February 2020

Following applications for major changes, the authorisations of
- Mosquito Milk Roll On 30% DEET
- Mosquito Milk Roll On 50% DEET
- Mosquito Milk Spray 50% DEET
were changed with respect to the biocidal claim.

We refer to the file: 'Addendum to PAR February 2019'

March 2017

Following an application for an administrative change, for the authorisation of
- Mosquito Milk Roll On 30% DEET
the manufacturer of the biocidal product was changed.

March 2016

Following applications for minor changes, the authorisations of
- Mosquito Milk Spray 30% DEET
- Mosquito Milk Spray 50% DEET
were changed with respect to the packaging sizes.

We refer to the file: 'Addendum to PAR March 2016'

March 2015

Following applications for minor changes, the authorisations of
- Mosquito Milk Spray 30% DEET
- Mosquito Milk Spray 50% DEET
- Mosquito Milk Roll On 30% DEET
- Mosquito Milk Roll On 50% DEET
were changed with respect to the shelf life and the packaging types. In addition, the composition of Mosquito Milk Roll On 30% DEET has changed.

We refer to the file: 'Addendum to PAR March 2015'

Furthermore, the following amendments to the environmental and toxicological sections of the PAR were made:

<u>Environment:</u>
- H412 was included in the C&L

<u>Toxicology:</u>
- the indication of the age in the use instructions is changed from <12 years and <17 years to:
'Not for use on children under 13 years' or 'Not for use on children under 18 years'

Product Assessment Report

Mosquito Milk DEET Products

Including:

Mosquito Milk Gel 24.5% DEET

Mosquito Milk Gel 50% DEET

Mosquito Milk Spray 30% DEET

Mosquito Milk Spray 50% DEET

Mosquito Milk Roll On 30% DEET

Mosquito Milk Roll On 50% DEET

August 1th 2014

Product name	Internal registration/file no:	Authorisation no:
Mosquito Milk Gel 24.5% DEET	20120032	14283N
Mosquito Milk Gel 50% DEET	20120031	14284N
Mosquito Milk Spray 30% DEET	20120095	14285N
Mosquito Milk Spray 50% DEET	20120033	14286N
Mosquito Milk Roll On 30% DEET	20120096	14288N
Mosquito Milk Roll On 50% DEET	20120035	14289N
Granting date/entry into force of authorisation	01-08-2014	
Expiry date of authorisation/ registration:	01-08-2024	
Active ingredient:	DEET	
Product type:	19	

Biocidal product assessment report related to product authorisation under Regulation (EU) 528/2012

Contents

1 General information about the product applications

1.1 Applicant

Company Name:	[redacted]
Address:	[redacted]
City:	[redacted]
Postal Code:	[redacted]
Country:	[redacted]
Telephone:	[redacted]
Fax:	[redacted]
E-mail address:	[redacted]

1.1.1 Person authorised for communication on behalf of the applicant

Name:	[redacted]
Function:	[redacted]
Address:	[redacted]
City:	[redacted]
Postal Code:	[redacted]
Country:	[redacted]
Telephone:	[redacted]
Fax:	[redacted]
E-mail address:	[redacted]

1.2 Current authorisation holder

Not applicable

1.3 Proposed authorisation holder

Company Name:	[redacted]
Address:	[redacted]
City:	[redacted]
Postal Code:	[redacted]
Country:	[redacted]
Telephone:	[redacted]
Fax:	[redacted]
E-mail address:	[redacted]
Letter of appointment	n.a.

for the applicant to represent the authorisation holder provided (yes/no):	

1.4 Information about the product application

Application received:	10-1-2012
Application reported complete:	15-8-2012
Type of application:	Application for first authorisation

1.5 Information about the biocidal products

1.5.1 General information

Product type:	19
Composition of the product (identity and content of active substance(s) and substances of concern; full composition see confidential annex):	See below for specific information on each product.
Formulation type:	See below for specific information on each product.
Ready to use product (yes/no):	All products are ready to use.
Is the product the very same (identity and content) to another product already authorised under the regime of directive 98/8/EC (yes/no); If yes: authorisation/registration no. and product name: or Has the product the same identity and composition like the product evaluated in connection with the approval for listing of active substance(s) on to Annex I to directive 98/8/EC (yes/no):	No

1.5.2 Information on the intended use(s)

Overall use pattern (manner and area of use):	Topical application on exposed body parts. Area of use: indoors in well ventilated areas and outdoors.

Target organisms:	*Mosquitoes (Culicidae)* *Culex* spp. *Anopheles* spp. *Aedes* spp.
Category of users:	Non-professional
Directions for use including minimum and maximum application rates, application rates per time unit (e.g. number of treatments per day), typical size of application area:	Apply sparingly on the uncovered parts of the body. Spread equally. Do not apply near eyes, lips and damaged skin. Use ca. 1 ml per 600 cm^2 of skin (corresponds with 1 ml per adult male arm) For use on face, spray into palm of hand before applying. Frequency: 1 time a day.
Potential for release into the environment (yes/no):	Yes
Potential for contamination of food/feedingstuff (yes/no)	No
Proposed Label:	See SPC for each product.
Use Restrictions:	**All Mosquito Milk DEET products:** • Do not breathe spray • Use only outdoors or in a well-ventilated area **Mosquito Milk Gel 24.5% DEET, Mosquito Milk Roll On 30% DEET, Mosquito Milk Spray 30% DEET:** • Do not use on children < 12 years old **Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 50% DEET and Mosquito Milk Gel 50% DEET:** • Do not use on children < 17 years old

1.5.3 Information on active substance

Active substance chemical name:	IUPAC name: *N,N*-diethyl-*m*-toluamide Common name (non-ISO): DEET
CAS No:	134-62-3
EC No:	205-149-7 (EINECS)
Purity (minimum, g/kg or g/l):	970g/kg
Inclusion directive:	2010/51/EU
Date of inclusion:	1 August 2012
Is the active substance equivalent to the active substance listed in Annex I to 98/8/EC (yes/no):	Yes: same source as evaluated for approval of the substance.
Manufacturer of active substance(s) used in the biocidal product:	Please refer to the SPC.

