earthworm (mg/kg wet earthworm)	0.495	0.441

5.1.27.6 Overall Summary of exposure assessment

The biocidal product is a ready-to-use bait containing 0.005% Brodifacoum as the active substance. Brodifacoum is a second-generation single-dose anticoagulant rodenticide. It is used against rat at the maximal rate of 60 g of product equivalent to 3 mg a.s. per baiting post and against mouse at 20 g product equivalent to 1 mg a.s. by baiting post. This formulation is intended for indoor and outdoor uses.

PECs were calculated in accordance with the ESD for PT14. These calculations are outlined in the previous sections. Based on environmental fate and behaviour of Brodifacoum the following PEC values were determined:

Scenario	In and around buildings		Sewer system		Open Areas		Waste Dumps	
	Worst case	Realistic	Worst case	Realistic	Worst case	Realistic	Worst case	Realistic
PEC soil (mg/kg wwt)	0.047	0.006			0.173	N/a	0.00817	0.00204
PEC groundwater (mg/l)	5.3×10^{-5}	6.62×10^{-6}			1.96×10^{-4}	n/a	9.26×10^{-6}	2.31×10^{-6}
PEC microorganisms (mg/l)			1.93×10^{-5}	1.27×10^{-5}				
PEC surface water (mg/l)			1.77×10^{-6}	1.18×10^{-6}				
PEC agricultural soil (mg/kg wwt)			4.86×10^{-4}	3.24×10^{-4}				
PEC groundwater (ag) (mg/l)			4.66×10^{-7}	3.11×10^{-7}				
PECsediment (mg/kg)			1.92×10^{-3}	1.28×10^{-3}				

No new data related to the environment fate and behaviour or the ecotoxicology of the active substance or the biocidal product has been submitted by the applicant. There were three studies submitted related to secondary poisoning to dogs and foxes and the hazard/risk to barn owls which are considered only supplementary data and not considered further in the risk assessment.

PNECs were calculated based on the studies submitted for the EU approval of the active substance. PECS for assessment of primary and secondary poisoning were determined based on the ESD for PT14 and the TGD (2003).

5.1.28 Risk Characterisation for the Environment

Brodifacoum products are non-selective and can pose a risk of primary and secondary poisoning to non-target animals.

Product containing brodifacoum are placed at secured bait points. To maximise exposure of the target rodents and minimise unintended exposure of other non-target vertebrates, the products are placed where they are most likely to be encountered by the target organisms (e.g. on habitual rat-runs).

The type of secured bait point suitable for a given situation is determined on a case-by-case basis, taking into account such factors as shielding from sunlight and moisture necessary to maintain bait integrity and the level of security required to prevent access to and/or interference by non-target animals etc.

The risks posed by products containing 50 mg Brodifacoum/kg are characterised for the following scenarios:

1. **In and around buildings (houses, animal houses, commercial and industrial sites)**
2. **Open areas**
3. **Dumps**

5.1.28.1 Aquatic compartment

A contamination of surface water with Brodifacoum from the placing of product in and around buildings is highly unlikely. A lack of exposure to surface water is also stated in the EUBEES 2 emission scenario document. Contamination of surface waters is however expected to arise following use of bait in sewers.

The most sensitive organism in the aquatic tests was alga with a nominal 72 hr ErC50 of 0.04 mg/L. This **$PNEC_{water}$** of 0.04/1000 AF**= 0.00004 mg/L**.

The test with micro-organisms in inhibition of microbial activity showed that concentrations that it is not likely that Brodifacoum will have a negative impact on the microbial processes in a sewage treatment plant at solubility limits. This gives a **$PNEC_{STP}$** of **= 0.0058 mg/L.**

As no specific data are available, the toxicity of Brodifacoum to sediment-dwelling organisms is covered by the risk to aquatic compartment. The application of an additional factor of 10, as done in CAR A, is considered not necessary as an experimental log Kow = 4.92 (i.e. lower than 5) is available. **Therefore, the PNECsediment organisms = 0.00004 mg/l**.

The risk characterisation for the aquatic compartment is presented in the following table applying the relevant PEC values as indicated in the table in the overall summary of the exposure assessment in the previous section.

Aquatic PEC/PNEC ratios using the realistic and worst case scenario

Exposed compartment	Endpoint	PNEC mg/L	PEC Worst case	PEC Realistic	Risk quotient PEC/PNEC
Surface water	Algae	0.00004	1.77E-06	1.18E-06	0.044
Sediment	Based on aquatic data and equilibrium partitioning method	4.348E-02	1.92E-03	1.28E-03	0.044

STP	Inhibition of microbial activity	0.0058	1.93E-05	1.27E-05	0.003

The PEC/PNEC risk quotient in all compartments are below the trigger value of 1 indicating Brodifacoum following the recommended use of the product does not cause an unacceptable risk to aquatic organisms.
Brodifacoum is not readily biodegradable under environmentally relevant conditions or during sewage treatment processes. Accordingly, the degradation of Brodifacoum in sediment is also anticipated to be low. However, it has limited exposure to the aquatic compartment and this is confirmed by the PEC calculations. The PEC/PNEC ratio is below the level that leads to an unacceptable risk, thus the risk for unacceptable accumulation in sediment can be regarded as low.

For an indication of the risk in relation to surface water and groundwater/porewater used for drinking refer to the section on the aquatic compartment and groundwater in the exposure assessment.

Since the potential for metabolites formation is negligible, risk characterisation is not required.

Summary: No risk is identified

5.1.28.2 Atmospheric compartment

There are no releases of brodifacoum to air from manufacturing, formulating, use or disposal phases. Based on this and the physical and chemical properties of brodifacoum, the compound is not expected to contribute to global warming, ozone depletions in the stratosphere, or acidification.

Summary: No risk is identified

5.1.28.3 Terrestrial compartment

Exposure of the terrestrial compartment (soil) will also occur when product is deployed outdoors. Exposure is assumed to arise through a combination of transfer (direct release) and deposition via urine and faeces (disperse release) onto soil.

As there is only one test result available with soil dwelling organisms the risk assessment is performed on the basis of this result using an AF and on the basis of the equilibrium partition method. For the EPM the PNEC is calculated from the aquatic toxicity data **PNECaquatic**= **0.00004 mg/kg**.

PEC/PNEC ratios using the realistic worst case scenario

Exposed compartment	Endpoint	PNEC	PEC Worst case	Risk quotient PEC/PNEC Worst case
In and around buildings	Based on aquatic data and equilibrium partitioning method Based on the availability of test result with soil dwelling organisms and AF	1. 4.348 x E-02 2. 14-d LC50 > 879.6 mg/kg wwt/1000 = 0.8796 mg/kg	0.047	1. 1.08 2. 0.053
Open areas	Based on aquatic data and equilibrium partitioning method Based on the availability of test result with soil dwelling organisms and	1. 4.348 x E-02 2. 14-d LC50 > 879.6 mg/kg wwt/1000 = 0.8796 mg/kg	0.173	1. 3.97 2. 0.196

	AF			
Waste dump	Based on aquatic data and equilibrium partitioning method Based on the availability of test result with soil dwelling organisms and AF	1. 4.348 x E-02 2. 14-d LC50 > 879.6 mg/kg wwt/1000 = 0.8796 mg/kg	0.00817	1. 1.87 2. 9.29 x 10^{-3}

The PEC/PNEC ratio was greater than 1 when used **in and around buildings and in open areas** when applying the EPM indicating for this calculation method that Brodifacoum, following recommended use of the product, causes an unacceptable risk to organisms in this terrestrial compartment. However, this PNEC value based in and around buildings and in open areas **represents only a screening value** of contamination and is superseded by the PNEC value determined from the 14-day earthworm toxicity study.

Summary: No risk is identified

Non compartment specific effects relevant to the food chain

5.1.28.4 Primary poisoning

Referring to rodenticide applications **in sewer systems**, there is no primary poisoning hazard to non-target mammals or birds because this is not a habitat for them (*cf.* ESD PT 14).

Regarding the possible primary hazard to non-target animals following applications **in and around buildings**, several non-target species are assessed for primary poisoning risk assessments.

Acute exposure:
Non-target mammals and birds are unlikely to enter sewers and feed on product in sewage systems. Therefore, there will be no significant exposure following the use of product in sewers. Rats that live underground in sewers are also unlikely to take bait and deposit significant quantities in accessible places above ground, thus preventing exposure to non-target animals living above sewers. In conclusion, the risks to non-target mammals and birds following the use of bait containing Brodifacoum in sewers are considered to be very low.

Following applications in and around buildings, the empirical risk assumes direct or indirect consumption of the deployed baits. For primary poisoning the initial PEC_{oral} values assume that there is no bait avoidance by the non-target animals and that they obtain 100% of their diet in the treated area and have access to the product.
The concentration in the final product is 0.005% for the active substance Brodifacoum. The PECoral is 50 mg/kg (Brodifacoum present at 0.005% w/w in the product) and is used in quantitative risk assessment for the acute and long-term situation.

Tier I risk assessment: $PEC_{oral}/PNEC_{oral}$ ratio for birds and mammals exposed to Brodifacoum

	PEC_{oral} (concentration in food, mg/kg)	**$PNEC_{oral}$ (concentration in food, mg/kg)**	**PEC / PNEC**
Acute			
Bird	50	19	2.63
Mammal	50	-	-
Long-term			
Bird	50	0.0004	125000
Mammal	50	0.000011	4545454

The ratios PEC/PNEC are above 1 indicating a potential risk.

Therefore, a refined tier 2 assessment is set out below, based on representative species. The refined tier 2 risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes. Food intake of non-target animals can vary significantly, depending on the metabolic rates of species, the nature of their food, weather conditions, time of year, etc.

Tier 2 acute risk assessment: $PEC_{oral}/PNEC_{oral}$ for non-target animals accidentally exposed to bait containing Brodifacoum after one meal

Non-target animals	ETE, concentration of Brodifacoum after one meal (one day) (mg/kg b.w.)		$PNEC_{oral}$ (dose, mg/kg b.w./d)	PEC/PNEC	
	Step 1	Step 2		Step 1	Step 2
Tree sparrow	17.27	12.09	0.0004	43175	30225
Chaffinch	15.00	10.50	0.0004	37500	26250
Wood pigeon	5.42	3.79	0.0004	13550	9475
Pheasant	5.39	3.77	0.0004	13475	9425
Dog	2.28	1.596	0.000011	207272	159600
Pig	0.375	0.2625	0.000011	34090	26250
Pig, young	1.20	0.864	0.000011	109090	78545

In Tier 2, Step 1 (worst case) AV, PT and PD are all set to 1, whilst in the realistic worst case (Step 2) these AV and PT are refined to 0.9 and 0.8, respectively.

The ratios PEC/PNEC are above 1 indicating a potential risk even after refinement.

Long -term exposure:
In this assessment, long-term exposure also has to be taken into account in the evaluation of primary poisoning of rodenticides.

Tier 2 long-term risk assessment: $EC_{oral}/PNEC_{oral}$ ratio after 1-day elimination of Brodifacoum

Species	EC_{oral} (mg/kg b.w./d) after 1 day		$PNEC_{oral}$ (mg/kg b.w./d)	Ratio $PEC_{oral}/PNEC_{oral}$	
	Step 1	Step 2		Step 1	Step 2
Tree sparrow	12.09	8.71	0.0004	30225	21775
Chaffinch	10.5	7.56	0.0004	26250	18900
Wood pigeon	3.79	2.73	0.0004	9475	6825
Pheasant	3.77	2.72	0.0004	9425	6800
Dog	1.596	1.149	1.1E-05	145091	104455
Pig	0.2625	0.189	1.1E-05	23864	17182
Pig, young	0.864	0.6048	1.1E-05	78545	54982

The ratios PEC/PNEC are above 1 indicating a potential risk.

According to the guidance agreed at the 23rd Biocides CA meeting, EC_5 values are used for quantitative risk assessment of primary poisoning in the long-term situation.

Tier 2 long-term risk assessment: $EC_{oral}/PNEC_{oral}$ ratio after 5-day elimination

Species	EC_{oral} after 5 days (mg/kg b.w./d) with excretion factor = 0.3, AV = 1, PT = 1 (mg/kg bw)[a]	EC_{oral} after 5 days (mg/kg b.w./d) with excretion factor = 0.3, AV = 0.9, PT = 0.8 (mg/kg bw)[a]	$PNEC_{oral}$ (mg/kg b.w./d)	Ratio $EC_{oral}/PNEC_{oral}$
Tree sparrow	30.7	22	0.0004	55260
Chaffinch	26.6	19	0.0004	47880
Wood pigeon	9.61	7	0.0004	17298
Pheasant	9.56	7	0.0004	17208
Dog	4.05	3	0.000011	265091
Pig	0.666	0.480	0.000011	43593
Pig, young	2.13	2	0.000011	139418

The ratios PEC/PNEC are above 1 indicating a potential risk even after refinement.

Summary: Risk is identified
Overall, for primary poisoning all acute and long-term $PEC_{oral}/PNEC_{oral}$ ratios are still above the trigger value of 1 indicating acute and long-term unacceptable risks

5.1.28.5 Secondary poisoning

It is unlikely that target rodents that have ingested bait containing Brodifacoum will leave the sewer system and be exposed, in significant numbers, to predators or scavengers. Therefore, the secondary poisoning risks from the use of bait in sewers are considered to be very low.

For the first tier assessment of secondary poisoning in and around buildings the maximum residue levels in target rodents that arise on day-5 after the last meal ($ETE_{oral\ predator}$) are compared to the PNEC values for concentration in food. The first tier assessment also assumes the following three levels of Brodifacoum bait consumption: 20%, 50% and 100% of the daily food intake of the target rodents. For long-term exposure, it is assumed that the rodents have fed entirely on rodenticide and that the non-target animals consume 50% of their daily intake on poisoned rodents.

Tier 1 risk assessment of secondary poisoning at day 5 (non-resistant rodents)

Organism group	$PNEC_{oral}$ (mg a.s./kg b.w.)	$ETE_{oral,\ predator}$ (mg a.s./kg b.w.)			$PEC_{oral}/PNEC_{oral}$ – day 5		
PD values		0.2	0.5	1.0	0.2	0.5	1.0
Acute							
Birds	19	2.77	6.93	13.87	3.84	9.62	19.26
Mammals	-				-	-	-
Long-term							
Birds	0.0004	1.39	3.47	6.93	10692	26692	53307
Mammals	0.000011				6261	15630	31216

Tier 1 risk assessment of secondary poisoning at day 14 (resistant rodents)

Organism group	$PNEC_{oral}$ (mg a.s./kg b.w.)	$ETE_{oral, predator}$ (mg a.s./kg b.w.)			$PEC_{oral}/PNEC_{oral}$ – day 14		
PD values	-	0.2	0.5	1.0	0.2	0.5	1.0
Acute							
Birds	19	2.31	5.79	11.58	0.121	0.30	0.60
Mammals	-				-	-	-
Long-term							
Birds	0.0004	1.15	2.31	5.79	287	5775	14475
Mammals	0.000011				104545	231000	526363

According to the tier 1 assessment the risk for secondary poisoning of non-target predator birds and mammals during long-term exposure via rodents poisoned with Brodifacoum is very high as indicated by the trigger value of 1 being exceeded in all cases. Therefore, a refined tier 2 assessment is set out below, based on representative species.

The refined tier 2 risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes. Food intake of non-target animals can vary significantly, depending on the metabolic rates of species, the nature of their food, weather conditions, time of year, etc.

Tier 2 risk assessment of secondary poisoning (non resistant and resistant rodents)

Species	Exposure	$ETE_{oral\ predators}$ (mg a.s./kg/d)	$PNEC_{oral}$ (mg a.s./kg/d)	Ratio $ETE_{oral\ predators}$ / $PNEC_{oral}$
Barn owl	Day 5 before the last meal	1.10	0.0004	2750
	Day 5 after the last meal	1.72		4300
	Day 14 after the last meal	2.06		5150
Kestrel	Day 5 before the last meal	1.68	0.0004	4200
	Day 5 after the last meal	2.62		6550
	Day 14 after the last meal	3.13		7825
Little owl	Day 5 before the last meal	1.26	0.0004	3150
	Day 5 after the last meal	1.97		4925
	Day 14 after the last meal	2.35		5875
Tawny owl	Day 5 before the last meal	1.01	0.0004	2525
	Day 5 after the last meal	1.58		3950
	Day 14 after the last meal	1.89		4725
Fox	Day 5 before the last meal	0.41	0.000011	41000
	Day 5 after the last meal	0.63		63000
	Day 14 after the last meal	0.76		76000
Polecat	Day 5 before the last meal	0.85	0.000011	77272
	Day 5 after the last meal	1.32		132000
	Day 14 after the last meal	1.58		143636
Stoat	Day 5 before the last meal	1.21	0.000011	121000
	Day 5 after the last meal	1.89		189000
	Day 14 after the last meal	2.26		226000
Weasel	Day 5 before the last meal	1.74	0.000011	174000
	Day 5 after the last meal	2.72		272000
	Day 14 after the last meal	3.25		325000

Summary: Risk is identified

The ratios PEC/PNEC are all above 1 indicating a potential risk even after refinement.

5.1.28.6 Secondary poisoning via the terrestrial food chain

Emissions of brodifacoum to soil take place in two scenarios. In the scenario **in and around buildings** the uptake to soil proceeds directly (when considering outdoor applications as proposed in the ESD PT 14), whereas in the scenario for the **sewer** is not applicable in this PAR.

However, the TGD gives advice to take the 180 days averaged PEClocal for soil with respect to sewage sludge when calculating the PEC in earthworms. Hence, the mode of application given in the TGD is in fact not applicable for direct intake of substances.

In the product dossier $PEC_{oral,earthworm}$ for the direct soil intake has been calculated. The applicant advises that these figures be interpreted with care as concentrations in earthworm due to direct soil intake are not dealt with in the TGD. Soil concentrations used for the calculation represent a brodifacoum intake within a soil mixing depth of just 10 cm. Degradation has not been considered. Soil concentrations are halved since the TGD assumes only 50% of the soil uptake by earthworm to origin from the contaminated area.

Table-2: Secondary poisoning risk to earthworm-eating birds and mammals

Scenario	$PEC_{oral,earthworm}$ (mg/kg wet earthworm)		PNEC (mg/kg food)	PEC/PNEC	
	Tier 1[a]	Tier 2[b]		Tier 1[a]	Tier 2[b]
Birds					
Sewer system	N/a	N/a	4.0×10^{-4}	N/a	N/a
In and around buildings	0.495	0.441		1237	1102
Mammals					
Sewer system	N/a	N/a	2.22×10^{-4}	N/a	N/a
In and around buildings	0.495	0.441		2229	2004

[a] Product specific application data and default value for release (90% direct +indirect release)

[b] Product specific application data and refined metabolism

Summary: Risk is identified but is likely to have been overestimated

The results for the **in and around buildings** scenario indicate a risk of secondary poisoning for birds and mammals consuming contaminated earthworms.

5.1.28.7 Overall Summary

Based on toxicity data Brodifacoum presents a hazard to birds and non-target mammals. Non-target vertebrate animals may be exposed to the product containing Brodifacoum, either directly by ingestion of exposed product (primary poisoning) or indirectly by ingestion of the carcasses of target rodents that contain Brodifacoum residues (secondary poisoning). Brodifacoum products are non-selective and can pose a risk of primary and secondary poisoning to non-target animals. There are many uncertainties associated with quantification of the risk associated with the use of Brodifacoum products. Overall, because of the toxic nature of rodenticides and the over-riding public health requirement it is more appropriate to develop and validate risk management measures than to refine the risk assessment procedures further. It is noted that the product contains a bittering agent and this may deter some non-target animals. It is also noted that the attractiveness of the product may be impacted by the use of dye.

5.1.28.7.1 Primary poisoning:

Overall, all acute and long-term PECoral/PNECoral ratios are above the trigger value of 1 indicating acute and long-term unacceptable risks. Even when avoidance and elimination are taken into account the empirical exposure levels result in unacceptable risks to birds and mammals.

5.1.28.7.1.1 Secondary poisoning:

Via ingestion of target rodents by non-target vertebrates
All ratios of PECoral/PNECoral are above the trigger value of 1 indicating an unacceptable risk of secondary poisoning. Even when avoidance and elimination are taken into account the empirical exposure levels result in unacceptable risks to birds and mammals. Studies are submitted in the product dossier that indicate that the realistic risk for secondary poisoning is significantly lower than that using the PEC/PNEC approach. These studies are only considered as supplementary information.

Via the aquatic food chain
Only one of the proposed four use scenarios, namely use in sewers, will lead to exposure of surface water. It is concluded that risk to fish-eating birds and mammals in a real situation cannot be excluded it potentially is overestimated.

Via the terrestrial food chain
The results for the **in sewer** and **in and around buildings** scenario indicate a risk of secondary poisoning for birds and mammals consuming contaminated earthworms.

5.1.28.7.2 Conclusion for primary and secondary poisoning:

Due to the risk assessment results for primary and secondary poisoning and the uncertainty associated with quantification of this risk, risk mitigation measures must be taken into account to lead to an acceptable use of the rodenticide product.

5.1.28.7.3 The following risk mitigation measures are proposed to mitigate the primary and secondary poisoning risk to non-target mammals and lead to an acceptable use of this rodenticide:

- Use of an integrated management strategy and precautionary systems
- Unless under the supervision of a pest control operator use or other competent person do not use anticoagulants as permanent baits

- There should be proper and secure placing of baits so as to minimise the risk of consumption by other animals or children. Where possible secure baits so they cannot be dragged away.
- Users should select tamper-resistant bait boxes, secured bait boxes, covered applications or burrow baiting (placing of bait in appropriate containers or under a curved tile or in a piece of tube) to minimize exposure of non-target animals
- Monitor and replenish bait stations as appropriate
- Frequent visits to bait stations to ensure that any bait that is split or dragged out of bait stations is removed
- Unconsumed baits must be collected after termination of the control campaign and dispose of them in accordance with local requirements
- Remove dead and moribund rodents at frequent intervals, at least as often as baits are checked or replenished during a baiting campaign
- Baits should be deployed in accordance with the product labelling
- Baits should be deployed in accordance with other approved guidance on good practice.
- Restrict the use of the product to treatment campaigns of limited duration
- To minimise the likelihood of target rodents developing resistance to second-generation anticoagulant rodenticides, long-term deployment of baits as a preventative control measure is not recommended
- The resistance status of the population should be taken into account when considering the choice of rodenticide to be used.
- When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary and secondary poisoning by the anticoagulant as well as indicating the first measure to be taken in case of poisoning must be made available alongside the baits

10.4 Measures to protect man, animals and the environment

The information submitted covering the requirements as described in the TNsG on Data Requirements, common core data for the product, section 8, points 8.1 to 8.8 is provided below.

3.4.17. Methods and precautions concerning handling, use, storage, transport or fire

Methods and precautions concerning handling and use:

- Always read the label before use and follow the instructions provided.
- Do not decant product into unlabelled containers.
- Product must be handled in a safe manner.
- Avoid all unnecessary exposure, in particular avoid ingestion.
- A thorough survey of the infested area is essential, particularly in secluded and sheltered places, to determine the extent of the infestation.
- Baits must be securely deposited in baiting stations or other coverings so as to minimise the risk of consumption by companion animals, other non-target animals and children. Where possible, secure baits so that they cannot be dragged away.
- PUBLIC AREA USE: When the product is being used in public areas and tamper-resistant bait stations are not used, the following must be implemented. When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary or secondary poisoning by the anticoagulant as well as indicating the first measures to be taken in case of poisoning must be made available alongside the baits. When tamper-resistant bait stations are used, they should be clearly marked to show that they contain rodenticides and that they should not be disturbed.
- Dead rodent bodies, remains of unused bait or any fragments of bait found away from the bait station must be collected during all control operations to minimize the risk of consumption and poisoning to children, companion animals and other non-target animals.
- It is illegal to use this product for the intentional poisoning of non-target, beneficial and protected animals.
- Wash hands and face after application and use of the product, and before eating, drinking or smoking.
- For professional users the use of appropriate personal protective equipment (PPE) is advised.

Methods and precautions concerning storage:

- Store in a cool, dry, well-ventilated secure (lockable) place
- Store locked up in the original container
- Store original container tightly closed
- Keep/store out of reach of children and companion animals
- Keep/store away from food, drink and animal feedstuffs and products which may have an odour.

Methods and precautions concerning transport:

Hazard classification for transport: TOXIC, MARINE POLLUTANT

UN-No Coumarin derivative pesticide, solid, toxic, n.o.s (BRODIFACOUM)

Class 6.1 Hazard ID 66

Proper Shipping name Coumarin derivative pesticide, solid, toxic (contains brodifacoum)

UN-No 3027 Packing Group 1

Class 6.1

Methods and precautions concerning fire:

Suitable Extinguishing Media:

Keep fire exposed containers cool by spraying with water if exposed to fire. Fight surrounding fire with foam, water fog, or dry powder.

Extinguishing media which must not be used for safety reasons:

DO NOT USE WATER JETS

Specific hazards:

This product is not flammable but is combustible. Avoid run-off into water courses. Self-contained breathing apparatus should be won by fire-fighting personnel.

Special protective equipment for fire-fighters:

In the event of fire, wear self contained breathing apparatus, a chemical protection suit, suitable gloves and boots.

Residues:

Dispose of residues to certified waste disposal operator for incineration and licensed waste disposal site.

3.4.18. Specific precautions and treatment in case of an accident

Personal precautions

Wear suitable protective clothing, gloves and eye/face protection, if applicable and where appropriate.

- Respiratory Protection: No special respiratory protection equipment is recommended under normal conditions of use with adequate ventilation.
- Hand protection: Wear gloves for professional products.
- Skin protection: No special clothing/skin protection equipment is recommended under normal conditions of use.
- Eye protection: Not required.
- Ingestion: When using this product, do not eat, drink or smoke

Personal treatment

- General advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible and report the authorisation number).
- Skin contact: Obtain medical advice immediately. Remove contaminated clothing. After contact with skin, wash immediately with plenty of water, followed by soap and water in order to minimise skin contact.
- Contaminated clothing should be washed and dried before re-use.
- Eye contact: Obtain medical advice immediately. Rinse eyes immediately with copious amounts of water.
- Inhalation: Unlikely to present an inhalation hazard unless excessive dust is present. Remove person to fresh air. Obtain medical advice immediately.
- Ingestion: Do no induce vomiting. If swallowed, obtain medical advice immediately. Wash out mouth with water.

ADVICE FOR DOCTORS:

Brodifacoum is an indirect anti-coagulant. Phytomenadione, Vitamin K1, is antidotal. In the case of suspected poisoning, determine prothrombin times not less than 18 hours after consumption. If elevated, administer vitamin K1 and continue until prothrombin times normalise. Continue determination of prothrombin time for three days after withdrawal of antidote and resume reatment if elevation recurs in that time.

Report all incidents of poisonings to the relevant national poisons centre; include information on the product authorisation number, product trade name and active substance. In Ireland, this is the National Poisons Information Centre, Beaumont Hospital, Dublin (01-8092166)

Environmental precautions

- Prevent accidental exposure of the product to the environment.
- Keep un-used bait locked-up and in secure storage containers
- Bait must be secured in tamper resistant bait boxes in areas away from drains, water courses and non-target organisms.

Environmental treatment

- Clean up accidental spillages promptly by sweeping or vacuum.
- If the product gets into water or soil, it should be removed mechanically. In the event of a significant accidental release, inform the appropriate authority.
- Transfer to a suitably labelled container and dispose of to a certified waste disposal operator for incineration and licensed waste disposal site.
- Subsequently, wash the contaminated area with water, taking care to prevent the washings entering sewers or drains.
- For further instructions, see section 3.4.6 below.

3.4.19. Procedures for cleaning application equipment

No application equipment is required, therefore, no specific cleaning for equipment is required

If necessary, following use, bait boxes should be washed with detergent and water. The bait box should be washed out 3 times (triple rinsed).

3.4.20. Identity of relevant combustion products in cases of fire

This product contains paraffin wax.

3.4.21. Procedures for waste management of the biocidal product and its packaging

The best means of disposal of any product is through proper use according to the label. For the product incinerate under controlled conditions. For the pack, do not dispose of the pack in domestic refuse. Empty completely, puncture or crush and dispose of safely to Local Authority and National requirements. Dispose of packaging, remains of unused product and dead rodents to a certified waste disposal operator for incineration and licensed waste disposal site.

3.4.22. Possibility of destruction or decontamination following accidental release

Air:

Brodifacoum has a low vapour pressure, therefore the potential for evaporation is low The vapour pressure is 5 x 10^{-5} Pa. As a rodenticide, this material is not intentionally aerosolised. Therefore, destruction in air is not a concern.

Water (including drinking water):
Prevent further leakage or spillage if safe to do so. Prevent entry into watercourses, sewers.

Soil:
Direct and/or intentional release to soil is not anticipated for the use of the product as a rodenticide. In the event of a significant accidental release, inform the appropriate authority.

3.4.23. Undesirable or unintended side-effects

Toxic to mammalian and avian species, including domesticated animals, wildlife and humans. Therefore the risk to these non-target species should be considered when using bait.

3.4.24. Poison control measures

The paste baits are dyed (e.g. red or blue) to make them unattractive to wildlife, and birds in particular. In addition, in case of accidental ingestion, the presence of a dye may help to confirm that there has been ingestion and thus facilitate antidote treatment.

The product contains a human taste deterrent (adversive agent – Bitrex).

To report human poisoning incidents call the relevant national poison information centre. Include information on the product authorisation number, product trade name and active substance. Where possible provide a copy of the label or safety data sheet (SDS).

In Ireland to report a poisoning incident, call: 01 (8092566 / 8379964) The Poisons Information Centre of Ireland, Beaumont Hospital, Beaumont Road, Dublin 9.

ADVICE FOR DOCTORS:

Brodifacoum is an indirect anti-coagulant. Phytomenadione, Vitamin K1, is antidotal. In the case of suspected poisoning, determine prothrombin times not less than 18 hours after consumption. If elevated, administer vitamin K1 and continue until prothrombin times normalise. Continue determination of prothrombin time for three days after withdrawal of antidote and resume reatment if elevation recurs in that time.

Report all incidents of poisonings to the relevant national poisons centre (include information on the product authorisation number, product trade name and active substance)

4. Proposal for Decision

The assessment presented in this report has shown that the ready-to-use product, Saphir Paste, formulated by Lodi S.A.S. with the active substance Brodifacoum, at a level of 0.005% w/w, may be authorised for use as a rodenticide (product-type 14) for the control of rodents (rats and mice).

Physical-Chemical Properties:
Saphir Paste has been shown not to present a physical-chemical hazard to end users and does not classify as highly flammable, oxidising or explosive. The bait is stable when stored at 54^{o}C for two weeks and when stored at ambient temperatures (20^{o}C) for two years. A shelf life of two years is proposed. A suitable method of analysis for the determination of Brodifacoum in the bait was provided.

The source of active substance used in the biocidal product Saphir Paste is the same source of active substance that is listed in Annex I of 98/8/EC. Syngenta initially supported the source, then the task force (Pelgar International Ltd and Activa) also supported the source, Italy carried out an equivalence check on the Task force source of Brodifacoum and found it to be equivalent to the Syngenta source. The RefMS accepted Italy's assessment.

Efficacy:
Saphir Paste (containing 40 mg/kg brodifacoum) is a ready-to-use paste bait (RB) intended to control the brown rat (*Rattus norvegicus*) and the house mouse mice (*Mus musculus*) indoors and outdoors (in and around buildings, open areas and waste disposal sites). The use scenario encompassing waste disposal sites and open areas is intended for professional users only. Effectiveness data has confirmed that Saphir Paste is effective in the proposed areas for use, at the recommended dose rate. Effective control should be expected from bait stored up to two years under suitable storage conditions.

Human Health:
The calculations presented have been made with the assumptions of rat control, and there are no separate calculations to assess exposure for mice control in which smaller bait sizes are used.

Using both the MOE and AEL approaches for risk assessment indicates that there is a satisfactory margin between the predicted exposure and the NOAEL (LOAEL) as well as exposures below the threshold value for the AEL for all intended uses by trained professionals with PPE, untrained professionals and amateurs (with and without PPE). The product is deemed suitable for authorisation and appropriate personal protective equipment is advised.

Secondary exposure from transient mouthing of the product exceeds the AEL reference value (0.0033µg/kg/day), both with the assumption of 0.01 g and 5 g of product ingested by infants. This is of concern. There is no margin of safety using the existing data and models. There is no safe scenario for indirect exposure if estimated according to TNsG and User Guidance. Mitigation and protection measures such as the inclusion of bittering agents and the enclosure of product in sealed packs and tamper resistant bait boxes are essential to reducing the risk of secondary exposure. Baits should not be placed where food, feeding stuffs or drinking water could be contaminated.

Environment:
The applicant did not submit any new environmental fate and behaviour studies with this product. Therefore the conclusions made at the Annex I inclusion stage for the active substance stand. The uses of this product were assessed here under the TGD and the PT14 ESD and all PEC/PNEC ratios were <1. However there is a risk for primary and secondary poisoning for non-target vertebrates. These identified risks are mitigated by applying all appropriate and available risk mitigation measures.

Conclusion:

During the active substance review of Brodifacoum by Italy, primary and secondary poisoning risks were identified for non-target organisms and for potential accidental poisoning incidents involving children. The assessment of those EU identified risks during the product authorisation evaluation of Brodifacoum have also indicated a potential risk of primary and secondary poisoning to non-target animals and the potential for the accidental primary poisoning of children. Due to these findings risk mitigation measures are applied to product authorisation.

Additionally, as the target rodents are vermin and are both direct transmitters of disease (such as through biting or contamination of food/feed by urine or faeces) or indirect carriers of disease (such as disease vectors, where fleas move from rat to humans) to humans and other animals. Transmitted diseases can include leptospirosis (or Weil's disease), trichinosis and salmonella. Authorisation of this product is considered necessary on the basis of public health grounds, since rodent populations are considered to constitute a danger to public health through the transmission of disease. However, risk mitigation measures and restrictions are required to prevent the possibility of the identified risks to non-target animals, companion animals and children.

Conditions of authorisation

Two authorisations should be issued. The first authorisation covers professional and trained professional use product. The second authorisation covers amateur use product.

This authorisation of Saphir Paste is for a period of 5-years with an annual renewal.

The concentration of the active substance, Brodifacoum, in Saphir Paste shall **not** exceed 0.05 g/kg (0.005% w/w).

Only ready-to-use Saphir Paste product is authorised.

As a poison control measure, the authorisation requires that the product shall contain an aversive, bittering agent.

The authorisation requires that the product be dyed with a colour to make them unattractive to wildlife, and birds in particular.

This product shall **not** be used as a tracking poison.

The product is authorised only for use against rats and mice (for example brown rats and house mice). Authorisation of this product does **not** allow use against non-target organisms.

The authorisation of this product for professionals and trained professionals only allows for use indoors and outdoors in the following areas: Indoors, including areas such as houses, warehouses, outbuildings and commercial premises. Outdoors uses only includes in-and-around buildings. The product can also be utilised in sewers. Brodifacoum baits must not be placed where food, feeding stuffs or drinking water can become contaminated.

The authorisation of this product for amateurs allows for use of this product indoors and outdoors around buildings in the following areas: Indoors, including only privates houses and outbuildings. Outdoors uses, including only around private building premises and private gardens and waste dumps. Brodifacoum baits should not be placed where food, feeding stuffs or drinking water can become contaminated.

The product should be used for rodent control in tamper resistant, secured bait stations or other secure coverings.

Bait stations should be clearly marked to show that they contain rodenticides and that they should not be disturbed.

Baits shall be secured to the bait station(s) so that rodents cannot remove bait from the bait box.

For amateur use products placed on the market in Ireland packaging restrictions are to be limited to pre-baited bait stations and refill packs with a maximum pack-size of 500g. Refill packs for amateurs must contain bait that is wrapped. Loose baits or grain (without wrapping) shall not be packaged for amateurs.

All product placed on the Irish market after the date of authorisation must be in compliance with the conditions of this authorisation and shall carry the approved label with the IE/BPA authorisation number and be packaged in the approved packaging.

Prior to any amendment relating to this authorised product, such as specification, use, labelling or administrative changes, application must be made to this Authority to do so

Upon annual renewal of the biocidal product, the authorisation holder shall provide statistics to PRCD on the import and export from Ireland and also manufacture statistics where appropriate for the product for the given full annual period or part thereof.

Authorisation of the biocidal product may be subject to review, following a detailed assessment of the risks involved, in accordance with the European Communities (Authorisation, Placing on the Market, Use and Control of Biocidal Products) Regulations, 2001, as amended. This review may lead to changes in or revocation of this authorisation.

Note (April 2018) The Annexes to PAR v1.2 are identical to those of V1.0

Annex 6 – PAR v1.3 – 15 December 2014

Product Assessment Report
Saphir Paste

Active substance:	**Brodifacoum**
Product-type:	**PT 14**
Type of application:	**Authorisation**
Authorisation No:	**IE/BPA 70286 (Professional)** **IE/BPA 70287 (Non-professional)**
Date:	**15 December 2014**
Version:	**1.3**

Biocidal Product Assessment Report (PAR) related to Product Authorisation.

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

Pesticide Registration and Control Division
Department of Agriculture, Food and the Marine
Backweston Campus
Young's Cross
Celbridge
Co. Kildare
Ireland

CONTENTS

4. General information about the product application

This application for product authorisation is for:

Trade name:	Saphir Paste
Authorisation No.:	IE/BPA 70286 (Professional and Trained Professional) IE/BPA 70287 (General public / Non-professional)

Saphir Paste trade names in other Member States (based on R4BP data):

Trade name	Member State
Brodipesce Pate	Estonia, France, Latvia
Raco Force Paste	Ireland, UK
Saphir (Pasta)	Italy
Rodistar	Italy
Biosnap Rat and Mouse Killer	UK
Doff Prebaited Mouse Station	UK
Ratta Extra Brodifacoum Paste	UK

10.5 Applicant/ Authorization Holder

Company Name:	Lodi S.A.S.
Address:	Parc d'Activités des 4 Routes F-35390 Grand Fougeray, France
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

10.6 Marketing/Distributing Company (where applicable)

Company Name:	LODI (UK)
Address:	Pensnett Trading Estate, Building 69, 3rd Avenue, Kingswinford, West Midlands, DY6 7FD UK
Tel:	[redacted]
E-mail:	N/A
Contact:	N/A

10.7 General Information on the Biocidal Product

Trade name:	Saphir Paste
Manufacturer's development code number(s):	N/A
Active substance content:	0.004% w/w Brodifacoum
Main group:	MG03 Pest Control
Product type:	PT14 (Rodenticides)

Product Specification:	See Confidential Annex
Site of product formulation:	See Confidential Annex
Frame formulation (yes/no):	No
Formulation type:	Paste Bait
Ready to use product (yes/no):	Yes
Chemical/micro-organism:	Chemical Substance
Contain or consist of GMOs[37] (yes/no):	N/A
Is the product already notified/authorised (Directive 98/8/EC) (yes/no); **If yes:** **product name:**	No N/A
Is the biocidal product equivalent to the product assessed for the purpose of Annex I inclusion to 98/8/EC (yes/no):	No.

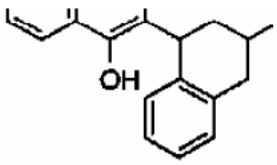
Manufacturer of Formulated Product	
Company Name:	Company CGB (Compagnie Générale des Biocides)
Address:	Parc d'Activités des 4 Routes – F-35390 Grand Fougeray, France
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

10.8 Information on active substance(s)[38]

Active substance chemical name:	Brodifacoum
IUPAC name:	*3-[3-(4'-bromobiphenyl-4-yl)-1,2,3,4-tetrahydro-1-naphthyl]-4-hydroxycoumarin*
CAS No:	56073-10-0
EC No:	259-980-5
Purity (minimum, g/kg or g/l):	950 g/kg
Molecular formula:	$C_{31}H_{23}BrO_3$

[37] A copy of any written consent(s) of the competent authorities to the deliberate release into the environment of the GMOs for research and development purposes where provided for by Part B of the above-mentioned Directive was provided.

[38] Please insert additional columns as necessary

Structural Formula:	
Manufacturing site:	See Confidential Annex
Specification of pure active substance:	See Confidential Annex
Is a new active substance data package (source) supplied (yes/no):	No
If yes, Is the active substance equivalent to the active substance listed in Annex I to 98/8/EC (yes/no):	N/A
If no, does the applicant have a LoA to the active substance data packaged used to support Annex I inclusion (yes/no):	Yes (Pelgar International Ltd.)

Manufacturer of active substance(s)	
Company Name:	Pelgar International Ltd.
Address:	Unit 13 Newman Lane Industrial Estate Alton. Hants. GU34 2 QR UK
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

10.9 Information on the intended use(s) of the biocidal product

Main Group:	MG03 (Pest control)
Product-type:	PT14 (Rodenticide)
Intended use:	Brodifacoum paste bait to control rodents indoors, outdoors around buildings (amateur use) and outdoors in open areas and waste dumps (professionals only) for the protection of public health, stored products and materials.
Target organisms:	(I.1) Rodents (I.1.1) Murids (I.1.1.1) Brown rats (*Rattus Norvegicus*) (I.1.1.3) House mouse (*Mus musculus*)
Development stage:	(II.1) Juveniles (II.2) Adults
Function:	Rodenticide
Mode of action:	Anticoagulant III.2 long-term action III.2.1 anticoagulant III.2.1.1 ingestion toxin

	III.2.1.1.1 ingestion by eating
Application aim:	VII.1 Stored product protection/food protection VII.2 Health protection VII.3 Material protection (e.g. historical buildings, technical objects)
Category of users:	V.1 Non Professional/General public V.2 Professional V.3 Trained/specialised professional
Area of use (indoors/outdoors):	IV.1 Indoors (warehouses, houses, outbuildings) IV.2 Outdoors (in and around buildings), IV.2 Outdoors (open areas and waste dumps) IE/BPA 70286 only
Application method:	VI.2 Covered applications VI.2.1 In bait stations(product can only be applied in bait stations for waste dump and open area applications) VI.2.2 Other coverings (this does not include application down rat holes)
Directions for use including minimum and maximum application rates, typical size of application area:	**IE/BPA 70286, IE/BPA 70287** Indoors and outdoors (in and around buildings) Rats (Adult and Juvenile): Secure 60g of bait in covered, tamper resistant baiting stations spaced 10m apart (3m apart in areas of high infestation) in areas where rats are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings). Mice (Adult and Juvenile): Secure 10g of bait, in covered, tamper resistant baiting stations spaced 5m apart (3m apart in high infestation areas) in areas where mice are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings). **IE/BPA 70286 (Professional Use Only)** Outdoors (open areas and waste dumps) Rats: Secure 60g of baits in covered tamper resistant baiting stations or covered bait points spaced 10m apart (5m apart

	in areas of high infestation) in areas where rats are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings). Mice: Secure 10g bait in covered tamper resistant baiting stations or covered bait points spaced 5m apart (3m apart in high infestation areas) in areas where mice are active. Regularly check bait consumption and replace consumed or spoilt bait until consumption has stopped. Repeat treatment in situations where there is evidence of new infestation (e.g. fresh tracks or droppings).
Potential for release into the environment (yes/no):	Yes
Potential for contamination of food/feedingstuff (yes/no):	No

10.10 Documentation

5.1.29 Data submitted in relation to product application

A full new product dossier was submitted by Lodi S.A.S in support of the product Saphir Paste containing brodifacoum. Please see the attached reference list in Annex IV:

5.1.30 Access to documentation

Lodi S.A.S. has a letter of access to data held by PelGar International Ltd which was used to support the Annex I listing of the active substance brodifacoum in Directive 98/8/EC. Lodi S.A.S. does not have access to the Annex III product data package held by PelGar International Ltd.

Lodi S.A. has a letter of access to product data held by Belgagri S.A. relating to brodifacoum choice feeding trial for rats and mice in fresh and aged bait.

Lodi S.A. has a letter of access to product data held by BIO 6 S.A. relating to brodifacoum choice deeding trial against rats and albino house mice on aged product.

Lodi S.A.S has a letter of access to formulation toxicological data for the product Vertox Pasta Bait held by Pelgar International Limited.

8. Classification, labelling and packaging

Under this heading the assessment of the classification, labelling and packaging should be summarised. Further, any result of the assessments made under the following headings that require recommendations or restrictions appearing on the label should be summarised here.

8.1. Harmonised classification of the active substance

Brodifacoum is not currently classified in Annex I of Council Directive 67/548/EEC or according to Annex VI of Regulation (EC) no 1907/2006 (REACH). The following classification and labelling is proposed on the basis of available data resulting from the review programme for brodifacoum and is provided in the table below according to Directive 67/548/EEC/Regulation (EC) 1272/2008. Additionally, the extrapolation of these proposals using the BG RCI converter tool (http://www.gischem.de/ghs/konverter) is also provided in the table below in accordance with Regulation (EC) 1272/2008.

Classification of the active substance, brodifacoum, according to Directive 67/548/EEC and CLP Regulation (EC) 1272/2008:

Symbol(s):	 	**Pictogram(s):**	
Indication(s) of danger:	T+ Very Toxic N Dangerous for the Environment	**Signal word(s):**	Danger
Risk phrases:	R26/27/28: Very toxic by inhalation, in contact with skin and if swallowed. R43: May cause sensitisation by skin contact R48/23/24/25: Toxic: Danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed. R61: May cause harm to the unborn child. R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.	**Hazard statements:**	H300: Fatal if swallowed. H310: Fatal in contact with skin. H317: May cause an allergic skin reaction H330: Fatal if inhaled. H360D: May damage the unborn child. H372: Causes damage to organs through prolonged or repeated exposure through inhalation. H400: Very toxic to aquatic life H410: Very toxic to aquatic life with long lasting effects.
Safety phrases:	S20/21: When eating do not eat, drink or smoke S35: The material and its container must be disposed of in a safe way S36/37: Wear suitable protective clothing and gloves S45: In case of accident or if you feel unwell seek medical advice immediately (show the label where possible) S60: This material and its container must be disposed of as hazardous waste. S61: Avoid release to the environment. Refer to special instructions/safety data sheet.	**Precautionary statements:**	P101: If medical advice ist needed, have product container or label at hand. P103: Read label before use. P270: Do not eat, drink or smoke when using this product. P273: Avoid release to the environment. P280: Wear protective gloves and clothing P281: Use personal protective equipment as required. P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P308 + P313: IF exposed or concerned: Get medical advice/attention.

			P314: Get medical advice/attention if you feel unwell. P501: Dispose of contents/container to hazardous waste facilities in accordance with national regulations.

Specific concentration limits for brodifacoum are proved below in accordance with Directive 67/548/EEC:

Specific concentration limits:	C≥2.5% 1%≤C<2.5% 0.5%≤C<1% 0.25%≤C<0.5% 0.025%≤C<0.25% 0.0025%≤C<0.025%	T+, N; R26/27/28-48/23/24/25-43-61-50/53 T+, N; R26/27/28-48/23/24/25-43-61-51/53 T+, N; R26/27/28-48/23/24/25-61-51/53 T+, N; R26/27/28-48/23/24/25-51/53 T ; R23/24/25-48/20/21/22-52/53 Xn; R20/21/22

Additionally, brodifacoum does not exhibit hazardous physical-chemical properties. Brodifacoum is thermally stable at 52°C. It is not classified as highly flammable and does not undergo self ignition below its melting point. It is not considered to be explosive or to have oxidising properties. There is no record that it has reacted with any storage container during many years of industrial production. It is concluded therefore, that there are no hazards associated with its physico-chemical properties under normal conditions of use.