1.5.4 Information on the substance of concern

Substance chemical name	Ethanol
CAS No:	64-17-5
EC No :	200-578-6 (EINECS)
Purity (minimum, g/kg or g/l):	~99.9%, denaturated with 0.1% *tert*-butyl alcohol and 10ppm (0.001%) bitrex
Typical concentration (minimum and maximum, g/kg, or g/l):	335 - 369g/kg
Relevant toxicological/ecotoxicological information:	See paragraph 2.7.1.2 (human tox) and paragraph 1.6.1 (environmental tox)
Original ingredient (trade name):	Ethyl alcohol absolute

Other co-formulants in the formulations were not considered substances of concern, as they are present at concentrations below the cut-off criterion of 0.1% for human hazard assessment and 1% or (0.1/M)% for environmental hazard assessment and/or are covered by the classification and labelling of the products.

1.5.5 Provision on preservatives

The products Mosquito Milk Gel 24.5% DEET, Mosquito Milk Gel 50% DEET and Mosquito Milk Roll On 30% DEETcontain preservatives identified as PT6 active substances which are not included in the review programme. The evaluations of these products were started in 2012 under the BPD, and the Dutch CA has accepted these formulations, following an agreement that was reached in the PAMRFG concerning acceptance of these preservatives. However, the applicant has been informed that an application for replacement of these preservatives has to be submitted to Ctgb within 6 months after the start date of the authorisations. The CMSs will be informed on the change of composition.
This provision is not relevant for the products Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 30% DEET and Mosquito Milk Spray 50% DEET.

1.6 Documentation

1.6.1 Data submitted in relation to product application

New studies concerning the products have been submitted with respect to physical-chemical properties of the product, analytical methods, toxicity and efficacy. The studies are listed in Annex 2.

No new studies concerning the Mosquito Milk DEET products have been submitted with respect to the environmental aspect. According to the applicant the Mosquito Milk DEET products contain only one active substance (DEET and no substances of concern for the environment). Therefore environmental effects of the products can be extrapolated from the environmental effect studies on DEET.

1.6.2 Access to documentation

The applicant has submitted a letter of access of the owner of the data on the active substance DEET submitted for the inclusion of DEET into Annex I of Directive 98/8/EC.

2 Summary of the product assessment

2.1 Identity related issues

General information

This assessment report contains the evaluation of six products based on the active substance DEET (*N,N*-diethyl-*m*-toluamide). DEET was evaluated and included in Annex I of Directive 98/8/EC for PT19 as part of the review programme for existing substances. The manufacturing site of DEET was evaluated as part of the EU review.

Product specific information

Product name	DEET content (%w/w)*		Substance of concern
	TGAI	PAI	
Mosquito Milk Gel 24.5% DEET	26.0	25.3	Ethanol
Mosquito Milk Gel 50% DEET	50	48.5	Ethanol
Mosquito Milk Spray 30% DEET	31.9	30.9	Ethanol
Mosquito Milk Spray 50% DEET	50	48.5	Ethanol
Mosquito Milk Roll On 30% DEET	31.9	31.0	Ethanol
Mosquito Milk Roll On 50% DEET	50	48.5	Ethanol

** TGAI = technical active ingredient with a minimum purity of 97%; PAI = pure active ingredient. Values rounded to a maximum of three significant digits.*

2.2 Classification, labelling and packaging

2.2.1 Proposed classification based on Directive 1999/45/EC

See Annex 5 for classification according to Directive 1999/45/EC.

2.2.2 Proposed classification based on Regulation EC 1272/2008

Based on the profile of the substances the provided toxicology of the preparations, the characteristics of the co-formulants, the method of application and the risk assessment for the operator, the following labeling of the preparations is proposed:

Mosquito Milk Gel 24.5% DEET

The identity of all substances in the mixture that contribute to the classification of the mixture *:			
-			
Pictogram:	GHS02	Signal word:	Danger
	GHS05		
H-statements:	H226	Flammable liquid and vapour.	
	H318	Causes serious eye damage.	
P-statements:	P101	If medical advice is needed, have product container or label at hand.	
	P102	Keep out of reach of children	
	P210	Keep away from heat/sparks/open flames/hot surfaces. – No smoking.	
	P260	Do not breathe vapour	
	P271	Use only outdoors or in a well-ventilated area	
	P305+P351+P338+P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.	
Supplemental Hazard information:	EUH208	Contains citronellal. May produce an allergic reaction.	
Child-resistant fastening obligatory?			No
Tactile warning of danger obligatory?			No

* according to Reg. (EC) 1272/2008, Title III, article 18, 3 (b)

Mosquito Milk Gel 50% DEET

The identity of all substances in the mixture that contribute to the classification of the mixture *:			
-			
Pictogram:	GHS02	Signal word:	Danger
	GHS05		
	GHS07		
H-statements:	H226	Flammable liquid and vapour.	
	H302	Harmful if swallowed	
	H318	Causes serious eye damage.	
P-statements:	P102	Keep out of reach of children.	
	P210	Keep away from heat/sparks/open flames/hot surfaces. – No smoking.	
	P260	Do not breathe vapour	
	P271	Use only outdoors or in a well-ventilated area	
	P301+P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.	
	P305+P351+P338+P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.	
Supplemental Hazard information:	EUH208	Contains geraniol and citronellal. May produce an allergic reaction.	
Child-resistant fastening obligatory?			No
Tactile warning of danger obligatory?			Yes

* according to Reg. (EC) 1272/2008, Title III, article 18, 3 (b)

Mosquito Milk Spray 30% DEET

The identity of all substances in the mixture that contribute to the classification of the mixture *:			
-			
Pictogram:	GHS02	Signal word:	Warning
	GHS07		
H-statements:	H226	Flammable liquid and vapour.	
	H319	Causes serious eye irritation.	
P-statements:	P102	Keep out of reach of children.	
	P210	Keep away from heat/sparks/open flames/hot surfaces. – No smoking.	
	P260	Do not breathe spray.	
	P270	Do not eat, drink or smoke when using this product.	
	P271	Use only outdoors or in a well-ventilated area.	
	P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.	
Supplemental Hazard information:	-	-	
Child-resistant fastening obligatory?			No
Tactile warning of danger obligatory?			No

* according to Reg. (EC) 1272/2008, Title III, article 18, 3 (b)

Mosquito Milk Spray 50% DEET

The identity of all substances in the mixture that contribute to the classification of the mixture *:			
-			
Pictogram:	GHS02	Signal word:	Danger
	GHS07		
H-statements:	H225	Highly flammable liquid and vapour.	
	H319	Causes serious eye irritation	
P-statements:	P102	Keep out of reach of children	
	P210	Keep away from heat/sparks/open flames/hot surfaces. – No smoking.	
	P260	Do not breathe spray.	
	P270	Do not eat, drink or smoke when using this product	
	P271	Use only outdoors or in a well-ventilated area.	
	P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.	
Supplemental Hazard information:	EUH208	Contains geraniol. May produce an allergic reaction.	
Child-resistant fastening obligatory?			No
Tactile warning of danger obligatory?			Yes

* according to Reg. (EC) 1272/2008, Title III, article 18, 3 (b)

Mosquito Milk Roll On 30% DEET

The identity of all substances in the mixture that contribute to the classification of the mixture *:			
-			
Pictogram:	GHS02	Signal word:	Danger
	GHS05		
H-statements:	H226	Flammable liquid and vapour.	
	H318	Causes serious eye damage.	
P-statements:	P101	If medical advice is needed, have product container or label at hand.	
	P102	Keep out of reach of children.	
	P210	Keep away from heat/sparks/open flames/hot surfaces. – No smoking.	
	P260	Do not breathe vapour	
	P271	Use only outdoors or in a well-ventilated area.	
	P305+P351+P338+P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.	
Supplemental Hazard information:	-		
Child-resistant fastening obligatory?			No
Tactile warning of danger obligatory?			No

* according to Reg. (EC) 1272/2008, Title III, article 18, 3 (b)

Mosquito Milk Roll On 50% DEET

The identity of all substances in the mixture that contribute to the classification of the mixture *:			
-			
Pictogram:	GHS02	Signal word:	Danger
	GHS05		
H-statements:	H225	Highly flammable liquid and vapour.	
	H318	Causes serious eye damage.	
P-statements:	P101	If medical advice is needed, have product container or label at hand.	
	P102	Keep out of reach of children.	
	P210	Keep away from heat/sparks/open flames/hot surfaces. – No smoking.	
	P260	Do not breathe vapour	
	P271	Use only outdoors or in a well-ventilated area.	
	P305+P351+P338+P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.	
Supplemental Hazard information:	EUH208	Contains geraniol. May produce an allergic reaction.	
Child-resistant fastening obligatory?			No
Tactile warning of danger obligatory?			Yes

* according to Reg. (EC) 1272/2008, Title III, article 18, 3 (b)

2.2.3 Packaging of the biocidal products

Product specific information concerning packaging

Product	Container	Opening	Closure
Mosquito Milk Gel 24.5% DEET	75 mL HDPE/LDPE tube.	22 mm	PP dispenser
Mosquito Milk Gel 50% DEET	100 mL LDPE/HDPE tube.	22 mm	PP dispenser
Mosquito Milk Spray 30% DEET	75 mL PP flask.	13 mm	PP cap and PP/PE/steel/alu spray pump.
Mosquito Milk Spray 50% DEET	75 mL PP flask.	13 mm	PP cap and PP/PE/steel/alu spray pump.
Mosquito Milk Roll On 30% DEET	50 mL glass roll-on flask.	30 mm	PP cap and PE fitment with PP ball.
Mosquito Milk Roll On 50% DEET	50 mL HDPE flask.	30 mm	PP cap and PE fitment with PP ball.

The shelf-life of the products is considered to be 2 years. Please refer to chapter 2.3.1 for a detailed evaluation.

2.3 Physico/chemical properties and analytical methods

The applicant has access to the active substance dossier. The physical and chemical properties for the active substance DEET are detailed in this dossier, Doc IIIA, Section 3.