8.2. Harmonised classification and labelling of the biocidal product

The current classification and labelling, based on the biocidal product evaluation for Saphir Paste, is provided in the tables below according to Directive 99/45/EC and Regulation (EC) 1272/2008, Annex VI, Part 3.

Classification and Labelling of the biocidal product according to Directive 99/45/EC:

Symbol(s):	Not applicable
Indication(s) of danger:	Not applicable
Risk phrases:	Not applicable
Safety phrases:	S1+S2: Keep locked up and out of reach of children S13: Keep away from food, drink and animal feeding stuffs. S20 + S21: When using do not eat, drink or smoke. S24: Avoid contact with skin S35: This material and its container must be disposed of in a safe way. S37: Wear suitable gloves (Professional only) S46: If swallowed, seek medical advice immediately and show this container or label. S49: Keep only in the original container S61: Avoid release to the environment. Refer to special instructions/safety data sheet

Classification and Labelling of the biocidal product according to the CLP Regulation (EC) 1272/2008:

Pictogram(s):	Not applicable
Signal word(s):	Not applicable
Hazard statements:	Not applicable
Precautionary statements	P102: Keep out of reach of children. P103: Read label before use. P220: Keep/Store away from food, drink and animal feedingstuffs. P262: Do not get on skin P270: Do not eat, drink or smoke when using this product. P273: Avoid release to the environment P280: Wear protective gloves (Professional only) P301+310: IF SWALLOWED: Immediately call a poison centre or doctor/physician. P404+405: Store locked up in a closed container. P501: Dispose of contents/container in accordance with national regulations.

Physical-chemical properties:
Not explosive, oxidising or highly flammable and therefore does not classify from a physical-chemical point of view.

Toxicology:
There is no toxicology classification for the product under the Directive 99/45.

There is no toxicology classification for the product under the CLP Regulation 1272/2008.

Environment:
There is no environmental classification for the product under the Directive 99/45.

There is no environmental classification for the product under the CLP Regulation 1272/2008.

Other:
Further, the content of the label should be updated to comply with the labelling requirements established (for biocidal products) where the labelling requirements in Article 20(3) of Directive 98/8/EC has been implemented. The safety data sheet should comply with the requirements in Regulation (EC) 1907/2006.

Additional Labelling Requirements:

Addition safety Information:	To avoid risks to human health and the environment, comply with the instructions for use. Harmful to wildlife Use bait containers clearly marked “poison” at all surface baiting points. Remove all remains of bait, dead rodents during and after treatment and dispose of safely. Apply only in positions inaccessible to children and pets.
Special labelling provisions for Ireland:	Use Biocides Safely and Sustainably (IE/BPA 70286) Not For Amateur Sale It is illegal to use this product for uses or in a manner other than that prescribed on this label.
If a separate leaflet is attached to or supplied with the product, add the following information to the front label:	Read attached instructions before use

8.3. Packaging

The packaging details for the biocidal product, Saphir Paste, as presented by the applicant, are outlined below for amateur and professional users.

Nomenclature: PP = polypropylene, PS = polystyrene, PE = polyethylene, HDPE = high-density polyethylene, PVC = polyvinylchloride, AL = Aluminium

Amateur product packaging:
On the basis of the packaging details presented, it is considered appropriate to limit aspects of the packaging for amateur users as a risk mitigation measure. Packaging restrictions are to be limited to pre-baited bait stations and refill packs with a **maximum pack-size of 500g**. Additionally, the pasta bait should be supplied to the amateur market in sachets/wrapped in order to reduce exposure risks to amateur operators during application to bait stations.

Amateur product packaging:

Amateur product packaging: cardboard case

Container description:	Cardboard case			
Pack size(s):	50g	100g	120g	200g
Baits per pack:	5x 10g	10x 10g	12x 10g	20x 10g
Pack dimensions (LxWxH):	50 x 24 x 80	100 x 48 x 160	100 x 48 x 160	140 x 55 x 180
Inner packaging materials:	PE or PP sachet			
Outer packaging materials:	Cardboard + PE liner			
Ready-to-use (yes/no)	Yes			
Child safety features (yes/no):	No			
If yes, please specify:	N/A			
Shelf-life:	3 years			
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.			

Amateur product packaging: cardboard case

Container description:	Cardboard case			
Pack size(s):	240g	250g	480g	500g
Baits per pack:	24x 10g	25x 10g	48x 10g	50x 10g

Pack dimensions (LxWxH):	140 x 55 x 180	140 x 55 x 180	140 x 70 x 210	140 x 70 x 210
Inner packaging materials:	PE or PP sachet			
Outer packaging materials:	Cardboard + PE liner			
Ready-to-use (yes/no)	Yes			
Child safety features (yes/no):	No			
If yes, please specify:	N/A			
Shelf-life:	3 years			
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.			

Amateur product packaging: SACHETS

Container description:	Sachets			
Pack size(s):	200 g	250 g	480 g	500 g
Baits per pack:	20*10g	25*10g	48*10g	50*10g
Pack dimensions (LxWxH):	180 x 50 x 190	190 x 50 x 190	190 x 50 x 250	190 x 50 x 250
Inner packaging materials:	PE or PP sachet			
Outer packaging materials	PE	PE sachet (zip pouch)	PE	PE
Ready-to-use (yes/no)	Yes			
Child safety features (yes/no):	No			
If yes, please specify:	N/A			
Shelf-life:	3 years			
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.			

Amateur product packaging: PREBAITED BAIT STATIONS

Container	Pre-baited bait stations in cardboard outer

description:			
Pack size(s):	10 g	20 g	60 g
Baits per pack:	1*10g	2*10g	6*10g
Pack dimensions (LxWxH):	135 x 43 x 80	135 x 43 x 80	240 x 105x x190
Packaging materials:	PP pre-baited station into Cardboard case		
Ready-to-use (yes/no)	Yes		
Child safety features (yes/no):	No		
If yes, please specify:	N/A		
Shelf-life:	3 years		
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.		

Professional product packaging

Professional Product packaging: Buckets

Container description:	Buckets				
Pack size(s):	1 kg	2 kg	2.5 kg	3 kg	4 kg
Baits per pack:	100*10g	200*10g	250*10g	300*10g	400*10g
Pack dimensions (LxWxH):	250 x 170 x 120	290 x 205 x 215	290 x 205 x 215	290 x 205 x 215	290 x 200 x 270
Inner Packaging materials:	PE or PP sachet or loose bait				
Outer Packaging materials:	PE or PP bucket				
Ready-to-use (yes/no)	Yes				
Child safety features (yes/no):	No				
If yes, please specify:	N/A				
Shelf-life:	3 years				
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.				

Professional Product packaging: Buckets

Container description:	Buckets				
Pack size(s):	5 kg	10 kg	15 kg	20 kg	25 kg
Baits per pack:	500*10g	1000*10g	1500*10g	2000*10g	2500*10g
Pack dimensions (LxWxH):	290 x 200 x 270	390 x 300 x 350	380 x 285 x 450	380 x 285 x 450	380 x 285 x 450
Inner Packaging materials:	PE or PP sachet or loose bait				
Outer Packaging materials:	PE or PP bucket				
Ready-to-use (yes/no)	Yes				

Child safety features (yes/no):	No
If yes, please specify:	N/A
Shelf-life:	3 years
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional product packaging: cardboard boxes

Container description:	Cardboard boxes					
Pack size(s):	3 kg	5 kg	10 kg	15 kg	20 kg	25 kg
Baits per pack:	300*10g	500*10g	1000*10g	1500*10g	2000*10g	2500*10g
Pack dimensions (LxWxH):	150 x 100 x 150	290 x 200 x 270	390 x 290 x 240	390 x 390 x 245	400 x 400 x 370	400 x 400 x 370
Inner Packaging materials:	PE or PP sachet or loose bait					
Outer Packaging materials:	Cardboard + PE liner					
Ready-to-use (yes/no)	Yes					
Child safety features (yes/no):	No					
If yes, please specify:	N/A					
Shelf-life:	3 years					
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.					

Professional product packaging: cardboard cases

Container description:	Cardboard cases				
Pack size(s):	50 g	100 g	120 g	200 g	240 g
Baits per pack:	5*10g	10*10g	12*10g	20*10g	24*10g
Pack dimensions (LxWxH):	70 x 50 x 105	100 x 48 x 160	100 x 48 x 160	140 x 55 x 190	140 x 55 x 190
Inner Packaging materials:	PE or PP sachet or loose bait				
Packaging materials:	Cardboard + PE liner				
Ready-to-use (yes/no)	Yes				

Child safety features (yes/no):	No
If yes, please specify:	N/A
Shelf-life:	3 years
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional product packaging: cardboard cases

Container description:	Cardboard cases				
Pack size(s):	250g	480g	500g	520g	720g
Baits per pack:	25*10g	48*10g	50*10g	52*10g	72*10g
Pack dimensions (LxWxH):	140 x 55 x 190	140 x 70 x 210	140 x 70 x 210	140 x 70 x 210	183 x 72 x 263
Inner Packaging materials:	PE + PP sachet or loose bait				
Packaging materials:	Cardboard + PE liner				
Ready-to-use (yes/no)	Yes				
Child safety features (yes/no):	No				
If yes, please specify:	N/A				
Shelf-life:	3 years				
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.				

Professional product packaging: cardboard cases

Container description:	Cardboard cases		
Pack size(s):	750 g	1 kg	2 kg
Baits per pack:	75*10g	100*10g	200*10g
Pack dimensions (LxWxH):	183 x 72 x 263	183 x 72 x 263	320 x 210 x 170
Inner Packaging materials:	PE + PP sachet or loose bait		
Packaging materials:	Cardboard + PE liner		
Ready-to-use (yes/no)	Yes		
Child safety features (yes/no):	No		
If yes, please specify:	N/A		
Shelf-life:	3 years		

Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional product packaging: Zip pouch

Container description:	Zip pouch
Pack size(s):	250 g
Baits per pack:	25*10g
Pack dimensions (LxWxH):	195 x 150 x 40
Outer packaging materials:	PE + PP sachet or loose bait
Inner packaging materials:	PE sachet (zip pouch)
Ready-to-use (yes/no)	Yes
Child safety features (yes/no):	No
If yes, please specify:	N/A
Shelf-life:	3 years
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional product packaging: Prebaited bait stations

Container description:	Prebaited bait stations	
Pack size(s):	240 g	480 g
Baits per pack:	24*10g	48*10g
Pack dimensions (LxWxH):	240 x 115 x 190	240 x 115 x 190
Outer packaging materials:	cardboard case	
Inner packaging materials:	PP + PP pre-baited station	
Ready-to-use (yes/no)	Yes	

Child safety features (yes/no):	No
If yes, please specify:	N/A
Shelf-life:	3 years
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.

Professional product packaging: Cartridge (for use with caulking gun)

Container description:	Cartridge					
Pack size(s):	80g	150g	280g	310g	400g	500g
Baits per pack:	N/A	N/A	N/A	N/A	N/A	N/A
Pack dimensions (LxWxH):	145*Ø28 ;	124,5* 46,2	216*Ø46,2	256*Ø46,8	216*Ø58.2	
Packaging materials:	PP	PP	PP	PP	PP	PP
Ready-to-use (yes/no)	Yes					
Shelf-life:	3 years					
Conditions of storage:	Store in dry, cool area. Store in tightly closed packaging. Keep in original containers. Store away from damp or wet conditions. Keep away from children.					

Container materials[39]:

Case – cardboard with PE liner

Bag – PE

Sachets – PE + PP

Pre-baited bait stations – PP

Bucket – PP or PE

Box – Cardboard with PE liner

Cartridge: PP

39 PP = polypropylene, PS = polystyrene, PE = polyethylene, HDPE = high-density polyethylene, PVC = polyvinylchloride

Safety features:	Covered bait stations (tamper resistant)
	Wrapped bait (sachets)

6. Summary of the product assessment

6.1. Physico/chemical properties and analytical methods

Active substance (taken from the Activa/PelGar Brodifacoum and Difenacoum Task Force CAR):
Brodifacoum is an off-white powder at 20°C and atmospheric pressure, with a relative density of 1.53. It was observed to darken and decompose at 235.8°C, whereas no decomposition or transformation occurred below 150°C. Brodifacoum is non-volatile, with a Henry's Law Constant value of 2.35E-18 $Pa.m^3.mol^{-1}$. It is essentially insoluble in water at pH 5, but its solubility proved to increase with pH, due to the variation of the ionisation degree of the 4-*hydroxycoumarin* group in pH range under investigation (5-9). Brodifacoum also turned out to be soluble in organic solvents; results showed that solubility did not vary with temperature, except for dichloromethane.

Brodifacoum dissociation constant was estimated to be 4.50. Log P_{ow} was found to be 4.92 at pH 7 and 20°C. As expected, Log P_{ow} decreased with higher temperature and pH. Brodifacoum is not highly flammable. Besides, it does not show explosive or oxidising properties. Reaction with container materials (mild steel) has not been observed, either. All results considered, it can be concluded that Brodifacoum does not exhibit hazardous physical-chemical properties.

Biocidal product:
Saphir Paste is not explosive, oxidising or highly flammable and therefore does not classify from a physical and chemical point of view. The paste bait is stable when stored for 2 weeks at 54°C and when stored at ambient temperatures (20°C) for 3 years. The paste bait is stable when stored in various different packaging materials (with the exception of the coextruded bag with cardboard box) for 3 years at ambient temperature (20°C). The test item is a ready-to-use paste bait and is not intended to be added or mixed with any other product.

3.1.1. Identity related issues

An equivalence check was carried out by Italy that showed that the PelGar source of Brodifacoum active substance was equivalent to the source of Brodifacoum active substance listed in Annex I of 98/8/EC (see Annex I: Confidential Information and Data).

Composition of the biocidal product Saphir Paste

Component	% w/w	g/kg	Chemical name	CAS no	Function
Brodifacoum	0.005	0.05	3-[3-(4'-bromobiphenyl-4-yl)-1,2,3,4-tetrahydro-1-naphthyl]-4-hydroxycoumarin	56073-10-0	Active substance
Co-formulants	See Confidential Data and Information (Annex I)				

Note: The biocidal product Saphir Paste is not the same as the representative biocidal product accompanying the Annex I inclusion. See confidential information and data for details of the composition of Saphir Paste.

5.1.31 3.1.2. Physico-chemical properties

LODI S.A.S. have a letter of access from PelGar International Limited which covers the all the data for the Annex I listing of the active ingredient Brodifacoum. PelGar International Limited is a member of the Activa/PelGar Difenacoum and Brodifacoum Task Force and as such has access to the complete Annex I listing documentation submitted by this group. LODI do not have access to any of PelGar's product studies (Annex III) data for the purpose of product authorisation at the Member State level.

3.1.3. Physical, Chemical and Technical Properties of the Biocidal Product

Summary of the Physical and Chemical Properties of the Biocidal Product Saphir Paste

Section	Study	Method	Results	Comment	Reference
1.1	Appearance	Observation.	Aspect: Malleable blue paste in individual sachet Colour: 2.5PB5/6 Odour: No characteristic odour	Carried out to GLP. The results are acceptable.	"Chemical stability of Brodifacoum paste bait after accelerated storage". Study no. LODI.59/2011. 15th November 2011. Richerioux, Sandra.
1.2.1	Explosive properties	Justification (examination of the components of the formulation)	"Based on the structural formula of the components, Brodifacoum paste bait has no potential of explosivity and the test according to OECD A14 method is not required."	Carried out to GLP. The components do not contain any group that might act as an explosive agent. The RefMS accepts the Applicant's justification. Saphir Paste is not explosive.	"Explosive properties of Brodifacoum paste bait". Study no. LODI.66/2011. 25th September 2011. Richerioux, Sandra.
1.2.2	Oxidising properties	Justification (examination of the components of the formulation)	"Based on the structural formula of the components, the product have no potential for oxidising properties and the test according to OECD A17 method is not required."	Carried out to GLP. The components do not contain any group that might act as an oxidising agent. The RefMS accepts the Applicant's justification. Saphir Paste is not oxidising.	"Oxidising properties of Brodifacoum paste bait". Study no. LODI.65/2011. 8th November 2011. Richerioux, Sandra.
1.3.1	Flash point			Not required. The test item is not a liquid.	
1.3.2	Flammability	EEC method A 10	Preliminary test: The flame of a gas burner ignited the test substance pile. The test substance glowed, burned with a little flame and turned into a charred residue. A light white smoke was observed. After removal of the ignition source, the flame doesn't spread and extinguished immediately. No more propagation of combustion was observed.	Carried out to GLP. Propagation of combustion of the test item is less than 200mm length of the pile within 4 minutes. Therefore, the main test is not required. The test item is not highly	"Flammability of Brodifacoum paste bait". Study no. LODI.58/2011. 27th June 2011. Meriadec, Elodie.

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td></td><td>flammable.</td><td></td></tr>
<tr><td>1.3.3</td><td>Auto-flammability</td><td>EEC method A 16.</td><td>No self ignition temperature of the test item was recorded up to 400^{o}C (corrected value).</td><td>Carried out to GLP. The result is acceptable.
The test item is not auto-flammable.</td><td>“Self ignition temperature of solids on Brodifacoum paste bait”. Report no. 11-912011-010. 23rd January 2012. Demangel, Benjamin.</td></tr>
<tr><td>1.4.1</td><td>Free acidity/ Alkalinity</td><td></td><td>Determination is not required because pH of a 1% (m/v) aqueous dilution of Brodifacoum Paste Bait is >4 and < 10 (FAO guideline).</td><td>Not required.</td><td></td></tr>
<tr><td>1.4.2</td><td>pH (1 %)</td><td>CIPAC MT 75.3</td><td>The pH in distilled water is 6.3 after 10 minutes.</td><td>Carried out to GLP. The result is acceptable.</td><td>“pH of Brodifacoum paste bait”. Study no. LODI.64/2011. 7th October 2011. Richerioux, Sandra.</td></tr>
<tr><td>1.5.1</td><td>Viscosity</td><td></td><td></td><td>Not applicable as the product is a ready to use paste.</td><td></td></tr>
<tr><td>1.5.2</td><td>Surface tension</td><td></td><td></td><td>Not applicable as the product is a ready to use paste.</td><td></td></tr>
<tr><td>1.6</td><td>Relative density</td><td>OECD 109 and NF T20-053 method.</td><td>1.142</td><td>Carried out to GLP. A pycnometer was used to determine the relative density. The result is acceptable.</td><td>“Relative density of Brodifacoum paste bait”. Study no. LODI.52/2011. 9th September 2011. Richerioux, Sandra.</td></tr>
<tr><td>1.7.1</td><td>Storage stability
(accelerated storage)</td><td>CIPAC MT 46.
GIFAP Monograph no.17</td><td>Aspect:
<table><tr><th></th><th>Aspect</th><th>Colour</th><th>Odour</th></tr><tr><td>T_0</td><td>Malleable blue paste in individual sachet</td><td>2.5PB5/6</td><td>No characteristic odour</td></tr><tr><td>T_{14days}</td><td>Still malleable blue</td><td>10B4/4</td><td>No</td></tr></table></td><td>Carried out to GLP. The test item is stable for 2 and 3 weeks at 54^{o}C. The results indicate that the test item will be stable for 2 and 3 years at ambient temperatures. The results are acceptable.</td><td>“Chemical stability of Brodifacoum paste bait after accelerated storage”. Study no. LODI.59/2011. 15th November 2011. Richerioux, Sandra.</td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td></td><td>paste but slightly friable, in individual sachet</td><td></td><td>characteristic odour</td></tr>
<tr><td>T_{21days}</td><td>Still malleable blue paste but slightly friable, in individual sachet</td><td>10B4/4</td><td>No characteristic odour</td></tr>
</table>
Active substance content:
<table>
<tr><th></th><th>Concentration (ppm)</th><th>Deviation with declared value (%)</th><th>Deviation between T_0 and T_{14} and T_{21} (%)</th></tr>
<tr><td>T_0</td><td>45.12</td><td>+12.80</td><td>-</td></tr>
<tr><td>T_{14days}</td><td>43.62</td><td>+9.05</td><td>-3.32</td></tr>
<tr><td>T_{21days}</td><td>42.64</td><td>+6.60</td><td>-5.50</td></tr>
</table>
The declared active substance content was 40 ppm.
</td><td></td><td></td></tr>
<tr><td>1.7.2</td><td>Shelf life (storage ambient temperatures)</td><td>GIFAP Monograph no.17.</td><td>
Aspect:
T_0 = Malleable blue paste in individual bag
$T_{6months}$ = Malleable blue paste in individual bag
T_{1year} = Malleable blue paste in individual bag
$T_{17months}$ = Malleable blue paste in individual bag
$T_{2\ years}$ = Malleable blue paste in individual bag

Colour:
T_0 = 2.5PB5/6
$T_{6months}$ = 2.5PB5/6
T_{1year} = 2.5PB5/6
$T_{17months}$ = 2.5PB5/6
T_{2years} = 2.5PB5/6
</td><td>Carried out to GLP. Carried out at $20^oC \pm 2^oC$. The paste bait is stable for 2 years storage at ambient temperatures. The results are acceptable.</td><td>“Chemical stability of Brodifacoum Paste Bait after 1 year storage at 20^oC.” Study no. LODI.60/2011. 26th October 2012. Richerioux, Sandra.
&
“Chemical stability of Brodifacoum Paste Bait after 2 years storage at 20^oC.” Study no. LODI.61/2011. 19th November 2013. Richerioux, Sandra.</td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
Odour:
T_0 = No characteristic odour
$T_{6months}$ = No characteristic odour
T_{1year} = No characteristic odour
$T_{17months}$ = No characteristic odour
T_{2years} = No characteristic odour

Active substance content:
<table>
<tr><th></th><th>Conc. (ppm)</th><th>Deviation with declared value (%)</th><th>Deviation between T_0 and T_x (%)</th></tr>
<tr><td>T_0</td><td>45.1</td><td>+12.75</td><td>-</td></tr>
<tr><td>T_{6month}</td><td>41.7</td><td>+4.25</td><td>-7.54</td></tr>
<tr><td>T_{1year}</td><td>41.6</td><td>+4.00</td><td>-7.76</td></tr>
<tr><td>$T_{17months}$</td><td>43.9</td><td>+9.75</td><td>-2.66</td></tr>
<tr><td>T_{2years}</td><td>42.4</td><td>+6.00</td><td>-5.99</td></tr>
</table>
The declared value is 40 ppm.
</td><td></td><td></td></tr>
<tr><td>1.7.3</td><td>Packaging stability
(20°C)</td><td></td><td>
Chemical stability:
<table>
<tr><th></th><th>Colour</th><th>Odour</th><th>Aspect</th><th>Analysis</th></tr>
<tr><td>T_0</td><td>2,5PB5/6</td><td>Slight odour of hazelnut</td><td>Malleable blue paste in individual bag. Presence of grease on individual bag.</td><td>45.1 ppm</td></tr>
<tr><td>T_{3years}</td><td>2,5PB5/6</td><td>Fat odour</td><td>Malleable blue paste in individual bag. Presence of grease on individual bag.</td><td>43.4 ppm</td></tr>
<tr><td colspan="4">Deviation between T_0 and T_{3years}</td><td>-3.77%</td></tr>
</table>
</td><td>Carried out to GLP. The results are acceptable.
The deviation weights (packaging weights and test item weights) after 3 years at 20 ± 2°C are lower than 5% for the following packaging: PP bucket, PP and PE bag with cardboard box, Doypack, PS and PP prebaited baitbox. Moreover, no significant changes were observed on these packaging and on the test item.</td><td>“Chemical and packagings stability of Brodifacoum paste bait after 3 years storage at 20°C (Analysis at T = 1year)”. Study no. LODI.62/2011.B. 30th October 2012. Richerioux, Sandra.
&
“Chemical and packagings stability of Brodifacoum paste bait after 3 years storage at 20°C (Analysis at T = 2years)”. Study no. LODI.62/2011.C. 6th</td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>
Physical properties (for all types of packaging):
T_0 = Blue and malleable paste in individual bag. Presence of grease on individual bag.
$T_{6months}$ = Blue and malleable paste in individual bag. Presence of grease on individual bag.
T_{1year} = Blue and malleable paste in individual bag. Presence of grease on individual bag.
T_{2years} = Blue and malleable paste in individual bag. Presence of grease on individual bag.
T_{3years} = Blue and malleable paste in individual bag. Presence of grease on individual bag.
PP Bucket:
<table>
<tr><th></th><th colspan="3">Weight</th></tr>
<tr><th></th><th>Bucket (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
<tr><td>T_0</td><td>44.134</td><td>293.21</td><td>337.35</td></tr>
<tr><td>$T_{6months}$</td><td>44.428</td><td>292.67</td><td>337.11</td></tr>
<tr><td>Deviation</td><td>0.67%</td><td>-0.18%</td><td>-0.07%</td></tr>
<tr><td>T_{1year}</td><td>44.436</td><td>291.58</td><td>336.01</td></tr>
<tr><td>Deviation</td><td>0.68%</td><td>-0.56%</td><td>-0.40%</td></tr>
<tr><td>T_{2years}</td><td>44.430</td><td>290.19</td><td>334.63</td></tr>
<tr><td>Deviation</td><td>0.67%</td><td>-1.03%</td><td>-0.81%</td></tr>
<tr><td>T_{3years}</td><td>44.435</td><td>289.89</td><td>334.33</td></tr>
<tr><td>Deviation</td><td>0.68%</td><td>-1.13%</td><td>-0.90%</td></tr>
</table>
T_0 = Bucket with white and non-porous internal wall
$T_{6months}$ = Bucket with white and non-porous internal wall. Presence of grease on internal wall of the bucket
T_{1year} = Bucket with white and non-porous internal wall. Presence of grease on internal wall of the bucket
T_{2years} = Bucket with white and non-porous internal wall. Presence of grease on internal wall of the bucket
T_{3years} = Bucket with white and non-porous internal wall. Presence of grease on internal wall of the bucket
</td>
<td>For the coextruded bag with cardboard box, the deviation weight is higher than 5% (-8.29%) and grease was observed at the bottom of the box.
The packaging is stable for 3 years at ambient temperature with the exception of the coextruded bag with cardboard box.</td>
<td>November 2013. Richerioux, Sandra.
&
“Chemical and packagings stability of Brodifacoum paste bait after 3 years storage at 20°C”. Study no. LODI.62/2011. 12th November 2014. Richerioux, Sandra.</td>
</tr>
</table>

Section	Study	Method	Results	Comment	Reference

PE bag with cardboard box:

	Weight			
	PE bag (g)	Cardboard box (g)	Test item (g)	Total (g)
T_0	3.420	23.410	122.75	149.57
$T_{6months}$	3.512	23.690	120.47	147.64
Deviation	2.69%	1.20%	-1.86%	-1.29%
T_{1year}	3.484	23.998	121.18	148.66
Deviation	1.87%	2.51%	-1.28%	-0.61%
T_{2years}	3.485	23.931	120.70	148.12
Deviation	1.90%	2.23%	-1.67%	-0.97%
T_{3years}	3.508	23.797	120.76	148.04
Deviation	2.57%	1.65%	-1.62%	-1.02%

T_0 = Transparent bag without hole – cardboard box with grey and dry internal wall

$T_{6months}$ = Transparent bag, without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

T_{1year} = Transparent bag, without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

T_{2years} = Transparent bag, without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

T_{3years} = Transparent bag, without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

PP bag with cardboard box:

	Weight			
	PP bag (g)	Cardboard box (g)	Test item (g)	Total (g)
T_0	6.972	23.503	111.36	141.83
$T_{6months}$	7.042	23.776	110.18	141.01

Section	Study	Method	Results	Comment	Reference

Deviation	1.00%	1.16%	-1.06%	-0.58%
T_{1year}	7.037	24.094	110.22	141.36
Deviation	0.93%	2.51%	-1.02%	-0.33%
T_{2years}	7.053	24.005	109.55	140.61
Deviation	1.16%	2.14%	-1.63%	-0.86%
T_{3years}	7.089	23.872	109.50	140.46
Deviation	1.68%	1.57%	-1.67%	-0.97%

T_0 = Transparent bag with one hole – cardboard box with grey and dry internal wall

$T_{6months}$ = Transparent bag with one hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

T_{1year} = Transparent bag with one hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

T_{2years} = Transparent bag with one hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

T_{3years} = Transparent bag with one hole. Presence of grease within bag – cardboard box with grey and dry internal wall.

Coextruded bag with cardboard box:

	Weight			
	Coextruded bag (g)	**Cardboard box (g)**	**Test item (g)**	**Total (g)**
T_0	5.016	23.386	82.638	111.04
$T_{6months}$	4.600	23.950	79.887	108.91
Deviation	-8.29%	2.41%	-3.33%	-1.92%
T_{1year}	4.652	24.269	80.954	110.20
Deviation	-7.76%	3.78%	-2.04%	-0.76%
T_{2years}	4.942	24.479	80.534	109.96
Deviation	-1.48%	4.67%	-2.55%	-0.97%
T_{3years}	4.968	24.354	80.539	109.83

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>Deviation</td><td>-0.96%</td><td>4.14%</td><td>-2.54%</td><td>-1.09%</td></tr>
</table>
T_0 = Transparent and non-porous bag without hole – cardboard box with grey and dry internal wall
$T_{6months}$ = Transparent and non-porous bag without hole. Presence of grease within bag – cardboard box with grey internal wall. Presence of grease at the bottom of the box.
T_{1year} = Transparent and non-porous bag without hole. Presence of grease within bag – cardboard box with grey and dry internal wall.
T_{2years} = Transparent and non-porous bag. Holes in the weld. Presence of grease within bag – presence of grease on the wall of the box.
T_{3years} = Transparent bag. Holes in the weld. Presence of grease within bag – presence of grease on the wall of the box.

Doypack:
<table>
<tr><th></th><th colspan="3">Weight</th></tr>
<tr><th></th><th>Doypack (g)</th><th>Test item (g)</th><th>Total (g)</th></tr>
<tr><td>T_0</td><td>11.803</td><td>154.86</td><td>166.66</td></tr>
<tr><td>$T_{6months}$</td><td>12.118</td><td>154.21</td><td>166.33</td></tr>
<tr><td>Deviation</td><td>2.67%</td><td>-0.42%</td><td>-0.20%</td></tr>
<tr><td>T_{1year}</td><td>12.126</td><td>154.15</td><td>166.27</td></tr>
<tr><td>Deviation</td><td>2.74%</td><td>-0.46%</td><td>-0.23%</td></tr>
<tr><td>T_{2years}</td><td>12.131</td><td>153.61</td><td>165.74</td></tr>
<tr><td>Deviation</td><td>2.78%</td><td>-0.81%</td><td>-0.55%</td></tr>
<tr><td>T_{3years}</td><td>12.146</td><td>153.30</td><td>165.45</td></tr>
<tr><td>Deviation</td><td>-2.91%</td><td>-1.01%</td><td>-0.73%</td></tr>
</table>
T_0 = Internal wall in aluminium, without porosity and hole
$T_{6months}$ = Internal wall in aluminium, without porosity and hole. Presence of grease on internal wall of the doypack
T_{1year} = Internal wall in aluminium, without porosity and hole. Presence of grease on internal wall of the doypack
</td><td></td><td></td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
T_{2years} = Internal wall in aluminium, without porosity and hole. Presence of grease on internal wall of the doypack
T_{3years} = Internal wall in aluminium, without porosity and hole. Presence of grease on internal wall of the doypack

PP prebaited baitbox:
<table>
<tr><th></th><th colspan="4">Weight (g)</th></tr>
<tr><th></th><th>Bait station</th><th>Sample 1</th><th>Sample 2</th><th>Total</th></tr>
<tr><td>T_0</td><td>47.465</td><td>10.942</td><td>10.177</td><td>68.583</td></tr>
<tr><td>$T_{6months}$</td><td>47.725</td><td>10.616</td><td>9.849</td><td>68.191</td></tr>
<tr><td>Deviation</td><td>0.55%</td><td>-2.98%</td><td>-3.22%</td><td>-0.57%</td></tr>
<tr><td>T_{1year}</td><td>47.735</td><td>10.770</td><td>9.980</td><td>68.487</td></tr>
<tr><td>Deviation</td><td>0.57%</td><td>-1.57%</td><td>-1.94%</td><td>-0.14%</td></tr>
<tr><td>T_{2years}</td><td>47.738</td><td>10.742</td><td>10.001</td><td>68.484</td></tr>
<tr><td>Deviation</td><td>0.58%</td><td>-1.83%</td><td>-1.73%</td><td>-0.14%</td></tr>
<tr><td>T_{3years}</td><td>47.740</td><td>10.671</td><td>9.963</td><td>68.372</td></tr>
<tr><td>Deviation</td><td>0.58%</td><td>-2.48%</td><td>-2.10%</td><td>-0.31%</td></tr>
</table>
T_0 = Black box with smooth internal wall, without porosity.
$T_{6months}$ = Black box with smooth internal wall, without porosity. Presence of grease at the location of the paste.
T_{1year} = Black box with smooth internal wall, without porosity. Presence of grease at the location of the paste.
T_{2years} = Black box with smooth internal wall, without porosity. Presence of grease at the location of the paste.
T_{3years} = Black box with smooth internal wall. Presence of grease at the location of the paste.

PS prebaited baitbox:
<table>
<tr><th></th><th colspan="4">Weight (g)</th></tr>
<tr><th></th><th>Bait station</th><th>Sample 1</th><th>Sample 2</th><th>Total</th></tr>
</table>
</td><td></td><td></td></tr>
</table>

<table>
<tr><th>Section</th><th>Study</th><th>Method</th><th>Results</th><th>Comment</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>T_0</td><td>11.992</td><td>10.258</td><td>10.374</td><td>32.625</td></tr>
<tr><td>$T_{6months}$</td><td>12.259</td><td>9.955</td><td>10.047</td><td>32.263</td></tr>
<tr><td>Deviation</td><td>2.23%</td><td>-2.95%</td><td>-3.15%</td><td>-1.11%</td></tr>
<tr><td>T_{1year}</td><td>12.268</td><td>10.072</td><td>10.215</td><td>32.559</td></tr>
<tr><td>Deviation</td><td>2.30%</td><td>-1.81%</td><td>-1.53%</td><td>-0.20%</td></tr>
<tr><td>T_{2years}</td><td>12.265</td><td>10.101</td><td>10.189</td><td>32.556</td></tr>
<tr><td>Deviation</td><td>2.28%</td><td>-1.53%</td><td>-1.78%</td><td>-0.21%</td></tr>
<tr><td>T_{3years}</td><td>12.266</td><td>10.030</td><td>10.141</td><td>32.436</td></tr>
<tr><td>Deviation</td><td>2.28%</td><td>-2.22%</td><td>-2.25%</td><td>-0.58%</td></tr>
</table>
T_0 = Black box with smooth internal wall at the location of the paste
$T_{6months}$ = Black box with smooth internal wall at the location of the paste. Presence of grease at location of the paste.
T_{1year} = Black box with smooth internal wall at the location of the paste. Presence of grease at location of the paste.
T_{2years} = Black box with smooth internal wall at the location of the paste. Presence of grease at location of the paste.
T_{3years} = Black box with smooth internal wall. Presence of grease at location of the paste.
</td><td></td><td></td></tr>
<tr><td>1.8.1</td><td>Wettability</td><td></td><td></td><td>Not applicable as the product is a ready to use paste.</td><td></td></tr>
<tr><td>1.8.2</td><td>Persistent foaming</td><td></td><td></td><td>Not applicable as the product is a ready to use paste.</td><td></td></tr>
<tr><td>1.8.3.1</td><td>Suspensibility</td><td></td><td></td><td>Not applicable as the product is a ready to use paste.</td><td></td></tr>
<tr><td>1.8.3.2</td><td>Dispersibility</td><td></td><td></td><td>Not applicable as the product is a ready to use paste.</td><td></td></tr>
</table>

Section	Study	Method	Results	Comment	Reference
1.8.4	Wet/dry sieving test			Not applicable as the product is a ready to use paste.	
1.8.5	Particle size distribution			Not applicable as the product is a ready to use paste.	
1.8.6	Water content			Not applicable as the product is a ready to use paste.	
1.8.7	Emulsion stability			Not applicable as the product is a ready to use paste.	
1.8.8	Flowability, pourability and dustability			Not applicable as the product is a ready to use paste.	
1.9	Physical compatibility			Not applicable. The product is ready-to-use. It is not intended to be mixed with any other product.	

Conclusions:

Saphir Paste is not explosive, oxidising or highly flammable and therefore does not classify from a physical and chemical point of view. The paste bait is stable when stored for 2 weeks at 54^{o}C and when stored at ambient temperatures (20^{o}C) for 3 years. The paste bait is stable when stored in various different packaging materials (with the exception of the coextruded bag with cardboard box) for 3 years at ambient temperature (20^{o}C). The test item is a ready-to-use paste bait and is not intended to be added or mixed with any other product.

Data requirements:

None.

The paste bait is compatible with the following packaging:

PP bucket, PP and PE bag with cardboard box, Doypack, PS and PP prebaited baitbox.

Professional product amendment to packaging:

An application to include an additional pack type, a PP cartridge for use with a caulking gun was submitted for the Saphir paste formulation. Based on a justification by the applicant and the previous information provided under the original application it was considered that the brodifacoum formulation would be compatible with the PP cartridge and would hold up to long term storage in a mastic tube.

Previous information (see point 1.7.3 in the table above) indicated that the deviation weights (packaging weights and test item weights) after 3 years at 20 ± 2oC are lower than 5% for the following packaging: PP bucket, PP and PE bag with cardboard box, Doypack, PS and PP prebaited baitbox. Moreover, no significant changes were observed on these packaging and on the test item.

On the basis of the proposed amendment for Saphir Paste to be contained in a cartridge for use with a caulking gun; since we know that Brodifacoum containing products do not have any negative interaction with packaging made from PP and since we know that a Brodifacoum containing product has held up to long term storage in a mastic tube, it is considered that the inclusion of the “cartridge” packaging type is acceptable for Saphir Paste.

The paste bait is incompatible with the following packaging:

Coextruded bag with cardboard box.

Proposed shelf life for the paste bait:

3-years.

5.1.32 3.1.4. Analytical methods

Saphir Paste was not assessed as part of the Annex I inclusion process therefore the Applicant has submitted the following method of analysis to cover the outstanding data gap.

<table>
<tr><td>Report:</td><td>LODI.51/2011</td></tr>
<tr><td>Title:</td><td>“Brodifacoum paste bait, Brodifacoum grain bait”</td></tr>
<tr><td>Author(s):</td><td>Richerioux, Sandra.</td></tr>
<tr><td>Date:</td><td>23rd January 2012</td></tr>
<tr><td>GLP: Yes/No</td><td>Yes</td></tr>
<tr><td>Principle of the Method:</td><td>Brodifacoum was quantified by liquid chromatography using a reverse phase column and a UV detector at 310 nm.</td></tr>
<tr><td>Linearity:</td><td>The operator prepared five solutions containing 80%, 90%, 100%, 110% and 120% of the concentration of the test item. Three injections were carried out for each solution. The concentrations used were 1.61, 1.81, 2.01, 2.21 and 2.41 mg/L.
For Brodifacoum peak 1 the r^2 was 0.9949. A calibration curve was provided and was linear.
For Brodifacoum peak 2 the r^2 was 0.9923. A calibration curve was provided and was linear.</td></tr>
<tr><td>Precision/repeatability:</td><td>Three solutions were prepared of a concentration C (~ 2.00586 mg/l) of the product. Three injections of each solution were carried out and the RSD was calculated.

Intermediary fidelity (mg/l):
<table>
<tr><th></th><th>1st Injection</th><th>2nd Injection</th><th>3rd Injection</th></tr>
<tr><td>Solution a</td><td>2.23</td><td>2.21</td><td>2.25</td></tr>
<tr><td>Solution b</td><td>2.25</td><td>2.19</td><td>2.25</td></tr>
<tr><td>Solution c</td><td>2.26</td><td>2.21</td><td>2.22</td></tr>
</table>
% RSD = 0.949

Intralaboratory fidelity (mg/l):
<table>
<tr><th></th><th>1st Injection</th><th>2nd Injection</th><th>3rd Injection</th></tr>
<tr><td>Solution a</td><td>2.21</td><td>2.28</td><td>2.23</td></tr>
<tr><td>Solution b</td><td>2.25</td><td>2.19</td><td>2.25</td></tr>
<tr><td>Solution c</td><td>2.26</td><td>2.21</td><td>2.22</td></tr>
</table>
% RSD = 1.188</td></tr>
<tr><td>Accuracy:</td><td>Recovery results:
<table>
<tr><td>Paste bait</td><th>50% doped placebo</th><th>100% doped placebo</th><th>150% doped placebo</th><th>Overall MR</th></tr>
<tr><td>Theoretical content (ppm)</td><td>22.38</td><td>41.12</td><td>59.06</td><td rowspan="2">99.28%</td></tr>
<tr><td>Experimental content</td><td>23.98</td><td>40.68</td><td>54.20</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td>(ppm) – mean of 3 injections</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Mean recovery (MR)</td><td>107.15%</td><td>98.93%</td><td>91.77%</td><td></td></tr>
</table>
The operator doped a placebo with 50, 100 and 150% of the theoretical concentration of test item. Three injections were carried out per solution. The mean recovery (MR) was calculated for each solution.
</td></tr>
<tr><td>Specificity:</td><td>The operator injected a placebo. If an adjacent peak appeared, the resolution must be higher than 2. The operator then stresses the sample by adding 5 ml of acetic acid and injects the solution. If a peak appeared, the resolution must be higher than 2.

No peak other than internal standard was found for the placebo paste.
No peak appeared for the paste bait that was stressed with acetic acid.
Chromatograms were provided and were acceptable.</td></tr>
<tr><td>Limit of detection:</td><td>The operator injected a solution containing 10 ppm of active substance and calculated the ratio S/N between the intensity of the peak and the intensity of the background noise. The operator divided by 10 then by 2 the concentration of the active substance until obtaining a ratio lower than 3. The LOD is the last concentration for which S/N is higher than 3.

LOD = 0.1254 ppm</td></tr>
<tr><td>Limit of quantification:</td><td>The operator injected a solution containing 50 ppm of active substance and calculated the ratio S/N between the intensity of the peak and the intensity of the background noise. The operator divided by 10 then by 2 the concentration of the active substance to obtain a ratio lower than 10. The LOQ is the last concentration for which S/N is higher than 10.

LOQ = 0.6270 ppm</td></tr>
</table>

Conclusion:
The method is acceptable for the determination of Brodifacoum in the paste bait.

Data requirements:
None.

5.1.33 3.1.5. Analytical method for the relevant impurities, isomers and co-formulants in the biocidal product

Not applicable.

9.2. Efficacy of the Biocidal Product

9.2.1. Function/Field of use

PT14: Rodenticide

9.2.2. Organisms to be controlled

Saphir Paste (containing 40 mg/kg brodifacoum) is a ready-to-use paste bait (RB) intended to control the brown rat (*Rattus norvegicus*) and the house mouse mice (*Mus musculus*). Lodi has proposed the use area as indoors and outdoors (in and around buildings, waste disposal sites, open areas) for the protection of public health stored products and materials. The use scenario encompassing waste disposal sites and open areas is intended for professional users only.
For rats, each bait point will contain 60g of bait; a mouse bait point will contain 10g bait. Bait points are placed typically every 5-10m (rats) or 2-5 m (mice) with the distances adapted to the infestation level.

Advice concerning application frequency should be included on the draft label.
The label should contain wording to the effect that effective control should be expected from bait stored up to two years under suitable storage conditions.

9.2.3. Dose/Mode of action

Anticoagulant rodenticides are vitamin K antagonists. The main site of their action is the liver, where several of the blood coagulation precursors undergo vitamin K dependent post translation processing before they are converted into the respective procoagulant zymogens. The specific point of action is thought to be the inhibition of K_1 epoxide reductase. The anticoagulants accumulate and are stored in the liver until broken down. The plasma prothrombin (procoagulant factor II) concentration provides a suitable guide to the severity of acute intoxication and to the effectiveness and required duration of the antidoting therapy (vitamin K_1).

9.2.4. Effects on the target organisms (efficacy)

Data from trials using the paste formulation were provided in the form of laboratory and field studies to verify the proposed label claims.

Laboratory palatability and efficacy studies:
One laboratory palatability and efficacy (choice) test conducted on rats (lab reared and wild) and wild mice with fresh bait.
One laboratory palatability and efficacy (choice) test conducted on rats and mice with fresh and aged bait (6, 12 & 24 month storage).
One laboratory palatability and efficacy (choice) test conducted on rats with bait with aged bait (accelerated storage).
One laboratory palatability and efficacy (choice) test conducted on mice with with aged bait (accelerated storage).

Field efficacy studies:
One field studies conducted on rats (*Rattus norvegicus*).
One field studies conducted on mice (*Mus musculus*).

The applicant provided the study reports from four laboratory studies conducted on Brodipasta which is equivalent to Saphir paste. The experiments were all choice studies conducted to high standard according to relevant in-house methods, CEB methods, EPPO guideline or in accordance with the TNsG on Product Evaluation Appendices to Chapter 7 - Product Type 14 - Efficacy Evaluation of Rodenticidal Biocidal Products endorsed at the 32nd meeting of representatives of Members States Competent Authorities.
The results from the studies are summarised in **Table 3.2**. The results achieved demonstrated that Saphir paste is palatable to the house mouse and the brown rat according to the criteria given in TNsG on Product Evaluation as the bait intake was greater than 20% of the total food consumption in all the studies. The storage treatment (even up to 24 month storage) was found not to adversely affect the

palatability or effectiveness of the product. The treated bait achieved 100% mortality across all the laboratory tests.

Results from two field studies using Saphir paste were also provided. The field trial programme demonstrated an overall efficacy based on post baiting consumption figures of 89.9% for the mouse field trial and efficacy of >95% for the brown rat field trial. The field trial programme demonstrated high effectiveness against wild populations of the brown rat (*Rattus norvegicus*) and for the mouse (*Mus musculus*) under normal use situations.

Table 3.2: Experimental data on the effectiveness of Saphir Paste containing 40 mg/kg brodifacoum.