Table 1a: Physico-chemical properties of the biocidal product: Mosquito Milk Gel 24.5% DEET

	Method	Purity/Specification	Results	Reference
Physical state and nature	Visual examination	24.5 % DEET, batch: G2399	Opaque gel	[redacted] 2013g
Colour	Visual examination	24.5 % DEET, batch: G2399	Off white	[redacted] 2013g
Odour	Organoleptic examination	Not reported	Mild, pleasant odour	No reference given, study report not submitted.
Explosive properties	Statement	n.a.	Considering the molecular structures and the composition of the formulation, explosive properties are not expected.	[redacted] 2006b
Oxidizing properties	Statement	n.a.	Considering the molecular structures and the composition of the formulation, oxidizing properties are not expected.	[redacted], 2006b
Flash point	EC method A.9	24.5 % DEET, batch: A3534	33.8 °C at 99.5 kPa	[redacted] 2011o
Autoflammability	EC method A.15	24.5 % DEET, batch: A3534	415°C at 99.5 kPa	[redacted] 2011p
Other indications of flammability			n.a.	
Acidity / Alkalinity	SOP QC-4002/02	24.5 % DEET, batch: G2399	pH 10 % solution = 5.2 ± 1	[redacted] 2013g

	Method	Purity/Specification	Results	Reference
Relative density / bulk density	EC method A.3, GLP	24.5 % DEET, batch: E1570	0.9412 at 20 °C	[redacted], 2006b
Storage stability – stability and shelf life	Various	24.5 % DEET, batch: G2399	Storage for 5 months at 54 °C and 60 % RH in HDPE/LDPE. Tested properties: pH, a.i. content, appearance, viscosity, density. For details see table 9b	[redacted] 2013g
			No real-time shelf life study submitted.	
Effects of temperature			See above	
Effects of light			n.a.	
Reactivity towards container material			See above	
Technical characteristics in dependence of the formulation type			n.a.	
Compatibility with other products			n.a.	
Surface tension			n.a.	
Viscosity	Brookfield viscometer	24.5 % DEET, batch: G2399	8756 mPa.s (20°C)	[redacted] 2013g
Particle size distribution			n.a.	

Table 1b – storage stability data (at 54°C, 60%RH, in 75mL gel tube)

t (months)	0	1/2	1	2	3	5
DEET content (%w/v)	24.43	25.29	26.38	25.26	26.30	26.42
pH	5.2	4.7	4.9	4.8	4.8	5.0
Density (mg/mL)	944	955	945	925	945	945
Viscosity (mPa.s)	8756	8300	7905	7500	7480	7240

Table 2a: Physico-chemical properties of the biocidal product: Mosquito Milk Gel 50% DEET

	Method	Purity/Specification	Results	Reference
Physical state and nature	Visual examination	50 % DEET, batch: A3631	Transparent gel	[redacted], 2013h
Colour	Visual examination	50 % DEET, batch: A3631	Slightly yellow	[redacted] 2013h
Odour	Organoleptic examination	Not reported	Mild, pleasant odour	No reference given, study report not submitted.
Explosive properties	Statement	n.a.	Considering the molecular structures and the composition of the formulation, explosive properties are not expected.	No reference given
Oxidizing properties	Statement	n.a.	Considering the molecular structures and the composition of the formulation, oxidizing properties are not expected.	No reference given
Flash point	EC method A.9	50 % DEET, batch: A3631	32.7 °C at 100 kPa	[redacted] 2011q

	Method	Purity/Specification	Results	Reference
Autoflammability	EC method A.15	50 % DEET, batch: A3631	410 °C at 100 kPa	[redacted] 2011r
Other indications of flammability			n.a.	
Acidity / Alkalinity	SOP QC-4002/02	50 % DEET, batch: A3631	pH 10 % solution = 5.2 ± 1	[redacted] 2013h
Relative density / bulk density	EC method A.3	50 % DEET, batch: A3631	0.9543 at 20 °C	[redacted] 2011s
Storage stability – stability and shelf life	Various	50 % DEET, batch: A3631	Storage for 5 months at 54 °C and 60 % RH in HDPE/LDPE. Tested properties: pH, a.i. content, appearance, viscosity, density. For details, see table 10b	[redacted] 2013h
Effects of temperature			See above	
Effects of light			n.a.	
Reactivity towards container material			See above	
Technical characteristics in dependence of the formulation type			n.a.	
Compatibility with other products			n.a.	
Surface tension			n.a.	
Viscosity	Brookfield viscometer	50 % DEET, batch: A3631	10200mPa.s (20°C)	[redacted] 2013h
Particle size distribution			n.a.	

Table 2b – storage stability data (at 54°C, 60%RH, in 75mL polypropylene container)

t (months)	0	1/2	1	2	3	5
DEET content (%w/v)	51.2	51.0	51.3	50.6	51.4	51.6
pH	5.2	5.3	5.2	5.3	5.2	5.2
Density (mg/mL)	945	943	944	941	942	946
Viscosity (mPa.s)	10200	9900	9700	9400	9300	9200

Table 3a: Physico-chemical properties of the biocidal product: Mosquito Milk Spray 30% DEET

	Method	Purity/Specification	Results	Reference
Physical state and nature	Visual examination	Not reported	Transparent liquid*	No reference given, study report not submitted.
Colour	Visual examination	Not reported	Weak yellow*	No reference given, study report not submitted.
Odour	Organoleptic examination	Not reported	Mild, pleasant* odour	No reference given, study report not submitted.
Explosive properties	Statement	n.a.	Considering the molecular structures and the composition of the formulation,	