Test organisms	Test system / Concentrations applied / exposure time	Test conditions	Test results: effects, mode of action, resistance	Reference
Norway rats (*Rattus norvegicus* Berkenhout). 10 wild animals. House mice (*Mus musculus* L.). 10 wild animals. Albino laboratory Norway rats (*Rattus norvegicus*) 22 animals (11 males and 11 females, 10 to 20 weeks old, including one control pair).	Laboratory test. Choice feeding test: fresh baits. 5-day pre-test control diet intake assessment and 21-day bait feeding period. During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 40 g of ground wheat grains and 45 g of the test item per day for rat and about 10 g of ground wheat grains and 15 g of the test item per day for mice) Brodipasta, equivalent to Saphir Paste, freshly manufactured	The animals were individually caged. The wild animals were acclimatised to test conditions for at least 3 weeks in order to discard pregnant females or sick individuals. The laboratory rats were acclimatised to test conditions for at least 5 days. Normal laboratory requirements.	The mean acceptance of the test item was 38.7% (s.d. 28.4%) for wild Norway rats, 43.4% (s.d. 9.5%) for wild house mice and 43.8% (s.d. 18.9%) for albino Norway rats. The efficacy was excellent. Mortality was total (100%) in all test groups after a 21-day choice between this test substance and the challenge diet. The mean time to death ranged from 3 to 19 days after the first intake of treated baits.	B5.10/01
Albino laboratory Norway rats (*Rattus norvegicus*) 22 animals (11 males and 11 females, 10 to 20 weeks old, including one control pair) for each test group. Laboratory House mice (*Mus musculus*) 22 animals (11 males and 11 females, including one control pair) for each test group.	Laboratory test. Choice feeding test: fresh and aged baits. 5-day pre-test control diet intake assessment and 21-day bait feeding period. During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 30 g of ground wheat grains, in competition with the test item) Brodipasta, equivalent to Saphir Paste, stored at 20°C for respectively 6, 12 and 24 months	The animals were individually caged. The laboratory rodents were acclimatised to test conditions for 8 days. Normal laboratory requirements.	For rats, the mean acceptance of the test item was 43.8% (s.d. 18.9%) for the fresh bait, 42.0% (s.d. 16.2%) for the 6-month aged bait, 33.7% (s.d. 13.0%) for the 12-month aged bait and 37.5% (s.d. 15.9%) for the 24-month aged bait. For mice, the mean acceptance of the test item was 46.9% (s.d. 15.1%) for the 12-month aged bait and 36.0% (s.d. 14.2%) for the 24-month aged bait. The efficacy was excellent. Mortality was total (100%) in all test groups after a 21-day choice between this test substance and the challenge diet. The mean time to death ranged from 3 to 20 days after the first intake of treated baits.	B5.10/02

Test organisms	Test system / Concentrations applied / exposure time	Test conditions	Test results: effects, mode of action, resistance	Reference
Norway rat (*Rattus norvegicus*). 20 animals (10 males, 10 females)	Laboratory test. Choice feeding test: fresh baits. 4-day pre-test control diet intake assessment, 4-day bait feeding period and 15-day control bait period. Unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during the pre-test period. During the 4-day test period, the quantity of food placed in each pot was sufficient to meet each animal's daily needs (approximately 50 g of aged rodenticide paste bait and approximately 50 g of challenged diet, in each corresponding pot) Brodifacoum paste bait, similar to Saphir Paste, aged for 3 weeks at 54°C	The animals were individually caged. Normal laboratory requirements: 20 - 24°C, a relative humidity range of 45% to 65%, with between 15 and 20 air changes per hour, and with a 12-hour light-dark cycle	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.9% (s.d. 9.89%). The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 4.7 days (3 to 7 days) after the first intake of treated baits.	B5.10/03
House mouse (*Mus musculus*). 20 animals (10 males, 10 females)	Laboratory test. Choice feeding test: fresh baits. 4-day pre-test control diet intake assessment, 4-day bait feeding period and 15-day control bait period. Unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during the pre-test period. During the 4-day test period, the quantity of food placed in each pot was sufficient to meet each animal's daily needs (approximately 10 g of aged rodenticide paste bait and approximately 20 g of challenged diet in each corresponding pot) Brodifacoum paste bait, similar to Saphir Paste, aged for 3 weeks at 54°C	The animals were individually caged. Normal laboratory requirements: 20 - 24°C, a relative humidity range of 45% to 65%, with between 15 and 20 air changes per hour, and with a 12-hour light-dark cycle	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.8% (s.d. 10.2%). The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 5.8 days (4 to 7 days) after the first intake of treated baits.	B5.10/04
Wild Norway Rats (*Rattus norvegicus*). At least 41 animals estimated by pre-treatment bait census	Field test carried out in a farm raising cows. After a pre-bait until the rats were feeding readily on the bait (25 days), baiting were carried out. The non-poisoned baits were replaced by the product to be tested for 10 days. At each day's treatment, the bait stations were emptied then refilled. Post-baiting (8 days) is done to assess the level of the survival rodent population. The quantity of food placed in each bait station was sufficient to meet each animal's daily needs (approximately 150 g of bait in each bait station). Brodifacoum paste 0.004%, equivalent to Saphir Paste	Natural conditions.	The efficacy measured was 95.18%. Dead rodents found during and after the baiting and the post-baiting phases were only *Rattus norvegicus.* The field assay showed a very good efficacy with a fast decrease of the population.	B5.10/05

Test organisms	Test system / Concentrations applied / exposure time	Test conditions	Test results: effects, mode of action, resistance	Reference
Wild house mouse (*Mus musculus*) At least 72 animals estimated by pre-treatment bait census	Field test carried out in a farm. After a pre-bait until the mice were feeding readily on the bait (31 days), baiting were carried out. The non-poisoned baits were replaced by the product to be tested for 8 days. At each day's treatment, the bait stations were emptied then refilled. Post-baiting (7 days) is done to assess the level of the survival rodent population. The quantity of food placed in each bait station was sufficient to meet each animal's daily needs (approximately 30 g of bait in each bait station). Brodifacoum paste 0.004%, equivalent to Saphir Paste	Natural conditions.	The efficacy measured was 89.9%. Dead rodents found during and after the baiting and the post-baiting phases were only *Mus musculus.* The field assay showed a very good efficacy with a fast decrease of the population.	B5.10/06

9.2.5. Known limitations (e.g. resistance)

Resistance is exclusively related to the active substance Brodifacoum and is discussed in Doc. II-A (please see Brodifacoum Assessment Report – 17/09/2009, revised 16/12/2010 and refer to Letter of Access from Pelgar International Limited). The resistance to Brodifacoum is not regarded as unacceptable and only few events are referred as “suspected” resistance to Brodifacoum products. In conclusion there is no reason to suspect a lack of efficacy of Brodifacoum-based products and it is possible to state that Brodifacoum is fully active against rodents' populations that developed resistance to Warfarin.

Where resistance to Brodifacoum is suspected or has been shown, resistant management strategies should be employed and products containing an alternative active substance should be used or a professional pest control operator be consulted.

Moreover, the following measures from Codes of Good Practice in Rodent control[40] (EPPO standards - Guidelines on Good Plant Protection Practice – Rodent control for crop protection and on farms- PP 2/5) are recommended and usually respected by the applicators:
- The population size of the target rodent should be evaluated before a control campaign. The number of baits and the timing of the control campaign should be in proportion to the size of the infestation.
- A complete elimination of rodents in the infested area should be achieved.
- The use instruction of products should contain guidance on resistance management for rodenticides.
- Resistant management strategies should be developed, and Brodifacoum should not be used in an area where resistance to this substance is suspected.
- The authorisation holder shall report any observed resistance incidents to the Competent Authorities or other appointed bodies involved in resistance management.
- When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary or secondary poisoning by the anticoagulant as well as indicating the first measures to be taken in case of poisoning must be made available alongside the baits.

In addition, the IE CA recommends the following in relation to resistance management:
The immediate aim of resistance management is to prevent or retard the development of resistance to a given anticoagulant while, as far as is not counterproductive, permitting its continued use. The ultimate aim is to reduce or eliminate the adverse consequences of resistance.

CropLife International has published a strategy for resistant management of rodenticides (RRAC 2003). The habitat management is addressed in the strategy in addition to chemical control. The access of rodents should be restricted by physical barriers and no food should be available for rodents. Rotation between different anticoagulants is not a reliable means of managing the

[40] EPPO standards - Guidelines on Good Plant Protection Practice – Rodent control for crop protection and on farms- PP 2/5

anticoagulant resistance, as all anticoagulants have the same mode of action and the nature of resistance is also similar. The resistant individuals can be identified by conducting a blood clotting response (BCR) test (Gill et al. 1993, RRAC 2003).

Resistance management strategies

The immediate aim of resistance management is to prevent or retard the development of resistance to a given anticoagulant while, as far as is not counterproductive, permitting its continued use.

To this extent the applicant suggests the following measures to aid in the prevention of resistance:

- Maximum use of non-chemical control techniques.
- Preferential use of rodenticides and formulations to which resistance rarely develops.
- Ensure the complete eradication of the target population whenever a rodenticide is used.
- Avoid the use of first generation anticoagulants, to which resistance develops relatively easily.
- Maintain uncontrolled, susceptible populations in refugia from which emigration can occur.

It is recommended that the label states that any instances of resistance are referred to the manufacturer of the a.s.

In order to prevent the development and spreading of resistance, some resistance management strategies measures such as those from the Codes of Good Practices in rodent control are recommended:

- The population size of the target rodent should be evaluated before a control campaign. The number of baits and the timing of the control campaign should be in proportion to the infestation level.
- A complete elimination of rodents in the infested area should be achieved.
- The use instruction of products should contain guidance on resistance management for rodenticides.
- The authorisation holder shall report any observed resistance incident to the Competent Authorities or other appointed bodies involved in resistance management.

The proposed labels contain detailed instructions for use.

- The population size of the target rodent should be evaluated before a control campaign.
- The number of baits and the timing of the control campaign must be in proportion to the infestation level.
- Baits must be placed in a safe manner inaccessible to children and non-target species and not be applied to areas where food/feed, food utensils or food processing surfaces may come into contact with, or be contaminated by the product.
- Bait consumption should be regularly checked and consumed or spoilt bait replaced until consumption has stopped. The remaining baits and material must be removed and disposed of safely at the end of the treatment according to local/national wastes disposal regulation.
- Water must not be contaminated with the product or its container.
- The rodents' bodies all along the treatment must be disposed of according to local/national regulation.

In addition to the above applicant and label recommendations the RMS advocates the adoption of the following advice to avoid the development of resistance in susceptible rodent populations.

Details of treatment should be recorded.

- Apply effective Integrated Pest Management measures (remove alternative food sources, remove water sources, remove harbourage and proof susceptible areas against rodent access).
- Inspected baiting points weekly and replace old bait where necessary.
- Do not routinely use anticoagulant rodenticides as permanent baits. Use permanent baits only where there is a clear and identified risk of immigration or introduction or where protection is afforded to high-risk areas. (The RMS view is that routine use of anticoagulant baits should not be recommended in above described situations.) .
- Where rodent activity persists due to problems other than resistance, use alternative baits or baiting strategies, extend the baiting programme or apply alternative control techniques to eliminate the residual infestation (acute or sub-acute rodenticides, gassing or trapping).

Treatment of rodent infestations containing resistant individuals

- Where rodent infestations containing resistant individuals are identified, immediately use an alternative anticoagulant of higher potency. If in doubt, seek expert advice on the local circumstances.
- Alternatively use an acute or sub-acute but non-anticoagulant rodenticide.
- In both cases it is essential that complete elimination of the rodent population is achieved. Where residual activity is identified apply intensive trapping to eliminate remaining rodents. Gassing or fumigation may be useful in specific situations.
- Apply thorough Integrated Pest Management procedures (environmental hygiene, proofing and exclusion).

Application of area or block rodent control to eliminate resistance

- Where individual infestations are found to be resistant or contain resistant individuals it is possible that the resistance extends further to neighbouring properties.
- Where there are indications that resistance may be more extensive than a single infestation, apply area or block control rodent programmes.
- The area under such management should extend at least to the boundaries of the area known resistance and ideally beyond.
- These programmes must be effectively coordinated and should encompass the procedures identified above.

9.2.6. Humaneness

The use of Brodifacoum as a rodenticide could cause suffering of vertebrate target organisms. The use of anti-coagulant rodenticides is necessary as there are at present no other valuable measures available to control the rodent population in the European Union. Rodent control is needed to prevent disease transmission, contamination of food and feeding stuffs and structural damage. It is recognised that such substances do cause pain in rodents but it is considered that this is not in conflict with the requirements of Article 5.1 of Directive 98/8/EC ‘to avoid unnecessary pain and suffering of vertebrates’, as long as effective, but comparable less painful alternative biocidal substances or biocidal products or even non-biocidal alternatives are not available.

Conclusion:

The IE CA considers that the palatability and efficacy data provided is adequate to support the recommendation for the use of the product against rats and mice, even when stored for up to two years.
The treatment frequency is 2-4 applications per year, 3-6 months apart, when re-infestation occurs.

Issues identified:
Advice concerning application frequency should be included on the draft label.
The label should contain wording to the effect that effective control should be expected from bait stored up to two years under suitable storage conditions.

3.3 Biocidal Product Risk Assessment (Human Health and the Environment)

5.1.34 3.3.1 Description of the intended use(s)

The product is a paste rodenticide. It is a ready-to-use paste or pasta which contains 50 ppm (0.005% w/w) brodifacoum (56073-10-0) used by professional and amateur users. The bait is used in and around buildings and in sewer systems. The target organisms to be controlled are Brown rat, Roof rat or House rat, House mouse and Field mouse.

5.1.35 3.3.2 Hazard Assessment for Human Health

No new exposure studies have been submitted for evaluation. Signs of poisoning in rodents and other mammals are those associated with an increased tendency to bleed, leading ultimately to profuse haemorrhage. Non-target organisms are most at risk from secondary poisoning, i.e. consumption of rodent carcasses by predators such as raptors.

5.1.35.1 3.3.2.1 Toxicology of the active substance

Brodifacoum is a second-generation single-dose anticoagulant rodenticide. It disrupts the normal blood clotting mechanisms resulting in increased bleeding tendency and, eventually, profuse haemorrhage and death. Like all anticoagulant rodenticides, brodifacoum is structurally similar to vitamin K. Blood forms a clot at the site of injury by virtue of a complicated 'clotting cascade', involving numerous clotting factors. The clotting factors are made in the liver as inactive precursors, converted to active form and allowed to circulate in the bloodstream. Vitamin K is employed in the liver in the activation process, and is used in a continuous cyclic process involving several enzymes. The anticoagulant rodenticides block these enzymes, preventing regeneration of the vitamin K and preventing activation of the clotting factors.

Brodifacoum requires labelling with the symbol T+ and the risk phrases R 28 'Very toxic if swallowed'; R27 'Very toxic in contact with the skin' and R26 'Very toxic by inhalation'. Brodifacoum is not classified as a skin irritant or eye irritant.
Repeated dosing studies show effects on blood coagulation and death at low doses (µg/kg bw/day), and therefore labelling with R48/23/24/25 is warranted.

Under the GHS scheme Acute tox. 1, H310, Acute tox. 2 H300 and STOT RE 1 H372.
The Commission Working Group of Specialised Experts on Reproductive Toxicity has unanimously recommended that all AVK rodenticides should collectively be regarded as human teratogens due to the structural similarity to and the same mode of action as the known developmental toxicant warfarin (meeting in Ispra, 19-20 September 2006). Therefore based on read across data from warfarin, brodifacoum is considered to be a possible developmental toxicant and requires the classification as Reprotoxic with the labelling R61, may cause harm to the unborn child.

An almost complete oral absorption can be considered, on the basis of amount of radioactivity recovered in the excreta and retained in the tissues. *Brodifacoum* is widely distributed and bioaccumulates mainly in the liver with lower concentrations in the kidney. Hepatic bioaccumulation of *Brodifacoum* is a non-linear *vs* dose and time. The elimination kinetic from the liver was biphasic, with

an half-life in the range of 282-350 days. The excretion after oral administration is very slow (11 – 14% in 10 days), occurring via the urine and the bile, both as polar metabolites (glucuronide) and parent compound. The metabolism of *Brodifacoum* is limited and the toxicologically relevant chemical species is the parent compound.

As long as dermal absorption is concerned, on the basis of the available study and reading acroos from data on other 2nd generation anticoagulant rodenticides, two different values could be used for risk characterisation depending on the type of formulation, that is 3% (pellets and grains) or 0.047% (wax block bait).

Brodifacoum is very toxic after oral administration and also via the dermal and inhalation routes. Death was the result of internal haemorrhage. Classification with T+; R26/27/28; 'Very toxic by inhalation, in contact with skin and if swallowed' is warranted.
Brodifacoum does not fulfil the EU criteria for classification as a skin or eye irritant. Although showed no sensitizing potential in a LLNA study in mice, it was able to cause skin sensitization in guinea pig and fulfils the EU criteria for classification as a skin sensitizer.

Summary of brodifacoum subchronic, chronic, mutagenic and reproductive toxicity.

Repeated oral exposure to *Brodifacoum* resulted in clinical signs and toxicity consistent with the mode of action of the rodenticide and its properties of anti-coagulant agent (lethal haemorrhages). The NOEL for subchronic oral toxicity is in the range 0.04 -0.001 mg/kg/day (the lowest values identified with sensitive end-points, such as increases in both the kaolin-cephalin time and the prothrombin time). Based on results from the acute dermal and inhalation toxicity studies, route-to-route extrapolation, consistently with the decision adopted for *Difenacoum*, it is justified to assume serious damages associated to prolonged exposure through dermal and inhalation routes also. Therefore, classification with T; R48/23/24/25 "Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed" is warranted.

Genotoxicity and Carcinogenicity

Brodifacoum displayed no mutagenic activity in a standard range of genotoxicity tests. No long-term carcinogenicity study was submitted. In fact, chronic toxicity studies were not considered to be technically feasible due to the specific action of the active substance on the test/target species. However, the anticoagulant action is apparently the only pharmacological action of Brodifacoum. The active substance has no structural alerts for carcinogenicity and no concern about possible non-genotoxic carcinogenic potential can be derived from the toxicological studies. Therefore the justifications for non-submission of carcinogenicity data was considered acceptable.

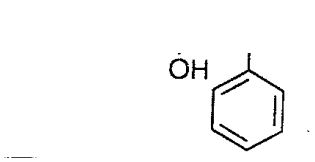
Conclusion on Reproductive toxicity

Reproductive and developmental toxicity studies on *Brodifacoum* did not reveal any specific effects. General toxicity effects were consistent with the mode of action of the rodenticide and its properties of anti-coagulant agent. The lowest NOAELs for rabbits and rats were 0.002 and 0.001 mg/kg bw.
In spite of these findings, a provisional decision has been made at the Technical Meeting of Classification and Labelling that [R61] should be applied to all anticoagulant active substances on the basis of analogy to *Warfarin*. None of the acute or subchronic performed tests gave any indication for a potential neurotoxic effect of *Brodifacoum.*

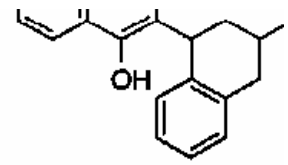
Medical data

Routine monitoring of workers (industrial users) producing *Brodifacoum* and formulating products has been carried out for the last forty years. Between June 1981 and September 1982, three poisoning incidents occurred with successful recovery. With the exception of these incidents, routine monitoring has shown no clinical effects in any workers. During this time there has been no evidence of allergenicity, sensitisation or any other abnormal effects induced by repeated and continual exposure to these anticoagulant rodenticides.

The molecules both have significant structural similarity to vitamin K. This structural similarity is responsible for the ability to interfere with i.e. block the enzymes used to regenerate vitamin K. The major differences in the active substances lie in their 'tails', which have varying degree of lipophilicity. There is long term experience with warfarin, widely used in anti-clotting therapy in humans for over forty years, with no association with increased incidence of cancer. The absence of adverse effects in millions of humans following four decades of long term warfarin therapy is considered sufficient evidence that warfarin is not carcinogenic. The structural similarity of brodifacoum to warfarin (see below), together with the negative results in the guideline mutagenicity tests, indicates that brodifacoum is not carcinogenic.



Warfarin



Brodifacoum

TMIII09 agreed to derive $AEL_{medium\ term}$ consistently with what decided for the other AVK rodenticides. Therefore, $AEL_{medium\ term}$ was calculated from the NOAEL of 0.002 mg/kg bw/day (developmental oral toxicity study in rabbit) divided by an Assessment Factor of 300 (10 for interspecies x 10 for intraspecies x 3 additional factor for severity of effects). The $AEL_{medium\ term}$ results to be of 6.7×10^{-6} mg/kg bw/day.

Conclusions:
The following AELs should be considered in the risk characterization for *Brodifacoum*:

- AEL_{acute} of 0.0000033 mg/kg/day based on the maternal NOEL from a teratogenicity study of 0.001 mg/kg bw/day (rat, maternal effect)
- $AEL_{medium\ term}$ of 6.7×10^{-6} mg/kg bw/day based on the NOAEL from a developmental study (female rabbit) of 0.002 mg/kg bw/day

- AEL_{chr} of 3.3 x 10^{-6} mg/kg bw/day based on the NOAEL for females from the reproductive 2-generation study in rat of 0.001 mg/kg bw/day

Data requirements: (List if applicable)
None.

5.1.35.2 3.3.2.2 Toxicology of the biocidal product

The toxicology of the biocidal product was examined appropriately according to standard requirements. The product was not a dummy product in the EU- review program for inclusion of the active substance in Annex I of Directive 98/8/EC.

Summary of acute toxicity data for the biocidal product Ruby Block

Parameter	Test material	Species	Result	Classification	Ref.
Acute Oral Toxicity	Brodifacoum Pasta Bait. Batch: 61509601	See comments below	See comments below	none.	[redacted] (2007a). study number: 2254/0025
	Acceptable (Y/N): Yes		**Method:** OECD 420 (2001)		**GLP (Y/N): Yes**
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Acute Dermal Toxicity	Brodifacoum Pasta Bait. Batch: 61509601	See comments below	See comments below	none.	[redacted] (2007b). study number: 2254/0026
	Acceptable (Y/N): Yes		**Method:** OECD 402 (1987)		**GLP (Y/N): Yes**
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Acute Inhalation Toxicity	none	none	none	none	none
	Acceptable (Y/N):		**Method:**		**GLP (Y/N):**
	Comments: Inhalation exposure is not appropriate for Pasta Bait formulation. Active substance has very low volatility and is only present at 0.005% (w/w) in the semi solid, wax product. Company justification accepted.				
Information on mixture of biocidal products	none	none	none	none	none
	Acceptable (Y/N): Yes		**Method:**		**GLP (Y/N):**
	Not applicable since following the proposed uses of Pasta Bait and the label claims, the rodenticide Pasta Bait is not intended to be used in a mix with other biocidal products. Company justification accepted.				
Acute Skin Irritation	Brodifacoum Pasta Bait. Batch: 61509601	See comments below	See comments below	none	[redacted] (2007c). study number: 2254/0027
	Acceptable (Y/N): Yes		**Method:** OECD 404 (2002)		**GLP (Y/N): Yes**
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Acute Eye Irritation	Brodifacoum wax block bait. Batch: 61509601	See comments below	See comments below	none	[redacted] (2007d). study number: 2254/0028
	Acceptable (Y/N): Yes		**Method:** OECD 405 (2002)		**GLP (Y/N):**

Parameter	Test material	Species	Result	Classification	Ref.
					Yes
	Comments: Please refer to the document 'Saphir Paste PAR – MS addendum for Tox – 70286, 70287'. The applicant has a LoA to the study referenced above from Pelgar, see section 1.6.2				
Skin Sensitisation	none	none	none	none	none
	Acceptable (Y/N):		**Method:**		**GLP (Y/N): Yes**
	Comments: A skin sensitisation study is not available for the product so active substance data has been used to derive a classification. Brodifacoum showed no sensitizing potential in a LLNA study in mice, it was able to cause skin sensitization in guinea pig and fulfils the EU criteria for classification as a skin sensitizer (CAR IT). However, based on the generic concentration limits for mixtures at a Brodifacoum concentration of 0.005% w/w classification is not required by Directive 1999/45/EC or Regulation (EC) No 1272/2008.				

Conclusion:
According to the results of the toxicological studies, Brodifacoum paste does not classify with respect to Directive 1999/45/EC or Regulation (EC) No 1272/2008. However, safety phrases and precautionary statements are proposed by the Rapporteur.

Data requirements:
None.

5.1.35.3 3.3.2.3 Toxicology of the co-formulants (substances of concern)

The biocidal product contains no other substances in quantities that would be of toxicological concern. The majority of these components are food grade materials and are not classified.

Please refer to consolidated Annexes (include. Confid Annex) for product specification and list of co-formulants.

5.1.36 3.3.3 Exposure Assessment for Human Health

The contact gel is used as a gel in plastic bait boxes or covered/protected gel points or contact gel can be placed on strips of insulation tape or paper tape fixed to, for example, overhead pipe-ways and ductwork. The product is applied by professional pest controllers, only.

Single-use pre-treated 'gel tubes' (plastic tube containing gel - analogous to single-use pre-treated bait boxes) are also sold. As the amount of gel in a single gel point is enclosed in a sealed tube and there is no exposure to the user, the standard risk assessment for professionals applying bait from other packs is protective of this use.

The application of Block bait is regarded as a suitable worst case scenario for Paste bait. In the Chambers study operators secured 5 compressed wax blocks (each of 20g, in total 100g bait per box this value was then doubled for 200g boxes) into a bait station by pushing bait mounting pegs in the stations through holes in wax blocks.

The most relevant route of exposure to the active substance is the dermal route. For exposure assessment only active substance from wax blocks has been modelled. The block product typically takes the form of a solid waxy block with a strong sweet smell containing 0.005% w/w Brodifacoum.

In the final CAR for brodifacoum dermal absorption values were derived from read across from data on Difenacoum. The values chosen were 0.047% for wax formulations and 3% for grain/pellet formulations. These values were deemed appropriate in the absence of product specific data.

The active substance has a low vapour pressure, therefore the potential for evaporation is low, and hence the potential for inhalation exposure is low. Inhalation exposure is only of concern during the formulation process where the active substance has a potential for becoming airborne when mixed with dry bait ingredients. In the case of wax blocks, inhalation exposure is irrelevant. Inhalation exposure from handling grain bait during loading/application and cleaning is also proposed as negligible. The only relevant inhalation exposure is assumed to be that from the decanting of loose grain, pellets and granules due to the potential release of airborne dusts.

Any potential oral exposure will be indirect exposure via possible release to the environment. Other possible exposure scenarios include dermal contact with dead animals and accidental ingestion of poison baits by children.

Key Endpoints for Exposure Assessment

The following AELs should be considered in the risk characterization for *Brodifacoum*:

- AEL_{acute} of 0.0000033 mg/kg/day based on the maternal NOEL from a teratogenicity study of 0.001 mg/kg bw/day (rat, maternal effect)
- $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day based on the NOAEL from a developmental study (female rabbit) of 0.002 mg/kg bw/day
- AEL_{chr} of 3.3 x 10^{-6} mg/kg bw/day based on the NOAEL for females from the reproductive 2-generation study in rat of 0.001 mg/kg bw/day

Data requirements:
None.

5.1.36.1 Exposure to professional users

MG/PT	Field of uses envisaged	Likely concentrations at which a.s. will be used
Main group 03; PT 14	**Professional uses**	
	Rodenticide used in and around buildings Use in sewerage (only against rats)	0.005% w/w
	Non-professional uses	
	Rodenticide used in and around buildings	0.005% w/w

There are two groups of humans which may be potentially exposed to the rodenticide baits : those who handle, apply and dispose of the product or other residues such as carcasses or faeces (direct exposure) and those who may be incidentally exposed while the product is in use (incidental exposure).

5.1.37 Method of application

Block bait is made of paraffinic blocks to which the active substance has been added. These Brodifacoum baits are used indoors and outdoors to kill mice and rats: they are placed at the appropriate places in bait stations or covered under a curved tile, a wooden board or in a piece of tube; the animals eat some of the product and die.
Baits must be deposited in a way to minimize the risk for non-target animals and for children. Where possible, baits are secured so that they cannot be dragged away by the rodents. Preferably bait stations will be used where the bait can't be hidden, fixed or locked up.
The common strategy is to explore the site, locate runs, burrows, droppings or signs of damage and place the bait boxes at entry points into buildings and around areas where rats are known to feed. For

the mice control, as mice are sporadic feeders, many bait points are placed throughout the areas where mice are known to feed.
In sewers, the bait is eaten *in situ* by target rodents. The brown rat is the only mammal able to live in sewers.
For house and field mice control, the recommended dose is 20 to 30 g of bait every 2 to 5 meters.
For rat control, the recommended dose is 60 to 100 g of bait every 5 to 10 meters.
In sewers, place 200 to 300 g every 30-50m (never more than 300 g at each manhole).

There are three phases for the human exposure:

- Application phase: application of rodenticides by professionals and non-professionals.
In and around domestic, industrial and commercial buildings, the product is applied manually, at measured amounts in bait boxes or covered. Professional users are assumed to wear protective gloves when handling the product unlike amateur users.
In sewerage, the bait is applied only by professionals, typically hanged to a wire tied up to the wall a few centimetres above the bottom of manholes.
Bait points are controlled regularly. Any bait eaten or damaged has to be replaced. Depending on infestation rate, an advised frequency of inspection is 3 to 5 days. During the bait inspections, also a search in the zone will be done for dead rodents.

- Use phase: Post-application, *i.e.* from the use of rodenticide products and from contact with the product (*e.g*. residential exposure including indoor air contamination, contact with the product during use). The use phase is the period when the biocidal product is waiting to be consumed by the target organism. This means that no primary exposure of humans is intended and should not take place (please refer to point 3.2.4 Secondary exposure).

- Disposal phase: Disposal (including handling of surplus formulated product, burning/incineration, dumping, empty containers, dead rodents (carcasses) disposal).
When no further bait take is observed, bait stations must not be left in place. All bait stations must be removed from the site, cleaned up and the bait and bait remainders must be disposed of in accordance with local requirements.
For sewer systems no specific removal disposal is instructed.

Human exposure assessment

5.1.37.1 3.3.3.1 Identification of main paths of human exposure towards active substance from its use in biocidal product

Exposure path	Industrial use[1)]	Professional use[2)]	General public[3)]	*via* the environment[4)]
Inhalation[5)]	Not appropriate	Yes	Yes	No
Dermal[6)]	Not appropriate	Yes	Yes	No
Oral	Not appropriate	No	Yes	No

[1)] Industrial use (manufacture of active substance and formulation of products) is not covered by BPD. Workers in formulation manufacture are not exposed to levels of a.s. that would affect blood clotting.
[2)] Includes non-trained professionals.
[3)] Indirect exposure due to transient mouthing by infants is included in the scenarios for the general public.
[4)] According to the TNsG, indirect exposure *via* the environment is considered to be of minor importance as the release of rodenticides to the environment is limited.
[5)] The skin is the main exposure route with a small proportion of inhalation exposure to dust when grain-based baits are mechanically handled by professionals. The active substance is of low volatility and it is incorporated at very low concentrations into a solid, non-volatile matrix. Therefore inhalation exposure is considered as negligible.
[6)] Except for the grain block bait which is always packed in individual sachets for both professionals and general public and for grain bait only for the amateurs, dermal contact with the product is a realistic scenario.

The magnitude of human exposure to block bait can be assessed by applying standard exposure models of TNsG[41] for human exposure (2007) or the Harmonised approach for the assessment of rodenticides (anticoagulants) endorsed at TM II 2011 for professionals and amateurs users. Moreover, CONSEXPO 4.1 model can be used to assess the exposure to the biocidal product used by non-professionals.

The following basic primary exposure pathways have to be considered for a risk assessment in order to sum up the exposure of humans to Brodifacoum. The main exposure path is direct skin contact during the use of the biocidal product.
Ingestion is a secondary pathway or an accidental primary exposure during the use of the biocidal product.
Inhalation is considered as negligible.
According to the various pathways, the following absorptions will be applied in the assessment:
- Inhalatory uptake fraction: 1 (default value of 100%);
  Inhalation rate: 1.25 m^3/h (default value)

41 Human exposure to Biocidal products-Technical Notes for Guidance, June 2007

- Dermal uptake: 0.047% for wax formulations and 3 % for and grain/pellet.
- Oral uptake fraction 100%

5.1.38 3.3.3.2 Professional exposure

For professional use, the operator is trained in the correct use of the bait, *i.e.* placement, number of bait points/boxes required based on the infestation rate area, the amount of bait or number of bait place packs per bait point/box and safe handling procedures.

The use of PPE - disposable gloves and a dust mask may be employed when decanting bait and disposable gloves may be employed when loading bait boxes and disposing of remaining bait and carcasses. However, when the bait is contained within a bait box there will be no exposure of the operator to the product.

PPE (coverall, boots and gloves) is required as standard when the bait is used in sewage systems.

Exposure calculations – professionals

The CEFIC/EBPF Rodenticides Data Development Group conducted an operator exposure study using flocoumafen (which may be considered a suitable surrogate for all other second generation anti-coagulants) to determine exposure during simulated use of rodenticide baits (*Chambers* 2004, unpublished, confidential). This study examined exposure to wax blocks (20g wax block baits, 5 blocks/bait box) and grain bait. Guidance is also taken from a confidential paper entitled "Harmonised Approach for Rodenticides" by the German Competent Authority, Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (BAuA).

The daily exposure frequency and its division between different tasks are based on a survey organised by CEFIC (and based on a questionnaire answered by selected pest control companies in several EU countries), and on an agreement between Member States on the common approach for exposure assessment and ECB guidelines.

The application of Block bait is regarded as a suitable worst case scenario for Paste and Cluster Baits. In the Chambers study operators secured 5 compressed wax blocks (each of 20g, in total 100g bait per box) into a bait station by pushing bait mounting pegs in the stations through holes in wax blocks.

The Chambers study determined exposure from the application phase from the following scenario: 5 operators secured 5 compressed wax blocks (each of 20g, in total 100g bait per box) into a bait station by pushing bait mounting pegs in the stations through holes in wax blocks. Three trials were conducted with 1, 5 and 10 times securing of these wax blocks. Since the results of 1, 5 and 10 securing are similar all trials were included in the calculation of the 75th percentile by the RMS. The proposed value of **28mg (of wax bait) per manipulation** is valid for loading of one bait box with 100g of wax blocks (a single manipulation constitutes the placement of a single bait station). Since the recommended amount for rat control is up to 200g bait per bait point, this exposure value is multiplied by a factor of 2 because only 100g was used in the Chambers Study. The proposed value of **56mg (of wax bait) per manipulation** is valid for loading of one bait box with 200g of wax blocks.

For professional operators the potential total daily dermal exposure (assuming the previously agreed number of 60 manipulations from TM III/10 is applied) from the application-phase is **3360mg** wax block product (i.e. 56mg × 60 bait sites).

The Chambers study determined exposure from the disposal or post-application phase from the following scenario: 5 operators emptied a loaded bait station by sliding the wax block off the mounting pegs into a 10 L plastic bucket. This is done 1, 5 and 10 times. The proposed value of **5.75 mg per manipulation (determined by the RMS, Difenacoum CAR 2009)** is valid for cleaning of one bait box. For the resulting potential dermal exposure of post-application-phase the agreed number of 15 manipulations (TM III/10) should be taken into account. For the post-application phase the potential total daily dermal exposure is **86 mg** wax block product (i.e. 5.75mg x 15 disposal manipulations). The size of one bait block is ignored and the figure is valid for different sized blocks (e.g. 10g, 100 g).

The calculation of PCO (pest control operator) and amateur dermal exposure in placing and clean-up of rodenticidal wax blocks, taking into account measured values (75th percentiles), defaults according to ECB guidelines and the common agreement on daily exposure frequencies (TM III/10) is presented in the following table.

Pest Control Operator, No PPE:

Amount of exposure to product (75th percentile) during securing of 10 20g wax blocks (200g). Value is for placement of 1 bait station.	56.0 mg
Amount of Brodifacoum on fingers/hands (0.005% in wax block, 20 x 10g blocks sewer maximum application worst case)	112 mg × (0.005 / 100) = 5.6×10^{-3} mg
Systemic dose per application at 1 bait station: (dermal absorption 0.047%, bw 60kg)	(5.6×10^{-3} mg) × (0.047 / 100)) / 60kg = 4.39×10^{-8} mg/kg
Amount of exposure to product (75th percentile) during clean-up and disposal per bait station	5.75 mg
Systemic dose (Brodifacoum concentration 0.005%, dermal absorption 0.047%, bw 60 kg) per clean-up of one bait station.	2.25×10^{-9} mg/kg
Assuming 'reasonable worst case' scenario of 60 bait sites and 15 clean-ups, systemic dose per day	((4.39×10^{-8} mg/kg × 60) + (2.25×10^{-9} mg/kg × 15)) = **2.6×10^{-6} mg/kg/day** **0.0026 µg/kg/day**
Expressed as a % of the AEL: $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**39% of the AEL**

Pest Control Operator, With PPE (gloves)

Default 10-fold reduction of exposure.	**2.6×10^{-7} mg/kg/day** **0.00026 µg/kg/day**
Expressed as a % of the AEL: $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**3.9% of the AEL**

Non-Trained Professional (e.g. farmer), No PPE:

Systemic dose resulting from application of product to five bait sites plus five bait sites cleaned per day, no PPE (difenacoum concentration 0.005%, dermal absorption 0.047%, bw 60 kg).	((2.19×10^{-8} mg/kg × 5) + (2.25×10^{-9} mg/kg × 5)) = **1.2×10^{-7} mg/kg/day**
Expressed as a % of the AEL: $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**0.0001 µg/kg/day** **1.5%**

Non-Trained Professional (e.g. farmer), With PPE (gloves):

Default 10-fold reduction of exposure.	**1.2×10^{-8} mg/kg/day** **0.00001 µg/kg/day**
Expressed as a % of the AEL: $AEL_{medium\ term}$ of 6.7 x 10^{-6} mg/kg bw/day **(0.0067 µg/kg/d)**	**0.15%**

Application by spatula and caulking gun

This calculation covers the exposure of a professional user when applying rodenticide bait via a caulking gun or spatula. The calculation is based on the information from the worked examples database, based on bridging to the paste application of wood preservative using a trowel (reverse-reference approach). The worked examples data are ADE values inside gloves so the calculation assumes that gloves are worn.

From the wood preservative example, which addresses application of pastes by brush, trowel, caulking gun and gloved hand, a good case for bridging can be made for the contact gel application by spatula (vs trowel) and by caulking gun.

The wood preservative example assumes that the application process leads to a maximum of 30 minutes' exposure per day and we must assess whether this is a reasonable exposure time for a professional pest controller using contact gel.

Time Required to Apply and Clean up Contact Gel Points

In the case of contact gel applied by caulking gun, a case could be made that this is covered by the 14 manipulations listed for paste bait. The text in the HEEG document states:
For the handling of paste bait the following was agreed: The paste bait described in the report by Vetter and Sendor was paste bait deployed using prefilled cartridges. Dermal exposure was considered possible only at removal and re-attachment of the nozzle's protection cap and was assumed to occur only before the first and after the last bait placing on a given site. Hence, the number of sites visited per day (multiplied with 2) was considered to be the relevant exposure determinant.

If a user were filling a number of gel points in a small area, the same would be true for use of our contact gel caulking gun product - the user may not find it necessary to put the cap on between filling each bait station on that site.

For spatula application, an alternative way of thinking of this is again to assume that, given the contact gel is applied by spatula in the same way as wax blocks are placed in bait points, the number of manipulations would be at a maximum the same as the number for a wax block. ie. 60+15.

The applicants experts think that to apply bait, either by spatula or by caulking gun, a maximum time of 15 seconds per bait point would be plenty of time. Clean up probably takes about half a minute per bait point at most. (this time estimate agrees with UK Toban pasta bait which is applied in the same manner)

For application by caulking gun using the figure of 11 loadings and 3 clean ups, exposure is far lower than the 30 minutes used in the model.

Loading: 11 bait stations x 15 seconds = 2.75 minutes
Clean up: 3 bait stations x 30 seconds = 1.5 minutes
This gives a total handling time of 4.25 minutes.

For application by spatula and assuming the number of bait stations is the same as for wax blocks, this would give a total handling time of :

Loading: 60 bait stations x 15 seconds = 15 minutes
Clean up: 15 bait stations x 30 seconds = 7.5 minutes
Total time = 22.5 minutes

Therefore in both cases, the figure used in the modelling of 30 minutes is sufficient to cover a professional user.

Acceptable Exposure Level

The maximum level of exposure to the active substance has already been calculated in the AS review and is listed in the Assessment Report List of End Points as follows:

	VALUE	STUDY	SAFETY FACTOR
AEL_{acute}	0.0000033mg/kg/day	Rat developmental tox	300

Therefore maximum amount of AS = 0.0000033 mg/kg/day

Reverse-reference Calculation
For a non-volatile paste (such as this brodifacoum product), inhalation exposure is assumed to be negligible and so, using the dermal absorption data for this formulation (0.047%), to exceed the acceptable exposure level, active substance contamination to the skin would need to exceed:

0.0000033 x 2128
= 7.00×10^{-3} mg/kg/day

If the operator weights 60 kg then the AS contamination would have to exceed:
7.00×10^{-3} x 60 kg
= 0.42 mg/day

As the maximum concentration of AS in the ready-for-use paste formulation is 0.005%, then the weight of paste product containing 0.42 mg AS will be:
0.25/0.005 x 100
= 8400 mg

Assuming that dermal exposure will be predominantly to the hands and in this case, based on the worked examples database, gloves are assumed to be worn since professionals are expected to wear gloves, then the rate of actual hand exposure to the hands is required to exceed:
8400 mg / 30 min
= 280 mg/min

If it is considered that the penetration of brodifacoum through protective gloves is 10%, the operator would need to get about 84 g of product on the outside of the gloves and this would have to remain on the surface until the active had migrated through the paste and penetrated the glove.
Part 2 of the TNsG (2002) states that “in an HSE survey of pest controllers (1994) it was estimated that the median duration "using pesticides" was 120 minutes.” It expands to say that treatment time is up to 100 minutes for pastes. If the 100 minutes is applied rather than 30 as suggested by the company

84g / 100 min
= 0.84 g/min

To put this exposure in context. To recieve an exposure of paste product in excess of the AEL the operator would be required to have almost the same quanity of gel on his protective glove as would load a 100g bait station. This level of exposure is considered very unlikely.

5.1.38.1 3.3.3.3 Exposure to non-professional users

Contact gels applied by gun or syringe are professional use only and are not modelled for armature use. Block baits are considered a suitable worst case for paste bait delivered in a closed sachet.

Bait boxes for use by the general public may be supplied as sealed units or as lockable, tamper-proof units that may be refilled by the user. Bait may be used in covered/protected bait points, rather than bait boxes, where appropriate.

Calculations for non-professional exposure are presented below; the first scenario assumes no exposure during application phase while the second scenario assumes that the bait boxes would have to be loaded by the user. As for the non-trained professionals, it is assumed that a non-professional user places ten bait blocks per site (200g) on five bait sites and cleans five bait sites per day.

Product type	Exposure scenario	PPE	Inhalation uptake	Dermal uptake

14	Non-professional (amateur)	None	Not relevant	1.12×10^{-8} mg/kg/day[1)]
14	Non- professional (amateur)	None	Not relevant	1.2×10^{-7} mg/kg/day[2)]

1) scenario 1, 2) scenario 2.

Scenario 1: No dermal contact during placing of baits due to sealed bait boxes. Potential exposure is only during clean-up. Default exposure value for cleanup is 5.75mg product per bait site, bromadialone present at a concentration of 0.005% (w/w), 60kg body mass, 0.047% dermal absorption value. The value is calculated from the cleanup exposure per bait station of ((2.25×10^{-8} mg/kg) × 5).

Scenario 2: Assuming that conventional bait boxes are loaded then the exposure is equal to that of the non-trained professional (e.g. farmer) with no PPE. As a worst case scenario, scenario 2 can be taken forward to risk assessment.

5.1.38.2 3.3.3.4 Exposure to children/workers/general public

Bait points should be covered or protected in such a way to prevent access to the bait. However, the ingestion of wax block bait by infants has been assessed as a potential secondary exposure route associated with the use of Brodifacoum in rodenticide products. Secondary exposure is anticipated to be acute in nature. Two different scenarios of secondary exposure are available, the 'handling of dead rodents' scenario and the 'transient mouthing of poison bait' scenario. The former is excluded from the risk assessment due to unrealistic assumptions. The estimated exposure for the 'transient mouthing of poison bait' scenario is either $2.5\times10^{-}2$ mg/kg or 5.0×10^{-5} mg/kg, depending on the default assumptions. This results in Margin of Exposure (MOE) values of 0.01 or 6.6, respectively. It shows that infants are at significant risk for secondary exposure, i.e. there is no safe use for children.
For the 'transient mouthing of poison bait' scenario, either 5g (User Guidance) or 10 mg (TNsG, with bittering agent) of the product is assumed to be swallowed by an infant per poisoning event.

Oral exposure infant. TNsG Assumptions: Transient mouthing of poison bait (10mg) treated with repellent: (10mg × 0.00005) / 10kg bw

Transient mouthing infant. User Guidance Assumptions: Transient mouthing of poison bait (5000mg) without repellent; (5000mg × 0.00005) / 10kg bw

	Total dose (mg/kg b.w./day)	% AELacute (0.0033 µg/kg b.w.)
Oral exposure infant	0.00005	1515%
Transient mouthing infant	0.025	757575%

The RMS considered that in connection with transient mouthing of poison baits, infants are also exposed via the dermal route while handling the bait. This however is assumed to play a minor role relative to the amount that could be ingested. It is therefore not included in the overall exposure scenario.

5.1.38.3 3.3.3.5 Exposure to consumers from residues in food

Not applicable.

5.1.38.4 3.3.3.6 Overall Summary

The exposure data based on measurements in simulated use conditions are acceptable and should be used in risk assessment. The models assume that inhalation exposure is of minor importance compared with dermal exposure. The calculations have been made with the assumptions of rat control, and there are no separate calculations to assess exposure in mice control in which smaller bait sizes are used.

5.1.39 3.3.4 Risk Characterisation for Human Health

5.1.39.1 3.3.4.1 Professional users

Caulking gun or spatula

Calculation of the exposure of a professional user when applying rodenticide bait via a caulking gun or spatula was assessed via reverse reference scenario. Assuming that dermal exposure will be predominantly to the hands and in this case, based on the worked examples database, gloves are assumed to be worn since professionals are expected to wear gloves, then the rate of actual hand exposure to the hands is required to exceed:

8400 mg / 30 min
= 280 mg/min

If it is considered that the penetration of brodifacoum through protective gloves is 10%, the operator would need to get about 84 g of product on the outside of the gloves and this would have to remain on the surface until the active had migrated through the paste and penetrated the glove.

84g / 100 min
= 0.84 g/min

Using a reverse reference scenarios for caulking and or spatula application it was calculated that a professional operator would require exposure to 84g per day on his gloves. To recieve an exposure of paste product in excess of the AEL the operator would be required to have almost the same quanity of gel on his protective glove as would load a 100g bait station. This level of exposure is considered very unlikely.

Wrapped sachet or blocks

The exposure assessment for professional pest control operators (PCOs) under reasonable worst case assumptions (60 loadings and 15 clean-ups/day), as presented above, yielded a potential dermal exposure leading to a systemic dose 0.0026µg/kg/day day for an unprotected operator during bait handling operations. Comparison to calculated NOAEL for MOE shows that the use of rodenticide baits containing 0.005% brodifacoum results in a margin of exposure of 257.

Since pest control operators wear protective gloves by default during pest control operations, a refined assessment is conducted. The resulting margin of exposure (MOE = 2570) indicates that the use of rodenticide baits containing 0.005% brodifacoum does not cause a risk for PCOs if gloves are worn.
Likewise, the exposure assessment for non-trained professionals (e. g., farmers) under reasonable worst case assumptions (five loadings and five clean-ups/day), yielded a potential dermal exposure leading to a systemic dose of 1.2×10^{-7} mg/kg/day for an unprotected person. Even without PPE, the resulting margin of exposure (MOE = 6700) indicates that use of rodenticide baits containing 0.005 %

brodifacoum is not a risk at the stated exposure frequency. A refined assessment was, nevertheless, conducted since wearing of protective gloves is recommended in the instructions for use. The resulting margin of exposure (MOE = 67000) indicates a high level of protection for non-trained professional users when gloves are worn.