	Method	Purity/Specification	Results	Reference
			explosive properties are not expected.	
Oxidizing properties	Statement	n.a.	Considering the molecular structures and the composition of the formulation, oxidizing properties are not expected.	
Flash point	EC A9, GLP	Batch B3782, 28.99% DEET	Pensky-Martens closed cup: 29°C	[redacted] 2013a
Autoflammability	Statement	n.a.	The product does not contain any self-igniting components.	
Other indications of flammability			n.a.	
Acidity / Alkalinity	SOP QC-4002/02	Not reported	pH = 6.5 ± 1*	No reference given, study report not submitted.
	SOP 10.2/A	Not reported	pH: 6.42 (10%w/w)*	Anonymous (no date)
Relative density / bulk density	EC A3 (pycnometer), GLP	Batch B3782, 28.99% DEET	D_4^{20} = 0.9287	[redacted] 2013b
Storage stability – stability and shelf life			Not reported, study in progress.	
Effects of temperature			Not reported, study in progress.	
Effects of light			Not investigated. Product to be stored in the dark.	
Reactivity towards container material			Not reported, study in progress.	
Technical characteristics in dependence of the formulation type			n.a.	
Compatibility with other products			n.a.	
Surface tension			n.a.	
Viscosity			n.a.	
Particle size distribution			n.a.	

** The product is highly comparable to the 20% and 50% Spray products. It is considered acceptable that these properties are reported based on a summary only.*

Table 4a: Physico-chemical properties of the biocidal product: Mosquito Milk Spray 50% DEET

	Method	Purity/Specification	Results	Reference
Physical state and nature	Visual examination	50 % DEET, batch: A3523	Transparent liquid	[redacted] 2013c
Colour	Visual examination	50 % DEET, batch: A3523	Weak yellow	[redacted] 2013c
Odour	Organoleptic examination	Not reported	Mild, pleasant odour	No reference given, data from summary
Explosive properties	Statement	n.a.	Considering the molecular structures and the composition of the formulation, explosive properties are not expected.	No reference given
Oxidizing properties	Statement	n.a.	Considering the molecular	No reference given

	Method	Purity/Specification	Results	Reference
			structures and the composition of the formulation, oxidizing properties are not expected.	
Flash point	EC method A.9	50 % DEET, batch: A3452	18.7°C at 101.3 kPa	[redacted] 2011f
Autoflammability	EC method A.15	50 % DEET, batch: A3452	375°C at 100.7kPa	[redacted] 2011g
Other indications of flammability			n.a.	
Acidity / Alkalinity	SOP QC-4002/02	50 % DEET, batch: A3523	pH 10% solution = 7.6 ± 1	[redacted] 2013c
Relative density / bulk density	EC method A.3	50 % DEET, batch: A3452	0.9126 at 20 °C	[redacted] 2011h
Storage stability – stability and shelf life	In-house methods, CIPAC MT46.3	50 % DEET, batch: A3523	Storage for 5 months at 54 °C and 60 % RH in PP. Tested properties: pH, a.i. content, appearance, density. For details see table 4b	[redacted] 2013c
			No real-time shelf life study submitted.	
Effects of temperature			See above	
Effects of light			Not investigated. Product to be stored in the dark.	
Reactivity towards container material			See above	
Technical characteristics in dependence of the formulation type			n.a.	
Compatibility with other products			n.a.	
Surface tension			n.a.	
Viscosity			n.a.	
Particle size distribution			n.a.	

Table 4b – storage stability data (at 54°C, 60%RH, in 75mL polypropylene container)

t (months)	0	1/2	1	2	3	4	5
Appearance	Transparent weak yellow liquid	No change	No change	No change	No change	No change	No change
DEET content (%w/v)	49.92	49.98	50.16	50.57	50.97	No data	51.38
pH	7.6	7.5	7.3	7.1	7.1	No data	6.7
Density (mg/mL)	900	899	900	905	904	No data	906

Table 5a: Physico-chemical properties of the biocidal product: Mosquito Milk Roll On 30% DEET

	Method	Purity/Specification	Results	Reference
Physical state and nature	Visual examination	Batch G2333	Opaque liquid	[redacted] 2013e
Colour	Visual examination	Batch G2333	White	[redacted] 2013e
Odour	Organoleptic	Not reported	Mild, pleasant	No reference given,

	Method	Purity/Specification	Results	Reference
	examination		odour	data from summary
Explosive properties	Statement	n.a.	Considering the molecular structures and the composition of the formulation, explosive properties are not expected.	No reference given
Oxidizing properties	Statement	n.a.	Considering the molecular structures and the composition of the formulation, oxidizing properties are not expected.	No reference given
Flash point	Statement	n.a.	> 23 °C and at 100 kPa Product contains less flammable substances (ethanol) than comparable Roll On 20% DEET*	No reference given
Autoflammability	Statement	n.a.	No risk since all comparable products are harmless with regards to autoflammability	No reference given
Other indications of flammability			n.a.	
Acidity / Alkalinity	SOP QC-4002/02	Batch G2333	pH 10 % solution = 6.3 ± 1	[redacted] 2013e
Relative density / bulk density	In-house methode	Batch G2333	Density: 956 g/L at 20 °C	[redacted] 2013e
Storage stability – stability and shelf life	In-house methods.	Batch G2333	Storage for 36 months at 54 °C and 60 % RH in glass. Tested properties: pH, a.i. content, viscosity, density. For details see table 7b.	[redacted] 2013e
	In-house methods	30 % DEET, batches: 99D28, 99D29, 99H18	Study scheduled for 36 months storage at 54°C and 60% RH. For details see table 7c.	Anonymous (no date)
Effects of temperature			See above	
Effects of light			n.a.	
Reactivity towards container material			See above	
Technical characteristics in dependence of the formulation type			n.a.	
Compatibility with other products			n.a.	
Surface tension			n.a.	
Viscosity			190 mPa.s (20°C,	[redacted] 2013e

	Method	Purity/Specification	Results	Reference
			10rpm)	
Particle size distribution			n.a.	

** For the three Roll On products, two flash point studies are available. The 20% and 30% Roll ons contain a level of flammable constituent which would most likely lead to classification as a cat 3 flammable liquid (see confidential annex for composition details). For further discussion, please refer to the summary/discussion at the bottom of this chapter.*

Table 5b – storage stability data (at 54°C, 60%RH, in 50mL glass container)

t (months)	0	1	2	3	4	5	6	9	12
DEET content (%w/v)	30.2	31.2	30.6	30.1	30.6	30.7	30.7	30.3	30.4
pH	6.3	5.5	6.1	5.9	6.4	6.2	6.6	6.8	6.6
Density (g/L)	956	953	954	953	943	944	948	949	946
Viscosity (mPa.s)	190	130	70	60	65	65	63	62	60

Table 5c – storage stability data (at 54°C, 60%RH, in 50mL glass container in triplicate)

t (months)	0	1	2	3	4	5	6
DEET content (%w/v)	29.9 29.8 30.0	29.9 29.8 30.1	30.0 30.0 30.0	29.9 29.9 30.0	29.8 29.8 29.8	29.9 29.8 29.8	29.8 29.8 29.8
pH	6.9 7.0 7.1	6.8 7.0 7.0	6.9 6.9 7.0	6.9 7.0 6.9	6.8 6.8 7.0	6.8 6.9 7.1	6.7 6.8 6.9
Density (mg/mL)	941 940 940	941 940 940	941 940 940	941 940 940	941 939 940	941 939 939	941 940 939
Viscosity (mPa.s)	392 420 412	384 411 405	380 402 398	377 395 391	370 389 385	366 382 374	359 374 366
t (months)	9	12	15	18	24	30	36
DEET content (%w/v)	29.7 29.6 29.9	29.9 29.7 30.0	29.8 29.7 29.8	29.7 29.8 29.8	29.7 29.6 29.8	29.6 29.5 29.7	29.5 29.5 29.7
pH	6.8 6.7 6.8	6.7 6.8 6.9	6.5 6.7 6.8	6.7 6.8 6.9	6.6 6.7 7.0	6.7 6.8 6.9	6.6 6.7 6.9
Density (mg/mL)	940 940 939	941 939 939	940 939 939	940 939 939	940 938 938	940 938 939	940 938 938
Viscosity (mPa.s)	342 362 354	330 350 341	312 330 322	301 319 304	280 303 289	266 287 265	210 263 239

Table 6a: Physico-chemical properties of the biocidal product: Mosquito Milk Roll On 50% DEET

	Method	Purity/Specification	Results	Reference
Physical state and nature	Visual examination	Not stated	Viscous liquid	[redacted] 2013f
Colour	Visual examination	Not stated	White, opaque	[redacted] 2013f
Odour	Organoleptic examination	Not stated	Mild, pleasant odour	No reference given, study report not submitted.
Explosive properties	Statement	n.a.	Considering the molecular structures and the composition of the formulation, explosive properties are not expected.	No reference given
Oxidizing properties	Statement	n.a.	Considering the molecular	No reference given

	Method	Purity/Specification	Results	Reference
			structures and the composition of the formulation, oxidizing properties are not expected.	
Flash point	EC method A.9	50 % DEET, batch: A3584	18.7 °C at 100 kPa	[redacted] 2011l
Autoflammability	EC method A.15	50 % DEET, batch: A3584	400 °C at 100 kPa	[redacted] 2011m
Other indications of flammability			n.a.	
Acidity / Alkalinity	SOP QC-4002/02	Not stated	pH 10 % solution = 6.6 ± 1	[redacted] 2013f
Relative density / bulk density	EC method A.3	50 % DEET, batch: A3584	0.9195 at 20 °C	[redacted] 2011n
Storage stability – stability and shelf life	In-house methods	50 % DEET, batch: H2552	Storage for 5 months at 54 °C and 60 % RH in HDPE. Tested properties: pH, a.i. content, appearance, density. See table 8b for details.	[redacted] 2013f
			No real-time shelf life study submitted.	[redacted] 2013f
Effects of temperature			See above	
Effects of light			n.a.	
Reactivity towards container material			See above	
Technical characteristics in dependence of the formulation type			n.a.	
Compatibility with other products			n.a.	
Surface tension			n.a.	
Viscosity	Brookfield viscometer		2020 mPa.s (20°C)	[redacted] 2013f
Particle size distribution			n.a.	

Table 6b – storage stability data (at 54°C, 60%RH, in HDPE)

t (months)	0	1	2	3	4	5
DEET content (%w/v)	49.9	49.9	49.8	49.9	49.8	49.9
pH	6.6	6.6	6.7	6.7	6.6	6.6
Density (mg/mL)	933	932	931	931	932	931
Viscosity at 20°C (mPa.s)	2020	2100	2120	2080	2060	2020

Summary and discussion

Sufficient data was provided regarding the physical and chemical properties of the various DEET products. None of the products are auto-flammable, explosive or oxidising. The products are all considered flammable.

Because the products are all ready-to-use, no data on technical properties is considered required.

Shelf-life
For all products applied for, stability data was provided in the packaging proposed for the European market, with the exception of the 30% DEET Spray. Generally speaking, a shelf-life of at least two years for all products is considered supported because of the properties of the individual components; none of the components are sensitive to hydrolysis or are heat sensitive. The 30% Spray is sufficiently comparable to the 20% (authorised product 14219N) and 50% Spray to allow extrapolation of storage data.