The result of the risk assessment concerning use of brodifacoum in bait blocks/sachets indicates that the acceptable exposure level is not exceeded for trained professionals (PCOs) without PPE (gloves). In addition, the risk is at an acceptable level without gloves for non-trained professionals. However, use of protective gloves is recommended in all cases for hygiene reasons. In the case of application for caulking gun or spatula it was concluded that exposure to 84g of bait by a PCO on a glove was exceedingly unlikely and this application method was expected to yield safe exposure levels for trained operators.

5.1.39.2 3.3.4.2 Non-professional users

Blocks/sachets are supplied either in pre-sealed units or as loose blocks for use in covered/protected bait points or refillable bait boxes. An exposure assessment has been performed taking into account potential exposure both from application and post-application tasks as a worst-case scenario. In the calculations, amateurs were assumed to load five bait points and clean five bait points per day without PPE. The estimated daily systemic dose, 1.2×10^{-7} mg/kg/day, results in an MOE value of 6700 showing that there is also little risk to amateurs.

5.1.39.3 3.3.4.3 Children/Workers/general public

As a potential secondary exposure route, associated with the use of difenacoum in rodenticide products, ingestion of wax block bait by infants has been assessed. Secondary exposure is anticipated to be acute in nature. The estimated exposure for the scenario, 2.5×10^{-2} mg/kg/day or 5.0×10^{-5} mg/kg/day, depending on the default assumptions, results in MOE values of 0.01 or 6.6, respectively indicating that infants are at risk of poisoning. This should be addressed by ensuring all bromodialone products targeted for amateur use are provided in sealed packs and tamper resistant bait boxes with a bittering agent. The potential exposure due to dermal contact with poisoned rodents is not included in the risk assessment because the available scenarios are unrealistic.

5.1.39.4 3.3.4.4 Consumers from residues in food

Not applicable, product is not used to treat food stuffs.

5.1.39.5 3.3.4.5 Overall Summary

The calculations presented have been made with the assumptions of rat control, and there are no separate calculations to assess exposure for mice control in which smaller bait sizes are used.

Using both the MOE and AEL approaches for risk assessment indicates that there is a satisfactory margin between the predicted exposure and the NOAEL (LOAEL) as well as exposures below the

threshold value for the AEL for all intended uses by trained professionals with PPE, untrained professionals and amateurs (with and without PPE). The product is deemed suitable for authorisation and appropriate personal protective equipment is advised.

Secondary exposure from transient mouthing of the product exceeds the AEL reference value (0.0023µg/kg/day), both with the assumption of 0.01 g and 5 g of product ingested by infants. This is of concern. There is no margin of safety using the existing data and models. There is no safe scenario for indirect exposure if estimated according to TNsG and User Guidance. Mitigation and protection measures such as the inclusion of bittering agents and the enclosure of product in sealed packs and tamper resistant bait boxes are essential to reducing the risk of secondary exposure. Baits should not be placed where food, feeding stuffs or drinking water could be contaminated.

Workplace operation	**PPE**	**Exposure path**	**Dose (µg/kg/day)**	**MOE**	**%AEL**
Trained Professional: Placing of wax block baits and clean-up	None	Dermal, hands	0.0026	257	39
Trained Professional: Placing of wax block baits and clean-up	Protective gloves	Dermal, hands	0.00026	2570	3.9
Trained Professional: Application via caulking gun/spatula and clean-up	None	Excess of 8.4g on hands to exceed AEL			
Trained Professional: Placing of wax block baits and clean-up	Protective Glove	Excess of 84g on hands to exceed AEL			
Non-Trained Professional: Placing of wax block baits and clean-up	None	Dermal, hands	0.0001	6700	15
Non-Trained Professional: Placing of wax block baits and clean-up	Protective gloves	Dermal, hands	0.00001	6700	1.5
Amateur: Placing of wax block baits and clean-up	None	Dermal, hands	0.0001	6700	15
Secondary Exposure Transient Mouthing of bait by infants	--	Oral	5.0×10^{-5} (TNsG)	6.6	--
			2.5×10^{-2} (User Guidance)	0.35	--

5.1.40 3.3.5 Effect and Exposure Assessment for the Environment

An overview of the EU review of environmental fate and behaviour and ecotoxicology for the active substance is presented below in conjunction with the exposure assessment and environmental effects for the biocidal product.

5.1.40.1 Environmental fate and behaviour of the active substance

5.1.40.1.1

5.1.40.1.2 Degradation

5.1.40.1.2.1 Biodegradation

Brodifacoum is not readily or inherently biodegradable.
The overall conclusion on biodegradation is that Brodifacoum is not readily or inherently biodegradable.

5.1.40.1.2.2 Abiotic Degradation

Brodifacoum is stable to hydrolysis (t½ > 1 year). It is however predicted to undergo rapid indirect photolysis with OH radicals and ozone (t½ = approximately 2 hours) and undergoes rapid direct photodegradation (t½ = 0.217 days). There are no predicted effects on the atmosphere.
The overall conclusion on abiotic degradation is that Brodifacoum is hydrolytically stable to hydrolysis (t½ > 1 year).

5.1.40.1.2.3 Distribution

Brodifacoum is a large aromatic organic compound of low volatility with two polar groups, which can potentially ionise at environmental pH. The active substance has a Log Pow (4.92), and is of low solubility in water (5.8 x 10-5 g/l at pH 7 and 20°C).
The DT50 value of 157 days (The Pesticide Manual 13th ed) and the Koc of 50000 (The Pesticide Manual 13th ed) indicate that Brodifacoum would be persistent and immobile in soil. The exposure to the groundwater is unlikely.
On the basis of its low volatility (vapour pressure of 2.6 10^{-22} Pa at 20°C) the exposure to the atmosphere is highly unlikely.
The overall conclusion on distribution is as follows: Brodifacoum is persistent (DT50 157 days) and immobile in soil (Koc > 9155 l/kg). Under basic conditions (high pH), Brodifacoum is not likely to be adsorbed onto soils or sewage sludge due to the ionisation of the molecule; whereas under acidic conditions (low pH), Brodifacoum is likely to be adsorbed onto soils or sewage sludge as the molecule is in its neutral or non-ionised form.

Mobility in soil
The Koc value (50000 The Pesticide Manual 13th Edition) indicates that the active substance would not be mobile in soil and is not expected to contaminate groundwater (PEC < 0.1 μg/l).

The overall conclusion on mobility in soil is as follows *Brodifacoum* is immobile in soil (Koc > 9155 l/kg). *Brodifacoum* is not expected to contaminate groundwater.

5.1.40.1.3 Accumulation

Based on a measured Log Kow = 4.92 it is considered that Brodifacoum has a potential for bioaccumulation. The BCFfish (3034) was calculated using the equation 74 of TGD (part II); the BCFearthworm (999) was calculated according to the equation 82d of TGD

The overall conclusion on bioaccumulation potential is as follows: No reliable bioaccumulation study is available. The measured log Kow = 4.92 (retrieved from CAR B) indicates that Brodifacoum can be potentially bioaccumulative and provides a calculated BCFfish = 3034. The experimental Kow confirms the adequacy of using, in CAR A, the calculated log Kow of 6.12 (rather than 8.5) and indicates that this value still overestimated the actual lipophilicity and, consequently, the BCF values estimated herein. The measured log Kow = 4.92 and a BCFfish = 3034 and BCFearthworm = 999, are considered therefore more reliable endpoints to be used in risk assessment.

5.1.40.2 3.3.5.1 Environmental effects (hazard) of the active substance (ecotoxicology)

Table 3.3.5.2-1: Summary of the eco-toxicological data for the active substance Brodifacoum

Parameter	Test material	Species	Result	Classification	Ref.
Short term toxicity testing on fish	ECO120140	Oncorhynchus mykiss	96-hour LC50 = 0.042 mg/L	Yes - R50/R53	W J Craig - March 2003. Chemex Environmental International Ltd report ENV5803/120140 (2003)
	Acceptability (Y/N): Yes		**Method:** OECD 203		**GLP (Y/N):** Yes
	Comments: None				
	Acceptability (Y/N): Yes		**Method:** OECD 202		**GLP (Y/N):** Yes
	Comments: Recorded under semi-static conditions.				
Toxicity to aquatic invertebrates	ECO120140	Daphnia magna	48 hour - EC50 = 0.25mg/l	Yes - R51 /R53	W J Craig - March 2003. Chemex Environmental International Ltd report - ENV5802/120140
	Acceptability (Y/N): Yes		**Method:** OECD 202		**GLP (Y/N):** Yes
	Comments: Recorded under semi-static conditions.				
Growth inhibition study on	ECO120140	Selenastrum capricornutum (Pseudokirkneriella	72h ErC50 = 0.04 mg/l	Yes - R50 /R53	W J Craig - March 2003. Chemex

algae		subcapitata)			Environmental International Ltd. Report - ENV5801/120140
	Acceptability (Y/N): Yes		**Method:** OECD 201		**GLP (Y/N):** Yes
	Comments: None				
Inhibition of microbial activity	7909101	3h respiration inhibition test with activated sludge from a sewage treatment plant treating predominantly domestic sewage	EC10 was set > water solubility limit of 0.058 mg/l measured at pH=7 and T=20°C	No acute toxicity	Staniland, J. (2004) Chemex Environmental International Ltd. Ref: ENV7009/120140
	Acceptability (Y/N): Yes		**Method:** OECD 209		**GLP (Y/N):** Yes
	Comments: Although the results of the study (EC50 >1003mg/l) are not reliable, the study can be used to derive the NOECmicroorganisms on the basis of the brodifacoum water solubility (EC50 > 0.058 mg/l).				
Studies on sediment dwelling organisms	-	No experimental data available for sediment dwelling organisms.	-	-	-
	Acceptability (Y/N): -		**Method: -**		**GLP (Y/N): -**
	Comments: The risk for the sediment compartment will be covered by the risk for the aquatic compartment.				
Growth inhibition of aquatic plants	-	No study submitted	-	-	-
	Acceptability (Y/N): -		**Method: -**		**GLP (Y/N): -**
	Comments: The evaluation concluded that there is no need for a study as there is no evidence that brodifacoum would be toxic to aquatic plants to a greater extent than to other aquatic organisms.				
Toxicity to earthworms	Chemex reference: ECO120140	14-day LC50	> 994 mg/kg dw	No acute or chronic toxicity	Staniland, J (2005) Environmental International Ltd. Ref:ENV7010/120140
	Acceptability (Y/N): Yes		**Method:** Static test conditions according to SOP E260 based on OECD 207.		**GLP (Y/N):** Yes
	Comments: 14-day LC50 was greater than 994 mg/kg dry soil (the highest concentration applied) corresponding to a 14-d LC50 > 879.6 mg/kg wwt.				
Toxicity to birds	Difenacoum	LD50 (Japanese quail)	19 mg/kg bw	Acute toxicity	Szabolcs Gaty (2005) LAB International. Study code: 04/903-115FU
	Acceptability (Y/N): Yes		**Method:** OPPTS 850.2100		**GLP (Y/N):** Yes
	Comments: An extrapolation factor of 8.05 was applied to correct for differences in toxicity based on the acute test results for Difenacoum (LD50 = 66 mg/kg, male and females) and Brodifacoum (LD50 = 19 mg/kg bw), both related to Japanese quail. The				

	Brodifacoum results indicate it is very toxic to birds, with an NOEC = 0.012 mg Brodifacoum/kg diet and an NOEL = 0.0012 mg Brodifacoum/kg bw/d.				
Toxicity to mammals	04359	Two-generation fertility study (rat, parent females)	NOAEL (0.001mg/kg bw/day)	Yes	Toxicological Research Centre Ltd. report 03/737-202P.
	Acceptability (Y/N): Yes		**Method:** OECD 416		**GLP (Y/N):** Yes
	Comments: Although a two-generation study is not normally required for anticoagulant rodenticides, the study is relevant for the establishment of an overall NOAEL for anticoagulant effects in rodents.				

5.1.40.2.1 Effects on Aquatic Organisms including the determination of PNECs:

Toxicity data are available for aquatic organisms exposed in an acute test. In a test performed under semi-static conditions, the 96-hour LC50 was 0.042mg/L for Oncorhynchus mykiss, based on measured concentrations. Daphnia magna was less sensitive than fish, with a 48-hour EC50 of 250 µg/L recorded under semi-static conditions. The endpoint was based on immobilisation and on measured concentrations of Brodifacoum in the test media. In a 72-hour algal growth inhibition test with Selenastrum capricornutum (Pseudokirkneriella subcapitata) the ErC50was 40 µg/l. The NOEC was 10µg/l with respect to specific growth rate. Results are based on measured concentrations. The outcome is that Brodifacoum is considered very toxic to aquatic organisms. The PNEC is derived from the algae 72h ErC50 = 0.04 mg/l (or fish 72h LC50 = 0.042 mg/l), and the application of an assessment factor of 1000. Therefore the **PNEC = 0.00004 mg/l**.

No experimental data are available for sediment dwelling organisms. A PNECsediment (0.043 mg/kg wwt) was derived through the Equilibrium Partitioning Method described in the TGD. However, due to the absence of measured data for the determination of a PECsed, according to TGD a quantitative risk characterization cannot be carried out. Therefore the risk for the sediment compartment will be covered by the risk for the aquatic compartment.

Based on the result of a 3h respiration inhibition test with activated sludge from a sewage treatment plant treating predominantly domestic sewage, no effects of Brodifacoum on aerobic biological sewage treatment processes are expected. As the test was carried out at nominal concentration much higher than the water solubility of Brodifacoum, the EC10 was set as greater than the water solubility limit of 0.058 mg/l measured at pH=7 and T=20°C. According to TGD, PNEC is derived applying an AF=10 to the NOEC from the respiration inhibition test. Therefore, the **PNECmicro-organisms > 0.0058 mg/l.**

No degradation or transformation products of Brodifacoum in water were detected. Toxicity of metabolites is not of concern.

PNECaquatic organisms = 0.00004 mg/l
PNECsediment organisms = 0.00004 mg/l

PNECmicro-organisms = > 0.0058 mg/l

Conclusion on hazard to the aquatic organisms:

PNEC	Task Force
PNECaquatic organisms	0.00004 mg/l
PNECsediment organisms	0.00004 mg/l
PNECmicro-organisms	> 0.0058 mg/l

The Brodifacoum a.s. results in the classification of toxic to aquatic organisms.

5.1.40.2.2 3.3.5.2 Effects on the Atmosphere including the determination of PNECs

Brodifacoum has a low vapour pressure (1 x 10^{-6} Pa) and a Henry's Law constant of 2.18 x 10^{-3} Pa.m3mol^{-1} (pH 7). Release to air via water is expected to be negligible. This is also supported by calculations using the TGD on risk assessment for percent release to air from a sewage treatment plant where a default of 0 is given (i.e., no release to air). The manufacture of the active substance is in a closed system. There are no releases to air of Brodifacoum from manufacturing, formulating, use or disposal phases.

5.1.40.2.3 Effects on Terrestrial Organisms including the determination of PNECs:

The effect of Brodifacoum on earthworms was assessed in an acute toxicity test in which E. fetida in artificial soil was exposed to concentrations of Brodifacoum up to 994 mg/kg dw. The 14-day LC50 was greater than 994 mg/kg dry soil (the highest concentration applied) corresponding to a 14-d LC50 > 879.6 mg/kg wwt. The PNEC for terrestrial organisms is derived from the LC50 with an AF of 1000 used. Therefore, **the PNECsoil ≥ 0.88 mg/kg wwt soil**.

Conclusion on hazard to terrestrial organisms:

PNEC	Task Force
PNECsoil	> 0.88 mg/kg wwt

Earthworms were not affected after acute exposure to Brodifacoum at concentration closed to 1 g/kg dw. It is concluded that Brodifacoum is of low toxicity to earthworms. **The PNECsoil ≥ 0.88 mg/kg wwt soil.**

5.1.40.2.3.1

5.1.40.2.3.2 Effects on Birds including the determination of PNECs:

Brodifacoum is moderately toxic to birds upon acute oral exposure with a LD50 value of 19 mg/kg bw in the Japanese quail.

No studies are available on the avian short term dietary toxicity.

A 6 weeks reproduction test on the Japanese quail exposure to Brodifacoum in drinking water was submitted but it was judged not adequate for risk assessment purposes. Therefore, acknowledging the decision taken at the Biocides TMIII09, the NOEC for Brodifacoum is based on the results of the chronic toxicity study with Difenacoum (with Japanese Quail), chosen as reference chemical for second generation anticoagulants. An extrapolation factor of 8.05 was applied to correct for differences in toxicity based on the acute test results for Difenacoum (LD50 = 66 mg/kg, male and females) and Brodifacoum (LD50 = 19 mg/kg bw), both related to Japanese quail. The Brodifacoum results indicate it is very toxic to birds, with an NOEC = 0.012 mg Brodifacoum/kg diet and an NOEL = 0.0012 mg Brodifacoum/kg bw/d. According to the TGD, an assessment factor of 30 is applied to derive the PNEC. Therefore the **PNECoral-birds = 0.012 mg Brodifacoum/kg diet/30 = 0.0004 mg Brodifacoum/kg diet.** In relation to dose the **PNECoral-birds = 0.0012 mg Brodifacoum/kg bw/d/30 = 0.00004 mg Brodifacoum /kg bw/d**.

Conclusion on hazard to birds:

PNEC	PNECoral bird diet	PNECoral bird
Task Force	0.0004 mg/kg	0.00004 mg/kg bw/d

5.1.40.2.3.3 Effects on Mammals including the determination of PNECs:

The lowest mammalian NOAEL (0.001mg/kg bw/day) comes from a two-generation fertility study with rats and refers to parent females. This endpoint was converted, according to TGD, to NOEC mammal, food = 0.02 mg/kg food. As the exposure lasted 90 days as a minimum, for PNEC derivation an AF oral of 90 is applied (table 23 of TGD). Therefore, the **PNECoral-mammals = 0.02/90 = 2.22E-04 mg/kg food**, corresponding to **PNECoral-mammals = 0.001 mg/kg bw day/90 = 1.1 E-05 mg/kg bw**.

Conclusion on hazard to mammals:

PNEC	Task Force
PNECoral mammals food	2.22E-04 mg/kg
PNECoral mammals	1.1 E-05 mg/kg bw

Brodifacoum is very toxic to mammals.

5.1.40.2.3.4 Metabolites

No significant amounts of metabolites are expected to be formed in soil. In rats, no toxicologically relevant metabolites have been identified which could be introduced in soil via urine or faeces.

5.1.40.3 Environmental effects (hazard) of the biocidal product

The example products in the EU-review program for approval of the active substance for inclusion in Annex I of Directive 98/8/EC were pellet bait and wax block mixtures (formulations) containing Brodifacoum.

The aquatic, terrestrial, avian and mammalian toxicity data used for the assessment of the Annex I representative biocidal product was based on data determined in the Brodifacoum active substance studies. This included the following studies.

7.8.7.1 (1)	Kaukeinen DE	1982	A Review of the Secondary Poisoning Hazard to Wildlife from the use of Anticoagulant Rodenticides Proceedings of the 10th Vertebrate Pest Conference (1982). Published	N	Public Domain
7.8.7.1 (2)	Newton I and Wyllie I	-	Effects of New Rodenticides on Owls, Institute of Terrestrial Ecology, Monks Wood Experimental Station, Abbots Ripton, Huntingdon, Cambs PE17 2LS Published	N	Public Domain
7.8.7.1 (3)	Gray A, Eadsforth CV and Dutton AJ	1994	The Toxicity of Three Second-Generation Rodenticides to Barn Owls, Pesticide Science, 42, 179-184. Published	N	Public Domain
7.8.7.1 (4)	Wyllie I, Newton, I and Freestone P	-	The Toxicity of Three Second-Generation Rodenticides to Barn Owls, Institute of Terrestrial Ecology, Monks Wood, Abbots Ripton, Huntingdon, Cambs PE17 2LS Published	N	Public Domain

There were no additional ecotoxicology studies provided for authorisation of the biocidal product in this process.

5.1.40.4 Environmental effects (hazard) of the co-formulants (substances of concern)

Please refer to Annex I of the consolidated Annexes I-IV which contains the confidential information on the co-formulants that are used in this product along with the active substance.

None of the co-formulants that carry an environmental classification are present at a sufficient concentration to trigger the classification of the product.

Product Classification & Labelling:

There is no requirement for classification and labelling with regard to the co-formulants used in the product.

There is no environmental classification for the product under the Directive 99/45.
There is no environmental classification for the product under the CLP Regulation 1272/2008.

5.1.41 Exposure Assessment for the Environment

The environmental exposure was assessed during the EU active substance review process and the current intended uses are similar.

The rodenticide product is used by professional and amateur users. The product is intended for indoors use, in and around buildings and for outdoors uses in non-agricultural open areas and waste dumps. It is not supported for use in sewers; however the applicant has included this scenario in their application as a worst case scenario.

It is always used in the same manner for all these purposes. Bait points are placed throughout the infested areas with 20g per bait point for mice and 20 to 60 g per bait point for rats. Application sites are located 2-5 m apart for mice and 5-10 m apart for rats. A shorter distance is used in severe infestations. The number of baits and the distances should be adapted to the infestation level. Bait points are inspected frequently and replenished when bait has been eaten.

Bait points are placed securely to help prevent access to non-target animals. For amateur use, the label prescribes to use tamper resistant bait stations for rat control. Baits for amateur mouse control have to be placed into/at a covered or protected bait station. For professional rodent control the use of tamper resistant bait stations is not compulsory however, if tamper resistant bait stations are not employed, the wax blocks must be fixed by strings or wire to avoid uptake by non target animals/humans, or uncontrolled dispersal.

Based on the environmental fate and behaviour of Brodifacoum, as outlined in the detailed calculations provided in Annex VI of this Product Authorisation Report, the environmental exposure assessment was conducted.

5.1.41.1 Aquatic compartment

As mentioned previously the product is not supported for use in sewers but the scenario has been included as part of the risk assessment for the other scenarios. Therefore exposure to the aquatic compartment has been assessed through the STP route also. Based on worst case ESD assumptions the maximum predicted environmental concentration (PEC) of the active substance for microorganisms in the STP is 1.93×10^{-5} mg/L. The corresponding amount in surface water is 1.77×10^{-6} mg/L. The maximum permissible concentration by directive 80/778/EEC (amended by 98/83/EC) of 0.1 µg/L is not exceeded in surface waters. Full details of the calculations are contained in Annex VI.

5.1.41.2 Atmospheric compartment

Brodifacoum has a vapour pressure of less than 10^{-6} Pa at 20^{o}C and a Henry's Law constant of less than 2.18×10^{-3} $Pa.m^3.mol^{-1}$ at pH 7. In the Assessment Report for brodifacoum it has been concluded that releases to air from manufacturing, formulating, use or disposal phases are not to be expected. An exposure assessment for air is therefore not required.

5.1.41.3 Terrestrial compartment

Exposures of soil to the active substance occurs via direct (spillages) and disperse release (deposition by urine and faeces) after the use of the product in and around buildings, open areas and waste dumps. As mentioned previously the product is not supported for use in sewers however exposure to agricultural soil via spreading of sludge from an STP has been included as part of the worst case risk assessment.

Using ESD worst-case assumptions of the typical usage patterns and release mechanisms, the maximum concentration in agricultural soil (averaged over 30 d) after 10 years of sludge application from STP is 4.86 x 10^{-4} mg/kg wwt. When the applicant's dosage rates are used as inputs the figure for agricultural soil is 3.24 x 10^{-4} mg/kg wwt. No information on the metabolism of brodifacoum was used to lower the exposure levels further.
The highest concentration of Brodifacoum in soil following use in and around buildings is 0.047 mg/kg wwt under ESD realistic worst case conditions (see table below). For a normal use pattern the ESD recommends a total of 2.6 replenishments (as opposed to 5 for the worst case). This usage pattern leads to an estimated soil concentration of 0.006 mg/kg wwt.

For the open areas scenario ESD realistic worst-case conditions assume one application site is treated twice with the product. The fraction released during use and application is 0.25. The exposed soil area is assumed to be the lower half of the burrow wall surrounding an 8 cm diameter tunnel, with a soil mixing depth of 10 cm and up to 30 cm from the entrance hole. The amount of product used at each refilling in the control operation is not specified by the ESD. However, the Reviewer notes the ESD states "A typical initial dose for a rat hole in the Nordic countries is 100-200 g grain.hole^{-1}. However, in e.g. France a typical dose for a rat hole is about 50-100 g product." The applicant supports a dosage of 60 g bait per refill but bearing in mind the ESD statements the reviewer feels that a dosage value of 100 g is a sufficiently worst case value to use in the exposure assessment.. The local concentration arising in soil after a campaign is predicted to be 0.173 mg/kg wwt.

The default area for a waste dump defined in the ESD is 1 ha. If bait points are placed at distances of 5 m apart in a grid covering the entire dump this would yield a total of 441 points (21 x 21). 100 g in each bait point corresponds to a total loading of 44.1 kg of bait. This is higher than the default value considered in the ESD under realistic worst-case conditions (40 kg). Consequently the applicant's exposure calculation is not sufficient to support this use. The Reviewer generated new exposure calculations for this use. The local concentration arising in soil after such a campaign is predicted to be 0.00817 mg/kg wwt. A more realistic campaign would use a total of 11 kg of bait resulting in a local concentration of 0.00204 mg/kg wwt.

In and around buildings	Open areas	Waste dumps
Amount of product used in control operation for each bait point: 0.25 kg (ESD), 0.06 kg (applicant). Realistic worst-case: 21 day campaign Bait stations: 10 No. of replenishments: 5 (2.6 realistic) Bait stations are 5 m apart. Fraction released due to spillage: 0.01 Fraction ingested: 0.99 Spillage area: 0.09 m^2 (0.1 m around station) Frequented area: 550 m^2 (10 m around building)	Amount of product used at each refilling in the control operation: 100 g Realistic worst-case: 6 day campaign Bait stations: 1 No. of replenishments: 2 Fraction of product released to soil during application: 0.05 Fraction of product released to soil during use: 0.2	Area of waste dump: 1 ha Amount of product per station: 100 g Spacing between blocks: 5 m (worst case), 10 m (realistic) Total mass of product used: 21 x 21 x 100 g = 44.1 kg (worst case) 11 x 10 x 100 g = 11 kg (realistic) No. of replenishments: 7 Fraction of active ingredient released to soil through urine, faeces and dead animals: 0.9

5.1.41.4 Groundwater

Exposure of groundwater may occur as a result of soil exposure which occurs via residues present in sewage sludge after using the product in sewers and via direct (spillages) and disperse release (urine and faeces) after the use of the product in the scenarios in and around buildings, open areas and waste dumps. As an indication for potential groundwater levels, the concentration in soil porewater in the various scenarios was examined. It should be noted that this is a worst-case assumption, neglecting transformation and dilution in deeper soil layers. A summary of the PECs obtained are presented in the table below. The calculated value for the open areas scenario exceeds the EU trigger value of 0.1 µg/L. However this figure is derived from a soil concentration value in a small localised area in the immediate vicinity of the baiting point. When taken in the context of a larger area (field, park, etc.) this figure would be several orders of magnitude lower. In addition it must be noted that these

two scenarios give a value for groundwater under industrial soil – not agricultural soil as specified by the ESD.

Scenario	In and around buildings		Open area	Waste dump		Sewer system
	Worst case	Realistic		Worst case	Realistic	
PEC groundwater (mg/l)	5.3×10^{-5}	6.62×10^{-6}	1.96×10^{-4}	9.26×10^{-6}	2.31×10^{-6}	1.93×10^{-5}

5.1.41.5 Primary & Secondary Poisoning Exposure Assessment

Non-target vertebrates may be exposed to rodenticides primarily through consumption of bait and secondarily from consumption of poisoned rodents and for predators eating earthworms which have ingested the active substance absorbed to soil. Small pellets and whole grain baits are highly attractive to birds.

In and around buildings:
Primary Poisoning:

Regarding the possible primary hazard to non-target animals this is assessed for birds and mammals.

Acute:

In the first tier scenario, PECoral is the concentration of the rodenticide in the food of a non-target organism. The PECoral is **50 mg/kg** (Brodifacoum present at 0.005% w/w in the product) and is used in the quantitative risk assessment for the acute and long-term situation.

In the second tier (refined) risk assessment the daily uptake (ETE) for birds and mammals is considered. This risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes and takes into account avoidance factor (AV), the fraction of the diet obtained in the treated area (PT) and a a default excretion factor.

Table-1 Brodifacoum concentrations in non-target birds following a single uptake of the product

Species	Body weight (g)	Daily food intake (FIR) (g/d)[a]	Conc. of a.i. after single meal (mg/kg bw/d) (ETE)	Expected conc. after elimination[b] (mg/kg bw/d) (EC)
Tree sparrow	22	7.6	17.27	12.43
Chaffinch	21.4	6.42	15.00	10.80
Wood pigeon	490	53.1	5.42	3.90
Pheasant	953	102.7	5.39	3.88
Dog	10 000	456[d]	2.28	1.64
Pig	80 000	600[e]	0.375	0.270

Pig, young	25 000	600[e]	1.20	0.864

Long-term:

In the first tier scenario, the risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes and takes into account avoidance factor (AV), the fraction of the diet obtained in the treated area (PT) and a default excretion factor.

Expected concentration of Brodifacoum in the animal after one meal followed by a 24-hour elimination period

Species	Estimated daily uptake of a compound (ETE) (mg/kg b.w./d)		Fraction of daily uptake eliminated (number between 0 and 1) (EI)	Expected concentration of active substance in the animal (EC) (mg/kg b.w./d)	
	Step 1	Step 2		Step 1	Step 2
Tree sparrow	17.27	12.43	0.3	12.09	8.71
Chaffinch	15.00	10.80	0.3	10.50	7.56
Wood pigeon	5.42	3.90	0.3	3.79	2.73
Pheasant	5.39	3.88	0.3	3.77	2.72
Dog	2.28	1.64	0.3	1.596	1.149
Pig	0.375	0.270	0.3	0.2625	0.189
Pig, young	1.20	0.864	0.3	0.864	0.6048

In the second tier scenario for primary poisoning long-term exposure according to the guidance agreed at the 23rd Biocides CA meeting, EC5 values are used for quantitative risk assessment of primary poisoning in the long-term situation.

EC_{oral} for different relevant species

Days	EC_{oral} (mg/kg b.w./d)						
Species	Tree sparrow	Chaffinch	Wood pigeon	Pheasant	Dog	Pig	Young pig
Day 1 after first meal	17.27	15.00	5.42	5.39	2.28	0.375	1.20
Day 2 before new meal	12.1	10.5	3.79	3.77	1.60	0.266	0.840
Day 3 before new meal	20.6	17.9	6.45	6.41	2.72	0.449	1.43
Day 4 before new meal	26.5	23.0	8.31	8.26	3.50	0.577	1.84

Day 5 before new meal	30.7	26.6	9.61	9.56	4.05	0.666	2.13

Secondary Poisoning:

Secondary poisoning hazard can only be ruled out completely when the rodenticide is used in fully enclosed spaces so that rodents cannot move to outdoor areas or to (parts of) buildings where predators may have access. Predators among mammals and birds may occur inside buildings or they may hunt in the immediate vicinity of buildings, e.g. parks and gardens. Scavengers may also search for food close to buildings.

Tier 1 exposure assessment:

According to the ESD PT 14, a normal susceptible rodent may eat anticoagulant rodenticide for a number of days before it stops eating. The feeding period has been set to a default value of 5-days, which corresponds to the feeding pattern observed in laboratory experiments. The mean time until death has been set to a default value of 7-days. Concentrations in contaminated rodents have been calculated for the time point immediately after the last meal. The factor PD (fraction of food type in diet) is set to 0.2 (minimum factor for normal case), 0.5 (normal use situation), and 1.0 (worst case situation). Regarding the elimination rate, the default of 0.3 supported by the ESD is adopted. The assessment also takes into account the concentration in resistant rodents.

	Residues of rodenticide in target animal, mg a.s./kg b.w. with bait consumption expressed as PD		
	0.2	**0.5**	**1.0**
A normal non-resistant target rodent stops eating on day 5			
Day 1 after the first meal*	1.00	2.50	5.00
Day 2 before new meal**	0.70	1.75	3.50
Day 3 before new meal	1.19	2.97	5.95
Day 4 after the last meal	1.53	3.83	7.66
Day 5**	1.77	4.43	8.86
Day 7 (mean time to death)**	1.36	3.39	6.79
A target rodent continues eating due to resistance			
Day 14 after the meal	2.31	5.79	11.58

Tier 2 Exposure Assessment:

The refined tier 2 considers exposure of relevant species of predators, based on their bodyweights and food intakes and takes into account avoidance factor (AV), the fraction of the diet obtained in the treated area (PT) and a default excretion factor. Food intake of non-target animals can vary significantly, depending on the metabolic rates of species, the nature of their food, weather conditions, time of year, etc.

Brodifacoum concentrations in non-target mammals and birds consuming contaminated rodents

				Normal susceptible rodents caught on day 5, before their last meal.	**Normal susceptible rodents caught on day 5 just after their last meal**	**Resistant rodents caught on day 14 just after their last meal**

Species		Body weight *)	Daily mean food intake*)	Amount a.s. consumed by the non-target animal**	Concentration in non-target animal	Amount a.s. consumed by the non-target animal***	Concentration in non-target animal	Amount a.s. consumed by the non-target animals****	Concentration in non-target animal
		(g)	(g)	(mg)	(mg a.s./kg b.w.)	(mg)	(mg a.s./kg b.w.)	(mg)	(mg a.s./kg b.w.)
Barn Owl	*Tyto alba*	294	72.9	0.32	1.10	0.51	1.72	0.61	2.06
Kestrel	*Falco tinnunculi.*	209	78.7	0.35	1.68	0.55	2.62	0.65	3.13
Little owl	*Athene noctua*	164	46.4	0.21	1.26	0.32	1.97	0.39	2.35
Tawny Owl	*Strix aluco*	426	97.1	0.43	1.01	0.67	1.58	0.81	1.89
Fox	*Vulpes vulpes*	5 700	520.2	2.31	0.41	3.62	0.63	4.32	0.76
Polecat	*Mustela putorius*	689	130.9	0.58	0.85	0.91	1.32	1.09	1.58
Stoat	*Mustela erminea*	205	55.7	0.25	1.21	0.39	1.89	0.46	2.26
Weasel	*Mustela nivalis*	63	24.7	0.11	1.74	0.17	2.72	0.21	3.25

Calculation of concentration in earthworms:
Calculations for secondary poisoning are undertaken according to the ESD PT 14 for predators eating earthworms which have ingested the active substance absorbed to soil.

Brodifacoum concentrations in earthworms

		Tier 1[a]	Tier 2[b]
Input			
C_{soil} sewer system	Concentration in soil averaged over a period of 180 days and divided by 2 (mg/kg wwt)	8.70×10^{-5}	3.70×10^{-5}
C_{soil} building	Concentration in soil immediately after intake divided by 2 (mg/kg wwt)	0.0056	0.0050
$BCF_{earthworm}$	Bioconcentration factor in earthworm (L/kg wet fish)	15820	15820
$C_{porewater}$ sewer system	Concentration in porewater (mg/L) divided by 2	5.35×10^{-7}	2.29×10^{-7}
$C_{porewater}$ building	Concentration in porewater (mg/L) divided by 2	3.48×10^{-5}	3.10×10^{-5}
F_{gut}	Fraction of gut loading in worm (kg dwt/kg wwt)	0.1	0.1
$CONV_{soil}$	Conversion factor for soil concentration wet-dry weight soil (kg wwt/kg dwt)	1.13	1.13
Output			
$PEC_{oral,\ earthworm}$ building	Predicted environmental concentration in earthworm (mg/kg wet earthworm)	0.495	0.441

5.1.41.6 Overall Summary of exposure assessment

The biocidal product is a ready-to-use bait containing 0.005% Brodifacoum as the active substance. Brodifacoum is a second-generation single-dose anticoagulant rodenticide. It is used against rat at the maximal rate of 60 g of product equivalent to 3 mg a.s. per baiting post and against mouse at 20 g product equivalent to 1 mg a.s. by baiting post. This formulation is intended for indoor and outdoor uses.

PECs were calculated in accordance with the ESD for PT14. These calculations are outlined in the previous sections. Based on environmental fate and behaviour of Brodifacoum the following PEC values were determined:

Scenario	In and around buildings		Sewer system		Open Areas		Waste Dumps	
	Worst case	Realistic	Worst case	Realistic	Worst case	Realistic	Worst case	Realistic
PEC soil (mg/kg wwt)	0.047	0.006			0.173	N/a	0.00817	0.00204
PEC groundwater (mg/l)	5.3×10^{-5}	6.62×10^{-6}			1.96×10^{-4}	n/a	9.26×10^{-6}	2.31×10^{-6}
PEC microorganisms (mg/l)			1.93×10^{-5}	1.27×10^{-5}				
PEC surface water (mg/l)			1.77×10^{-6}	1.18×10^{-6}				
PEC agricultural soil (mg/kg wwt)			4.86×10^{-4}	3.24×10^{-4}				
PEC groundwater (ag) (mg/l)			4.66×10^{-7}	3.11×10^{-7}				
PECsediment (mg/kg)			1.92×10^{-3}	1.28×10^{-3}				

No new data related to the environment fate and behaviour or the ecotoxicology of the active substance or the biocidal product has been submitted by the applicant. There were three studies submitted related to secondary poisoning to dogs and foxes and the hazard/risk to barn owls which are considered only supplementary data and not considered further in the risk assessment.

PNECs were calculated based on the studies submitted for the EU approval of the active substance. PECS for assessment of primary and secondary poisoning were determined based on the ESD for PT14 and the TGD (2003).

5.1.42 Risk Characterisation for the Environment

Brodifacoum products are non-selective and can pose a risk of primary and secondary poisoning to non-target animals.

Product containing brodifacoum are placed at secured bait points. To maximise exposure of the target rodents and minimise unintended exposure of other non-target vertebrates, the products are placed where they are most likely to be encountered by the target organisms (e.g. on habitual rat-runs).

The type of secured bait point suitable for a given situation is determined on a case-by-case basis, taking into account such factors as shielding from sunlight and moisture necessary to maintain bait integrity and the level of security required to prevent access to and/or interference by non-target animals etc.

The risks posed by products containing 50 mg Brodifacoum/kg are characterised for the following scenarios:

1. **In and around buildings (houses, animal houses, commercial and industrial sites)**
2. **Open areas**
3. **Dumps**

5.1.42.1 Aquatic compartment

A contamination of surface water with Brodifacoum from the placing of product in and around buildings is highly unlikely. A lack of exposure to surface water is also stated in the EUBEES 2 emission scenario document. Contamination of surface waters is however expected to arise following use of bait in sewers.

The most sensitive organism in the aquatic tests was alga with a nominal 72 hr ErC50 of 0.04 mg/L. This **$PNEC_{water}$** of 0.04/1000 AF**= 0.00004 mg/L**.

The test with micro-organisms in inhibition of microbial activity showed that concentrations that it is not likely that Brodifacoum will have a negative impact on the microbial processes in a sewage treatment plant at solubility limits. This gives a **$PNEC_{STP}$** of **= 0.0058 mg/L.**

As no specific data are available, the toxicity of Brodifacoum to sediment-dwelling organisms is covered by the risk to aquatic compartment. The application of an additional factor of 10, as done in CAR A, is considered not necessary as an experimental log Kow = 4.92 (i.e. lower than 5) is available. **Therefore, the PNECsediment organisms = 0.00004 mg/l**.

The risk characterisation for the aquatic compartment is presented in the following table applying the relevant PEC values as indicated in the table in the overall summary of the exposure assessment in the previous section.

Aquatic PEC/PNEC ratios using the realistic and worst case scenario

Exposed compartment	Endpoint	PNEC mg/L	PEC Worst case	PEC Realistic	Risk quotient PEC/PNEC
Surface water	Algae	0.00004	1.77E-06	1.18E-06	0.044
Sediment	Based on aquatic data and equilibrium partitioning method	4.348E-02	1.92E-03	1.28E-03	0.044

STP	Inhibition of microbial activity	0.0058	1.93E-05	1.27E-05	0.003

The PEC/PNEC risk quotient in all compartments are below the trigger value of 1 indicating Brodifacoum following the recommended use of the product does not cause an unacceptable risk to aquatic organisms.
Brodifacoum is not readily biodegradable under environmentally relevant conditions or during sewage treatment processes. Accordingly, the degradation of Brodifacoum in sediment is also anticipated to be low. However, it has limited exposure to the aquatic compartment and this is confirmed by the PEC calculations. The PEC/PNEC ratio is below the level that leads to an unacceptable risk, thus the risk for unacceptable accumulation in sediment can be regarded as low.

For an indication of the risk in relation to surface water and groundwater/porewater used for drinking refer to the section on the aquatic compartment and groundwater in the exposure assessment.

Since the potential for metabolites formation is negligible, risk characterisation is not required.

Summary: No risk is identified

5.1.42.2 Atmospheric compartment

There are no releases of brodifacoum to air from manufacturing, formulating, use or disposal phases. Based on this and the physical and chemical properties of brodifacoum, the compound is not expected to contribute to global warming, ozone depletions in the stratosphere, or acidification.

Summary: No risk is identified

5.1.42.3 Terrestrial compartment

Exposure of the terrestrial compartment (soil) will also occur when product is deployed outdoors. Exposure is assumed to arise through a combination of transfer (direct release) and deposition via urine and faeces (disperse release) onto soil.

As there is only one test result available with soil dwelling organisms the risk assessment is performed on the basis of this result using an AF and on the basis of the equilibrium partition method. For the EPM the PNEC is calculated from the aquatic toxicity data **PNECaquatic**= **0.00004 mg/kg**.

PEC/PNEC ratios using the realistic worst case scenario

Exposed compartment	Endpoint	PNEC	PEC Worst case	Risk quotient PEC/PNEC Worst case
In and around buildings	Based on aquatic data and equilibrium partitioning method Based on the availability of test result with soil dwelling organisms and AF	1. 4.348 x E-02 2. 14-d LC50 > 879.6 mg/kg wwt/1000 = 0.8796 mg/kg	0.047	1. 1.08 2. 0.053
Open areas	Based on aquatic data and equilibrium partitioning method Based on the availability of test result with soil dwelling organisms and	1. 4.348 x E-02 2. 14-d LC50 > 879.6 mg/kg wwt/1000 = 0.8796 mg/kg	0.173	1. 3.97 2. 0.196

	AF			
Waste dump	Based on aquatic data and equilibrium partitioning method Based on the availability of test result with soil dwelling organisms and AF	1. 4.348 x E-02 2. 14-d LC50 > 879.6 mg/kg wwt/1000 = 0.8796 mg/kg	0.00817	1. 1.87 2. 9.29 x 10^{-3}

The PEC/PNEC ratio was greater than 1 when used **in and around buildings and in open areas** when applying the EPM indicating for this calculation method that Brodifacoum, following recommended use of the product, causes an unacceptable risk to organisms in this terrestrial compartment. However, this PNEC value based in and around buildings and in open areas **represents only a screening value** of contamination and is superseded by the PNEC value determined from the 14-day earthworm toxicity study.

Summary: No risk is identified

Non compartment specific effects relevant to the food chain

5.1.42.4 Primary poisoning

Referring to rodenticide applications **in sewer systems**, there is no primary poisoning hazard to non-target mammals or birds because this is not a habitat for them (*cf.* ESD PT 14).

Regarding the possible primary hazard to non-target animals following applications **in and around buildings**, several non-target species are assessed for primary poisoning risk assessments.

Acute exposure:
Non-target mammals and birds are unlikely to enter sewers and feed on product in sewage systems. Therefore, there will be no significant exposure following the use of product in sewers. Rats that live underground in sewers are also unlikely to take bait and deposit significant quantities in accessible places above ground, thus preventing exposure to non-target animals living above sewers. In conclusion, the risks to non-target mammals and birds following the use of bait containing Brodifacoum in sewers are considered to be very low.

Following applications in and around buildings, the empirical risk assumes direct or indirect consumption of the deployed baits. For primary poisoning the initial PEC_{oral} values assume that there is no bait avoidance by the non-target animals and that they obtain 100% of their diet in the treated area and have access to the product.
The concentration in the final product is 0.005% for the active substance Brodifacoum. The PECoral is 50 mg/kg (Brodifacoum present at 0.005% w/w in the product) and is used in quantitative risk assessment for the acute and long-term situation.

Tier I risk assessment: $PEC_{oral}/PNEC_{oral}$ ratio for birds and mammals exposed to Brodifacoum

	PEC_{oral} (concentration in food, mg/kg)	**$PNEC_{oral}$ (concentration in food, mg/kg)**	**PEC / PNEC**
Acute			
Bird	50	19	2.63
Mammal	50	-	-
Long-term			
Bird	50	0.0004	125000
Mammal	50	0.000011	4545454

The ratios PEC/PNEC are above 1 indicating a potential risk.

Therefore, a refined tier 2 assessment is set out below, based on representative species. The refined tier 2 risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes. Food intake of non-target animals can vary significantly, depending on the metabolic rates of species, the nature of their food, weather conditions, time of year, etc.

Tier 2 acute risk assessment: $PEC_{oral}/PNEC_{oral}$ for non-target animals accidentally exposed to bait containing Brodifacoum after one meal

Non-target animals	ETE, concentration of Brodifacoum after one meal (one day) (mg/kg b.w.)		$PNEC_{oral}$ (dose, mg/kg b.w./d)	PEC/PNEC	
	Step 1	Step 2		Step 1	Step 2
Tree sparrow	17.27	12.09	0.0004	43175	30225
Chaffinch	15.00	10.50	0.0004	37500	26250
Wood pigeon	5.42	3.79	0.0004	13550	9475
Pheasant	5.39	3.77	0.0004	13475	9425
Dog	2.28	1.596	0.000011	207272	159600
Pig	0.375	0.2625	0.000011	34090	26250
Pig, young	1.20	0.864	0.000011	109090	78545

In Tier 2, Step 1 (worst case) AV, PT and PD are all set to 1, whilst in the realistic worst case (Step 2) these AV and PT are refined to 0.9 and 0.8, respectively.

The ratios PEC/PNEC are above 1 indicating a potential risk even after refinement.

Long -term exposure:
In this assessment, long-term exposure also has to be taken into account in the evaluation of primary poisoning of rodenticides.

Tier 2 long-term risk assessment: $EC_{oral}/PNEC_{oral}$ ratio after 1-day elimination of Brodifacoum

Species	EC_{oral} (mg/kg b.w./d) after 1 day		$PNEC_{oral}$ (mg/kg b.w./d)	Ratio $PEC_{oral}/PNEC_{oral}$	
	Step 1	Step 2		Step 1	Step 2
Tree sparrow	12.09	8.71	0.0004	30225	21775
Chaffinch	10.5	7.56	0.0004	26250	18900
Wood pigeon	3.79	2.73	0.0004	9475	6825
Pheasant	3.77	2.72	0.0004	9425	6800
Dog	1.596	1.149	1.1E-05	145091	104455
Pig	0.2625	0.189	1.1E-05	23864	17182
Pig, young	0.864	0.6048	1.1E-05	78545	54982

The ratios PEC/PNEC are above 1 indicating a potential risk.

According to the guidance agreed at the 23rd Biocides CA meeting, EC_5 values are used for quantitative risk assessment of primary poisoning in the long-term situation.