A shelf-life of 5 years was claimed, however. Considering none of the reports contain detailed information on storage conditions (it is unlikely a RH of 60% can be maintained at 54 °C in an oven) and no real-time data is available for the various products, it is insufficiently clear whether the products will be physically stable for 5 years. Additional data should be submitted to support the claimed shelf-life of 5 years.

Flammability
The spray, roll on and lotion products contain flammable components and, based on their composition, are expected to be category 3 flammable liquids with a flashpoint between 23 and 60°C.

The 50% Spray and the 50% Roll on are reported to have flashpoints of 18.7°C, which is rather low, considering these products contain lower amounts of flammable constituents. It is however possible that the DEET content influences the ethanol vapour release, causing it to flash at lower temperatures. The 50% Spray and 50% Roll on are therefore considered to be category 2 flammable liquids.

2.3.1 Analytical methods

Analytical method for determination of the active substance in the biocidal product

The methods for the active substance DEET and the impurities in the technical active substance are detailed in the Annex I dossier, Doc IIIA, Section 4.1.

For all products, a GC-FID method was provided. However, validation includes the 20% DEET Roll On only ([redacted] 1995). See the Product Assessment Report of the NL-authorisation 14230N, Mosquito Milk 20% DEET Roll On.

Specificity
No interference based on representative chromatograms.
Linearity
r = 0.999, y = 1.364x - 0.007, n = 4x5 (5 sets of 4 measurements), range 60 – 140% of the theoretical concentration (100% = 2g/L).
Accuracy
Mean recovery 101.7%
Precision
0.545% SD, 0.54%RSD

The analytical method is based on dilution with acetone, using an amount of product to achieve 0.5g DEET in 25mL acetone, diluting 10 times with acetone, followed by filtration through a 0.45µm filter and injection into the GC system.

The substances that may interfere with the accurate determination in other products are mainly perfumes and solvents. In all products, the same perfumes and solvents are used and

the other components are not expected to cause problems during analysis. Therefore, it is considered acceptable to extrapolate validation data to all other DEET products.

Analyte	Principle of method
Technical active substance as manufactured:	GC-FID
Impurities in technical active substance:	GC-FID with GC-MS for confirmation of the identity
Active substance in the formulations	GC-FID (SOP QC 4001 04)

Residue analytical method in air
The EU review of DEET concluded that a residue analytical method for air may be required at the product authorisation stage. Considering the vapour pressure of DEET, a residue analytical method is required. The Technical Notes of Guidance state that an analytical method is required if the vapour pressure exceeds 0.01 Pa and/or the product is sprayed or occurrence in air is otherwise probable (IIA4.2b).

A new residue analytical method ([redacted] 2013) was developed and validated according to the latest legislatory requirements (SANCO/825/00 rev 8.1).

Method description
Air is drawn through a Tenax cartridge for 6 hours at 1L/min (360L air) at 35°C and 80%RH and at 20°C and 30%RH, followed by desorption with acetone and dilution in methanol, followed by analysis by HPLC-MS/MS with external standardisation.

Conditions

Instrument:	AB Sciex API 4000 (Analyst 1.4.2 software), Waters Acquity UPLC		
Mode:	Ion spray		
Column:	C18, 2.1mmx50mm, 1.7µm.		
Mobile phase A:	water:methanol:formic acid (90:10:0.1 v:v:v) + 0.01M ammonium formate		
Mobile phase B:	methanol:formic acid (100:0.1 v:v)		
Gradient	Time	%A	%B
	0	40	60
	1	40	60
	1.5	5	95
	2.5	5	95
	3	40	60
	4	40	60
Injection volume:	10 µL		
Flow rate:	0.5 mL/min		
Retention time:	approx. 0.6 minutes		

Validation data
The method validation is reported in table 2.3.2-1.

No matrix effect of the Tenax sorbent was observed.

Discussion and conclusion
The LC-MS/MS method submitted is acceptable and complies with SANCO/825/00 rev 8.1 and TNsG validation requirements. The required LOQ of 0.225mg/m^3, based on the lowest AEL_{acute} of 0.75 mg/kg bw/day, is met.

At 35°C and 80%RH breakthrough was detected at 10% of the nominal fortification rate. At 20°C and 30%RH, the breakthrough was 6%. The lab considers this to be acceptable. Considering the accuracy (87 – 110% overall, mean 90 – 103% per fortification level) and the repeatability (RSD ≤6% per fortification level) of the method are acceptable, the breakthrough volume of up to 10% still allows sufficiently accurate measurements and is therefore considered a minor deficiency.

In August 2011, RMS Sweden evaluated additional data, including a residue analytical method for water ([redacted] 2010). This method was validated using two transitions (192->119m/z and 192->91m/z). Considering the method for water is highly specific, the method for air can be considered highly specific as well. No additional confirmatory method is required.