Tier 2 long-term risk assessment: $EC_{oral}/PNEC_{oral}$ ratio after 5-day elimination

Species	EC_{oral} after 5 days (mg/kg b.w./d) with excretion factor = 0.3, AV = 1, PT = 1 (mg/kg bw)[a]	EC_{oral} after 5 days (mg/kg b.w./d) with excretion factor = 0.3, AV = 0.9, PT = 0.8 (mg/kg bw)[a]	$PNEC_{oral}$ (mg/kg b.w./d)	Ratio $EC_{oral}/PNEC_{oral}$
Tree sparrow	30.7	22	0.0004	55260
Chaffinch	26.6	19	0.0004	47880
Wood pigeon	9.61	7	0.0004	17298
Pheasant	9.56	7	0.0004	17208
Dog	4.05	3	0.000011	265091
Pig	0.666	0.480	0.000011	43593
Pig, young	2.13	2	0.000011	139418

The ratios PEC/PNEC are above 1 indicating a potential risk even after refinement.

Summary: Risk is identified
Overall, for primary poisoning all acute and long-term $PEC_{oral}/PNEC_{oral}$ ratios are still above the trigger value of 1 indicating acute and long-term unacceptable risks

5.1.42.5 Secondary poisoning

It is unlikely that target rodents that have ingested bait containing Brodifacoum will leave the sewer system and be exposed, in significant numbers, to predators or scavengers. Therefore, the secondary poisoning risks from the use of bait in sewers are considered to be very low.

For the first tier assessment of secondary poisoning in and around buildings the maximum residue levels in target rodents that arise on day-5 after the last meal ($ETE_{oral\ predator}$) are compared to the PNEC values for concentration in food. The first tier assessment also assumes the following three levels of Brodifacoum bait consumption: 20%, 50% and 100% of the daily food intake of the target rodents. For long-term exposure, it is assumed that the rodents have fed entirely on rodenticide and that the non-target animals consume 50% of their daily intake on poisoned rodents.

Tier 1 risk assessment of secondary poisoning at day 5 (non-resistant rodents)

Organism group	$PNEC_{oral}$ (mg a.s./kg b.w.)	$ETE_{oral,\ predator}$ (mg a.s./kg b.w.)			$PEC_{oral}/PNEC_{oral}$ – day 5		
PD values		0.2	0.5	1.0	0.2	0.5	1.0
Acute							
Birds	19	2.77	6.93	13.87	3.84	9.62	19.26
Mammals	-				-	-	-
Long-term							
Birds	0.0004	1.39	3.47	6.93	10692	26692	53307
Mammals	0.000011				6261	15630	31216

Tier 1 risk assessment of secondary poisoning at day 14 (resistant rodents)

Organism group	$PNEC_{oral}$ (mg a.s./kg b.w.)	$ETE_{oral, predator}$ (mg a.s./kg b.w.)			$PEC_{oral}/PNEC_{oral}$ – day 14		
PD values	-	0.2	0.5	1.0	0.2	0.5	1.0
Acute							
Birds	19	2.31	5.79	11.58	0.121	0.30	0.60
Mammals	-				-	-	-
Long-term							
Birds	0.0004	1.15	2.31	5.79	287	5775	14475
Mammals	0.000011				104545	231000	526363

According to the tier 1 assessment the risk for secondary poisoning of non-target predator birds and mammals during long-term exposure via rodents poisoned with Brodifacoum is very high as indicated by the trigger value of 1 being exceeded in all cases. Therefore, a refined tier 2 assessment is set out below, based on representative species.

The refined tier 2 risk assessment considers exposure of relevant species of predators, based on their bodyweights and food intakes. Food intake of non-target animals can vary significantly, depending on the metabolic rates of species, the nature of their food, weather conditions, time of year, etc.

Tier 2 risk assessment of secondary poisoning (non resistant and resistant rodents)

Species	Exposure	$ETE_{oral\ predators}$ (mg a.s./kg/d)	$PNEC_{oral}$ (mg a.s./kg/d)	Ratio $ETE_{oral\ predators}$ / $PNEC_{oral}$
Barn owl	Day 5 before the last meal	1.10	0.0004	2750
	Day 5 after the last meal	1.72		4300
	Day 14 after the last meal	2.06		5150
Kestrel	Day 5 before the last meal	1.68	0.0004	4200
	Day 5 after the last meal	2.62		6550
	Day 14 after the last meal	3.13		7825
Little owl	Day 5 before the last meal	1.26	0.0004	3150
	Day 5 after the last meal	1.97		4925
	Day 14 after the last meal	2.35		5875
Tawny owl	Day 5 before the last meal	1.01	0.0004	2525
	Day 5 after the last meal	1.58		3950
	Day 14 after the last meal	1.89		4725
Fox	Day 5 before the last meal	0.41	0.000011	41000
	Day 5 after the last meal	0.63		63000
	Day 14 after the last meal	0.76		76000
Polecat	Day 5 before the last meal	0.85	0.000011	77272
	Day 5 after the last meal	1.32		132000
	Day 14 after the last meal	1.58		143636
Stoat	Day 5 before the last meal	1.21	0.000011	121000
	Day 5 after the last meal	1.89		189000
	Day 14 after the last meal	2.26		226000
Weasel	Day 5 before the last meal	1.74	0.000011	174000
	Day 5 after the last meal	2.72		272000
	Day 14 after the last meal	3.25		325000

Summary: Risk is identified

The ratios PEC/PNEC are all above 1 indicating a potential risk even after refinement.

5.1.42.6 Secondary poisoning via the terrestrial food chain

Emissions of brodifacoum to soil take place in two scenarios. In the scenario **in and around buildings** the uptake to soil proceeds directly (when considering outdoor applications as proposed in the ESD PT 14), whereas in the scenario for the **sewer** is not applicable in this PAR.

However, the TGD gives advice to take the 180 days averaged PEClocal for soil with respect to sewage sludge when calculating the PEC in earthworms. Hence, the mode of application given in the TGD is in fact not applicable for direct intake of substances.

In the product dossier $PEC_{oral,earthworm}$ for the direct soil intake has been calculated. The applicant advises that these figures be interpreted with care as concentrations in earthworm due to direct soil intake are not dealt with in the TGD. Soil concentrations used for the calculation represent a brodifacoum intake within a soil mixing depth of just 10 cm. Degradation has not been considered. Soil concentrations are halved since the TGD assumes only 50% of the soil uptake by earthworm to origin from the contaminated area.

Table-2: Secondary poisoning risk to earthworm-eating birds and mammals

Scenario	$PEC_{oral,earthworm}$ (mg/kg wet earthworm)		PNEC (mg/kg food)	PEC/PNEC	
	Tier 1[a]	Tier 2[b]		Tier 1[a]	Tier 2[b]
Birds					
Sewer system	N/a	N/a	4.0×10^{-4}	N/a	N/a
In and around buildings	0.495	0.441		1237	1102
Mammals					
Sewer system	N/a	N/a	2.22×10^{-4}	N/a	N/a
In and around buildings	0.495	0.441		2229	2004

[a] Product specific application data and default value for release (90% direct +indirect release)

[b] Product specific application data and refined metabolism

Summary: Risk is identified but is likely to have been overestimated

The results for the **in and around buildings** scenario indicate a risk of secondary poisoning for birds and mammals consuming contaminated earthworms.

5.1.42.7 Overall Summary

Based on toxicity data Brodifacoum presents a hazard to birds and non-target mammals. Non-target vertebrate animals may be exposed to the product containing Brodifacoum, either directly by ingestion of exposed product (primary poisoning) or indirectly by ingestion of the carcasses of target rodents that contain Brodifacoum residues (secondary poisoning). Brodifacoum products are non-selective and can pose a risk of primary and secondary poisoning to non-target animals. There are many uncertainties associated with quantification of the risk associated with the use of Brodifacoum products. Overall, because of the toxic nature of rodenticides and the over-riding public health requirement it is more appropriate to develop and validate risk management measures than to refine the risk assessment procedures further. It is noted that the product contains a bittering agent and this may deter some non-target animals. It is also noted that the attractiveness of the product may be impacted by the use of dye.

5.1.42.7.1 Primary poisoning:

Overall, all acute and long-term PECoral/PNECoral ratios are above the trigger value of 1 indicating acute and long-term unacceptable risks. Even when avoidance and elimination are taken into account the empirical exposure levels result in unacceptable risks to birds and mammals.

5.1.42.7.1.1 Secondary poisoning:

Via ingestion of target rodents by non-target vertebrates
All ratios of PECoral/PNECoral are above the trigger value of 1 indicating an unacceptable risk of secondary poisoning. Even when avoidance and elimination are taken into account the empirical exposure levels result in unacceptable risks to birds and mammals. Studies are submitted in the product dossier that indicate that the realistic risk for secondary poisoning is significantly lower than that using the PEC/PNEC approach. These studies are only considered as supplementary information.

Via the aquatic food chain
Only one of the proposed four use scenarios, namely use in sewers, will lead to exposure of surface water. It is concluded that risk to fish-eating birds and mammals in a real situation cannot be excluded it potentially is overestimated.

Via the terrestrial food chain
The results for the **in sewer** and **in and around buildings** scenario indicate a risk of secondary poisoning for birds and mammals consuming contaminated earthworms.

5.1.42.7.2 Conclusion for primary and secondary poisoning:

Due to the risk assessment results for primary and secondary poisoning and the uncertainty associated with quantification of this risk, risk mitigation measures must be taken into account to lead to an acceptable use of the rodenticide product.

5.1.42.7.3 The following risk mitigation measures are proposed to mitigate the primary and secondary poisoning risk to non-target mammals and lead to an acceptable use of this rodenticide:

- Use of an integrated management strategy and precautionary systems
- Unless under the supervision of a pest control operator use or other competent person do not use anticoagulants as permanent baits

- There should be proper and secure placing of baits so as to minimise the risk of consumption by other animals or children. Where possible secure baits so they cannot be dragged away.
- Users should select tamper-resistant bait boxes, secured bait boxes, covered applications or burrow baiting (placing of bait in appropriate containers or under a curved tile or in a piece of tube) to minimize exposure of non-target animals
- Monitor and replenish bait stations as appropriate
- Frequent visits to bait stations to ensure that any bait that is split or dragged out of bait stations is removed
- Unconsumed baits must be collected after termination of the control campaign and dispose of them in accordance with local requirements
- Remove dead and moribund rodents at frequent intervals, at least as often as baits are checked or replenished during a baiting campaign
- Baits should be deployed in accordance with the product labelling
- Baits should be deployed in accordance with other approved guidance on good practice.
- Restrict the use of the product to treatment campaigns of limited duration
- To minimise the likelihood of target rodents developing resistance to second-generation anticoagulant rodenticides, long-term deployment of baits as a preventative control measure is not recommended
- The resistance status of the population should be taken into account when considering the choice of rodenticide to be used.
- When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary and secondary poisoning by the anticoagulant as well as indicating the first measure to be taken in case of poisoning must be made available alongside the baits

12.4 Measures to protect man, animals and the environment

The information submitted covering the requirements as described in the TNsG on Data Requirements, common core data for the product, section 8, points 8.1 to 8.8 is provided below.

3.4.25. Methods and precautions concerning handling, use, storage, transport or fire

Methods and precautions concerning handling and use:

- Always read the label before use and follow the instructions provided.
- Do not decant product into unlabelled containers.
- Product must be handled in a safe manner.
- Avoid all unnecessary exposure, in particular avoid ingestion.
- A thorough survey of the infested area is essential, particularly in secluded and sheltered places, to determine the extent of the infestation.
- Baits must be securely deposited in baiting stations or other coverings so as to minimise the risk of consumption by companion animals, other non-target animals and children. Where possible, secure baits so that they cannot be dragged away.
- PUBLIC AREA USE: When the product is being used in public areas and tamper-resistant bait stations are not used, the following must be implemented. When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary or secondary poisoning by the anticoagulant as well as indicating the first measures to be taken in case of poisoning must be made available alongside the baits. When tamper-resistant bait stations are used, they should be clearly marked to show that they contain rodenticides and that they should not be disturbed.
- Dead rodent bodies, remains of unused bait or any fragments of bait found away from the bait station must be collected during all control operations to minimize the risk of consumption and poisoning to children, companion animals and other non-target animals.
- It is illegal to use this product for the intentional poisoning of non-target, beneficial and protected animals.
- Wash hands and face after application and use of the product, and before eating, drinking or smoking.
- For professional users the use of appropriate personal protective equipment (PPE) is advised.

Methods and precautions concerning storage:

- Store in a cool, dry, well-ventilated secure (lockable) place
- Store locked up in the original container
- Store original container tightly closed
- Keep/store out of reach of children and companion animals
- Keep/store away from food, drink and animal feedstuffs and products which may have an odour.

Methods and precautions concerning transport:

Hazard classification for transport: TOXIC, MARINE POLLUTANT

UN-No Coumarin derivative pesticide, solid, toxic, n.o.s (BRODIFACOUM)

Class 6.1 Hazard ID 66

Proper Shipping name Coumarin derivative pesticide, solid, toxic (contains brodifacoum)

UN-No 3027 Packing Group 1

Class 6.1

Methods and precautions concerning fire:

Suitable Extinguishing Media:

Keep fire exposed containers cool by spraying with water if exposed to fire. Fight surrounding fire with foam, water fog, or dry powder.

Extinguishing media which must not be used for safety reasons:

DO NOT USE WATER JETS

Specific hazards:

This product is not flammable but is combustible. Avoid run-off into water courses. Self-contained breathing apparatus should be won by fire-fighting personnel.

Special protective equipment for fire-fighters:

In the event of fire, wear self contained breathing apparatus, a chemical protection suit, suitable gloves and boots.

Residues:

Dispose of residues to certified waste disposal operator for incineration and licensed waste disposal site.

3.4.26. Specific precautions and treatment in case of an accident

Personal precautions

Wear suitable protective clothing, gloves and eye/face protection, if applicable and where appropriate.

- Respiratory Protection: No special respiratory protection equipment is recommended under normal conditions of use with adequate ventilation.
- Hand protection: Wear gloves for professional products.
- Skin protection: No special clothing/skin protection equipment is recommended under normal conditions of use.
- Eye protection: Not required.
- Ingestion: When using this product, do not eat, drink or smoke

Personal treatment

- General advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible and report the authorisation number).
- Skin contact: Obtain medical advice immediately. Remove contaminated clothing. After contact with skin, wash immediately with plenty of water, followed by soap and water in order to minimise skin contact.
- Contaminated clothing should be washed and dried before re-use.
- Eye contact: Obtain medical advice immediately. Rinse eyes immediately with copious amounts of water.
- Inhalation: Unlikely to present an inhalation hazard unless excessive dust is present. Remove person to fresh air. Obtain medical advice immediately.
- Ingestion: Do no induce vomiting. If swallowed, obtain medical advice immediately. Wash out mouth with water.

ADVICE FOR DOCTORS:

Brodifacoum is an indirect anti-coagulant. Phytomenadione, Vitamin K1, is antidotal. In the case of suspected poisoning, determine prothrombin times not less than 18 hours after consumption. If elevated, administer vitamin K1 and continue until prothrombin times normalise. Continue determination of prothrombin time for three days after withdrawal of antidote and resume reatment if elevation recurs in that time.

Report all incidents of poisonings to the relevant national poisons centre; include information on the product authorisation number, product trade name and active substance. In Ireland, this is the National Poisons Information Centre, Beaumont Hospital, Dublin (01-8092166)

Environmental precautions

- Prevent accidental exposure of the product to the environment.
- Keep un-used bait locked-up and in secure storage containers
- Bait must be secured in tamper resistant bait boxes in areas away from drains, water courses and non-target organisms.

Environmental treatment

- Clean up accidental spillages promptly by sweeping or vacuum.
- If the product gets into water or soil, it should be removed mechanically. In the event of a significant accidental release, inform the appropriate authority.
- Transfer to a suitably labelled container and dispose of to a certified waste disposal operator for incineration and licensed waste disposal site.
- Subsequently, wash the contaminated area with water, taking care to prevent the washings entering sewers or drains.
- For further instructions, see section 3.4.6 below.

3.4.27. Procedures for cleaning application equipment

No application equipment is required, therefore, no specific cleaning for equipment is required

If necessary, following use, bait boxes should be washed with detergent and water. The bait box should be washed out 3 times (triple rinsed).

3.4.28. Identity of relevant combustion products in cases of fire

This product contains paraffin wax.

3.4.29. Procedures for waste management of the biocidal product and its packaging

The best means of disposal of any product is through proper use according to the label. For the product incinerate under controlled conditions. For the pack, do not dispose of the pack in domestic refuse. Empty completely, puncture or crush and dispose of safely to Local Authority and National requirements. Dispose of packaging, remains of unused product and dead rodents to a certified waste disposal operator for incineration and licensed waste disposal site.

3.4.30. Possibility of destruction or decontamination following accidental release

Air:

Brodifacoum has a low vapour pressure, therefore the potential for evaporation is low The vapour pressure is 5 x 10^{-5} Pa. As a rodenticide, this material is not intentionally aerosolised. Therefore, destruction in air is not a concern.

Water (including drinking water):
Prevent further leakage or spillage if safe to do so. Prevent entry into watercourses, sewers.

Soil:
Direct and/or intentional release to soil is not anticipated for the use of the product as a rodenticide. In the event of a significant accidental release, inform the appropriate authority.

3.4.31. Undesirable or unintended side-effects

Toxic to mammalian and avian species, including domesticated animals, wildlife and humans. Therefore the risk to these non-target species should be considered when using bait.

3.4.32. Poison control measures

The paste baits are dyed (e.g. red or blue) to make them unattractive to wildlife, and birds in particular. In addition, in case of accidental ingestion, the presence of a dye may help to confirm that there has been ingestion and thus facilitate antidote treatment.

The product contains a human taste deterrent (adversive agent – Bitrex).

To report human poisoning incidents call the relevant national poison information centre. Include information on the product authorisation number, product trade name and active substance. Where possible provide a copy of the label or safety data sheet (SDS).

In Ireland to report a poisoning incident, call: 01 (8092566 / 8379964) The Poisons Information Centre of Ireland, Beaumont Hospital, Beaumont Road, Dublin 9.

ADVICE FOR DOCTORS:

Brodifacoum is an indirect anti-coagulant. Phytomenadione, Vitamin K1, is antidotal. In the case of suspected poisoning, determine prothrombin times not less than 18 hours after consumption. If elevated, administer vitamin K1 and continue until prothrombin times normalise. Continue determination of prothrombin time for three days after withdrawal of antidote and resume reatment if elevation recurs in that time.

Report all incidents of poisonings to the relevant national poisons centre (include information on the product authorisation number, product trade name and active substance)

4. Proposal for Decision

The assessment presented in this report has shown that the ready-to-use product, Saphir Paste, formulated by Lodi S.A.S. with the active substance Brodifacoum, at a level of 0.005% w/w, may be authorised for use as a rodenticide (product-type 14) for the control of rodents (rats and mice).

Physical-Chemical Properties:
Saphir Paste has been shown not to present a physical-chemical hazard to end users and does not classify as highly flammable, oxidising or explosive. The bait is stable when stored at 54^{o}C for two weeks and when stored at ambient temperatures (20^{o}C) for three years. A shelf life of three years is proposed. A suitable method of analysis for the determination of Brodifacoum in the bait was provided.

The source of active substance used in the biocidal product Saphir Paste is the same source of active substance that is listed in Annex I of 98/8/EC. Syngenta initially supported the source, then the task force (Pelgar International Ltd and Activa) also supported the source, Italy carried out an equivalence check on the Task force source of Brodifacoum and found it to be equivalent to the Syngenta source. The RefMS accepted Italy's assessment.

Efficacy:
Saphir Paste (containing 40 mg/kg brodifacoum) is a ready-to-use paste bait (RB) intended to control the brown rat (*Rattus norvegicus*) and the house mouse mice (*Mus musculus*) indoors and outdoors (in and around buildings, open areas and waste disposal sites). The use scenario encompassing waste disposal sites and open areas is intended for professional users only. Effectiveness data has confirmed that Saphir Paste is effective in the proposed areas for use, at the recommended dose rate. Effective control should be expected from bait stored up to two years under suitable storage conditions.

Human Health:
The calculations presented have been made with the assumptions of rat control, and there are no separate calculations to assess exposure for mice control in which smaller bait sizes are used.

Using both the MOE and AEL approaches for risk assessment indicates that there is a satisfactory margin between the predicted exposure and the NOAEL (LOAEL) as well as exposures below the threshold value for the AEL for all intended uses by trained professionals with PPE, untrained professionals and amateurs (with and without PPE). The product is deemed suitable for authorisation and appropriate personal protective equipment is advised.

Secondary exposure from transient mouthing of the product exceeds the AEL reference value (0.0033µg/kg/day), both with the assumption of 0.01 g and 5 g of product ingested by infants. This is of concern. There is no margin of safety using the existing data and models. There is no safe scenario for indirect exposure if estimated according to TNsG and User Guidance. Mitigation and protection measures such as the inclusion of bittering agents and the enclosure of product in sealed packs and tamper resistant bait boxes are essential to reducing the risk of secondary exposure. Baits should not be placed where food, feeding stuffs or drinking water could be contaminated.

Environment:
The applicant did not submit any new environmental fate and behaviour studies with this product. Therefore the conclusions made at the Annex I inclusion stage for the active substance stand. The uses of this product were assessed here under the TGD and the PT14 ESD and all PEC/PNEC ratios were <1. However there is a risk for primary and secondary poisoning for non-target vertebrates. These identified risks are mitigated by applying all appropriate and available risk mitigation measures.

Conclusion:

During the active substance review of Brodifacoum by Italy, primary and secondary poisoning risks were identified for non-target organisms and for potential accidental poisoning incidents involving children. The assessment of those EU identified risks during the product authorisation evaluation of Brodifacoum have also indicated a potential risk of primary and secondary poisoning to non-target animals and the potential for the accidental primary poisoning of children. Due to these findings risk mitigation measures are applied to product authorisation.

Additionally, as the target rodents are vermin and are both direct transmitters of disease (such as through biting or contamination of food/feed by urine or faeces) or indirect carriers of disease (such as disease vectors, where fleas move from rat to humans) to humans and other animals. Transmitted diseases can include leptospirosis (or Weil's disease), trichinosis and salmonella. Authorisation of this product is considered necessary on the basis of public health grounds, since rodent populations are considered to constitute a danger to public health through the transmission of disease. However, risk mitigation measures and restrictions are required to prevent the possibility of the identified risks to non-target animals, companion animals and children.

Conditions of authorisation

Two authorisations should be issued. The first authorisation covers professional and trained professional use product. The second authorisation covers amateur use product.

This authorisation of Saphir Paste is for a period of 5-years with an annual renewal.

The concentration of the active substance, Brodifacoum, in Saphir Paste shall **not** exceed 0.05 g/kg (0.005% w/w).

Only ready-to-use Saphir Paste product is authorised.

As a poison control measure, the authorisation requires that the product shall contain an aversive, bittering agent.

The authorisation requires that the product be dyed with a colour to make them unattractive to wildlife, and birds in particular.

This product shall **not** be used as a tracking poison.

The product is authorised only for use against rats and mice (for example brown rats and house mice). Authorisation of this product does **not** allow use against non-target organisms.

The authorisation of this product for professionals and trained professionals only allows for use indoors and outdoors in the following areas: Indoors, including areas such as houses, warehouses, outbuildings and commercial premises. Outdoors uses only includes in-and-around buildings. The product can also be utilised in sewers. Brodifacoum baits must not be placed where food, feeding stuffs or drinking water can become contaminated.

The authorisation of this product for amateurs allows for use of this product indoors and outdoors around buildings in the following areas: Indoors, including only privates houses and outbuildings. Outdoors uses, including only around private building premises and private gardens and waste dumps. Brodifacoum baits should not be placed where food, feeding stuffs or drinking water can become contaminated.

The product should be used for rodent control in tamper resistant, secured bait stations or other secure coverings.

Bait stations should be clearly marked to show that they contain rodenticides and that they should not be disturbed.

Baits shall be secured to the bait station(s) so that rodents cannot remove bait from the bait box.

For amateur use products placed on the market in Ireland packaging restrictions are to be limited to pre-baited bait stations and refill packs with a maximum pack-size of 500g. Refill packs for amateurs must contain bait that is wrapped. Loose baits or grain (without wrapping) shall not be packaged for amateurs.

All product placed on the Irish market after the date of authorisation must be in compliance with the conditions of this authorisation and shall carry the approved label with the IE/BPA authorisation number and be packaged in the approved packaging.

Prior to any amendment relating to this authorised product, such as specification, use, labelling or administrative changes, application must be made to this Authority to do so

Upon annual renewal of the biocidal product, the authorisation holder shall provide statistics to PRCD on the import and export from Ireland and also manufacture statistics where appropriate for the product for the given full annual period or part thereof.

Authorisation of the biocidal product may be subject to review, following a detailed assessment of the risks involved, in accordance with the European Communities (Authorisation, Placing on the Market, Use and Control of Biocidal Products) Regulations, 2001, as amended. This review may lead to changes in or revocation of this authorisation.

Annex 7 – Annexes to PAR v1.3 – 15 December 2014

ANNEXES

Annex:

1. Confidential Information and Data
8. Summary of the Product Characteristics (SPC)
9. Study Summaries of Studies Reviewed
10. List of Studies Reviewed
11. Toxicology Calculations
12. Environmental Calculations
13. Residue Calculations

ANNEX I: Confidential Information and Data

Manufacturing site(s) of the active substance(s)[42]

Manufacturer of the active substance(s):	
Company Name:	PelGar International Ltd.
Address:	Unit 13 Newman Lane Industrial Estate, Newman Lane, Alton, Hampshire, GU34 2QR, UK.
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

Manufacturer of the active substance(s):	
Company Name:	PelGar International Ltd.
Address:	Prazska 54, 280 02 Kolin, Czech Republic.
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

Manufacturing site(s) of the biocidal product[3]

Manufacturing site of the biocidal product:	
Company Name:	CGB (Compagnie Générale des Biocides)
Address:	Parc d'Activités des 4 Routes, F-35390 Grand Fougeray France.
Tel:	[redacted]
E-mail:	[redacted]
Contact:	[redacted]

42 All sites involved in the manufacturing process of each active substance and of the product must be listed.

Assessment of the technical equivalence of Brodifacoum from two different sources (Syngenta and PelGar):

Italy carried out an assessment on the technical equivalence of the PelGar International Ltd. Brodifacoum source with the Annex I source of Brodifacoum (reference source). Brodifacoum produced by Syngenta was considered to be the reference source, since it had been evaluated first and was already included in Annex I, whereas Brodifacoum produced by PelGar was regarded as the new source. The three reports have been sent to the Commission and are available on CIRCA in the TM section (CA-Reports\CA-Reports Review Programme\A-D\Brodifacoum\Product Type 14\Assessment Report). The PelGar source of Brodifacoum was found to be equivalent to the Syngenta source of Brodifacoum (that is listed in Annex I of 98/8/EC). Ireland accepts the Italian evaluation.

Assessment of the technical equivalence of the PelGar Annex I 5-batch analysis for Brodifacoum with a new 5-batch analysis from the same source with the same manufacturing process:

PelGar produced a new 5-batch analysis to address data requirements from other countries outside the European Union. The new study covers all potential impurities of the active substance. The source and manufacturing process of Brodifacoum technical material is unchanged from that in the EU submission. As RefMS Ireland assessed the new data and found that the new 5-batch analysis data is within the specification covered by the Annex I listing. This material is therefore technically equivalent to Brodifacoum as listed in Annex I of the Biocidal Products Directive 98/8/EC.
A full technical equivalence evaluation was not carried out as the criteria for triggering a full technical equivalence evaluation were not met. The criteria are 1. Technical material from a new/different manufacturer 2. Data from industrial scale production vs pilot scale production and 3. Change in the manufacturing process, and/or manufacturing location. The full assessment can be found in the Confidential Addendum to the Product Assessment Report (Member States Only).

Production process for Saphir Paste:

Equipment:

The preparation of the paste is done with an automatic mixer. The flour is stocked in external silos with a direct access to the mixer. The other ingredients of the formula are introduced manually in the mixer. During the preparation the workers are equipped with overalls and gloves and also with security glasses during handling.

Procedure:

Weigh and pour into the mixing tank all the ingredients of the formula excepted flour: lard, natural hazelnut aroma, sorbic acid, BHT, fish oil, Phodesweet and Brodifacoum blue +bitter concentrate (0.25%). Mix during 4 minutes. When this is done, release the flour to the mixing tank. Mix during 6 minutes. Inverse the mixer's rotation direction and mix during 5 minutes. Inverse once again the mixer rotation direction and mix during 5 minutes

General note:
The composition of the PelGar Brodifacoum Concentrate (0.25% Concentrate – blue, 0.0625% denatonium benzoate) used by Lodi in their product can be found in the Confidential Addendum to the Product Assessment Report (Member States Only).

Product trade name: Saphir Paste

Qualitative and quantitative information on the composition/specification of the biocidal product Saphir Paste

Active substance(s)				Contents				
Common name	IUPAC name	CAS No.	EC No.	Concentration	Unit[43]	w/w (%)	Minimum purity (% w/w)	Same source as for Annex I inclusion (Y/N)
Brodifacoum	3-[3-[4-(4-bromophenyl)phenyl] tetralin-1-yl]-2-hydroxy-chromen-4-one	56073-10-0	259-980-5	0.04	g/kg	0.004	[redacted]	[redacted]
Co-formulants				**Contents**				
Common name	Function	CAS No.	EC No.	Concentration	Unit	w/w (%)	Classification	Substance of concern (Y/N)
[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
			[redacted]	[redacted]		[redacted]		

43 g/l, g/kg, other. For biological products, the concentration should state the number of activity units/units of potency (as appropriate) per defined unit of formulation (e.g. per gram or per litre).

Annex II: Summary of the Products Characteristics (SPC)

Please see separate SPC accompanying the PAR and authorisation certificate that have uploaded to the R4BP2.

Annex III: Study Summaries of Studies Reviewed

Insert study summaries with expert evaluation in data point order.

Study summaries of new data[44] submitted in support of the evaluation of the active substance (IIIA)

Physical Chemical Characteristics:

New data was submitted in support of PelGar International Limited's Brodifacoum source of active substance. This included an assessment on the reactivity of the technical concentrate towards the container material. It was argued that there will be no chemical or physical reaction between the technical concentrate and container. This information was assessed by Germany and was found to be acceptable. Ireland accepts Germany's assessment (please see Addendum to Annex I Listing Information on Data Requirements, 26.07.2011).

Methods of Analysis

New data was submitted in support of PelGar International Limited's Brodifacoum source of active substance. This included a fully validated analytical method for the determination of Brodifacoum in soil. This information was assessed by Germany and found to be acceptable. Ireland accepts Germany's assessment (please see Addendum to Annex I Listing Information on Data Requirements, 26.07.2011).

Efficacy

There were no new additional studies submitted for product authorisation.

Toxicology

There were no new additional studies submitted for product authorisation.

Environment (including Eco-Toxicology)

There were no new additional studies submitted for product authorisation.

44 Data which have not been already submitted for the purpose of the Annex I inclusion.

Study summaries of new data submitted in support of the evaluation of the biocidal product (IIIB)

Physical Chemical Characteristics

Section B3	Physical and Chemical Properties of Biocidal Product							
Subsection (Annex Point/TNsG)	**Method**	**Purity/ Specification**	**Results**	**Remarks/ Justification**	**GLP (Y/N)**	**Reliability**	**Reference**	**Official use only**
3.1 Appearance (IIB3.1/Pt. I-B3.1)								
3.1.1 Physical state and nature	GIFAP Monograph No.17 and CIPAC MT 46	Brodifacoum 40 ppm	Malleable paste in individual sachet *After 2 weeks at 54°C: still malleable paste but slightly friable in individual sachet.*		Y	1	B3.7.1: Study report "LODI.59/2011", S.Richerioux, 2011, Lodi	
3.1.2 Colour	GIFAP Monograph No.17 and CIPAC MT 46	Brodifacoum 40 ppm	Blue 2.5PB5/6 (Munsell) *After 2 weeks at 54°C: blue 10B4/4 (Munsell)*		Y	1	B3.7.1: Study report "LODI.59/2011", S.Richerioux, 2011, Lodi	
3.1.3 Odour	GIFAP Monograph No.17 and CIPAC MT 46	Brodifacoum 40 ppm	No characteristic odor *After 2 weeks at 54°C: no characteristic odor*		Y	1	B3.7.1: Study report "LODI.59/2011", S.Richerioux, 2011, Lodi	
3.2 Explosive properties (IIB3.2/Pt. I-B3.2)	OECD method EC A.14	Brodifacoum 40 ppm	Examination of components: the components do not contain any chemical group which have explosive properties. Brodifacoum Paste Bait is considered as not having explosive properties.		Y	1	B3.2: Study report "LODI.66/2011", S.Richerioux, 2011, Lodi	
3.3 Oxidising properties	EC A.17	Brodifacoum 40 ppm	Examination of components: the components do not contain any		Y	1	B3.3: Study report	

Section B3	Physical and Chemical Properties of Biocidal Product							
Subsection (Annex Point/TNsG)	**Method**	**Purity/ Specification**	**Results**	**Remarks/ Justification**	**GLP (Y/N)**	**Reliability**	**Reference**	**Official use only**
(IIB3.3/Pt. I-B3.3)			chemical group that might act as an oxidizing agent. Brodifacoum Paste Bait is considered as not having oxidizing properties. The test according to EC A.17 method is not required.				"LODI.65/2011", C.Richerioux, 2011, Lodi	
3.4 Flash-point and other indications of flammability or spontaneous ignition (IIB3.4/Pt. I-B3.4)								
Flammability	EC A.10 (solid)	Brodifacoum 40 ppm	Preliminary test: no propagation of combustion along 200 mm length of the pile within 4 minutes is observed. According to the guideline, the main test is not required. Based on the results of preliminary test, Brodifacoum Paste Bait is considered as not highly flammable.		Y	1	B3.4.1: Study report "LODI.58/2011", E.Meriadec, 2011, Lodi	
Auto-flammability	EC A.16 (solid)	Brodifacoum 40 ppm	No self ignition temperature of the test item was recorded up to 400°C (corrected value).		Y	1	B3.4.2: Study report " No. 11–912011-010", B.Demangel, 2012, Défitraces	
3.5 Acidity/Alkalinity (IIB3.5/Pt. I-B3.5)								
pH values	CIPAC MT 75.3	Brodifacoum 40 ppm	pH of a 1% (m/v) aqueous dilution of Brodifacoum Paste Bait is 6.3 after 10 minutes at 20.6°C.		Y	1	B3.5: Study report "LODI.64/2011",	

Section B3		Physical and Chemical Properties of Biocidal Product							
Subsection (Annex Point/TNsG)		Method	Purity/ Specification	Results	Remarks/ Justification	GLP (Y/N)	Reliability	Reference	Official use only
								S.Richerioux, 2011, Lodi	
	Acidity/Alkalinity	CIPAC MT 191	Brodifacoum 40 ppm	Determination not required	Determination is not required because pH of a 1% (m/v) aqueous dilution of Brodifacoum Paste Bait is higher than 4 and lower than 10 (FAO guideline).				
3.6	**Relative density/bulk density (IIB3.6/Pt. I-B3.6)**	OECD 109 and NF T20-053	Brodifacoum 40 ppm	1.14	This relative density is determined with a pycnometer at 20°C ± 2°C.	Y	1	B3.6: Study report "LODI.52/2011", S.Richerioux, 2011, Lodi	
3.7	**Storage stability - stability and shelf life (IIB3.7/Pt. I-B3.7)**								
	Stability at 0 ± 2°C				Not required for solid (paste).				
	Accelerated storage procedure for 2 weeks at 54 ± 2°C	GIFAP Monograph No.17 and CIPAC MT 46	Brodifacoum 40 ppm	After the accelerated storage procedure, no significant change was observed concerning the characteristics of the test item. Brodifacoum paste bait is considered stable after the accelerated storage during 14 and 21 days at 54°C ± 2°C.		Y	1	B3.7.1: Study report "LODI.59/2011", S.Richerioux, 2011, Lodi	
	Analytical	An analytical	Brodifacoum 40	Relative deviation of Brodifacoum		Y	1	B3.7.1:	

Section B3	Physical and Chemical Properties of Biocidal Product							
Subsection (Annex Point/TNsG)	**Method**	**Purity/ Specification**	**Results**	**Remarks/ Justification**	**GLP (Y/N)**	**Reliability**	**Reference**	**Official use only**
quantification of the active substance before and after accelerated storage	method validation of brodifacoum in Saphir Paste is presented in Doc III - Section B4	ppm	content between analysis at initial time and after 14 days at 54°C, is 3.32%; and after 21 days at 54°C, is 5.50%. These relative deviations are lower than 15%. Brodifacoum paste bait is considered stable after the accelerated storage during 14 and 21 days at 54°C ± 2°C.				Study report "LODI.59/2011", S.Richerioux, 2011, Lodi	
Dilution stability				Not applicable. The product is ready-to-use. It is not intended to be mixed with any other product.				
Shelf life: storage procedure for 1 year at 20 ± 2°C	GIFAP Monograph No.17	Brodifacoum 40 ppm	Physical state: After 1 year of storage at 20 ± 2°C, no significant change is observed concerning the physical state of the test item. Chemical stability: Relative deviation of brodifacoum content between analysis at initial time and after 1 year at 20 ± 2°C is -7.76%.		Y	1	B3.7.2: Study report "LODI.60/2011", S. Richerioux, 2012, Lodi	
Shelf life: storage procedure for 2 years at 20 ± 2°C	GIFAP Monograph No.17	Brodifacoum 40 ppm	Physical state: After 2 years of storage at 20 ± 2°C, no significant change is observed concerning the physical state of the test item. Chemical stability: Relative deviation of brodifacoum content between analysis at initial time and after 2 years at 20 ± 2°C is -5.99%.		Y	1	B3.7.3: Study report "LODI.61/2011", S. Richerioux, 2013, Lodi	
Shelf life: storage	GIFAP	Brodifacoum 40	Physical state: After 3 years of storage at 20 ± 2°C, no		Y	1	B3.7.4:	

Section B3	Physical and Chemical Properties of Biocidal Product							
Subsection (Annex Point/TNsG)	**Method**	**Purity/ Specification**	**Results**	**Remarks/ Justification**	**GLP (Y/N)**	**Reliability**	**Reference**	**Official use only**
procedure for 3 years at 20 ± 2°C	Monograph No.17	ppm	significant change is observed concerning the physical state of the test item. Chemical stability: Relative deviation of Brodifacoum content between analysis at initial time and after 3 years at 20 ± 2°C is -3.77%. Packaging stability: Deviation weights (packagings weights and test item weights) after 3 years at 20 ± 2°C are lower than 5% for all packagings. Moreover, no significant changes are observed on these packagings and on the test item except for the coextruded bag with cardboard box (the cardboard box is soaked of grease).				Study report "LODI.62/2011", S. Richerioux, 2014, Lodi	
3.8 Technical characteristics (IIB3.8/Pt. I-B3.8)				Not applicable as the product is a paste.				
3.9 Compatibility with other products (IIB3.9/Pt. I-B3.9)				Not applicable. The product is ready-to-use. It is not intended to be mixed with any other product.				
3.10 Surface tension (Pt. I-B3.10)				Not applicable as the product is a paste.				
3.11 Viscosity				Not applicable as the				

Section B3	Physical and Chemical Properties of Biocidal Product							
Subsection (Annex Point/TNsG)	Method	Purity/ Specification	Results	Remarks/ Justification	GLP (Y/N)	Reliability	Reference	Official use only
(Pt. I-B3.10)				product is a paste.				
3.12 Particle size distribution (Pt. I-B3.11)				Not applicable as the product is a paste.				

Conclusions:

Saphir Paste is not explosive, oxidising or highly flammable and therefore does not classify from a physical and chemical point of view. The paste bait is stable when stored for 2 weeks at 54^{o}C and when stored at ambient temperatures (20^{o}C) for 3 years. The paste bait is stable when stored in various different packaging materials (with the exception of the coextruded bag with cardboard box) for 3 years at ambient temperature (20^{o}C). The test item is a ready-to-use paste bait and is not intended to be added or mixed with any other product.

Data requirements:

None.

Methods of Analysis

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**	
	1 Reference	**Official use only**
1.1 Reference	Richerioux S., 2012, Analytical validation for determination of Brodifacoum, Lodi, Study No. LODI.51/2011	
1.2 Data protection	Yes	
1.2.1 Data owner	LODI	
1.2.2 Criteria for data protection	Data on existing biocidal product to maintain a biocidal product's authorisation	
	2 MATERIALS AND METHODS	

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**	
2.1 Preliminary treatment		
2.1.1 Enrichment	/	
2.1.2 Cleanup	/	
2.2 Detection	Brodifacoum was quantified by liquid chromatography using a reverse phase column and an UV detector.	
2.2.1 Separation method	Chromatographic conditions: - Column: C18, 150 mm x 4.6 mm, 5 µm, 110 Å - Mobile phase: acetonitrile/Buffer pH 2.7 (70/30% v/v) - Wavelength: 310 nm - Flow: 1 mL/min - Injection volume: 20 µL - Acquisition time: 30 minutes - Retention time: Brodifacoum 1 =16.22 min Brodifacoum 2 = 17.97 min Internal Standard (1,3,5-triphenylbenzene) = 26.09 min Extraction conditions: - Extraction solvent: n-hexane/dichloromethane/methanol/acetic acid (80/16/2/2% v/v) - Protocol: 15 minutes in ultrasonic bath, 30 minutes with magnetic stirring, 4 hours settling	
2.2.2 Detector	UV detector: λ= 310 nm	
2.2.3 Analytical Standard(s)	Reference item: Name: Brodifacoum PESTANAL® Supplier: SIGMA-ALDRICH Batch number: SZB8324XV Expiry date: November 19th, 2013	
2.2.4 Interfering substance(s)	No substance may interfere with Brodifacoum.	

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**	
2.3 Linearity		

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**	
2.3.1 Calibration range	The linearity is given on an interval of concentration. The interval extends from 20% in lower part from the awaited concentration and 20% to the top of the awaited concentration. The operator prepares 5 solutions containing 80%, 90%, 100%, 110% and 120% of the concentration in the Test Item. The concentrations used are 1.61mg/L, 1.81mg/L, 2.01mg/L, 2.21mg/L and 2.41mg/L.	X
2.3.2 Number of measurements	Three measures per concentration level.	
2.3.3 Linearity	Coefficient of determination for Brodifacoum 1 peak: r^2 = 0.9949 (r = 0.9974), Coefficient of determination for Brodifacoum 2 peak: r^2 = 0.9923 (r = 0.9961), showing a good linearity (r > 0.99).	
2.4 Specificity: interfering substances	To define the specificity of the analytical method, the following items were analyzed: - Placebo - Bait stressed by adding 5 mL of acetic acid If a peak appears, the resolution (Rs) must be higher than 2: $Rs = 2 \times \frac{t_2 - t_1}{w_1 - w_2}$. with: - t_i = retention time - w_i = width at semi-height Results are: - placebo : no peak other than internal standard - stressed bait: no peak appears The specificity permits to make sure that no interference causes false-positive, or does not disturb the quantitative measurement of the Test Item.	
2.5 Recovery rates at different levels	The accuracy (precision) translates the narrowness between the value found and the value of reference. The operator dopes a placebo to 50, 100 and 150% of the theoretical concentration of Test Item. He carries out 3 injections per solution and calculates the Mean Recovery (MR) for each solution:	

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**

$$90\% < MR = \frac{\text{Experimental value}}{\text{True value}} \times 100 < 110\%$$

The recoveries of Brodifacoum are given in the following table:

Paste Bait	50% doped placebo	100% doped placebo	150% doped placebo	**Average of MR**
MR values	107.16%	98.92%	91.77%	99.28%

The recovery rates are included in the range 90% - 110%. The accuracy (precision) of the method is validated.

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**	
2.5.1 Relative standard deviation	Relative Standard Deviation (RSD) for: - intralaboratory fidelity 1.19% - intermediate fidelity 0.949%	
2.6 Limit of determination	Limit of detection: The operator injects a solution containing 10 ppm of active substance, and calculates the ratio S / N, with: - S = Signal (intensity of peak) - N = Noise (intensity of the background noise). The operator divides by 10 then by 2 the concentration of the active substance until obtaining a ratio S / N lower than 3. The limit of detection is the last concentration for which S / N is higher than 3. The limit of detection is 0.1254 ppm (S / N = 4.75).	
	Limit of quantification: The operator injects a solution containing 50 ppm of active substance, and calculates the ratio S / N, with: - S = Signal (intensity of peak) - N = Noise (intensity of the background noise). The operator divides by 10 then by 2 the concentration of the active substance until obtaining a ratio S / N lower than 10. The limit of quantification is the last concentration for which S / N is higher than 10. The limit of quantification is 0.6270 ppm (S / N = 15.25).	
2.7 Precision		
2.7.1 Repeatability	The fidelity (selectivity) translates the narrowness between series of measure and the average of the found values. It provides an indication on errors due to factors of variability (operator, equipment, calibration, environmental considerations,…). The relative standard deviation is the criterion of acceptability of the test according to the formula. The operator prepares 3 solutions of a concentration (C) of the product to be proportioned. He carries out 3 injections per solution. RSD (Relative Standard Deviation) is calculated for each solution:	

Section A4.1 Annex Point IIA4.1 & IIIA-IV.1	Analytical Methods for Detection and Identification

$$RSD < 2^{(1-0.5\log C)} \times 0.67$$

with : C = absolute concentration

The results are:

Intra-laboratory fidelity

	1st injection	2nd injection	3rd injection	Date	Opérateur
Solution a	2.21277	2.28407	2.23084	2011-09-06	SR
Solution b	2.25319	2.19532	2.24722	2011-09-06	SR
Solution c	2.26316	2.21401	2.22271	2011-09-06	SR
		RSD %=	**1.188**		

Intermediary fidelity

	1st injection	2nd injection	3rd injection	Date	Opérateur
Solution a	2.23254	2.21166	2.24662	2011-09-08	SR
Solution b	2.25319	2.19532	2.24722	2011-09-06	SR
Solution c	2.26316	2.21401	2.22271	2011-09-06	SR
		RSD %=	**0.949**		

In both cases, the fidelity (selectivity) of the method is validated.

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**	
2.7.2 Independent laboratory validation	Not available	
	3 Applicant's Summary and conclusion	
3.1 Materials and methods	The Test Item is quantified by High Performance Liquid Chromatography (HPLC) using a reverse phase column and an UV detector.	
3.2 Conclusion	In compliance with Guideline for quality in analytical chemistry (CITAC / EURACHEM), the analytical method for the determination of Brodifacoum in Paste Bait is validated during the study by definition of the linearity, the specificity, the accuracy (precision with recovery rates), the limit of detection and the limit of quantification, and the precision (with fidelity/selectivity) of the method. Linearity The response of the detector during the analysis of Brodifacoum is linear (r = 0.9974 (Brodifacoum 1), r = 0.9961 (Brodifacoum 2)). Specificity The specificity permits to make sure that no interference causes false-positive, or does not disturb the quantitative measurement of Brodifacoum. Accuracy (recovery rates) The accuracy results of Brodifacoum are in conformity with the range 90% - 110%. Indeed, the recovery results are experimentally between 91.77% and 107.16%, with an average at 99.28%. Limit of determination The limit of detection is 0.1254 ppm. The limit of quantification is 0.6270 ppm. Precision (fidelity/selectivity) Intermediate and intralaboratory fidelity is measured. In both cases, RSD are correct and the fidelity (selectivity) of the method is validated.	
3.2.1 Reliability	1	
3.2.2 Deficiencies	No deviation was requested.	
	Evaluation by Competent Authorities	
	Use separate "evaluation boxes" to provide transparency as to the comments and	

Section A4.1 **Annex Point IIA4.1 & IIIA-IV.1**	**Analytical Methods for Detection and Identification**
	views submitted
	EVALUATION BY REFERENCE MEMBER STATE (IRELAND)
Date	25.7.2012
Materials and methods	X: The linearity range in g/kg: 0.00161, 0.00181, 0.00201, 0.00221, 0.00241 g/kg. Applicant's version is adopted.
Conclusion	The method is acceptable for the determination of Brodifacoum in the paste bait.
Reliability	1
Acceptability	Acceptable
Remarks	None.
	COMMENTS FROM OTHER MEMBER STATE *(specify)*
Date	*Give date of comments submitted*
Results and discussion	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant´s summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section A4 (4.2) **Annex Point IIA4.2 & IIIA-IV.1**	**Analytical Methods in Soil, Air, Water, Animal and human body fluids and tissues and treated food or feedingstuffs**	
	JUSTIFICATION FOR NON-SUBMISSION OF DATA	Official use only
Other existing data [X]	**Technically not feasible [ ]** **Scientifically unjustified [ ]**	
Limited exposure [ ]	**Other justification [ ]**	
Detailed justification:	Validated methods for the determination of Brodifacoum in several matrices (water, soil and in food or feedstuffs) are available. No method is considered needed for analysis in air due to the low vapour pressure of Brodifacoum and as it is not used in spray applications. Please refer to the Letter of Access from Pelgar.	
Undertaking of intended data submission [ ]	–	
	Evaluation by Competent Authorities	
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted	
	EVALUATION BY REFERENCE MEMBER STATE (IRELAND)	
Date	25.7.2012	
Evaluation of applicant's justification	Accept the applicant's justification.	
Conclusion	The applicants' justification for the non-submission of data is acceptable.	
Remarks	A suitable MOA was not provided in the CAR for the determination of Brodifacoum in soil. However, a new MOA for the determination of Brodifacoum in soil was provided by PelGar post Annex I inclusion. This was assessed by Germany and found to be acceptable. Please see Annex III: Study Summaries of Studies Reviewed.	
	COMMENTS FROM OTHER MEMBER STATE *(specify)*	
Date	*Give date of comments submitted*	

Section A4 (4.2) **Annex Point IIA4.2 & IIIA-IV.1**	**Analytical Methods in Soil, Air, Water, Animal and human body fluids and tissues and treated food or feedingstuffs**
Results and discussion	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant´s summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section B5 Effectiveness against target organisms and intended uses

Subsection (Annex Point)			Official use only
5.1	**Product type(s) and field(s) of use envisaged (IIB5.1)**		
5.1.1	**Product type(s)**		
	MG03: Pest control	Product type PT14: rodenticide VIII.4.1 Paste VIII.4.1.1 Ready-to-use (sachets and other)	
5.1.2	**Overall use pattern**	Saphir Paste is presented as a ready-to-use paste bait for the control of Norway rats and house mice in and around buildings, in waste disposal sites, and in open areas, for amateur and professional users.	
5.2	**Method of application including description of system used (IIB5.2)**	Method of application VI.2: covered application VI.2.1: covered application in bait stations. VI.2.2: other covering Rodenticide ready-to-use paste baits, packaged in individual sachets of 10 g, containing 0.004% of Brodifacoum as the active substance, are for use indoors and outdoors for the protection of public health, stored products and materials. They are used as a response to an infestation. Bait points are placed where there are signs of activity. A thorough survey of the infested area is essential, particularly in secluded and sheltered places, to determine the extent of the infestation. Baits should be secured inside tamper resistant bait boxes or in bait containers under secure coverings to minimize the risk of consumption and poisoning by children, companion animals and other non-target animals and contamination of the environment. Tamper-resistant and secured bait stations should be used when used by professionals in public areas or where there is a risk of primary or secondary poisoning.	

Section B5 Effectiveness against target organisms and intended uses

		The distance between two bait stations, the number and timings of application are in function of the infestation level (see point 5.3) and can be adapted upon experience of bait uptake during the campaign. Since the product is formulated as a ready-to-use bait, no dilution or other preparation are necessary. Use of gloves when handling the baits is advised on the label. Hands and face should be washed after application and use of the product, and before eating, drinking or smoking. Bait points are to be checked regularly and any consumed or spoilt bait has to be replaced until consumption has stopped. Dead rodent bodies, remains of unused bait or any fragments of bait found away from the bait station must be collected during all control operations to minimize the risk of children, companion animals and other non-target animals' consumption and poisoning. Remains of unused product and dead rodents are to be disposed of in accordance with local/national regulations.
5.3	**Application rate and if appropriate, the final concentration of the biocidal product and active substance in the system in which the preparation is to be used, *e.g.* cooling water, surface water, water used for heating purposes (IIB5.3)**	Bait points are placed manually in dry locations and in appropriate positions. Baits should be placed where they are inaccessible to children and non-target organisms and not be applied in areas where food/feed, food utensils or food processing surfaces may come into contact with, or be contaminated by the product. Bait points are placed throughout the infested areas with 60 g per bait point for rats and 10 g per bait point for mice. Application sites are located 5-10 m apart for rats and 3-5 m apart for mice. The numbers of baits and the distances have to be adapted to the infestation level. The shortest distance is to be used in severe infestations.

Section B5 Effectiveness against target organisms and intended uses

5.4	**Number and timing of applications, and where relevant, any particular information relating to geographical variations, climatic variations, or necessary waiting periods to protect man and animals (IIB5.4)**	The quantity of bait used depends on the level of infestation and has to be adapted to local conditions. After the end of the baiting period, surveillance should continue and baiting must be re-started at signs of re-infestation (e.g. fresh tracks or droppings).
5.5	**Function (IIB5.5)**	Rodenticide
5.6	**Pest organism(s) to be controlled and products, organisms or objects to be protected (IIB5.6)**	
5.6.1	**Pest organism(s) to be controlled**	Target organisms to be controlled I.1.1.1 Brown rat: *Rattus norvegicus* I. I.1.1.3 House mouse: *Mus musculus* Developmental stages of target organisms to be controlled II.1 Juveniles II.2 Adults
5.6.2	**Products, organisms or objects to be protected**	Application aim VII.1 Stored product protection / food protection VII.2 Health protection VII.3 Material protection (historical buildings, technical objects)

Section B5 Effectiveness against target organisms and intended uses

		The product is used for the purpose of the protection of public health, including: - Prevention of transmission of disease; - Prevention of the contamination of food and feedingstuffs and other materials, at all stages of their production, storage and use; - Protection of buildings and structures including pipes, cables and overall integrity; - Protection of livestock, wild and domestic; - Social abhorrence and stigma; - Legal requirement.
5.7	**Effects on target organisms (IIB5.7)**	Brodifacoum is a second-generation single-dose anticoagulant rodenticide. It disrupts the normal blood clotting mechanisms by inhibiting hepatic vitamin K metabolism, resulting in increased bleeding tendency and, eventually, haemorrhage and death. Symptoms appear a few hours after ingestion and the rodents die a few days later. Effectiveness of Brodifacoum depends on exposure (*i.e.* consumption of the bait by the target organism).
5.8	**Mode of action (including time delay) in so far as not covered by section A5.4 (IIB5.8)**	<u>Function / Mode of action</u> III.2 long term action III.2.1 anticoagulant III.2.1.1 ingestion toxin III.2.1.1.1 ingestion by eating The active substance, Brodifacoum is a second generation anticoagulant rodenticide, which likes other coumarin derivatives, is a vitamin K antagonist. They function by inhibiting the ability of the blood to clot at the site of a haemorrhage, by blocking the regeneration of vitamin K in the liver. Death of target organisms is due to massive internal haemorrhages after several days of ingestion of a lethal dose. Please refer to the active substance dossier (Section A5.4 and Doc. IIA).
5.9	**User: industrial, professsional, general public**	<u>Field of use</u> IV.1 indoor use

Section B5 Effectiveness against target organisms and intended uses

	(non-professional) (IIB5.9)	IV.1.1 potential for contamination outdoors IV.1.1.1 yes IV.1.2 Potential for contamination of food IV.1.2.2 no IV.2: outdoor use
		User category V.1 non professional/ general public V.2 professional V.3 specialised professional
	1. Industrial	Not appropriate
	2. Professional	Pest control operators and non-trained professionals
	3. General public	Homeowners
5.10	**Efficacy data: The proposed label claims for the product and efficacy data to support these claims, including any available standard protocols used, laboratory tests, or field trials, where appropriate (IIB5.10)**	
5.10.1	**Proposed label claims for the**	Labels for amateurs and professional are provided in section B9.

Section B5 Effectiveness against target organisms and intended uses

	product	
5.10.2	**Efficacy data**	Please refer to Document B5.10_effectiveness
5.11	**Any other known limitations on efficacy including resistance (IIB5.10)**	
5.11.1	**Use-related restrictions**	The proposed labels contain detailed instructions for use. The population size of the target rodent should be evaluated before a control campaign. The number of baits and the timing of the control campaign have to be proportionate to the infestation level. Baits must be placed in a safe manner inaccessible to children and non-target species and not be applied to areas where food/feed, food utensils or food processing surfaces may come into contact with, or be contaminated by the product. Bait consumption should be regularly checked and consumed or spoilt bait replaced until consumption has stopped. The remaining baits and material must be removed and disposed of safely at the end of the treatment according to local/national wastes disposal regulation. The rodents' bodies all along the treatment must be disposed of according to local/national regulation.
5.11.2	**Prevention of the development of resistance**	The resistance status of the rodent population to Brodifacoum should be taken into account when considering the choice of rodenticide to be used. Where resistance to Brodifacoum is suspected or has been shown, resistant management strategies should be employed and products containing an alternative active substance should be used or a professional pest control operator be consulted. Moreover, the following measures from Codes of Good Practice in Rodent control are recommended and usually respected by the applicators: - The population size of the target rodent should be evaluated before a control campaign. The number of baits and the timing of the control campaign should be in proportion to the size of

Section B5 Effectiveness against target organisms and intended uses

		the infestation. - A complete elimination of rodents in the infested area should be achieved. - The use instruction of products should contain guidance on resistance management for rodenticides. - Resistant management strategies should be developed, and Brodifacoum should not be used in an area where resistance to this substance is suspected. - The authorisation holder shall report any observed resistance incidents to the Competent Authorities or other appointed bodies involved in resistance management. - When the product is being used in public areas, the areas treated must be marked during the treatment period and a notice explaining the risk of primary or secondary poisoning by the anticoagulant as well as indicating the first measures to be taken in case of poisoning must be made available alongside the baits.
5.11.3	**Concomittant use with other (biocidal) products**	The use of the product with other biocidal products is not recommended.

Table B5-1: Summary table of data on the method of application including description of system used

Serial number	Product type	Substance(s) used for dilution	Concentration of dilutant(s)	Other substance(s) added	Application technique	Remarks
(1)	PT14 - Rodenticide	None	Not relevant	No other active substance. The product contains a bittering agent to reduce accidental ingestion	The ready-to-use product is applied manually by placing product in a safe manner to prevent children and non-targeted animals' access. The product is to be used in and around buildings, in open areas and waste dumps.	The product is not intended to be used with any other product.

Table B5-2: Summary table of data on the number and timing of applications, and where relevant, any particular information relating to geographical variations, climatic variations, or necessary waiting periods to protect man and animals

Serial number	Product type	Application type	Number and timing of application	Waiting periods	Information on recommended variations of the application rate in different locations	Remarks
(1)	PT14 - Rodenticide	Ready-to-use bait against mice and rats For general public and for professionals For use in and around buildings, in open areas and waste dumps Application codes: I.1.1.1 and I.1.1.3, II.1 and II.2, III.2.1.1.1., IV.1 (IV.1.1.1 and IV.1.2.2) and IV.2, V.1, V.2 and V.3, VI 2.1 and VI.2.2, VII.1, VII.2 and VII.3, VIII.4.1.1	The number and timing of application depends on the infestation level.	Not applicable	The application is similar in all parts of the Community	Rodenticide use is closely related to the level of infestation. It is necessary to explore carefully the site before treatment.

Evaluation by Competent Authorities		
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted	
	EVALUATION BY RAPPORTEUR MEMBER STATE	
Date	March 2013	
Materials and Methods	N/A	
Results and discussion	N/A	
Conclusion	N/A	
Reliability	N/A	
Acceptability	N/A	
Remarks	N/A	
	COMMENTS FROM ... *(specify)*	
Date	*Give date of the comments submitted*	
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*	
Results and discussion	*Discuss if deviating from view of rapporteur member state*	
Conclusion	*Discuss if deviating from view of rapporteur member state*	
Reliability	*Discuss if deviating from view of rapporteur member state*	
Acceptability	*Discuss if deviating from view of rapporteur member state*	

NOTE: Efficacy studies on the rodenticide product were conducted by LODI S.A.S., Belgagri or BIO6. Letters of Access are provided in the administrative part of the dossier. In some of the studies, the trade names are different from the current trade name Saphir Paste. A certificate from LODI S.A.S. is provided certifying that the products are similar, only the trade names change (see the attestation in the document IV-B.5.10).

Section B5.10/01	**Efficacy Data**
Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, fresh product
TNsG: Pt. I-B5.10,	
Pt. III-Ch. 6	

Official use only

1 Reference

1.1 Reference

Mahaut T., Dr. Cavelier M., 2003, Evaluation of the effectiveness of Brodipasta, a ready-to-use rodenticide paste bait containing 0.004% brodifacoum, against the Norway rat (*Rattus norvegicus* Berkenhout) and the house mouse (*Mus musculus* L.), Wallon Agricultural Research Centre, Gembloux, Contract No. 2003-03-Belgagri (unpublished), 20 April 2003.

1.2 Data protection

Yes

1.2.1 Data owner

Belgagri SA

A letter of access from Belgagri SA is provided for this study (see the administrative dossier).

1.2.2 Criteria for data protection

Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its authorisation.

1.3 Guideline study

In-house laboratory test method (see the Doc. IV-B5.10/01 - Appendix 1 in French - Lignes directrices pour l'évaluation de l'efficacité des rodenticides et critères de décision – Royaume de Belgique, Ministère de l'Agriculture, CRA de Gembloux, Octobre 1994)

1.4 Deviations

-

2 Method

Section B5.10/01	**Efficacy Data**
Annex Point IIB5.10 **TNsG: Pt. I-B5.10,** **Pt. III-Ch. 6**	Efficacy on rats and mice, choice feeding test, fresh product

2.1 Test Substance (Biocidal Product)	Brodifacoum
2.1.1 Trade name/ proposed trade name	Brodipasta, similar to Saphir Paste (see the attestation for the different product names used in efficacy trials reports)
2.1.2 Composition of Product tested	Paste bait, freshly manufactured Batch number R211003a. Nominal concentration: 40.0 mg a.s. / kg Measured concentration: 35.5 mg a.s./kg (S.D. 0.33%) (within the acceptable decision criteria fixed to 40.0 ± 10.0 ppm)
2.1.3 Physical state and nature	Ready-to-use paste bait (RB)
2.1.4 Monitoring of active substance concentration	Not applicable
2.1.5 Method of analysis	HPLC method – WHO/IS/ (7.ROI.1 rev 1)
2.2 Reference substance	Standard rodent diet: ground wheat grains
2.2.1 Method of analysis for reference substance	Not relevant. The challenge diet was a non-poisoned product.
2.3 Testing procedure	
2.3.1 Test population	Trial No. EFFI2003-07: 10 wild Norway rats in individual cages. Trail No. EFFI2003-08: 10 wild house mice in individual cages.

Section B5.10/01	**Efficacy Data**
Annex Point IIB5.10 **TNsG: Pt. I-B5.10,** **Pt. III-Ch. 6**	Efficacy on rats and mice, choice feeding test, fresh product

/ **inoculum / test organism**	Trial No. ALBI2003-04: 22 albino laboratory Norway rats (11 males and 11 females, 10 to 20 weeks old, including one control pair) in individual cages. See Table 1.2
2.3.2 Test system	Laboratory test. For wild rodents, the trail was carried out with 10 rats and 10 mice. Rats were bred in three 10 m * 10 m enclosures, coming from 3 or 4 pairs captured on farms in the Gembloux area and fed with sow pellets (complete feed) and ground wheat grains. Mice were bred in mouse pens occupied by several dozen mice and fed with ground wheat grains. The populations of the enclosures are completely renewed annually. A time of at least three weeks was allowed between capture of the last rodent for the trial and the start of the trial, in order to discard pregnant females or sick individuals. Upon capture, the animals were individually housed in cages measuring 50 cm * 30 cm * 25 cm where they were given unlimited water and freshly ground wheat. The test is a choice test in which the rodents have unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during a 21-day test period. The same protocol was used for laboratory rats (stage 1 of the ageing test) except that 22 albino rats were used instead of 10 wild rats. See Table 1.2.
2.3.3 Application of Test Substance	During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 40 g of ground wheat grains and 45 g of the test item per day for rat and about 10 g of ground wheat grains and 15 g of the test item per day for mice) (see Table 1.4).
2.3.4 Test conditions	Ambient conditions in animal rooms were maintained in accordance with normal laboratory requirements. Animals were

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housed in single cages, equipped to provide food and water provided *ad libitum* during the pre-tested period and in excess during the 21-day test period (see Table 1.5).

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2.3.5 Duration of the test / Exposure time	The test consisted of a pre-test diet take assessment (conditioning period of at least 3 weeks with an estimation of the food eaten by each rodent for the last 5 days), followed by a test period (period of exposure to the test item) of 21 days.
2.3.6 Number of replicates performed	No replicate performed.
2.3.7 Controls	No for wild rodents (not required in EPPO guidelines and by the EU in order to reduce the number of test animals). One control pair of Norway rats was used for the laboratory trial.

2.4 Examination

2.4.1 Effect investigated	Palatability of the product in the presence of a competing alternative food (standard diet).
2.4.2 Method for recording / scoring of the effect	The daily intakes of challenge diet and test bait were measured and recorded. The weight of each animal was recorded during the conditioning period before the daily intake assessment.
2.4.3 Intervals of examination	Daily.
2.4.4 Statistics	Product acceptance (amount of product eaten expressed as a percentage of total [product + challenge diet] consumption) calculated for each individual and for the group, and for the different sexes of albino laboratory Norway rats. Percentage of mortality.
2.4.5 Post monitoring of the test organism	No

13 3 Results

3.1 Efficacy

Section B5.10/01	**Efficacy Data**
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3.1.1 Dose/Efficacy curve	Not applicable
3.1.2 Begin and duration of effects	The mean 'days to death' ranged: - with wild Norway rats after 6 to 17 days of exposure. - with wild house mouse after 6 to 19 days of exposure. - with albino Norway rats after 3 to 8 days of exposure.
3.1.3 Observed effects in the post monitoring phase	Mortality was total (100%) in all test groups after a 21-day choice test.
3.2 Effects against organisms or objects to be protected	Not applicable.
3.3 Other effects	Not applicable.
3.4 Efficacy of the reference substance	Not applicable.
3.5 Tabular and/or graphical presentation of the	Wild Norway rats, fresh bait:

	Initial weight of the animals	Day of death*	Mean intake (mg a.s./kg	Mean quantity consumed by each animal during the 21-day	% acceptance*

Section B5.10/01 **Efficacy Data**

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, fresh product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

summarised results

	(g)		b.w.)*	test period*		
				Treated	Control	
Average	279.6	9.9	0.72	4.56	10.70	38.7
SD	73.4	4.1	0.48	2.44	8.45	28.4

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

Wild house mice, fresh bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)*	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treated	Control	
Average	15.3	9.5	2.75	1.04	1.42	43.4
SD	3.7	3.7	0.65	0.31	0.65	9.5

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

Albino Norway rats, fresh bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)*	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treated	Control	
Fresh bait ♂	Mean = 188 SD = 5.2	Mean = 4.9 SD = 1.5	Mean = 1.07 SD = 0.37	Mean = 5.05 SD = 1.81	Mean = 8.51 SD = 2.26	Mean = 37.4% SD = 12.6%
Fresh bait ♀	Mean = 165 SD = 10.3	Mean = 6.1 SD = 1.2	Mean = 0.95 SD = 0.36	Mean = 3.98 SD = 1.63	Mean = 4.43 SD = 2.96	Mean = 50.1% SD = 22.5%
Fresh bait ♂+♀	Mean = 176 SD = 14.2	Mean = 5.5 SD = 1.4	Mean = 1.01 SD = 0.36	Mean = 4.52 SD = 1.76	Mean = 6.47 SD = 3.31	Mean = 43.8% SD = 18.9%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg)..

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3.6 Efficacy limiting factors

Not applicable

3.6.1 Occurrences of resistances

Not applicable

3.6.2 Other limiting factors

4 Relevance of the results compared to field conditions

Section B5.10/01	**Efficacy Data**
Annex Point IIB5.10 **TNsG: Pt. I-B5.10,** **Pt. III-Ch. 6**	Efficacy on rats and mice, choice feeding test, fresh product

4.1 Reasons for laboratory testing	This laboratory test is designed to determine the palatability of fresh product. Either the amount of bait consumed, in which the active substance is incorporated, or the mortality of the rodents is a measure for the palatability of the fresh bait in controlled and recognised conditions.
4.2 Intended actual scale of biocide application	Not applicable
4.3 Relevance compared to field conditions	
4.3.1 Application method	Rats and mice had the choice between bait and alternative food. This is intended to represents field conditions in which the animals have unrestricted access to food in competition with treated bait.
4.3.2 Test organism	House mice and Norway rats, the target organisms, are used both for laboratory and field tests. In addition, as proposed in the TNsG on Product Evaluation Appendices to Chapter 7 Product Type 14, wild rodents have been tested for the bait-choice test.
4.3.3 Observed effect	Brodifacoum Paste Bait was sufficiently attractive to rats and mice to divert them from feeding only on the familiar diet. The observed effects of high consumption of the test item by rodents and the total mortality of the test group are both relevant to field conditions.
4.4 Relevance for read-across	Yes and field data are available as well.

5 Applicant's Summary and conclusion

Section B5.10/01	**Efficacy Data**
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5.1 Materials and methods

The test material is a paste bait freshly manufactured (T_0) containing nominally 40 mg/kg of Brodifacoum.

The test was a laboratory choice feeding test. It consisted in at least 3-week acclimatisation period (conditioning period) followed by a 21-day test period.

The test group consisted of 10 wild Norway rats, 10 wild house mice and 22 albino laboratory Norway rats (11 males and 11 females), including a control pair. Rats and mice body weights', test substance and food consumption, observation of mortality were recorded during the essay.

The treated bait and control bait were placed in 2 food bowls and the quantity in each pot exceeded the normal daily requirement for each animal. The positions of the test item and of the challenge diet bowls were alternated daily.

The percentage of ingested bait containing the product in the bait choice feeding and the percentage of dead animals were used as criteria for this essay.

5.2 Reliability

1

5.3 Assessment of efficacy, data analysis and interpretation

Acceptance of the Brodifacoum Paste Bait was very good.

The mean acceptance of the test item was 38.7% (S.D. 28.4%) for wild Norway rats, 43.4% (S.D. 9.5%) for wild house mice and 43.8% (S.D. 18.9%) for laboratory Norway rats, showing that the Brodifacoum Paste Bait is a palatable formulation.

Mortality was total (100%) in all test groups, after a 21-day choice between this test substance and the challenge diet, with a mean 'days to death' ranging from the 3rd to the 19th day of exposure.

5.4 Conclusion

The study showed that, when freshly manufactured, Brodifacoum Paste Bait is palatable to wild Norway rats, to wild house mice and to laboratory Norway rats, with a mean palatability against ground laboratory diet above 20% (the minimum acceptance was observed for male albino rats: 37.4% (S.D. 12.6%). The test item also resulted in 100% mortality after a 21-day choice between this formulation and challenge diet.

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According to the European Commission document (European Commission, 2008), Section 4.1 “Norms and Criteria”:
“In the bait choice feeding test the percentage of ingested bait containing the product should be normally ≥ 20%. When the test results in ≥ 90% mortality, a lower level than 20% of the total food consumption is acceptable.”
The results obtained in the choice test with the test item Brodifacoum Paste Bait, freshly manufactured meet the required criteria.
The results of this test reflect field conditions as animals have unrestricted access to a well-known food.
It can be concluded that the tested Brodifacoum Paste Bait is palatable in the presence of a competing alternative food (standard diet).

5.5 Proposed efficacy specification

The efficacy of the test item is very good to excellent (100% mortality).

Section B5.10/01 Efficacy Data

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, fresh product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	March 2013.
Materials and Methods	**2.4.1** Effect observed included palatability and mortality.
Results and discussion	The mean acceptance of the test item was 38.7% for wild Norway rats, 43.4% for wild house mice and 43.8% for albino Norway rats. The efficacy was excellent. Mortality was total (100%) in all test groups. The mean time to death ranged from 3 to 19 days after the first intake of treated baits.
Conclusion	Agree with applicant's version.
Reliability	1
Acceptability	Acceptable.
Remarks	None.
	COMMENTS FROM ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	*Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section B5.10/01 Efficacy Data

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, fresh product

TNsG: Pt. I-B5.10,

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1.2 Test organism

Criteria	Details
Species	Wild and albino Norway rats (*Rattus norvegicus* Berkenhout) Wild house mice (*Mus musculus* L.)
Strain	Not specified
Source	Not specified
Laboratory culture	Yes for albino Norway rats
Stage of life cycle and stage of stadia	Healthy non-pregnant adults
Mixed age population	No relevant details
Other specification	The mean initial body weight of rats ranged from 190 to 420 g for wild Norway rats, from 11 to 22 g for wild house mice and from 150 to 196 g for laboratory Norway rats
Number of organisms tested	10 animals per species for wild rodents 22 animals, 11 males and 11 females for laboratory rats (including one pair control)
Method of cultivation	Wild animals were captured on farms in the Gembloux area. Wild rats are first placed in three 10 m * 10 m enclosures and each enclosure is occupied by several dozen rodents, bred from 3 or 4 pairs captured and fed with sow pellets (complete feed) and ground wheat grains. Wild mice are placed in a shed with several dozen mice fed with ground wheat grains per pen. The populations of the enclosures are completely renewed annually. Upon capture, rats and mice were individually housed in cages measuring 50 cm * 30 cm * 25 cm where they were given unlimited water and freshly ground

	wheat. The same protocol was used for laboratory rats (stage 1 of the ageing test) except that 22 albino rats were used instead of 10 wild rats. Animals were weighted and kept individually in cages under controlled conditions.
Pre-treatment of test organisms before exposure	The wild animals were acclimatised to test conditions for at least 3 weeks in order to discard pregnant females or sick individuals (with an estimation of the food eaten by each rodent for the last 5 days). The laboratory rats were acclimatised to test conditions for at least 5 days.
Initial density/number of test organisms in the test system	10 wild rats and 10 wild mice. Each animal was individually caged. 22 laboratory rats. Each animal was individually caged.

Section B5.10/01 Efficacy Data

Annex Point IIB5.10
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Efficacy on rats and mice, choice feeding test, fresh product

1.3 Test system

Criteria		Details
13.1.1	**Culturing apparatus / test chamber**	Mice and rats were individually caged under standard conditions.
13.1.2	**Number of vessels / concentration**	Two symmetrically-placed food bowls at the front of each cage.
13.1.3	**Test culture media and/or carrier material**	The test bait was a paste bait containing nominally 40 mg/kg of Brodifacoum, provided by the sponsor, and manufactured in October 2003. The challenge diet was ground wheat grains.
13.1.4	**Nutrient supply**	Not applicable
13.1.5	**Measuring equipment**	Weighing scale

1.4 Application of test substance

Criteria	Details
Application procedure	During the conditioning period, the animals had access to freshly ground wheat grains. The amount of food consumed by each animal was determined daily to the nearest 0.1 g by the difference method. On each morning, food bowls were weighed, replenished and re-weighed. During the 21-day test period, rats had access to about 45 g of fresh test item and to 40 g of the challenge diet and mice to about 15 g of fresh test item and to 10 g of the challenge diet and the positions of the bowls containing the two diets were alternated daily.
Delivery method	The challenge diet and test bait were placed in 2 food bowls.
Dosage rate	The contents of the food bowls were made up daily to provide an excess of the animals' daily requirement from each bowl.
Carrier	Not applicable
Concentration of liquid carrier	Not applicable
Liquid carrier control	Not applicable
Other procedures	No other relevant details.

Section B5.10/01 Efficacy Data

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, fresh product

TNsG: Pt. I-B5.10,

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1.5 Test conditions

Criteria	Details
13.1.6 Substrate	Not applicable
13.1.7 Incubation temperature	Ambient temperature
13.1.8 Moisture	Ambient relative humidity
13.1.9 Aeration	Not specified
13.1.10 Method of exposure	Oral exposure
13.1.11 Aging of samples	Fresh test bait
13.1.12 Other conditions	No other relevant details

Section B5.10/02	**Efficacy Data**
Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	

Section B5.10/02	**Efficacy Data**
Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	

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1 Reference

1.1 Reference	Dr. De Proft M., Dr. Meeùs P., 2005, Study of ageing behaviour of Brodipasta, a ready-to-use bait containing 0.004% brodifacoum, Wallon Agricultural Research Centre, Gembloux, Report No. 11595, Experiment ROD 2003-03 (unpublished), 01 June 2005.
1.2 Data protection	Yes
1.2.1 Data owner	Belgagri SA A letter of access from Belgagri SA is provided for this study (see the administrative dossier).
1.2.2 Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its authorisation.
1.3 Guideline study	In-house laboratory test method (see the Doc. IV-B5.10/02 - Appendix 1 in French - Lignes directrices pour l'évaluation de l'efficacité des rodenticides et critères de décision - – Royaume de Belgique, Ministère de l'Agriculture, CRA de Gembloux, Octobre 1994)
1.4 Deviations	-

2 Method

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Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	

Section B5.10/02	**Efficacy Data**
Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	

2.1 Test Substance (Biocidal Product)	Brodifacoum
2.1.1 Trade name/ proposed trade name	Brodipasta, similar to Saphir Paste (see the attestation for the different product names used in efficacy trials reports)
2.1.2 Composition of Product tested	Paste bait, manufactured on October 2003 and stored at 20°C for respectively 6, 12 and 24 months for the tests on aged product. Batch number R211003a. Nominal concentration: 40.0 mg a.s. / kg Measured concentration: - freshly manufactured test item. 35.5 mg a.s./kg (S.D: 0.33%) - after 6 months storage: 39.4 mg a.s./kg (S.D. 0.64%). - after 1 year storage: 36.1 mg a.s./kg (S.D. 0.55%). - after 2 years storage: 34.2 mg a.s./kg (S.D. 1.17%). Within two years, Brodipasta gave results conform to the chemical criteria of the Guidelines for Evaluation of Rodenticides.
2.1.3 Physical state and nature	Ready-to-use paste bait (RB) of about 15 g
2.1.4 Monitoring of active substance concentration	Not applicable
2.1.5 Method of analysis	HPLC method – WHO/IS/ (7.ROI.1.rev 1). Chemical analyses were performed on the samples placed at -18°C at

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Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	

	the exact date of the request ageing period.
2.2 Reference substance	Standard rodent diet: crushed wheat.
2.2.1 Method of analysis for reference substance	Not relevant. The challenge diet was a non-poisoned product.
2.3 Testing procedure	
2.3.1 Test population / inoculum / test organism	Trial No. ALBI2003-04, Trial No. ALBI2004-04, Trial No. ALBI2005-03, Trial No. ALBI2005-08: 22 albino laboratory Norway rats (11 males and 11 females, 10 to 20 weeks old, including one control pair) in individual cages, to test respectively the acceptance of the fresh product and of the 6, 12 and 24 months-aged test item (stored at 20°C). Trial No. ALBI2005-04, Trial No. ALBI2005-09: 22 laboratory House mice (11 males and 11 females, including one control pair) in individual cages, to test respectively the acceptance of the 12 and 24 months-aged test item (stored at 20°C). See Table 1.2
2.3.2 Test system	Laboratory test. Each test starts after an 8 days acclimatization period of the rodent in individual cages. During this period, rodents receive water and crushed wheat *ad libidum*. The test is a choice test in which the rodents have unrestricted access to the test bait and to palatable and

Section B5.10/02	**Efficacy Data**
Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
TNsG: Pt. I-B5.10,	
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	familiar alternative food (challenge diet) during a 21-day test period. See Table 1.2.
2.3.3 Application of Test Substance	During the test period, rats and mice received the test item from two symmetrically-placed food pots, one filled with the test product, the other with the challenge diet. The positions of the pots were alternated daily. The contents of the food pots were made up daily to provide an excess of the animals' daily requirement from each pot (about 30 g of ground wheat grains, in competition with the test item) (see Table 1.4).
2.3.4 Test conditions	Ambient conditions in animal rooms were maintained in accordance with normal laboratory requirements. Animals were housed in single cages that were equipped to provide food and water provided *ad libitum* during the pre-tested period and in excess during the 21-day test period (see Table 1.5).
2.3.5 Duration of the test / Exposure time	The test consisted of a pre-test diet take assessment (conditioning period of 8 days with an estimation of the food eaten by each rodent for the last 5 days), followed by a test period (period of exposure to the test item) of 21 days.
2.3.6 Number of replicates performed	No replicate performed.
2.3.7 Controls	A control pairs of Norway rats and house mice was used for each test. These control rodents were continued to be fed only with crushed wheat.

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Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
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2.4 Examination	
2.4.1 Effect investigated	Palatability of the product in the presence of a competing alternative food (standard diet).
2.4.2 Method for recording / scoring of the effect	The daily intakes of challenge diet and test bait were measured and recorded. The weight of each animal was recorded during the conditioning period before the daily intake assessment.
2.4.3 Intervals of examination	Daily.
2.4.4 Statistics	Product acceptance (amount of product eaten expressed as a percentage of total [product + challenge diet] consumption) calculated for each individual, for the group, and for the different sexes of rodents. Percentage of mortality.
2.4.5 Post monitoring of the test organism	No
	14 3 Results
3.1 Efficacy	
3.1.1 Dose/Efficacy curve	Not applicable
3.1.2 Begin and duration of effects	The mean ‘days to death’ ranged: - with albino Norway rats and fresh bait after 3 to 8 days of exposure.

Section B5.10/02	**Efficacy Data**
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- with albino Norway rats and 6 months-aged bait after 4 to 11 days of exposure.
- with albino Norway rats and 12 months-aged bait after 3 to 14 days of exposure.
- with albino Norway rats and 24 months-aged bait after 3 to 7 days of exposure.
- with House mice and 12 months-aged bait after 4 to 10 days of exposure.
- with House mice and 24 months-aged bait after 3 to 20 days of exposure.

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3.1.3 Observed effects in the post monitoring phase

Mortality was total (100%) in all test groups after a 21-day choice between this test substance and the challenge diet.

3.2 Effects against organisms or objects to be protected

Not applicable.

3.3 Other effects

Not applicable.

3.4 Efficacy of the reference substance

Not applicable.

3.5 Tabular and/or graphical presentation of the summarised results

Albino Norway rats, fresh bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)*	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treated	Control	
Fresh bait ♂	Mean = 188 SD = 5.2	Mean = 4.9 SD = 1.5	Mean = 1.07 SD =	Mean = 5.05 SD = 1.81	Mean = 8.51 SD = 2.26	Mean = 37.4% SD = 12.6%

Section B5.10/02 **Efficacy Data**

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

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			0.37			
Fresh bait ♀	Mean = 165 SD = 10 3	Mean = 6.1 SD = 1.2	Mean = 0.95 SD = 0.36	Mean = 3.98 SD = 1.63	Mean = 4.43 SD = 2.96	Mean = 50.1% SD = 22.5%
Fresh bait ♂ +♀	Mean = 176 SD = 14.2	Mean = 5.5 SD = 1.4	Mean = 1.01 SD = 0.36	Mean = 4.52 SD = 1.76	Mean = 6.47 SD = 3.31	Mean = 43.8% SD = 18.9%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg)..

Albino Norway rats, 6 months-aged bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treat	Contr	

Section B5.10/02 **Efficacy Data**

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

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			*	ed	ol	
6-m old bait ♂	Mean = 180 SD = 6.9	Mean = 6.4 SD = 2.1	Mean = 0.99 SD = 0.42	Mean = 4.43 SD = 1.87	Mean = 7.68 SD = 4.12	Mean = 39.0% SD = 17.6%
6-m old bait ♀	Mean = 159 SD = 6.0	Mean = 6.0 SD = 1.7	Mean = 1.04 SD = 0.30	Mean = 4.17 SD = 1.23	Mean = 5.48 SD = 2.61	Mean = 45.0% SD = 14.9%
6-m old bait ♂ +♀	Mean = 170 SD = 12.5	Mean = 6.2 SD = 1.9	Mean = 1.02 SD = 0.36	Mean = 4.30 SD = 1.55	Mean = 6.58 SD = 3.54	Mean = 42.0% SD = 16.2%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg)..

Section B5.10/02 **Efficacy Data**

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

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Albino Norway rats, 12 months-aged bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)*	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treated	Control	
12-m old bait ♂	Mean = 177 SD = 5.5	Mean = 5.6 SD = 1.9	Mean = 1.04 SD = 0.63	Mean = 4.64 SD = 2.86	Mean = 9.58 SD = 3.96	Mean = 32.8% SD = 14.6%
12-m old bait ♀	Mean = 159 SD = 6.6	Mean = 7.1 SD = 2.8	Mean = 0.90 SD = 0.39	Mean = 3.63 SD = 1.64	Mean = 6.69 SD = .73	Mean = 34.5% SD = 11.9%
12-m old	Mean = 168.	Mean = 6.4	Mean =	Mean = 4.13	Mean = 8.13	Mean = 33.7% SD

Section B5.10/02 **Efficacy Data**

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

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bait ♂ +♀	4 SD = 11.0	SD = 2.5	0.97 SD = 0.52	SD = 2.33	SD = 3.32	= 13.0%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg)..

Albino Norway rats, 24 months-aged bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)*	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treated	Control	
24-m old bait ♂	Mean = 187 SD = 7.0	Mean = 4.9 SD = 1.4	Mean = 0.92 SD = 0.43	Mean = 4.29 SD = 2.03	Mean = 10.49 SD = 3.80	Mean = 29.9% SD = 15.6%
24-m old	Mean = 168	Mean = 5.9	Mean =	Mean = 3.69	Mean = 4.59	Mean = 45.0% SD

Section B5.10/02 **Efficacy Data**

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

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bait ♀	SD = 5.9	SD = 0.7	0.88 SD = 0.29	SD = 1.20	SD = 1.81	= 12.7%
24-m old bait ♂ +♀	Mean = 177.6 SD = 11.9	Mean = 5.4 SD = 1.2	Mean = 0.90 SD = 0.36	Mean = 3.99 SD = 1.65	Mean = 7.54 SD = 4.19	Mean = 37.5% SD = 15.9%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg)...

House mice, 12 months-aged bait:

	Initial weight of the animals	Day of death*	Mean intake (mg a.s./	Mean quantity consumed by each animal during the 21-day test	% acceptance*

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Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

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	(g)		kg b.w.) *	period*		
				Treated	Control	
12-m old bait ♂	Mean = 20.4 SD = 1.1	Mean = 6.4 SD = 1.7	Mean = 2.86 SD = 0.97	Mean = 1.46 SD = 0.51	Mean = 2.45 SD = 0.54	Mean = 37.1% SD = 10.5%
12-m old bait ♀	Mean = 19.9 SD = 0.9	Mean = 6.6 SD = 2.1	Mean = 2.80 SD = 1.03	Mean = 1.39 SD = 0.49	Mean = 1.07 SD = 0.48	Mean = 56.6% SD = 12.8%
12-m old bait ♂ +♀	Mean = 20.1 SD = 1.0	Mean = 6.5 SD = 1.9	Mean = 2.83 SD = 0.97	Mean = 1.42 SD = 0.49	Mean = 1.76 SD = 0.86	Mean = 46.9% SD = 15.1%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

Section B5.10/02 **Efficacy Data**

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

House mice, 24 months-aged bait:

	Initial weight of the animals (g)	Day of death*	Mean intake (mg a.s./kg b.w.)*	Mean quantity consumed by each animal during the 21-day test period*		% acceptance*
				Treated	Control	
24-m old bait ♂	Mean = 20.5 SD = 0.4	Mean = 7.7 SD = 2.9	Mean = 2.95 SD = 1.74	Mean = 1.52 SD = 0.93	Mean = 2.45 SD = 0.64	Mean = 36.7% SD = 14.0%
24-m old bait ♀	Mean = 19.5 SD = 1.6	Mean = 9.2 SD = 5.6	Mean = 2.20 SD = 0.99	Mean 1.06 SD = 0.44	Mean = 2.09 SD = 0.89	Mean = 35.2% SD = 15.1%
24-m old bait	Mean = 20.0 SD	Mean = 8.5 SD	Mean = 2.58	Mean = 1.29 SD	Mean = 2.27 SD	Mean = 36.0% SD = 14.2%

Section B5.10/02 **Efficacy Data**

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

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♂ +♀	= 1.2	= 4.4	SD = 1.43	= 0.75	= 0.78	

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

3.6 Efficacy limiting factors

Not applicable

3.6.1 Occurrences of resistances

Not applicable

3.6.2 Other limiting factors

4 Relevance of the results compared to field conditions

Section B5.10/02	**Efficacy Data**
Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
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4.1 Reasons for laboratory testing	This laboratory test is designed to determine the palatability of aged product. Either the amount of bait consumed, in which the active substance is incorporated, or the mortality of the rodents is a measure for the palatability of the bait in controlled and recognised conditions.
4.2 Intended actual scale of biocide application	Not applicable
4.3 Relevance compared to field conditions	
4.3.1 Application method	Rats and mice had the choice between bait and alternative food. This is intended to represents field conditions in which the animals have unrestricted access to food in competition with treated bait.
4.3.2 Test organism	House mice and Norway rats, the target organisms, are used both for laboratory and field tests.
4.3.3 Observed effect	Brodifacoum Paste Bait was sufficiently attractive to rats and mice to divert them from feeding only on the familiar diet. The observed effects of high consumption of the test item by rodents and the total mortality of the test group are both relevant to field conditions.
4.4 Relevance for read-across	Yes and field data are available as well.

5 Applicant's Summary and conclusion

Section B5.10/02	**Efficacy Data**
Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
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5.1 Materials and methods	The test material is a paste bait freshly manufactured (T_0) containing nominally 40 mg/kg of Brodifacoum and the same paste bait stored at 20°C for 6, 12 and 24 months. The test was a laboratory choice feeding test. It consisted in a 8-day acclimatisation period (conditioning period) followed by a 21-day test period. The test groups consisted of 22 albino laboratory Norway rats (11 males and 11 females) or 22 laboratory House mice (11 males and 11 females) with a control pair for each group. Rats and mice body weights, test substances and food consumption, observation of mortality were recorded during the essay. The treated bait and control bait were placed in 2 food bowls and the quantity in each pot exceeded the normal daily requirement for each animal. The positions of the test item and of the challenge diet bowls were alternated daily.
5.2 Reliability	1
5.3 Assessment of efficacy, data analysis and interpretation	Acceptance of the Brodifacoum Paste Bait was very good. For laboratory Norway rats, the mean acceptance of the test item was 43.8% (S.D. 18.9%) for the fresh bait, 42.0% (S.D. 16.2%) for the 6 months-aged bait, 33.7% (S.D: 13.0%) for the 12 months-aged bait and 37.5% (S.D. 15.9%) for the 24 months-aged bait showing that the Brodifacoum Paste Bait is a palatable formulation for rats.

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For laboratory house mice, the mean acceptance of the test item was 46.9% (S.D. 15.1%) for the 12 months-aged bait and 36.0% (S.D. 14.2%) for the 24 months-aged bait showing that the Brodifacoum Paste Bait is a palatable formulation for mice.
Mortality was total (100%) in all test groups, after a 20-day choice between this test substance and the challenge diet, with a mean 'days to death' ranging from the 3rd to the 20th day of exposure.

5.4 Conclusion

The study showed that, when freshly manufactured or stored until two years at 20°C, Brodifacoum Paste Bait is palatable to laboratory house rats and mice, with a mean palatability above 20% (the minimum acceptance was observed for male albino rats with the 24 months-aged bait: 29.9% (S.D. 15.6%). The test item also resulted in 100% mortality after a 20-day choice between this formulation and challenge diet.
According to the European Commission document (European Commission, 2008), Section 4.1 "Norms and Criteria":
"In the bait choice feeding test the percentage of ingested bait containing the product should be normally ≥ 20%. When the test results in ≥ 90% mortality, a lower level than 20% of the total food consumption is acceptable."
The results obtained in the choice test with the test item Brodifacoum Paste Bait, freshly manufactured or stored until 2 years meet the required criteria.

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Annex Point IIB5.10	Efficacy on rats and mice, choice feeding test, aged product
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	The results of this test reflect field conditions as animals have unrestricted access to a well-known food. It can be concluded that the tested Brodifacoum Paste Bait is palatable in the presence of a competing alternative food (standard diet) and that a 24 months validity period can be accepted for the test item.
5.5 Proposed efficacy specification	The efficacy of the test item is very good to excellent (100% mortality).

Section B5.10.2 Efficacy Data

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	March 2013.
Materials and Methods	**2.4.1** Effect observed included palatability and mortality.
Results and discussion	For rats, the mean acceptance of the test item was 43.8% for the fresh bait, 42.0% for the 6-month aged bait, 33.7% for the 12-month aged bait and 37.5% for the 24-month aged bait. For mice, the mean acceptance of the test item was 46.9% for the 12-month aged bait and 36.0% for the 24-month aged bait. The efficacy was excellent. Mortality was total (100%) in all test groups. The mean time to death ranged from 3 to 20 days after the first intake of treated baits.
Conclusion	Agree with applicant's version.
Reliability	1
Acceptability	Acceptable.
Remarks	None.
	COMMENTS FROM ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section B5.10/02 Efficacy Data

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.2 Test organism

Criteria	Details
Species	Albino Norway rats (*Rattus norvegicus*) Laboratory house mice (*Mus musculus*)
Strain	Not specified
Source	Not specified
Laboratory culture	Yes
Stage of life cycle and stage of stadia	Healthy non-pregnant adults
Mixed age population	No relevant details
Other specification	The mean initial body weight of rats ranged from 149 to 199 g for laboratory Norway rats and from 16 to 22 g for laboratory house mice.
Number of organisms tested	22 rodents, 11 males and 11 females for each test group (including one pair control)
Method of cultivation	22 laboratory rodents were used per group, weighted and kept individually in cages under controlled conditions before the start of the test period.
Pre-treatment of test organisms before exposure	The animals were acclimatised to test conditions for 8 days in order to discard sick individuals.
Initial density/number of test organisms in the test system	22 laboratory rodents per group. Each animal was individually caged.

1.3 Test system

Criteria		Details
14.1.1	**Culturing apparatus / test chamber**	Mice and rats were individually caged under standard conditions.
14.1.2	**Number of vessels / concentration**	Two symmetrically-placed food bowls at the front of each cage.
14.1.3	**Test culture media and/or carrier material**	The test bait was a paste bait containing nominally 40 mg/kg of Brodifacoum, provided by the sponsor, manufactured in October 2003. The challenge diet was crushed wheat.
14.1.4	**Nutrient supply**	Not applicable
14.1.5	**Measuring equipment**	Weighing scale

Section B5.10/02 Efficacy Data

Annex Point IIB5.10 Efficacy on rats and mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.4 Application of test substance

Criteria	Details
Application procedure	During the conditioning period, the animals had access to crushed wheat. The amount of food consumed by each animal was determined daily to the nearest 0.1 g by the difference method. On each morning, food bowls were weighed, replenished and re-weighed. During the 21-day test period, the rodents had access to about 30 g of ground wheat grains, in competition with the test item. The positions of the bowls containing the two diets were alternated daily.
Delivery method	The challenge diet and test bait were placed in 2 food bowls.
Dosage rate	The contents of the food bowls were made up daily to provide an excess of the animals' daily requirement from each bowl.
Carrier	Not applicable
Concentration of liquid carrier	Not applicable
Liquid carrier control	Not applicable
Other procedures	No other relevant details.

1.5 Test conditions

Criteria	Details
14.1.6 Substrate	Not applicable
14.1.7 Incubation temperature	Ambient temperature
14.1.8 Moisture	Ambient relative humidity
14.1.9 Aeration	Not specified
14.1.10 Method of exposure	Oral exposure
14.1.11 Aging of samples	6, 12 and 24-month aged test bait
14.1.12 Other conditions	No other relevant details

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

		Official use only
	1 REFERENCE	
1.1 Reference	Loiseau M., 2012, Choice feeding trial for Brodifacoum paste bait (aged product) against rat, Biotrial Pharmacology, Study code 0BSIX2, Biotrial Pharmacology (unpublished), 11 January 2012	
1.2 Data protection	Yes	
1.2.1 Data owner	BIO6 S.A. A letter of access from BIO6 S.A. is provided for this study (see the administrative dossier)	
1.2.2 Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its authorisation.	
1.3 Guideline study	The study was conducted according to the TNsG on Product Evaluation Appendices to Chapter 7 - Product Type 14 - Efficacy Evaluation of Rodenticidal Biocidal Products endorsed at the 32nd meeting of representatives of Members States Competent Authorities.	
1.4 Deviations	None	
	2 METHOD	
2.1 Test Substance (Biocidal Product)	Brodifacoum	
2.1.1 Trade name/ proposed trade name	Brodifacoum paste bait, similar to Saphir Paste (see the attestation for the different product names used in efficacy trials reports)	
2.1.2 Composition of Product tested	Brodifacoum paste bait, manufactured and aged for 3 weeks at 54°C, provided by the sponsor and stored at room temperature at Biotrial Pharmacology. Batch number RB20110902brodif Nominal concentration: 40.0 mg a.s. / kg Measured concentration: 37 mg a.s./kg (see the Doc. IIIB5.10/03 - Appendix 1)	
2.1.3 Physical state and nature	Ready for use bait (RB)	
2.1.4 Monitoring of active substance	Not applicable.	

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

concentration	
2.1.5 Method of analysis	Not applicable.
2.2 Reference substance	Standard rat diet.
2.2.1 Method of analysis for reference substance	Not relevant. The challenge diet was a non-poisoned product.
2.3 Testing procedure	
2.3.1 Test population / inoculum / test organism	20 animals (10 males, 10 females). Norway rat (*Rattus norgevicus*). See details in Table 1.2
2.3.2 Test system	Laboratory test. The animals were individually caged. The test is a choice test in which the rodents have unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during a 4-day test period. During the conditioning period the animals were fed with standard meal and supplied with water *ad libitum* (see Table 1.3)
2.3.3 Application of Test Substance	Rats received the test item from two symmetrically-placed food bowls at the front of each cage, one filled with the test product, the other with the challenge diet. The positions of the bowls were alternated daily. The contents of the food bowls were made up daily to provide an excess of the animals' daily requirement from each bowl (approximately 50 g of the aged rodenticide paste bait and of the challenge diet, in each corresponding pot) (see Table 1.4).
2.3.4 Test conditions	Ambient conditions in animal rooms were maintained in accordance with normal laboratory requirements; with a temperature range of 20 - 24°C, a relative humidity range of 45% to 65%, with between 15 and 20 air changes per hour, and with a 12-hour light-dark cycle. Animals were housed in single polypropylene cages that were equipped to provide food and water *ad libitum* during the pre-tested period and the post-treatment and in excess during the 4-day test period (see Table 1.5).

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

2.3.5 Duration of the test / Exposure time	The duration of the test was at least of 25 days: - at least 6 days of acclimatization (including 4-day pre-test period when food intake and body weight of each animal were determined daily), - 4-day test period (period of exposure to the test item from day 7 to day 11) - 15-day observation period.	
2.3.6 Number of replicates performed	No replicate performed.	
2.3.7 Controls	No, not required in EPPO guidelines and in "TNsG Chapter 7 TP14" for choice tests. They are not required by the EU in order to reduce the number of test animals.	
2.4 Examination		
2.4.1 Effect investigated	Palatability of the product in the presence of a competing alternative food (standard diet).	X
2.4.2 Method for recording / scoring of the effect	The following parameters were measured and recorded for each animal: The daily intakes of challenge diet and test bait were measured between day 3 and day 11. The body weight was measured from day 3 to day 25. The mortality was observed from day 3 to day 25. During the experiment, animals showing morbid conditions were euthanized.	
2.4.3 Intervals of examination	Daily.	
2.4.4 Statistics	The percentage of intake of aged Brodifacoum paste bait and of challenge diet. The percentage of mortality, the body weight.	
2.4.5 Post monitoring of the test organism	Yes, 15-day post treatment observation period.	
	3 RESULTS	
3.1 Efficacy		
3.1.1 Dose/Efficacy curve	Not applicable	

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

3.1.2 Begin and duration of effects

The mean day to death was 4.7 ± 1.2 days after the beginning of the Brodifacoum paste bait consumption (range 3 to 7 days).

3.1.3 Observed effects in the post monitoring phase

Mortality occurred in 100% of the female and male rats, 7 days after the beginning of poison consumption.

3.2 Effects against organisms or objects to be protected

Not applicable.

3.3 Other effects

Not applicable.

3.4 Efficacy of the reference substance

Not applicable.

3.5 Tabular and/or graphical presentation of the summarised results

Body weight and mean time of death:

Rats	Initial weight of the animals at day 6 (before the choice feeding test)* (g)	Final weight of the animal at day 10 (at the end of the choice feeding test)* (g)	Day of death*
Aged bait ♂	Mean = 285 SD = 7.15	Mean = 316 SD =7.84	Mean = 4.44 SD = 1.01
Aged bait ♀	Mean = 226 SD =9.10	Mean = 243 SD =10.6	Mean = 5.00 SD = 1.33
Aged bait* ♂ + ♀	Mean = 256 SD =31.4	Mean = 278 SD =38.3	Mean = 4.74 SD = 1.19

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

Acceptance of the Brodifacoum paste bait between day 7 (the first day of the choice feeding test) and day 10 (the last day of the choice feeding test):

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Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

Rats	% acceptance at day7	% acceptance at day 8	% acceptance at day 9	% acceptance at day 10
Aged bait ♂	48%	50%	43%	30%
Aged bait ♀	61%	55%	52%	38%

Mean intake of the Brodifacoum paste bait between day 7 (the first day of the choice feeding test) and day 10 (the last day of the choice feeding test):

Rats	Mean intake* (mg a.s./kg b.w.) at day7	Mean intake* (mg a.s./kg b.w.) at day 8	Mean intake* (mg a.s./kg b.w.) at day 9	Mean intake* (mg a.s./kg b.w.) at day 10
Aged bait ♂	2,4	2,2	1,5	0,7
Aged bait ♀	2,6	2,1	1,7	0,8

Mean consumption and % acceptance during the whole test period (from day 7 to day 10):

Rats	Mean quantity consumed by each animal during the test period*		Mean intake* (mg a.s./kg b.w.) during the test period	% acceptance during the test period*
	Treated	Control		
Aged bait ♂	Mean = 50.6 SD = 12.9	Mean = 62.6 SD = 14.0	Mean 1.69 SD = 0.39	Mean = 44.9% SD = 7.88%
Aged bait ♀	Mean = 42.4 SD = 11.2	Mean = 37.3 SD = 8.6	Mean = 1.78 SD = 0.44	Mean = 52.9% SD = 10.4%
Aged bait ♂+♀	Mean = 46.5 SD = 12.4	Mean = 49.9 SD = 17.2	Mean = 1.74 SD = 0.41	Mean = 48.9% SD = 9.89%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

3.6 Efficacy limiting factors	
3.6.1 Occurrences of resistances	Not applicable
3.6.2 Other limiting factors	Not applicable

4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS

4.1 Reasons for laboratory testing	This laboratory test is designed to determine the palatability of aged product. Either the amount of bait consumed, in which the active substance is incorporated, or the mortality of the rodents is a measure for the palatability of the bait in controlled and recognised conditions.
4.2 Intended actual scale of biocide application	Not applicable

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

14.2 4.3 Relevance compared to field conditions	Rats had the choice between bait and alternative food. This is intended to represent field conditions in which the animals have unrestricted access to food in competition with treated bait.
14.3 4.3.1 Application method	Norway rats are the intended target organisms and are used both for laboratory and field tests.
14.4 4.3.2 Test organism	Brodifacoum paste bait was sufficiently attractive to rats to divert them from feeding only on the familiar diet. The observed effects of high consumption of the test item by rodents and the total mortality of the test group are both relevant to field conditions.
14.5 4.3.3 Observed effect	Yes, and field data are available as well.
14.6 4.4 Relevance for read-across	

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1 Materials and methods	The study was conducted according to TNsG on Product evaluation, Chapter 7. The test material is a paste bait containing Brodifacoum aged for 3 weeks at 54°C. The test animals were 10 males and 10 females Norway rats. The test was a laboratory choice feeding test. It consisted in at least 6-day acclimatisation (conditioning) period then a 4-day test period, followed by a 15-day observation period. The treated bait and control bait were placed in 2 food bowls and the quantity in each pot exceeded the normal daily requirement for each animal. The positions of the test item and of the challenge diet bowls were alternated daily. Amount of product consumed, body weight and mortality were recorded daily for each animal.
5.2 Reliability	1 (no deviation from standards)

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

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5.3 Assessment of efficacy, data analysis and interpretation	The mean initial weight of the test animals at day 6 (before the choice feeding test) was 285 and 226 g (males and females, respectively). Acceptance of the Brodifacoum paste bait was good. During the 4-day testing period, challenged diet consumption and Brodifacoum paste bait consumption of the 10 female and 10 male rats were almost similar (49.9 g, (S.D. 17.2 g) and 46.5 g (S.D. 12.4 g)), respectively, n=20) corresponding to a percentage intake Brodifacoum paste bate of 48.9% (S.D. 9.9% (n=20). Mortality was total (100%), with a mean day to death of 4.7 ± 1.2. days.
5.4 Conclusion	The study showed that Brodifacoum paste bait stored at 54°C for 3 weeks is palatable to Sprague Dawley rats, with a mean palatability against ground laboratory diet above 20% during the 4-day testing period (the minimum acceptance was observed for male rats: 44.9% (S.D. 7.88%). The test item also resulted in 100% mortality after a 4-day choice between the aged test item formulation and challenge diet. According to the European Commission document (European Commission, 2008), Section 4.1 “Norms and Criteria”, in the bait choice feeding test, the percentage of ingested bait containing the product should be normally ≥ 20%. When the test results in ≥ 90% mortality, a lower level than 20% of the total food consumption is acceptable. The results obtained in the choice test with the test item Brodifacoum paste bait meet the required criteria. The results of this test reflect field conditions as animals have unrestricted access to a well-known food. It can be concluded that the Brodifacoum paste bait stored at 54°C for 3 weeks is palatable in the presence of a competing alternative food (standard diet).
5.5 Proposed efficacy specification	The efficacy of the test item is very good to excellent (100% mortality, 7 days after the beginning of the Brodifacoum paste bait consumption).

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	March 2013.
Materials and Methods	**2.4.1** Effect observed included palatability and mortality.
Results and discussion	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.9%. The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 4.7 days (3 to 7 days) after the first intake of bait.
Conclusion	Agree with applicant's version.
Reliability	1
Acceptability	Acceptable.
Remarks	None.
	COMMENTS FROM ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	*Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.2 Test organism

Criteria	Details
Species	Norway rat (*Rattus norvegicus*)
Strain	Sprague Dawley rats
Source	Centre d'élevage R. Janvier (Saint Berthevin cedex, France)
Laboratory culture	Yes
Stage of life cycle and stage of stadia	Healthy non-pregnant adults
Mixed age population	No
Other specification	Mean body weight ranged from 232 to 240 g for male and from 192 to 211 g for female at their arrival at Biotrial Pharmacology.
Number of organisms tested	20 rats, 10 males and 10 females. Rats were numbered by marking their tail using indelible markers.
Method of cultivation	At their arrival and during all the experiment, animals were individually housed in polypropylene cages (floor area = 530 cm^2) under standard conditions: room temperature (22±2°C), hygrometry (55±10%), light/dark cycle (12h/12h), air replacement (15-20 volumes/hour), water and food (SAFE A04) *ad libitum.*
Pre-treatment of test organisms before exposure	The animals were acclimatised for at least 6 days before the choice feeding test.
Initial density/number of test organisms in the test system	20 animals. Each animal was individually caged.

1.3 Test system

Criteria	Details
Culturing apparatus / test chamber	Rats were individually caged in polypropylene cages (floor area = 530 cm^2) under standard conditions.
Number of vessels / concentration	Two symmetrically-placed food bowls at the front of each cage.
Test culture media and/or carrier material	The test bait is a paste bait stored at 54°C for 3 weeks, provided by the sponsor. The challenge diet is standard meal, provided by the laboratory. Water was supplied *ad libitum*.
Nutrient supply	Not applicable
Measuring equipment	Weighing scale

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.4 Application of test substance

Criteria	Details
Application procedure	During the 4-day pre-test period (the last 4 days of the acclimatization period (day 3 to day 6)), the animals had access to standard meal from two symmetrically-placed food bowls at the front of each cage. On day 3, 2 pots were placed in each cage, both filled with challenge diet (non-poisoned source). On day 4, day 5 and day 6, the remaining food was weighted and replaced every day by fresh diet. The place of the 2 pots was daily interchanged in order to avoid any place preference. Food consumption was calculated daily for each animal between day 3 and day 6. Any rodent not eating normally by the last day was discarded. During the 4-day test period (from day 7 to day 10), in each cage the animal had access to 1 pot containing approximately 50 g of aged rodenticidal paste bait and 1 pot containing approximately 50 g of challenge diet (non-poisoned source). The place of the 2 pots was daily interchanged in order to avoid any place preference. On day 8, day 9 and day 10, remaining diet in each pot was weighted and discarded before to provide approximately 50 g of fresh diet in each pot. On day 11, diet in each pot was weighted and discarded before to provide challenged diet *ad libitum.* Then, animals were daily observed up to day 25. Daily consumption of the bait and the challenged diet was measured from day 3 to day 11. Body weight and mortality were measured from day 3 to day 25. During the experiment, any moribund animal was sacrificed.
Delivery method	The challenge diet and test bait were placed in 2 food bowls.
Dosage rate	The contents of the food bowls were made up daily to provide an excess of the animals' daily

	requirement from each bowl (*i.e.* > 50 g).
Carrier	Not applicable
Concentration of liquid carrier	Not applicable
Liquid carrier control	Not applicable
Other procedures	No other relevant details.

Section B5.10/03 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, choice feeding test, aged product

TNsG: Pt. I-B5.10,

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1.5 Test conditions

Criteria	Details
Substrate	Not applicable
Incubation temperature	Ambient temperature was 20-24°C
Moisture	Relative humidity range of 45 to 65%
Aeration	15-20 air changes per hour
Method of exposure	Oral exposure
Aging of samples	Aged bait stored at 54°C for 3 weeks
Other conditions	12h light-dark cycle

Section B5.10/04 Efficacy Data

Annex Point IIB5.10
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

Efficacy on mice, choice feeding test, aged product

Official use only

1 REFERENCE

1.1 Reference	Loiseau M., 2012, Choice feeding trial for Brodifacoum paste bait (aged product) against albino house mice, Biotrial Pharmacology, Study code 0BSIX1, Biotrial Pharmacology (unpublished), 11 January 2012
1.2 Data protection	Yes
1.2.1 Data owner	BIO6 S.A. A letter of access from BIO6 S.A. is provided for this study (see the administrative dossier).
1.2.2 Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its authorisation.
1.3 Guideline study	The study was conducted according to the TNsG on Product Evaluation Appendices to Chapter 7 - Product Type 14 - Efficacy Evaluation of Rodenticidal Biocidal Products endorsed at the 32nd meeting of representatives of Members States Competent Authorities.
1.4 Deviations	None

2 METHOD

2.1 Test Substance (Biocidal Product)	Brodifacoum
2.1.1 Trade name/ proposed trade name	Brodifacoum paste bait, similar to Saphir Paste (see the attestation for the different product names used in efficacy trials reports)
2.1.2 Composition of Product tested	Brodifacoum paste bait, manufactured and aged for 3 weeks at 54°C, provided by the sponsor and stored at room temperature at Biotrial Pharmacology. Batch number RB20110902brodif Nominal concentration: 40.0 mg a.s. / kg Measured concentration: 37 mg a.s./kg (see the Doc. IV-B5.10/04 - Appendix 1)
2.1.3 Physical state and nature	Ready-to-use bait (RB)
2.1.4 Monitoring of active substance concentration	Not applicable.

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2.1.5 Method of analysis	Not applicable.
2.2 Reference substance	Standard mice diet.
2.2.1 Method of analysis for reference substance	Not relevant. The challenge diet was a non-poisoned product.
2.3 Testing procedure	
2.3.1 Test population / inoculum / test organism	20 animals (10 males, 10 females). House mouse (*Mus musculus*). See details in Table 1.2
2.3.2 Test system	Laboratory test. The animals were individually caged. The test is a choice test in which the rodents have unrestricted access to the test bait and to palatable and familiar alternative food (challenge diet) during a 4-day test period. During the conditioning period the animals were fed with standard meal and supplied with water *ad libitum* (see Table 1.3)
2.3.3 Application of Test Substance	Mice received the test item from two symmetrically-placed food bowls at the front of each cage, one filled with the test product, the other with the challenge diet. The positions of the bowls were alternated daily. The contents of the food bowls were made up daily to provide an excess of the animals' daily requirement from each bowl (approximately 10 g of the aged rodenticide paste bait and approximately 20 g of the challenge diet, in each corresponding pot) (see Table 1.4).
2.3.4 Test conditions	Ambient conditions in animal rooms were maintained in accordance with normal laboratory requirements; with a temperature range of 20 - 24°C, a relative humidity range of 45% to 65%, with between 15 and 20 air changes per hour, and with a 12-hour light-dark cycle. Animals were housed in single polypropylene cages that were equipped to provide food and water *ad libitum* during the pre-tested period and the post-treatment and in excess during the 4-day test period (see Table 1.5).
2.3.5 Duration of the test / Exposure	The duration of the test was at least of 25 days: - at least 6 days of acclimatization (including 4-day pre-test period when

Section B5.10/04 Efficacy Data

Annex Point IIB5.10
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Efficacy on mice, choice feeding test, aged product

time	food intake and body weight of each animal were determined daily), - 4-day test period (period of exposure to the test item from day 7 to day 11) - 15-day observation period.	
2.3.6 Number of replicates performed	No replicate performed.	
2.3.7 Controls	No, not required in EPPO guidelines and in "TNsG Chapter 7 TP14" for choice tests. They are not required by the EU in order to reduce the number of test animals.	
2.4 Examination		
2.4.1 Effect investigated	Palatability of the product in the presence of a competing alternative food (standard diet).	X
2.4.2 Method for recording / scoring of the effect	The following parameters were measured and recorded for each animal: The daily intakes of challenge diet and test bait were measured between day 3 and day 11. The body weight was measured from day 3 to day 25. The mortality was observed from day 3 to day 25. During the experiment, animals showing morbid conditions were euthanized.	
2.4.3 Intervals of examination	Daily.	
2.4.4 Statistics	The percentage of intake of aged Brodifacoum paste bait and of challenge diet. The percentage of mortality, the body weight.	
2.4.5 Post monitoring of the test organism	Yes, 15-day post treatment observation period.	
	3 RESULTS	
3.1 Efficacy		
3.1.1 Dose/Efficacy curve	Not applicable	
3.1.2 Begin and duration of effects	The mean day to death was 5.8 ± 1.2 days after the beginning of the Brodifacoum paste bait consumption (range 4 to 7 days).	
3.1.3 Observed	Mortality occurred in 100% of the female and male mice, 7 days after	

effects in the post monitoring phase	the beginning of poison consumption.
3.2 Effects against organisms or objects to be protected	Not applicable.
3.3 Other effects	Not applicable.
3.4 Efficacy of the reference substance	Not applicable.
3.5 Tabular and/or graphical presentation of the summarised results	Body weight and mean time of death:

Mice	Initial weight of the animals at day 6 (before the choice feeding test)* (g)	Final weight of the animal at day 10 (at the end of the choice feeding test)* (g)	Day of death*
Aged bait ♂	Mean = 29.6 SD = 1.65	Mean = 29.2 SD =2.25	Mean = 5.60 SD = 1.26
Aged bait ♀	Mean = 23.1 SD =0.99	Mean = 23.2 SD =1.40	Mean = 5.90 SD = 1.20
Aged bait* ♂ + ♀	Mean = 26.4 SD =3.59	Mean = 26.2 SD =3.58	Mean = 5.75 SD = 1.21

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

Acceptance of the Brodifacoum paste bait between day 7 (the first day of the choice feeding test) and day 10 (the last day of the choice feeding test):

Mice	% acceptance at day7	% acceptance at day 8	% acceptance at day 9	% acceptance at day 10

Aged bait ♂	54%	38%	40%	32%
Aged bait ♀	51%	65%	57%	45%

Mean intake of the Brodifacoum paste bait between day 7 (the first day of the choice feeding test) and day 10 (the last day of the choice feeding test):

Rats	Mean intake* (mg a.s./kg b.w.) at day7	Mean intake* (mg a.s./kg b.w.) at day 8	Mean intake* (mg a.s./kg b.w.) at day 9	Mean intake* (mg a.s./kg b.w.) at day 10
Aged bait ♂	3.7	1.9	1.7	0.8
Aged bait ♀	4.1	4.0	3.1	1.6

Mean consumption and % acceptance during the whole test period (from day 7 to day 10):

Mice	Mean quantity consumed by each animal during the test period*		Mean intake* (mg a.s./kg b.w.) during the test period	% acceptance during the test period*
	Treated	Control		
Aged bait ♂	Mean = 6.21 SD = 2.11	Mean = 8.13 SD = 1.41	Mean 2.06 SD = 0.71	Mean = 42.4% SD = 8.98%
Aged bait ♀	Mean = 7.54 SD = 1.55	Mean = 6.11 SD = 1.49	Mean = 3.20 SD = 0.57	Mean = 55.2% SD = 6.78%
Aged bait ♂+♀	Mean = 6.88 SD = 1.93	Mean = 7.12 SD = 1.75	Mean = 2.63 SD = 0.86	Mean = 48.8% SD = 10.2%

* values calculated in the purpose of this dossier with the nominal concentration of the active substance in the test item (40 mg/kg).

3.6 Efficacy limiting factors

3.6.1 Occurrences Not applicable

of resistances	
3.6.2 Other limiting factors	Not applicable

4 RELEVANCE OF THE RESULTS COMPARED TO FIELD CONDITIONS

4.1 Reasons for laboratory testing	This laboratory test is designed to determine the palatability of aged product. Either the amount of bait consumed, in which the active substance is incorporated, or the mortality of the rodents is a measure for the palatability of the bait in controlled and recognised conditions.
4.2 Intended actual scale of biocide application	Not applicable
14.7 4.3 Relevance compared to field conditions	
14.8 4.3.1 Application method	Mice had the choice between bait and alternative food. This is intended to represent field conditions in which the animals have unrestricted access to food in competition with treated bait.
14.9 4.3.2 Test organism	House mice are the intended target organisms and are used both for laboratory and field tests.
14.10 4.3.3 Observed effect	Brodifacoum paste bait was sufficiently attractive to mice to divert them from feeding only on the familiar diet. The observed effects of high consumption of the test item by rodents and the total mortality of the test group are both relevant to field conditions.
14.11 4.4 Relevance for read-across	Yes, and field data are available as well.

5 APPLICANT'S SUMMARY AND CONCLUSION

5.1 Materials and	The study was conducted according to TNsG on Product evaluation,

Section B5.10/04 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, choice feeding test, aged product
TNsG: Pt. I-B5.10, Pt. III-Ch. 6

methods	Chapter 7. The test material is a paste bait containing Brodifacoum aged for 3 weeks at 54°C. The test animals were 10 males and 10 females House mice. The test was a laboratory choice feeding test. It consisted in at least 6-day acclimatisation (conditioning) period then a 4-day test period, followed by a 15-day observation period. The treated bait and control bait were placed in 2 food bowls and the quantity in each pot exceeded the normal daily requirement for each animal. The positions of the test item and of the challenge diet bowls were alternated daily. Amount of product consumed, body weight and mortality were recorded daily for each animal.
5.2 Reliability	1 (no deviation from standards)
5.3 Assessment of efficacy, data analysis and interpretation	The mean initial weight of the test animals at day 6 (before the choice feeding test) was 30 and 23 g (males and females, respectively). Acceptance of the Brodifacoum paste bait was good. During the 4-day testing period, challenged diet consumption and Brodifacoum paste bait consumption of the 10 female and 10 male mice were almost similar (7.12 g, (S.D. 1.75 g) and 6.88 g (S.D. 1.93 g)), respectively, n=20) corresponding to a percentage intake Brodifacoum paste bate of 48.8% (S.D. 10.2% (n=20). Mortality was total (100%), with a mean day to death of 5.8 ± 1.2 days.
5.4 Conclusion	The study showed that Brodifacoum paste bait aged for 3 weeks at 54°C is palatable to house mice, with a mean palatability against ground laboratory diet above 20% during the 4-day testing period (the minimum acceptance was observed for male albino mice: 42.4% (S.D. 8.98%). The test item also resulted in 100% mortality after a 4-day choice between the aged test item formulation and challenge diet. According to the European Commission document (European Commission, 2008), Section 4.1 “Norms and Criteria”, in the bait choice feeding test, the percentage of ingested bait containing the product should be normally ≥ 20%. When the test results in ≥ 90% mortality, a lower level than 20% of the total food consumption is acceptable. The results obtained in the choice test with the test item Brodifacoum

	paste bait meet the required criteria. The results of this test reflect field conditions as animals have unrestricted access to a well-known food. It can be concluded that the Brodifacoum paste bait stored at 54°C for 3 weeks is palatable in the presence of a competing alternative food (standard diet).
5.5 Proposed efficacy specification	The efficacy of the test item is very good to excellent (100% mortality, 7 days after the beginning of the Brodifacoum paste bait consumption).

Section B5.10/04 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	March 2013.
Materials and Methods	**2.4.1** Effect observed included palatability and mortality.
Results and discussion	The mean acceptance of the test item during the whole test period (from day 7 to day 10) was 48.8%. The efficacy was excellent. Mortality was total (100%) in all test groups after a 4-day choice between this test substance and the challenge diet. The mean time to death was 5.8 days (4 to 7 days) after the first intake of bait.
Conclusion	Agree with applicant's version.
Reliability	1
Acceptability	Acceptable.
Remarks	None.
	COMMENTS FROM ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	*Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

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Annex Point IIB5.10 Efficacy on mice, choice feeding test, aged product

TNsG: Pt. I-B5.10,

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1.2 Test organism

Criteria	Details
Species	House mice (*Mus musculus*)
Strain	
Source	Centre d'élevage R. Janvier (Saint Berthevin cedex, France)
Laboratory culture	Yes
Stage of life cycle and stage of stadia	Healthy non-pregnant adults
Mixed age population	No
Other specification	Mean body weight ranged from 23 to 25 g for male and from 20 to 22 g for female at their arrival at Biotrial Pharmacology.
Number of organisms tested	20 mice, 10 males and 10 females. Mice were numbered by marking their tail using indelible markers.
Method of cultivation	At their arrival and during all the experiment, animals were individually housed in polypropylene cages (floor area = 530 cm^2) under standard conditions: room temperature (22±2°C), hygrometry (55±10%), light/dark cycle (12h/12h), air replacement (15-20 volumes/hour), water and food (SAFE A04) *ad libitum.*
Pre-treatment of test organisms before exposure	The animals were acclimatised for at least 6 days before the choice feeding test.
Initial density/number of test organisms in the test system	20 animals. Each animal was individually caged.

1.3 Test system

Criteria	Details
Culturing apparatus / test chamber	Mice were individually caged in polypropylene

	cages (floor area = 530 cm^2) under standard conditions.
Number of vessels / concentration	Two symmetrically-placed food bowls at the front of each cage.
Test culture media and/or carrier material	The test bait is a paste bait stored at 54°C for 3 weeks, provided by the sponsor. The challenge diet is standard meal, provided by the laboratory. Water was supplied *ad libitum*.
Nutrient supply	Not applicable
Measuring equipment	Weighing scale

Section B5.10/04 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.4 Application of test substance

Criteria	Details
Application procedure	During the 4-day pre-test period (the last 4 days of the acclimatization period (day 3 to day 6)), the animals had access to standard meal from two symmetrically-placed food bowls at the front of each cage. On day 3, 2 pots were placed in each cage, both filled with challenge diet (non-poisoned source). On day 4, day 5 and day 6, the remaining food was weighted and replaced every day by fresh diet. The place of the 2 pots was daily interchanged in order to avoid any place preference. Food consumption was calculated daily for each animal between day 3 and day 6. Any rodent not eating normally by the last day was discarded. During the 4-day test period (from day 7 to day 10), in each cage the animal had access to 1 pot containing approximately 10 g of aged rodenticidal paste bait and 1 pot containing approximately 20 g of challenge diet (non-poisoned source). The place of the 2 pots was daily interchanged in order to avoid any place preference. On day 8, day 9 and day 10, remaining diet in each pot was weighted and discarded before to provide the same quantity of fresh diet in each pot. On day 11, diet in each pot was weighted and discarded before to provide challenged diet *ad libitum.* Then, animals were daily observed up to day 25. Daily consumption of the bait and the challenged diet was measured from day 3 to day 11. Body weight and mortality were measured from day 3 to day 25. During the experiment, any moribund animal was sacrificed.
Delivery method	The challenge diet and test bait were placed in 2 food bowls.
Dosage rate	The contents of the food bowls were made up daily to provide an excess of the animals' daily requirement from each bowl (*i.e.* > 10 g).

Carrier	Not applicable
Concentration of liquid carrier	Not applicable
Liquid carrier control	Not applicable
Other procedures	No other relevant details.

Section B5.10/04 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, choice feeding test, aged product

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.5 Test conditions

Criteria	Details
Substrate	Not applicable
Incubation temperature	Ambient temperature was 20-24°C
Moisture	Relative humidity range of 45 to 65%
Aeration	15-20 air changes per hour
Method of exposure	Oral exposure
Aging of samples	Aged bait stored at 54°C for 3 weeks
Other conditions	12h light-dark cycle

Section B5.10/05 **Efficacy Data**

Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

Efficacy on rats, field test

Official use only

1 Reference

1.1 Reference

Lecomte L., Doyen A., 2011, Assessment of the efficacy of a rodenticide, in natural conditions, LODI (unpublished), Assay Number LODI.03/2011, 27 October 2011

1.2 Data protection

Yes

1.2.1 Data owner

Lodi

1.2.2 Criteria for data protection

Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its authorisation.

1.3 Guideline study

CEB Method No.002: Méthode d'essai d'efficacité pratique de raticides. J. Giban

EPPO Guidelines PP 1/114(2): Efficacy evaluation of rodenticides. Field tests against synanthropic rodents

1.4 Deviations

Yes.
The test was conducted regarding the CEB census baiting method. The initial consumption plateau is lower than the recommended 5 000 g/day and the initial quantity of bait by bait point is lower than 500 g.

2 Method

Section B5.10/05	**Efficacy Data**
Annex Point IIB5.10 **TNsG: Pt. I-B5.10,** **Pt. III-Ch. 6**	Efficacy on rats, field test

2.1 Test Substance (Biocidal Product)	Brodifacoum
2.1.1 Trade name/ proposed trade name	Brodifacoum paste 40 ppm, equivalent to Saphir Paste (see the attestation for the different product names used in efficacy trials reports)
2.1.2 Composition of Product tested	Paste bait containing 40 mg/kg of brodifacoum Batch No. 030711 Nominal concentration: 40.0 mg a.s. / kg Measured concentration: 38.4 mg a.s./kg (within the acceptable decision criteria fixed to 40.0 ± 25%) (see the Doc. IV-B5.10/05 - Appendix 1)
2.1.3 Physical state and nature	Ready-to-use paste bait (RB)
2.1.4 Monitoring of active substance concentration	Not applicable
2.1.5 Method of analysis	Not applicable.
2.2 Reference substance	None
2.2.1 Method of analysis for reference substance	Not applicable
2.3 Testing procedure	
2.3.1 Test population	Wild Norway Rats (*Rattus norvegicus*). See Table 1.2

Section B5.10/05	**Efficacy Data**
Annex Point IIB5.10 **TNsG: Pt. I-B5.10,** **Pt. III-Ch. 6**	Efficacy on rats, field test

/ inoculum / test organism	
2.3.2 Test system	The test was carried out on a farm raising cows infested with *Rattus norvegicus* (see Table 1.3).
2.3.3 Application of Test Substance	See table 1.4 When the pre-baiting consumption reached the plateau (day 25), the non-poisoned baits were replaced by the product to be tested (day 26). After the baiting period, the residual consumption was determined to be compared with the initial consumption. During the baiting period, bait stations received 150 g baits (40 mg/kg of Brodifacoum). Baits were replaced daily.
2.3.4 Test conditions	Natural conditions (see table 1.5).
2.3.5 Duration of the test / Exposure time	Duration of the whole test: 43 days The practical efficacy trial included three consecutive periods: - first period: determination of the consumption plateau of the initial population to measure initial daily consumption (25 days). - second period: rodenticide application (10 days). - third period: establishment of the consumption plateau of the surviving population to measure residual consumption (8 days). The comparison of the two consumption plateaus obtained experimentally before and after the rodenticide treatment enables the calculation, as a relative value, of the treatment efficacy.
2.3.6 Number of replicates performed	None (field test).
2.3.7 Controls	No control as the test is a field efficacy trial.
2.4 Examination	
2.4.1 Effect	Percentage of bait consumed after the control operation compared to the amount of bait consumed before the control

investigated	operation as an index of population size.
2.4.2 Method for recording / scoring of the effect	Bait consumption was recorded on daily basis and for each bait point. The bait stations were emptied of their content every day, around the same hour, and then refilled with the initial quantity of bait. Remaining uneaten baits were collected in separate bags and weighted with a laboratory balance at the laboratory.
2.4.3 Intervals of examination	Daily.
2.4.4 Statistics	The treatment efficacy, as a relative value, was calculated as follows: $E = \left[\frac{C_i - C_r}{C_i} \right] * 100$ Where: E = efficacy; C_i = initial consumption, average consumption before the treatment (when the plateau is reached); C_r = residual consumption, average consumption after the treatment (when the plateau is reached). A graph showing the variation of total daily consumption (consumption in all the bait stations of the experimental site) was completed every day.
14.11.1 2.4.5 Post monitoring of the test organism	Post-baiting residual consumption was determined for 8 days

3 Results

3.1 Efficacy

Initial consumption was calculated by averaging the consumption of the last three consecutive days (on the plateau).

Residual consumption was calculated by averaging the consumption of the last six consecutive days (on the plateau).

Section B5.10/05	Efficacy Data
Annex Point IIB5.10 **TNsG: Pt. I-B5.10,** **Pt. III-Ch. 6**	Efficacy on rats, field test

The efficacy measured was 95.18%.

3.1.1 Dose/Efficacy curve

Not applicable

3.1.2 Begin and duration of effects

Once the total daily consumption is considered to be stabilized, as a plateau is reached for three consecutive days during the pre-baiting period, the non-poisoned baits were replaced by the product to be tested. The graph of the total daily bait consumption is given in section 3.5.

3.1.3 Observed effects in the post monitoring phase

Total daily consumption was measured for 8 days after the baiting period to assess the level of the survival rodent population, with the same methods than those employed to measure pre-treatment activity. The consumption reached a plateau (about 50 g/day) and was lower than during the pre-baiting period (about 1 038 g/day).

3.2 Effects against organisms or objects to be protected

No adverse effects were reported.

3.3 Other effects

Not applicable.

3.4 Efficacy of the reference substance

Not applicable.

3.5 Tabular and/or graphical presentation of the summarised results

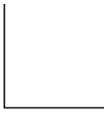
Daily consumption during the prebaiting period (g/day):

Section B5.10/05 **Efficacy Data**

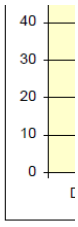
Annex Point IIB5.10
TNsG: Pt. I-B5.10,
Pt. III-Ch. 6

Efficacy on rats, field test

Daily consumption during the baiting phase (g/day):



Daily consumption during the post-baiting period (g/day):



3.6 Efficacy limiting factors

Not applicable

3.6.1 Occurrences of resistances

Not applicable

3.6.2 Other limiting factors

4 Relevance of the results compared

Section B5.10/05	**Efficacy Data**
Annex Point IIB5.10	Efficacy on rats, field test
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	

to field conditions

4.1 Reasons for laboratory testing

Not applicable.

4.2 Intended actual scale of biocide application

4.3 Relevance compared to field conditions

4.3.1 Application method

4.3.2 Test organism

4.3.3 Observed effect

4.4 Relevance for read-across

5 Applicant's Summary and conclusion

Section B5.10/05	**Efficacy Data**
Annex Point IIB5.10 **TNsG: Pt. I-B5.10,** **Pt. III-Ch. 6**	Efficacy on rats, field test

5.1 Materials and methods	The field assay, appropriate to the geographic regions in which the product will be used, was conducted in an experimentation station infested with wild *Rattus norvegicus* to assess under actual in-use conditions the palatability of the bait and the mortality it causes. A pre-baiting period (25 days) allowed to place bait points correctly and to determine a plateau of food consumption by the wild rats population. During the baiting period, 50 bait points were used with 150 g of bait (40 mg/kg of Brodifacoum) replaced daily for 10 days. The location of the bait points and the amount of bait consumed each day were recorded. During the post-baiting period (8 days), the food consumption was recorded up to reach a plateau. The total amount of census bait consumed give an index of the population size. The level of control is expressed as a percentage reduction in the pre-treatment index.
5.2 Reliability	1
5.3 Assessment of efficacy, data analysis and interpretation	The percentage of bait consumed after the control operation compared to the amount of bait consumed before the control operation was ≤ 10%, satisfying the criteria proposed for a good rodenticide efficacy in the field trials.
5.4 Conclusion	With an efficacy of 95.18% and a control restricted to *Rattus norvegicus* only (dead rodents found during and after the baiting and the post-baiting phases were only *Rattus norvegicus*), the field assay showed a very good efficacy with a fast decrease of the population.
5.5 Proposed efficacy specification	Efficacy of more than 95%.

Section B5.10/05 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, field test

TNsG: Pt. I-B5.10,

Pt. III-Ch. 6

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	March 2013.
Materials and Methods	Agree with applicant's version.
Results and discussion	The efficacy measured was 95.18%.
Conclusion	Agree with applicant's version.
Reliability	1
Acceptability	Acceptable.
Remarks	None.
	COMMENTS FROM ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	*Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section B5.10/05 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, field test

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.2 Test organism

Criteria	Details
Species	*Rattus norvegicus*
Strain	Wild
Source	Not applicable
Laboratory culture	Not applicable
Stage of life cycle and stage of stadia	Not applicable
Mixed age population	Yes
Other specification	None
Number of organisms tested	About 41, estimated by pre-treatment bait census
Method of cultivation	Not applicable
Pre-treatment of test organisms before exposure	The rodents were fed with grain baits (non-poisoned cereals) with negligible variations of weight due to the desiccation or hygrometry. Baits were placed in bait stations from which uneaten bait can be collected. The map of the site indicating the location of bait points is provided. Baits were placed where rats are regularly seen by the owner of the farm, where rats have recently been seen, where rats signs have been seen (holes, droppings…), where rats are liable to walk away and all around the station in order to surround the infestation. At day 16, some bait points were removed if the consumption was too weak (< 1 g).
Initial density/number of test organisms in the test system	The initial consumption calculated as the average of the consumption of the last three days of the pre-baiting period is 1 037.8 g/day. The average consumption per rat is estimated to be 25 g/day (ESD for biocides used as rodenticides). Therefore, the number of rats with a continuous supply of non-poisoned baits could be estimated ≥ 41 rats.

Section B5.10/05 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, field test

TNsG: Pt. I-B5.10,

Pt. III-Ch. 6

1.3 Test system

Criteria		Details
14.11.2	**Culturing apparatus / test chamber**	The test was carried out in a farm raising cows in France (Le Petit Closelande, F- 35470 Bain de Bretagne). The station map and the locations of the bait points are provided. The owner of the farm told that there was no current rodenticide treatment.
14.11.3	**Number of vessels / concentration**	Not applicable
14.11.4	**Test culture media and/or carrier material**	The Brodifacoum-based paste baits are ready-to-use. Paste baits were placed in bait stations.
14.11.5	**Nutrient supply**	During the baiting period, the non-poisoned baits were replaced by the rodenticide. The bait stations were refilled with a quantity of rodenticide equal to the bait quantity initially placed into the bait stations.
14.11.6	**Measuring equipment**	The uneaten baits were collected in separate bags and the weighing was carried out at the laboratory, using a laboratory balance.

1.4 Application of test substance

Criteria	Details
Application procedure	During the baiting period, bait stations were refilled with a quantity of rodenticide equal to the non-poisoned bait quantity placed during the pre-baiting period. In the same way as during the pre-baiting period, the bait stations were emptied of their contents every day, around the same hour (± 1h), then refilled with the initial quantity of rodenticide. The uneaten rodenticides of each bait station were collected in separate bags. The weighing was carried out at the laboratory. The baiting period lasted for 10 days.
Delivery method	During the baiting period, 150 g of bait (40 mg/kg of Brodifacoum) were placed into receptacles (bait stations).
Dosage rate	The bait stations received 150 g of bait each and were emptied and then refilled every day.
Carrier	Not applicable
Concentration of liquid carrier	Not applicable
Liquid carrier control	Not applicable
Other procedures	No other relevant details.

Section B5.10/05 Efficacy Data

Annex Point IIB5.10 Efficacy on rats, field test

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.5 Test conditions

Criteria	Details
14.11.7 Substrate	Not applicable
14.11.8 Incubation temperature	Not applicable
14.11.9 Moisture	Natural conditions
14.11.10 Aeration	Natural conditions
14.11.11 Method of exposure	The baits are placed in feeding trays (bait stations)
14.11.12 Aging of samples	No
14.11.13 Other conditions	Natural conditions

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	

Official use only

1 Reference

1.1 Reference

Lecomte L., Doyen A., 2011, Assessment of the efficacy of a rodenticide, in natural conditions, LODI (unpublished), Assay Number LODI.04/2011, 27 October 2011

1.2 Data protection

Yes

1.2.1 Data owner

Lodi

1.2.2 Criteria for data protection

Data submitted to the MS after 13 May 2000 on existing b.p. for the purpose of its authorisation.

1.3 Guideline study

CEB Method No.002: Méthode d'essai d'efficacité pratique de raticides. J. Giban

EPPO Guidelines PP 1/114(2): Efficacy evaluation of rodenticides. Field tests against synanthropic rodents

1.4 Deviations

Yes.
The test was conducted regarding the CEB census baiting method which was validated for rats but not for mice. Anyhow, this method can be considered suitable for any rodents.
Regarding EPPO, no replicates were tested but the assessment was made in an entire building on 59 bait stations.

2 Method

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10 **TNsG: Pt. I-B5.10,** **Pt. III-Ch. 6**	Efficacy on mice, field test

2.1 Test Substance (Biocidal Product)	Brodifacoum
2.1.1 Trade name/ proposed trade name	Brodifacoum paste 40 ppm, equivalent to Saphir Paste (see the attestation for the different product names used in efficacy trials reports)
2.1.2 Composition of Product tested	Paste bait containing 40 mg/kg of brodifacoum Batch No. 030711 Nominal concentration: 40.0 mg a.s. / kg Measured concentration: 38.4 mg a.s./kg (within the acceptable decision criteria fixed to 40.0 ± 25%) (see the Doc. IV-B5.10/06 - Appendix 1)
2.1.3 Physical state and nature	Ready-to-use paste bait (RB)
2.1.4 Monitoring of active substance concentration	Not applicable
2.1.5 Method of analysis	Not applicable.
2.2 Reference substance	None
2.2.1 Method of analysis for reference substance	Not applicable
2.3 Testing	

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10,	
Pt. III-Ch. 6	

procedure

2.3.1 Test population / inoculum / test organism	Wild house mouse (*Mus musculus*). See Table 1.2
2.3.2 Test system	The test was carried out on a farm infested with *Mus musculus* (see Table 1.3).
2.3.3 Application of Test Substance	See table 1.4 When the pre-baiting consumption reached the plateau (day 31), the non-poisoned baits were replaced by the product to be tested (day 32). After the baiting period, the residual consumption was determined to be compared with the initial consumption. During the baiting period, bait stations received 30 g baits (40 mg/kg of Brodifacoum). Baits were replaced daily.
2.3.4 Test conditions	Natural conditions (see table 1.5).
2.3.5 Duration of the test / Exposure time	Duration of the whole test: 46 days The practical efficacy trial included three consecutive periods: - first period: determination of the consumption plateau of the initial population to measure initial daily consumption (31 days). - second period: rodenticide application (8 days). - third period: establishment of the consumption plateau of the surviving population to measure residual consumption (7 days). The comparison of the two consumption plateaus obtained experimentally before and after the rodenticide treatment enables the calculation, as a relative value, of the treatment efficacy.
2.3.6 Number of replicates performed	None (field test).

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10,	
Pt. III-Ch. 6	

2.3.7 Controls

No control as the test is a field efficacy trial.

2.4 Examination

2.4.1 Effect investigated

Percentage of bait consumed after the control operation compared to the amount of bait consumed before the control operation as an index of population size.

2.4.2 Method for recording / scoring of the effect

Bait consumption was recorded on a daily basis and for each bait point. The bait stations were emptied of their content every day, around the same hour, and then refilled with the initial quantity of bait. Remaining uneaten baits were collected in separate bags and weighted with a laboratory balance at the laboratory.

2.4.3 Intervals of examination

Daily.

2.4.4 Statistics

The treatment efficacy, as a relative value, was calculated as follows:

$$E = \left[\frac{C_i - C_r}{C_i} \right] * 100$$

Where:

E = efficacy;

C_i = initial consumption, average consumption before the treatment (when the plateau is reached);

C_r = residual consumption, average consumption after the treatment (when the plateau is reached).

A graph showing the variation of total daily consumption (consumption in all the bait stations of the experimental site) was completed every day.

2.4.5 Post monitoring of the test organism

Post-baiting residual consumption was determined for 7 days

15 3 Results

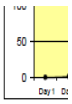
Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10,	
Pt. III-Ch. 6	

3.1 Efficacy	Both initial consumption and residual consumption were calculated by averaging the consumption of the last three consecutive days (on the plateau). The efficacy measured was 89.9%.
3.1.1 Dose/Efficacy curve	Not applicable
3.1.2 Begin and duration of effects	Once the total daily consumption is considered to be stabilized, as a plateau is reached for three consecutive days during the pre-baiting period, the non-poisoned baits were replaced by the product to be tested. The graph of the total daily bait consumption is given in section 3.5.
3.1.3 Observed effects in the post monitoring phase	Total daily consumption was measured for 7 days after the baiting period to assess the level of the survival rodent population, with the same methods than those employed to measure pre-treatment activity. The consumption reached a plateau (about 26 g/day) and was lower than during the pre-baiting period (about 253 g/day). No adverse effects were reported.
3.2 Effects against organisms or objects to be protected	
3.3 Other effects	Not applicable.
3.4 Efficacy of the reference substance	Not applicable.
3.5 Tabular and/or graphical presentation of the summarised results	Daily consumption during the prebaiting period (g/day):

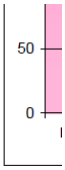
Section B5.10/06 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, field test

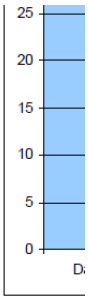
TNsG: Pt. I-B5.10, Pt. III-Ch. 6



Daily consumption during the baiting phase (g/day):



Daily consumption during the post-baiting period (g/day):



Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	

3.6 Efficacy limiting factors

Not applicable

3.6.1 Occurrences of resistances

Not applicable

3.6.2 Other limiting factors

4 Relevance of the results compared to field conditions

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10, Pt. III-Ch. 6	

4.1 Reasons for laboratory testing	Not applicable.
4.2 Intended actual scale of biocide application	
4.3 Relevance compared to field conditions	
4.3.1 Application method	
4.3.2 Test organism	
4.3.3 Observed effect	
4.4 Relevance for read-across	

5 Applicant's Summary and conclusion

Section B5.10/06	**Efficacy Data**
Annex Point IIB5.10	Efficacy on mice, field test
TNsG: Pt. I-B5.10,	
Pt. III-Ch. 6	

5.1 Materials and methods	The field assay, appropriate to the geographic regions in which the product will be used, was conducted in an experimentation station infested with wild *Mus musculus* to assess under actual in-use conditions the palatability of the bait and the mortality it causes. A pre-baiting period (31 days) allowed to place bait points correctly and to determine a plateau of food consumption by the wild mice population. Rodent activity on the site before and after treatment was determined. During the baiting period, 59 bait points were used with 30 g of bait (40 mg/kg of Brodifacoum) replaced daily for 8 days. The location of the bait points and the amount of bait consumed each day were recorded. During the post-baiting period (7 days), the food consumption was recorded up to reach a plateau. The total amount of census bait consumed give an index of the population size. The level of control is expressed as a percentage reduction in the pre-treatment index.
5.2 Reliability	1
5.3 Assessment of efficacy, data analysis and interpretation	The percentage of bait consumed after the control operation compared to the amount of bait consumed before the control operation was ≤ 10%, satisfying the criteria proposed for a good rodenticide efficacy in the field trials
5.4 Conclusion	With an efficacy of 89.9% and a control restricted to *Mus musculus* only (dead rodents found during and after the baiting and the post-baiting phases were only *Mus musculus*), the field assay showed a good efficacy with a fast decrease of the population.
5.5 Proposed efficacy specification	Efficacy of more than 89%

Section B5.10/06 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, field test

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

	Evaluation by Competent Authorities
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	March 2013.
Materials and Methods	Agree with applicant's version.
Results and discussion	The efficacy measured was 89.9%.
Conclusion	Agree with applicant's version.
Reliability	1
Acceptability	Acceptable.
Remarks	None.
	COMMENTS FROM ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	*Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Section B5.10/06 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, field test

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.2 Test organism

Criteria	Details
Species	*Mus musculus*
Strain	Wild
Source	Not applicable
Laboratory culture	Not applicable
Stage of life cycle and stage of stadia	Not applicable
Mixed age population	Yes
Other specification	None
Number of organisms tested	About 72, estimated by pre-treatment bait census
Method of cultivation	Not applicable
Pre-treatment of test organisms before exposure	The rodents were fed with grain baits (non-poisoned cereals) with negligible variations of weight due to the desiccation or hygrometry. Baits were placed in bait stations from which uneaten bait can be collected. The map of the site indicating the location of bait points is provided. Baits were placed where mice are regularly seen by the owner of the farm, where mice have been recently seen, where mice signs have been seen (holes, droppings…), where mice are liable to walk away and all around the station in order to surround the infestation. At Day 17, some bait points were removed if the consumption was too weak (< 1 g). On the contrary, the bait point showing a too high consumption has been duplicated.

Initial density/number of test organisms in the test system	The initial consumption calculated as the average of the consumption of the last three days of the pre-baiting period is 253.2 g/day. The average consumption per mice is estimated to be 3.5 g/day (ESD for biocides used as rodenticides). Therefore, the number of mice with a continuous supply of non-poisoned baits could be estimated ≥ 72 mice.

Section B5.10/06 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, field test

TNsG: Pt. I-B5.10, Pt. III-Ch. 6

1.3 Test system

Criteria		Details
15.1.1	**Culturing apparatus / test chamber**	The test was carried out in a farm in France (La Masserie, F- 35470 Bain de Bretagne). The station map and the locations of the bait points on the plan are provided. The owner of the farm told that there was no current rodenticide treatment.
15.1.2	**Number of vessels / concentration**	Not applicable
15.1.3	**Test culture media and/or carrier material**	The Brodifacoum-based paste baits are ready-to-use. Paste baits were placed in bait stations.
15.1.4	**Nutrient supply**	During the baiting period, the non-poisoned baits were replaced by the rodenticide. The bait stations were refilled with a quantity of rodenticide equal to the bait quantity initially placed into the bait stations.
15.1.5	**Measuring equipment**	The uneaten baits were collected in separate bags and the weighing was carried out at the laboratory, using a laboratory balance.

Section B5.10/06 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, field test

TNsG: Pt. I-B5.10,

Pt. III-Ch. 6

1.4 Application of test substance

Criteria	Details
Application procedure	During the baiting period, bait stations were refilled with a quantity of rodenticide equal to the non-poisoned bait quantity placed during the pre-baiting period. In the same way as during the pre-baiting period, the bait stations were emptied of their contents every day, around the same hour (± 1h), then refilled with the initial quantity of rodenticide. The uneaten rodenticides of each bait station were collected in separate bags. The weighing was carried out at the laboratory. The baiting period lasted for 8 days.
Delivery method	During the baiting period, 30 g of bait (40 mg/kg of Brodifacoum) are placed into receptacles (bait stations).
Dosage rate	The bait stations received 30 g of bait each and are emptied then refilled every day.
Carrier	None (ready-to-use product)
Concentration of liquid carrier	Not applicable
Liquid carrier control	Not applicable
Other procedures	Not relevant.

Section B5.10/06 Efficacy Data

Annex Point IIB5.10 Efficacy on mice, field test

TNsG: Pt. I-B5.10,

Pt. III-Ch. 6

1.5 Test conditions

Criteria	Details
15.1.6 Substrate	Not applicable
15.1.7 Incubation temperature	Not applicable
15.1.8 Moisture	Natural conditions
15.1.9 Aeration	Natural conditions
15.1.10 Method of exposure	The baits are placed in feeding trays (bait stations).
15.1.11 Aging of samples	No
15.1.12 Other conditions	Natural conditions

Please refer to the “Saphir Paste PAR – MS addendum for Tox – 70286, 70287” as Lodi received a LoA to toxicological data owned by Pelgar International Ltd.

Annex IV: List of studies reviewed

List of new data[45] submitted in support of the evaluation of the active substance (IIIA)

Not applicable

45 Data which have not been already submitted for the purpose of the Annex I inclusion.

List of new data submitted in support of the evaluation of the biocidal product (IIIB)

Section No in IUCLID/ IIIB / Non key study / Published	Author(s)	Year	Title/testing company	Report No	GLP study (Y/N)	Published (Y/N)	Data protection claimed (Y/N)	Data Owner
B3.2	S. Richerioux	2011	Explosive properties of Brodifacoum paste bait / LODIGROUP	LODI.66/2011, 25 November 2011	Y	N	Y	LODI S.A.S.
B3.3	S. Richerioux	2011	Oxidising properties of Brodifacoum paste bait / LODIGROUP	LODI.65/2011, 08 November 2011	Y	N	Y	LODI S.A.S.
B3.4.1	E. Meriadec	2011	Flammability of Brodifacoum paste bait / LODIGROUP	LODI.58/2011, 27 June 2011	Y	N	Y	LODI S.A.S.
B3.4.2	B. Demangel	2012	Self Ignition temperature of solids on Brodifacoum Paste Bait / ANADIAG-DEFITRACES	11-912011-010, 23 January 2012	Y	N	Y	LODI S.A.S.
B3.5	S. Richerioux	2011	pH of Brodifacoum paste bait / LODIGROUP	LODI.64/2011, 07 October 2011	Y	N	Y	LODI S.A.S.
B3.6	S. Richerioux	2011	Relative density of Brodifacoum paste bait / LODIGROUP	LODI.52/2011, 09 September 2011	Y	N	Y	LODI S.A.S.
B3.7.1	S. Richerioux	2011	Chemical stability of Brodifacoum paste bait after accelerated storage / LODIGROUP	LODI.59/2011, 15 November 2011	Y	N	Y	LODI S.A.S.
B3.7.2	S. Richerioux	2012	Chemical stability of Brodifacoum paste bait after 1 year storage at 20°C (final report) / LODIGROUP	LODI.60/2011 26 October 2012	Y	N	Y	LODI S.A.S.
B3.7.3	S. Richerioux	2013	Chemical stability of Brodifacoum paste bait after 2 years storage at 20°C (final report) / LODIGROUP	LODI.61/2011 19 November 2013	Y	N	Y	LODI S.A.S.
B3.7.4	S. Richerioux	2014	Chemical and packaging stability of Brodifacoum paste bait after 3 years storage at 20°C (final report) / LODIGROUP	LODI.62/2011 12 November 2014	Y	N	Y	LODI S.A.S.
B4	S. Richerioux	2012	Analytical validation for determination of Brodifacoum by HPLC / LODIGROUP	LODI.51/2011, 23 January 2012	Y	N	Y	LODI S.A.S.
B5.10	A. Doyen	2011	Attestation – Product names in efficacy trials report	13 December 2011	N	N	Y	LODI S.A.S.
B5.10/01	T. Mahaut, Dr. M. Cavelier	2003	Evaluation of the effectiveness of Brodipasta, a ready-to-use rodenticide paste bait containing 0.004% brodifacoum, against the Norway rat (*Rattus norvegicus* Berkenhout) and the house mouse (*Mus musculus* L.),	Contract No. 2003-03-Belgagri, 20 April 2003	N	N	Y	Belgagri SA

Section No in IUCLID/ IIIB / Non key study / Published	Author(s)	Year	Title/testing company	Report No	GLP study (Y/N)	Published (Y/N)	Data protection claimed (Y/N)	Data Owner
			Wallon Agricultural Research Centre, Gembloux					
B5.10/01 – Appendix 1	Centre de Recherches agronomiques de Gembloux	1994	Lignes directrices pour l'évaluation de l'efficacité des rodenticides et critères de décision, Stations de Zoologie appliquée et de Phytopharmacie	Deuxième édition, octobre 1994	N	N	Y	Belgagri SA
B5.10/02	Dr. M. De Proft, Dr. P. Meeùs	2005	Study of ageing behaviour of Brodipasta, a ready-to-use bait containing 0.004% brodifacoum, Wallon Agricultural Research Centre, Gembloux	Report No. 11595, Experiment ROD 2003-03, 01 June 2005	N	N	Y	Belgagri SA
B5.10/01 – Appendix 2			Please refer to IIIB5.10/01 – Appendix 1					
IIIB5.10/03	M. Loiseau	2012	Choice feeding trial for Brodifacoum paste bait (aged product) against rat, Biotrial Pharmacology	Study code 0BSIX2, 11 January 2012	N	N	Y	Bio 6 SA
IIIB5.10/03 – Appendix 1	H. Ricau	2011	Analytical Certificate, Anadiag – Defitraces	14 October 2011	N	N	Y	Bio 6 SA
B5.10/04	M. Loiseau	2012	Choice feeding trial for Brodifacoum paste bait (aged product) against albino house mice, Biotrial Pharmacology	Study code 0BSIX1, 11 January 2012	N	N	Y	Bio 6 SA
B5.10/04 – Appendix 1			Please refer to IIIB5.10/03 – Appendix 1					
B5.10/05	L. Lecomte, A. Doyen	2011	Assessment of the efficacy of a rodenticide, in natural conditions, LODIGROUP	Assay Number LODI.03/2011, 27 October 2011	N	N	Y	LODI S.A.S.
B5.10/05 – Appendix 1	Lodi	2011	Certificate of Analysis, LODIGROUP	19 August 2011	N	N	Y	LODI S.A.S.
B5.10/06	L. Lecomte, A. Doyen	2001	Assessment of the efficacy of a rodenticide, in natural conditions, LODIGROUP	Assay Number LODI.04/2011, 27 October	N	N	Y	LODI S.A.S.

Section No in IUCLID/ IIIB / Non key study / Published	Author(s)	Year	Title/testing company	Report No	GLP study (Y/N)	Published (Y/N)	Data protection claimed (Y/N)	Data Owner
				2011				
B5.10/06 – Appendix 1			Please refer to IIIB5.10/05 – Appendix 1					
B6.1.1	[redacted]	2007a	Brodifacoum Paste: Acute Oral Toxicity in the Rat – Fixed Dose Method SafePharm Laboratories Ltd.,	Report number 2254/0025	Y	N	Y	Pelgar International PCL
B6.1.2	[redacted]	2007b	Brodifacoum Paste: Acute Dermal Toxicity (Limit Test) in the Rat, SafePharm Laboratories Ltd.,	Report No 2254/0026	Y	N	Y	Pelgar International PCL
B6.2 (1)	[redacted]	2007c	Brodifacoum Paste: Acute Dermal Irritation in the Rabbit, SafePharm Laboratories Ltd.,	Report No 2254/0027	Y	N	Y	Pelgar International PCL
B6.2 (2)	[redacted]	2007d	Brodifacoum Paste: Acute Eye Irritation in the Rabbit, SafePharm Laboratories Ltd.,	Report No 2254/0028	Y	N	Y	Pelgar International PCL
B6.4	Dr. N. Piñeiro Costas	2011	Determination of the dermal absorption of chloralose from a paste bait in human skin *in vitro* / NOTOX	NOTOX project 496707 NOTOX Substance 202689/A	Y	N	Y	LODI S.A.S.

ANNEX V: Toxicology Calculations

Insert relevant exposure/effect calculations undertaken, if applicable.

ANNEX VI: Environmental Calculations

Environmental exposure assessment

The product contains the anticoagulant active substance brodifacoum (CAS No. 56073-10-0) at a concentration of 0.005% w/w (50 mg/kg). The product is designed to be used by professionals and amateurs in and around buildings infested by rats or mice. Furthermore, professional use of the product is envisaged in the area of rodent control in sewer systems.

For rat abatement (by amateurs and professionals), bait points containing 1-3 wax blocks (each of 20 g weight) are established, at distances of 5-10 m apart. For mouse control, bait points consist of 1 wax block, which are placed, at distances of 2-5 m apart. The label gives instruction to place the baits securely, i.e., in a way minimizing the risk of consumption by other animals or children. For amateur use the label prescribes to use tamper resistant bait stations for rat control. Baits for amateur mouse control have to be placed into/at a covered or protected bait station. For professional rodent control the use of tamper resistant bait stations is not compulsory however, if tamper resistant bait stations are not employed, the wax blocks must be fixed by strings or wire to avoid uptake by non target animals/humans, or uncontrolled dispersal.

Since non-target animals and the general public have no entrance to sewer infrastructure, a risk for primary poisoning does not arise due to rodent control in this compartment. The product can be applied by the 'pulsed-baiting' technique. At heavily infested sites bait points have to be replenished after 3-4 days and after 1 week. Thereafter, bait points should be checked weekly for curative treatment and every month for preventive treatment. Clearance of the rodent infestation will be achieved in 7-35 days.

In accordance with the TGD on Risk Assessment (EC, 2003[46]) and with the aid of the Emission Scenario Document for PT 14 (J. Larsen, 2003[47], in the following referred to as ESD PT 14), a quantitative approach is performed in order to estimate potential brodifacoum residues in environmental compartments, arising from its use as rodenticide, and local Predicted Environmental Concentrations (PECs) are calculated. These PECs will be compared with the Predicted No Effect Concentrations (PNEC), i.e., the concentrations below which unacceptable effects on organisms will most likely not occur. In the following environmental exposure assessment the active substance is exclusively taken into consideration as no further environmentally relevant substance is formed in the course of brodifacoum release into environmental compartments (*cf.* CA Report for brodifacoum). Besides denatonium benzoate (Bitrex®) none of the other ingredients in the product is classified with an environmentally relevant R-phrase. Bitrex® is classified with R52/R53. However, due to its significantly lower aquatic toxicity compared to brodifacoum (most sensitive species for Bitrex® is *Daphnia magna* with an EC_{50} of 13 mg/L, compared to brodifacoum with a lowest LC_{50}/EbC_{50} of 40 mg/L for fish and

46 Technical Guidance Document in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances and Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market. EUR 20418 EN/2. Italy, April 2003

47 Larsen, 2003: Emission scenario document for biocides used as rodenticides. EUBEES 2 report ENV.C3/SER/2001/0058.

algae, respectively), and its very low content in the product (0.001% w/w), Bitrex® does not have to be contemplated in this context.

Regional and continental PECs have not been calculated as they are not considered relevant for rodenticide use because the low consumption of rodenticide products leads to a negligible regional contribution (*cf.* Section 2.2, ESD PT 14).

Emissions to the environment from the use of brodifacoum in the product

Exposure during the production and formulation of brodifacoum should be addressed under other EU legislation (e.g. REACh) and not repeated under Directive 98/8/EC. The Biocides Technical Meeting (TMI06) agreed that a risk assessment for production and formulation of the active substance was not required, unless the active substance was totally new to the EU market and manufactured in the EU. This is not the case for brodifacoum which is an existing biocidal active substance within the EU.

Hence, the environmental exposure assessment focuses on the use and disposal of the rodenticide, which is in line with the scenarios proposed by the ESD.

Fate and distribution of brodifacoum in the environment

Details on the environmental fate and behaviour of brodifacoum are given in the CA Report for the active substance with regard to its inclusion in Annex I of Directive 98/8/EC.

Brodifacoum is very poorly soluble in water at an environmentally relevant pH (0.24 mg/L at pH 7 and 20°C), however measured solubility varies with pH (in the range of pH 5.2–9.3), indicating that dissociation occurs in this pH range. The estimated pKa is 4.5, therefore the compound is weakly acidic and can be expected to be mostly dissociated at pH 7. The compound has a low vapour pressure ($<<10^{-6}$ Pa at 20°C) and Henry's Law constant ($<<2.18*10^{-3}$ Pa*m3*mol^{-1}). Brodifacoum is hydrolysed relatively slowly under environmentally relevant conditions (DT_{50} = 300 d at pH 7 and 25°C) and degrades slowly in soil with a half life of 157 days (laboratory study, approx. 20°C). Photolysis in water is rapid (DT_{50} < 1 day). K_{oc} values calculated from absorption/desorption studies with three soils give a range of 4395-12603 L/kg (mean 9155 L/kg) at environmentally relevant pH values (6.6-7.6). Further experimental evidence (*cf.* IIIB, Doc. 7.1: Column leaching test with a pellet product containing 0.005% difenacoum, which is a related active substance to brodifacoum) shows that the compound is not mobile in soil, as concentrations in leachate from column leaching studies were non-determinable and no residues were found below the top 10 cm soil depth. Hence, there is evidence that brodifacoum is not mobile in soil.

PEC calculation

The ESD PT 14 categorises scenarios according to the application surrounding of the rodenticide and the application type. The PECs for the scenarios relevant to this product are presented below. It must be noted that the ESD PT 14 does not provide a scenario for the indoor use of rodenticides even though it is possible for a product to reach the sewer system due to cleaning processes following indoor use. However, these environmental emissions are considered negligible compared to emissions from outdoor use around buildings or sewer applications. Therefore, environmental emissions arising from the indoor use can be regarded to be covered by allowance for outdoor applications, as a conservative assumption. Since rat abatement requires higher application amounts compared to mouse control, the

assessment includes application amounts and distances for placing the bait for the former target organisms.

Emissions to the environment have been calculated in a two-tiered approach. In a first tier, the default values of the ESD PT 14 regarding application amounts and mode of use are used to calculate the worst-case PECs (first column in the tables). For refinement (Tier 2), product-specific application amounts and mode of use are used to derive PEC values that more closely reflect the realistic usage. The applicant also used data on the metabolism of brodifacoum to lower the exposure levels further; however the evaluator for the RMS removed this as no exposure assessment on the brodifacoum metabolites was included.

Sewer system

The product is used in sewer systems solely by professionals. Detailed usage instructions are provided on the label.

The ESD PT 14 proposes the scenario of pulsed baiting as a realistic worst case for rodenticide use in a city having a serious rat problem. A campaign of 21 days is assumed, with control operations at days 7 and 14. The revisit at day 7 requires the highest refill of wax blocks (1/3 of the rodenticide has been consumed and must be replaced) so only the first 7 days of the campaign are observed. This scenario has been taken for the current risk assessment, with the modification of assuming a first revisit already after 3.5 days with reference to the label instruction, recommending a first inspection after 3-4 days.

As outlined above, a two-tiered approach is conducted, comprising the following assumptions:

Tier 1:

In an area corresponding to 10,000 inhabitants 300 portions of wax blocks (300 g of bait per portion) are applied to 300 cesspools (in total 90 kg product in the catchment of one STP). During the first 7 days of control operation 1/3 of the wax blocks being placed is lost. Hence, the amount of product either being consumed by rodents or spilled (Q_{prod}) accounts for 30 kg. The fraction of the active released to the sewer system ($F_{released}$) is set to 0.9 by default.

Tier 2:

The applicant recommends a dosage rate of 3 wax blocks (20 g per block) to be placed at the 300 cesspools. This corresponds to a total mass of product of 18 kg. However in this instance the first revisit is performed after 3.5 days, at which stage one third of the bait (6 kg) has been eaten.

Regarding the fate and behaviour of brodifacoum in a STP, the SimpleTreat model distribution was adopted. Accordingly, the bulk of the active substance when entering a STP is translocated into sewage sludge (85%) with only minor amounts (15%) being present in the STP effluent after wastewater treatment. The evaluator for the RMS checked these figures using EUSES 2.1 and obtained a figure of 51.1% adsorption to sludge. Therefore the calculations presented below were repeated and corrected as per this parameter.

The input parameters for EUSES 2.1 are summarized in the following table. They have been adopted from the list of endpoints of the CA Report for brodifacoum.

Table 0-1: Input parameter for EUSES calculation

Parameter	Unit	Value	Condition
Molar mass	g/mol	523.4	
Melting point	°C	232	
Boiling point	°C	Not applicable	
Vapour pressure	Pa	10^{-6}	20°C
Henry's constant	Pa*m^3*mol	$2.18*10^{-3}$	pH 7
Water solubility	mg/L	0.24	pH 7, 20°C
Log P_{ow}		6.12	
DT_{50} in soil	d	157	20°C
		298	12°C
K_{oc} (soil)	L/kg	9155	average value from an adsorption/desorption study with three soils
Distribution in STP		48.9% water	SimpleTreat distribution
		51.1% sludge	
BCF fish		35134	Calculated according to the TGD
BCF earthworm		15820	

Using these input parameters and the Tier 1 and Tier 2 approaches explained above environmental concentrations have been assessed and are presented in the following tables. A PEC for sediment has not been calculated. According to the TGD, for substances with a log P_{ow} of > 5 and a determination of the PNEC in sediment with the equilibrium partition method (EPM), the PEC/PNEC ratio for sediment is by a factor of 10 higher than the PEC/PNEC ratio for surface water. Since for brodifacoum no studies on ecotoxicity towards sediment dwellers are available, the EPM method applies. Therefore, the risk characterization for sediment will be conducted in Document IIC on the basis of the PEC/PNEC ratios obtained for the water phase.

Table 0-2: Brodifacoum concentrations in environmental compartments for the scenario 'sewer system'

		Tier 1[a]	Tier 2[b]
Input			
Q_{prod}	Amount of product used in control operation (kg)	30	6
$Fc_{product}$	Fraction of active substance in product	0.00005	0.00005
$T_{emission}$	Number of emission days	7	3.5
$F_{released}$	Fraction of active ingredient released	0.9	0.9
Output			
$Elocal_{water}$[c]	Mean local emission of active substance to waste water during episode (g/d)	0.193	0.077
C_{infl}[d]	Concentration in sewage water to local STP (mg/L)	9.64×10^{-5}	3.86×10^{-5}
Local concentrations in different compartments after elimination processes in STP according to TGD (2003) calculated by EUSES 2.1.1			
PEC_{stp}	PEC for microorganisms in the STP (mg/L)	4.71×10^{-5}	1.89×10^{-5}
$PEClocal_{water}$	Local PEC in surface water during emission episode (mg/L)	4.65×10^{-6}	1.86×10^{-6}
$PEClocal_{soil}$	Through application of sewage sludge (mg/kg)	3.09×10^{-4}	1.24×10^{-4}
$PEClocal_{soil, porew}$	Concentration in porewater/groundwater of agricultural soil (mg/L)	1.62×10^{-6}	6.46×10^{-7}

[a] ESD default application data

[b] Product specific application data

[c] $Elocal_{water} = (Q_{prod} \times Fc_{product} / T_{emission}) \times F_{released}$

[d] $C_{influent}$ = $Elocal_{water}$ / total volume of sewage water per day (related to standard STP scenario in TGD with 200 L per person per day and 10000 inhabitants per STP)

In and around buildings

As mentioned above, in the ESD PT 14 emissions to the environment from the indoor use of rodenticides are considered to be insignificant compared to those arising from the outdoor use. Hence, the emission pathway: indoor use → disposal or cleaning operation → STP will not be contemplated.

The current risk assessment focuses on rat control because rat abatement with the product requires higher application amounts related to an area compared to mice control. The product can be applied by amateurs and professionals with the same maximum application amounts (3 blocks at maximum at a minimum distance of 5 m) however the modes of application may be slightly different for the two user groups. Amateurs are instructed to always use tamper resistant bait stations, reducing the risk for unintended uptake by humans and non-target vertebrates as well as leading to a decrease in exposure of soils if applied around buildings. The use of tamper resistant bait stations is not obligatory for professionals. However, if professionals do not employ tamper resistant bait stations they are instructed to secure wax blocks by strings or wire in order to limit access to the baits, and dispersal.

In conjunction with rodenticide applications around buildings the main exposed environmental compartment is soil contaminated by spills during the application, refilling and disposal (1% direct release) as well as from indirect release via urine and faeces (90% per default).

The environmental risk assessment for brodifacoum, a.i. of the product, is performed in a two steps approach:

Tier 1:

Tier 1 comprises the ESD PT 14 default values regarding dosages and emissions to the environment. Ten bait stations, each containing 250 g, are assumed to be placed within an area 55 m long and 10 m wide (550 m^2). The distance between the bait stations is 5 m. The ESD PT 14 assumes that during a campaign (21 days) a complete refill of the bait stations of 5 times (day 1, 3, 7, 14, 21) is necessary.

Tier 2:

Tier 2 comprises the product specific application mode and the ESD PT 14 default values regarding emissions to the environment (*cf.* Tier 1). In this case 3 x 20 g bait are placed at each bait point (60 g each). The placement of the bait is as described under Tier 1. The ESD recommends a total of 2.6 replenishments (as opposed to 5 for Tier 1). However, according to the label instruction for the product, a complete clearance of the rodent infestation will be achieved within 7-35 days. Hence the maximum duration of a campaign is longer than proposed in the ESD PT 14. According to the label a significant uptake of wax blocks in a highly infested area will occur during the first week, requiring two complete replenishments at maximum besides the initial application (replenishments at day 3-4 and day 7). Thereafter bait points only have to be inspected weekly with limited replenishment of the bait stations due to the decrease of the rat population. The applicant believes that this is difficult to quantify so the ESD PT 14 scenario of 5 complete refills within 21 days will be adopted here. The evaluator for the RMS agrees.

Table 0-3: Brodifacoum concentrations in environmental compartments for the scenario 'in and around buildings'

Input		**Tier 1[a]**	**Tier 2[b]**
Q_{prod}	Amount of product used in control operation (g) per site	250	60
$Fc_{product}$	Fraction of active substance in product	0.00005	0.00005
N_{sites}	Number of application sites	10	10
N_{refill}	Number of refilling times	5	5
$F_{releaseD, soil}$	Fraction of product released directly to soil	0.01	0.01
$F_{releaseID, soil}$	Fraction of unmetabolised active ingredient released indirectly to soil	0.9	0.9
Output			
$Elocal_{soil\text{-}D\text{-}campaign}$	Local direct emission of active substance to soil from a campaign (g/camp)	0.006	0.0015
$Elocal_{soil\text{-}D\text{-}campaign}$	Local indirect emission of active substance to soil from a campaign (g/camp)	0.557	0.134
$Elocal_{soilcampaign}$	Local emission of active substance to soil from a campaign (g/camp)	0.563	0.135
$Clocal_{soil\text{-}D}$[c]	Local concentration in soil due to direct release after a campaign (mg/kg)	0.041	0.0098
$Clocal_{soil\text{-}ID}$[d]	Concentration in soil due to indirect release after a campaign (mg/kg)	0.006	0.0014
$Clocal_{soil} = Clocal_{soil\text{-}D} + Clocal_{soil\text{-}D}$	Total concentration in soil (mg/kg)	0.047	0.011
$PEClocal_{soil, porew}$ (acc. to TGD, eq.67)	Concentration in porewater resulting from total concentration in soil (mg/L)	2.9×10^{-4}	6.94×10^{-5}

[a] Default application data and values for release

[b] Product specific application data

[c] $Clocal_{soil-D}$ = ($Elocal_{soil-D-campaign}$ x 1000) /($AREA_{exposed-D}$ x $DEPTH_{soil}$ x RHO_{soil} x N_{sites}) according to ESD: $AREA_{exposed-D}$ = 0.09 m², $DEPTH_{soil}$ = 0.1 m, RHO_{soil} = 1700 kg/m³ soil,

$Elocal_{soil-D-campaign}$ = Q_{prod} x Fc_{prod} x N_{sites} x N_{refil} x $F_{release-D,soil}$

[d] $Clocal_{soil-D}$ = (Q_{prod} x Fc_{prod} x N_{sites} x N_{refil} x 1000 x $F_{releaseID,soil}$ x (1-$F_{releaseD,soil}$)) / ($AREA_{exposed-ID}$ x $DEPTH_{soil}$ x RHO_{soil}), according to the ESD $AREA_{exposed-ID}$ = 550 m², $DEPTH_{soil}$ = 0.1 m, RHO_{soil} = 1700 kg/m³ soil.

$Elocal_{soil-D-campaign}$ = Q_{prod} x Fc_{prod} x N_{sites} x N_{refil} x $F_{releaseID,soil}$ x (1- $F_{releaseD,soil}$)

PEC in surface water, sewage treatment plant, groundwater and sediment

Using the relevant scenarios outlined in the ESD PT 14, the modes of calculation of the TGD, and the assumptions laid down above, the following PEClocal have been derived for aquatic compartments.

Table 0-4: Summary of brodifacoum PEC values obtained in the aquatic environment

Compartment/Scenario	Tier 1[a]	Tier 2[b]
SEWER SYSTEM		
PEC_{stp} (mg/L)	4.71 x 10^{-5}	1.89 x 10^{-5}
$PEClocal_{water}$ (mg/L)	4.65 x 10^{-6}	1.86 x 10^{-6}
$PEClocal_{sediment}$	Not relevant	Not relevant
$PEClocal_{soil,porewater}$ (mg/L)	1.62 x 10^{-6}	6.46 x 10^{-7}
IN AND AROUND BUILDINGS		
$PEClocal_{soil,porewater}$ (mg/L)	2.9 x 10^{-4}	6.94 x 10^{-5}

[a] ESD default application data and values for release

[b] Product specific application data

PEC in air

Brodifacoum has a vapour pressure of less than 10^{-6} Pa at 20°C and a Henry's Law constant of less than 2.18 x 10^{-3} Pa x m^3 x mol^{-1} at pH 7. In the Assessment Report for brodifacoum it has been concluded that releases to air from manufacturing, formulating, use or disposal phases are not to be expected. An exposure assessment for air is therefore not required.

PEC in soil

The following table contains a summary of the $PEClocal_{soil}$ derived from the different exposure scenarios.

Table 0-5: Summary of brodifacoum PEC values for soils

Compartment/Scenario	Tier 1[a]	Tier 2[b]
SEWER SYSTEM		
$PEClocal_{soil}$ (mg/kg) (via sewage sludge)	3.09×10^{-4}	1.24×10^{-4}
IN AND AROUND BUILDINGS		
$PEClocal_{soil}$ (mg/kg)	0.047	0.011

[a] ESD default application data and values for release

[b] Product specific application data

Primary poisoning

Referring to rodenticide applications in sewer systems, there is no primary poisoning hazard to non-target mammals or birds because this is no habitat for them (*cf.* ESD PT 14).

Regarding the possible primary hazard to non-target animals following applications around buildings, the label claim of The product contains precautious measures to be undertaken in order to minimise the risk for bait uptake by non-target vertebrates. Amateurs are given instruction to use tamper resistant bait boxes for wax block application. Professionals are directed to place the baits inaccessible for non-target animals and children. Wax blocks have to be put in tamper resistant stations, or fixed by strings or wire.

Hence, when using the product according to the label claim a risk for primary poisoning exists only for birds and mammals of the same size as the target rodents that may be able to enter the protected baits (*cf.* ESD PT 14). Domestic animals like dogs and pigs are therefore no relevant species for primary poisoning. The ESD PT 14 proposes several non-target species to be taken for primary poisoning risk assessments. The mammalian species proposed are pigs and dogs, which are, as indicated above, not relevant for The product applications. Several bird species are proposed (tree sparrow, chaffinch, woodpigeon and pheasant), all species will be taken into account in the current risk assessment. Although the pheasant is considerably larger than a rat, the species is included because of its association with the domestic hen.

Therefore, values for the estimated daily intake (ETE) are calculated for non-target birds consuming The product. The calculation is in a first step conducted according to the following equation, using the default values given in the ESD:

ETE = (FIR/BW)*C*AV*PT*PD (mg/kg bw/d) (eq 19, ESD).

Where, FIR is the food intake of indicator species (g fresh weight/d), BW is body weight (g), C is concentration of active compound in fresh diet (bait, mg/kg), PT is fraction of diet obtained in treated area (1 by default) and PD is fraction of food type in diet (1 by default). AV is the avoidance factor (1 by default).

In a second step expected concentrations are calculated, assuming a default excretion factor of 0.3. In a third step, the avoidance factor (AV) is set to 0.9 and the fraction of the diet obtained in the treated area (PT) is set to 0.8.

Table 0-1: Brodifacoum concentrations in non-target birds following a single uptake of The product

Species		Body weight (g)	Daily food intake (FIR) (g/d)[a]	Conc. of a.i. after single meal (mg/kg bw/d) (ETE)	Expected conc. after elimination[b] (mg/kg bw/d) (EC)	Expected conc. after elimination + reduced AV and PT[c] (mg/kg bw/d) (EC)
Tree sparrow	*Passer montanus*	22	7.6	17.27	12.09	8.71
Chaffinch	*Fringilla coelebs*	21.4	6.42	15.00	10.50	7.56
Wood pigeon	*Columba palumbus*	490	53.1	5.42	3.79	2.73
Pheasant	*Phasianus colchicus*	953	102.7	5.39	3.77	2.72

[a] *cf.* Table 3.1 of ESD PT 14
[b] Default excretion factor = 0.3
[c] AV = 0.9, PT = 0.8

For assessing the primary long-term situation, 5 days of exposure are assumed, considering excretion (30%). As a worst-case the parameter AV, PT and PD are all set to 1. In a second step, AV is set to 0.9 and PT is set to 0.8.

Table 0-2: Brodifacoum concentrations in non-target birds following 5 days of uptake of The product (AV = avoidance factor, PT = fraction of diet obtained in treated area)

Species	Expected concentration after 5 days of exposure with excretion factor = 0.3, AV = 1, PT = 1 (mg/kg bw)[a]	Expected concentration after 5 days of exposure with excretion factor = 0.3, AV = 0.9, PT = 0.8 (mg/kg bw)[a]
Tree sparrow	33.53	24.14
Chaffinch	29.12	20.96
Wood pigeon	10.52	7.57
Pheasant	10.46	7.53

[a] calculation according to equation 21 in the ESD

Non compartment specific exposure relevant to the food chain (secondary poisoning)

According to the ESD PT 14, the secondary poisoning hazard following sewage system applications is relevant only if poisoned rats or cockroaches move to the surface. However, since cockroaches are predominately nocturnal and the species found in sewers will remain underground, they are no significant prey for birds.

Secondary poisoning hazard can also be ruled out when the rodenticide is used in fully enclosed spaces. If buildings are not fully closed, predators may occur inside buildings or hunt in the vicinity of a building, and are potential targets for secondary poisoning.

Calculations for secondary poisoning are undertaken according to the ESD PT 14 for predators eating the rodent carcasses and earthworms which have ingested the active substance absorbed to soil. Also consideration is required for predators eating fish which have been exposed to the active substance.

Calculation of concentration in rodents

According to the ESD PT 14, a feeding period of the rodents of 5 days has been taken into account. Concentrations in contaminated rodents have been calculated for the time point immediately after the last meal. The factor PD (fraction of food type in diet) is set to 0.2 (minimum factor for normal case), 0.5 (normal use situation), and 1.0 (worst case situation).

Regarding the elimination rate, the default of 0.3 supported by the ESD is adopted, which is in line with the procedure in the Assessment Report for brodifacoum. The concentrations in rodents have been assessed according to equation 19 of the ESD (for explanation of the parameter see above):

ETE = (FIR/BW)*C*AV*PT*PD (mg/kg bw/d) (eq. 19, ESD)

The value for FIR/BW is set to a default of 0.1, i.e., the food intake is 10% of the body weight.

The calculation of the concentration in rodents after 5 days of bait consumption, immediately after the last meal, follows the procedure:

Total daily consumption is 100% (PD =1.0, worst case situation). After the first meal on day 1 the rodenticide in the rat accounts for:

ETE = 0.1 * 50 * 1* 1* 1 = 5 mg/kg

The concentration for day 2 just before the second meal is assessed, using a value of 0.3 for elimination (El).

EC_2 = 5 * (1 - 0.3) = 3.5 mg/kg (eq. 20, ESD)

For the following days the concentrations are:

EC_3 = (EC2 +ETE) * (1-0.3) = (3.5 +5) * 0.7 = 5.95 mg/kg

EC_4 = (EC3 +ETE) * (1-0.3) = (5.95 +5) * 0.7 = 7.665 mg/kg

EC_5 = (EC4 +ETE) * (1-0.3) = (7.665 +5) * 0.7 = 8.866 mg/kg

So the concentration in the rat before its last meal on the 5th day is 8.866 mg/kg. Once the ETE is added this results in **13.87 mg/kg**, i.e., this is the concentration **after** the last meal on the 5th day. The following table gives a summary of the expected brodifacoum concentrations in the rodents, using PD values of 1.0, 0.5 and 0.2.

Table 0-1: Brodifacoum concentrations in rodents after 5 days of The product uptake, immediately after the last meal (PD = fraction of food type in diet)

	PD = 1.0	**PD = 0.5**	**PD = 0.2**
Expected concentration in rodents immediately after a last meal on day 5 (mg a.i./kg rat, value corresponds to PEC_{oral} mg/kg food)	13.87	6.93	2.77

In the following table, concentrations in weasel, kestrel, and some other birds and mammals have been calculated after a single day of exposure for PD = 1 (rodents diet consisted entirely of The product). The parameter F_{rodent} (fraction of poisoned rodents in predator's diet) is set to 0.5.

Table 0-2: Brodifacoum concentrations in non-target mammals and birds consuming contaminated rodents

Species	**Body weight [g]**	**Daily mean food intake [g]**	**Rodents caught on day 5 after their last meal**	
			Brodifacoum consumed by non-target animal [mg]	**Concentration in the non-target animal [mg/kg bw]**
Barn owl (*Tyto alba*)	294	72.9	0.51	1.72
Kestrel (*Falco tinnunculus*)	209	78.7	0.55	2.61
Little owl (*Athene noctua*)	164	46.4	0.32	1.96
Tawny owl (*Strix aluco*)	426	97.1	0.67	1.58

Fox (*Vulpes vulpes*)	5700	520.2	3.61	0.63
Polecat (*Mustela putorius*)	689	130.9	0.91	1.32
Stoat (*Mustela erminea*)	205	55.7	0.39	1.88
Weasel (*Mustela nivalis*)	63	24.7	0.17	2.72

Calculation of the concentration in fish

The concentration of brodifacoum in fish (food) of fish-eating predators ($PEC_{oral,\ predator}$) is only relevant for the application of The product in the sewer system since only this scenario results in emissions to surface water (via STP). The $PEC_{oral,\ predator}$ (mg/kg wet fish) is calculated from the annual average PEC for surface water, divided by a factor of 2 since it is assumed, that only 50% of the diet comes from the local area (*cf.* TGD, 2003).

$PEC_{oral,\ predator} = PEC_{water} * BCF_{fish} * BMF$ (eq. 76, TGD, 2003)

The bioconcentration factor (BCF_{fish}) is calculated with the aid of equation 75 of the TGD, using a log P_{ow} of 6.12. The biomagnification factor is set to 10 according to the TGD.

The following table summarises the $PEC_{oral,\ fish}$ for the scenario 'sewage system'.

Table 0-3: Predicted brodifacoum concentrations in fish

		Tier 1[a]	Tier 2[b]
Input			
PEC_{water}	Annual average local PEC in surface (mg/l) divided by 2	2.74×10^{-9}	1.17×10^{-9}
BCF_{fish}	Bioconcentration factor in fish (l/kg wet fish)	36134	36134
BMF	Biomagnification factor	10	10
Output			
$PEC_{oral,\ fish}$	Predicted environmental concentration in fish (mg/kg wet fish)	$9.89 * 10^{-4}$	$4.22 * 10^{-4}$

[a] Product specific application data and default value for release

[b] Product specific application data and refined metabolism

Calculation of concentration in earthworms

The $PEC_{oral,predator}$ is calculated according to the TGD:

$PEC_{oral,predator} = C_{earthworm}$ (eq 80, TGD, 2003)

$C_{earthworm} = (BCF_{earthworm}*C_{porewater} + C_{soil}*F_{gut}*CONV_{soil})/ (1+F_{gut}*CONV_{soil})$ (eq 82c, TGD 2003)

$BCF_{earthworm} = (0.84 + 0.012Kow)/RHO_{earthworm}$ (eq 82d, TGD, 2003)

Where $RHO_{earthworm}$ is 1 by default.

So, $BCF_{earthworm} = (0.84 + 0.012*1318257)/1 = 15820$ $l/kg_{wwtearthworm}$

For PEC_{soil} the PEClocal is used with respect to sludge applications. The concentration in soil is averaged over a period of 180 days. As for the aquatic food chain it is assumed, that just 50% of the diet comes from the affected region. Hence, the PEC_{soil} averaged over 180 days as well as the $PEC_{porewater}$ are divided by 2.

According to the TGD soil concentrations due to sewage sludge (indirect emissions) are the basis for calculating potential concentrations in earthworms. However, in the current risk assessment a direct intake of brodifacoum in soils is applicable for the scenario 'in and around buildings'. EUSES 2.1.1 does not give a result for potential concentrations in earthworms for this scenario and it becomes obvious, that the required input parameter for calculating the $PEC_{oral,earthworm}$ according to equation 81 of the TGD can not be assessed for the respective scenarios. Anyway, the attempt is made to calculate $PEC_{oral,earthworm}$ for the direct soil intake, however, figures should be interpreted with care. Soil concentrations taken for the calculation represent a brodifacoum intake within a soil mixing depth of just 10 cm. Degradation has not been considered. However, concentrations are halved since the TGD assumes only 50% of the soil uptake by earthworm to origin from the contaminated area.

The parameter F_{gut} is set to 0.1 (kg dwt/kg wwt) and the conversion factor for soil concentration wet-dry weight ($CONV_{soil}$) is set to 1.13 kg wwt/kg dwt.

The $PEC_{oral,earthworm}$ are summarized in the following table.

Table 0-4: Brodifacoum concentrations in earthworms

		Tier 1[a]	Tier 2[b]
Input			
C_{soil} sewer system	Concentration in soil averaged over a period of 180 days and divided by 2 (mg/kg wwt)	8.70×10^{-5}	3.70×10^{-5}
C_{soil} building	Concentration in soil immediately after intake divided by 2 (mg/kg wwt)	0.0056	0.0050
$BCF_{earthworm}$	Bioconcentration factor in earthworm (L/kg wet fish)	15820	15820
$C_{porewater}$ sewer system	Concentration in porewater (mg/L) divided by 2	5.35×10^{-7}	2.29×10^{-7}
$C_{porewater}$ building	Concentration in porewater (mg/L) divided by 2	3.48×10^{-5}	3.10×10^{-5}
F_{gut}	Fraction of gut loading in worm (kg dwt/kg wwt)	0.1	0.1
$CONV_{soil}$	Conversion factor for soil concentration wet-dry weight soil (kg wwt/kg dwt)	1.13	1.13
Output			
$PEC_{oral,\ earthworm}$ sewer	Predicted environmental concentration in earthworm (mg/kg wet earthworm)	0.00763	0.00326
$PEC_{oral,\ earthworm}$ building	Predicted environmental concentration in earthworm (mg/kg wet	0.495	0.441

	earthworm)		

[a] Product specific application data and default value for release

[b] Product specific application data and refined metabolism

Environmental effects assessment

Aquatic compartment

Ecotoxicological studies with The product on aquatic organisms are not required as the toxicity of the product is expected to be entirely driven by that of the active substance.

As no substances of concern or active substances other than brodifacoum have been identified in The product, the toxicity of product can be derived from the data available from the active substance. This is in line with the conclusion drawn in Document IIB of the Assessment Report.

Atmosphere

Not applicable.

Terrestrial compartment

According to the TNsG on data requirements (Ch. 2.5, Part B), additional data is required with the formulation if this is intended for outdoor use in form of baits, granulates or powder. However, as no substances of concern or active substances other than brodifacoum have been identified in The product, the toxicity of product can be derived from the data available from the active substance. This is in line with the conclusion drawn in Document IIB of the Assessment Report.

Non compartment specific effects relevant to the food chain (secondary poisoning)

In frame of the Annex I inclusion of brodifacoum, the applicant had submitted several studies, dealing with secondary poisoning of non target vertebrates. The studies have been discussed in detail in Section 4.2.4 of Doc. IIA of the CA Report. The studies indicate that secondary toxicity is dependent on a variety of factors, related to exposure (like dose and treatment levels, habitat of the non-targets) and effect (species and condition of the animal).

ANNEX VII: Residue Calculations

No residue calculations are required as Saphir Paste is a ready to use bait, which is used to kill rats and mice. Saphir Paste will not come into contact with the human food chain. The bait may be used indoors, outdoors, in open areas and dumps when used by professionals and indoors and outdoors around buildings when used by amateurs. The bait will be placed at protected bait points in dry locations, protected from the weather to help prevent access by non target animals.