Table 2.3.2-1 validation data for the residue analytical method for air

Target analyte	Method / equipment	Specificity	Linearity	Accuracy (min-max (mean)) (%)		Repeatability (% RSD)	Reference
DEET	LC-MS/MS 192->119 m/z 35°C, 80%RH	No interference	0.2 – 5ng/L, n=9 r^2 = 0.9994 y=799154x+ 54527.8	Control (n=2)	Not detected	-	[redacted] 2013
				0.225mg/m³	101 - 105 (103)	1.7 (n=5)	
				2.25mg/m³	87 – 93 (90)	3.3 (n=5)	
	LC-MS/MS 192->119 m/z 20°C, 30%RH	No interference		Control (n=2)	Not detected	-	
				0.225mg/m³	94 – 110 (101)	6.0 (n=5)	
				2.25mg/m³	97 - 105 (101)	2.8 (n=5)	

2.4 Risk assessment for Physico-chemical properties

General information

No new data relevant to the risk assessment was provided. None of the products applied are auto-flammable, explosive or oxidising. All products are classified as flammable (cat 3 flammable liquids). The 50% Spray and Roll on are cat 2 flammable liquids.

2.5 Effectiveness against target organisms

2.5.1 Function

Mosquito Milk DEET products are insect repellents (PT19) based on 24.5%-50% (w/w) DEET.

2.5.2 Organisms to be controlled and products, organisms or objects to be protected

Mosquito Milk DEET products are used to repel mosquitoes (Culicidae).
Mosquito Milk DEET products are insect repellents that should be applied to the skin of exposed body parts with the purpose to protect humans from mosquito bites.

2.5.3 Effects on target organisms

DEET (*N*,*N*-Diethyl-*m*-toluamide) repels mosquitoes (Culicidae) without time delay. The mechanism of action of the active ingredient is not revealed yet; however, its effectiveness is determined experimentally. Protection time provided by DEET is proportional to logarithmic dose concentrations, with increased duration of efficacy at higher concentrations; however, increase of duration of efficacy tends to plateau at a concentration of approximately 50% active substance.

Mosquito Milk products differ from the product described in the CAR of DEET since the concentrations of the active ingredient and the formulation of the products are different. Therefore new laboratory studies have been provided with *Culex quinquefasciatus*, *Aedes aegypti* and *Anopheles stephensi* mosquitoes using Mosquito Milk DEET products. The resulting complete protection times (CPT's) are presented in Table 2.5.3.0 and are discussed in the text below.

Data requirements

The TNsG on PT18 and PT19* states that to show efficacy of products intended for use as repellent on skin or clothes against mosquitoes, both simulated-use tests (arm-in-cage) and field studies showing repellence in the field need to be provided. However, this guidance was not available during the process of data collection by the applicant. In line with the draft note for guidance discussed at PA&MRFG** 'competent authorities should therefore accept data based on the latest available guidance published (or applicable) on the date when the applicant can reasonably be expected to start collecting data, and not require re-alignment to any subsequently published guidance for the purpose of granting authorisation or mutual recognition'.

In the TNsG on product evaluation*** that was available during data collection, no details are given on the data requirements for repellents. The CA of the Netherlands is of the opinion that the simulated-use laboratory tests (arm-in-cage studies) are worst case scenarios and that field studies can be waived under the prerequisite that comparable product, comparable dosage and a sufficient number of test persons are used in lab studies provided.

According to the TNsG on PT18 and PT19, personal repellents for outdoor use have to be tested against at least two mosquito species, in particular *Aedes* spp*.* and *Culex* spp*. Culex* spp. are the most common species in Europe and bites mainly between dusk and dawn. *Aedes* mosquitoes are less common in Europe and more common in tropical areas where they are vectors of Yellow fever. *Aedes* species are more aggressive than *Culex* spp and mostly active during the day. Mosquito Milk DEET products were therefore tested with arm-in-cage tests against both these mosquito species at the Swiss Tropical and Public Health Institute in 2011 according to WHO guidelines (WHOPES 2009.4). In addition also efficacy data were provided for Mosquito Milk DEET products against the malaria mosquito *Anopheles stephensi* in a variety of different clinical tests performed at the Institute of Tropical Medicine in Antwerp (ITMA).

References:

* BPD 98/8/EC: Technical Notes for Guidance: TNsG on Product Evaluation, Insecticides, acaricides and products to control other arthropods (PT 18) and Repellents and attractants (only concerning arthropods) (PT 19). *European Commission, Directorate-General Environment,* CA-Dec12-Doc.6.2.a.-Final

****** Draft note for guidance. Relevance of new guidance becoming available during the process of authorisation and mutual recognition of authorisations of biocidal products. CA-July 12-Doc.6.2d. PA&MRFG-July 12-Doc.8.

*** TNsG on Product Evaluation, ECB, February 2008.

Complete Protection Time (CPT) calculation

Complete Protection Time (CPT) is the time from application of a repellent until the first confirmed event showing efficacy failure i.e., the first landing, bite, confirmed within 30 minutes by another similar event.

There are different possibilities to present a protection time on the label. The CA NL is of the opinion it is best to derive a mean CPT-value between the different tests provided and to use this value as the average protection time on the label. For the calculation of the mean CPT-value, we use those studies which fulfil the requirements of the official guidelines (EPA, WHO) and which were conducted with at least 8-10 test persons. Taking into account the high inter-individual variability among test persons, studies with lower numbers of tests persons are less valuable. Tests with lower numbers of test persons can be used, however, for rounding up or down the protection time to full hours.

A mean CPT-value is calculated and this value is given on the label as an average protection time (PT) in whole hours. Values are generally rounded up from 30 minutes upwards and taking the test results into account. As the efficacy against different species groups of mosquitoes may differ considerably the CA NL is of the opinion that the protection times should be specified per mosquito species group tested. This leads to the following label statements on the Dutch label: *Protects on average for x hours against mosquitoes in NW-Europe. For tropical mosquitoes the protection time may be shorter: y hours against yellow fever mosquitoes and z hours against malaria mosquitoes ".*

Tabel 2.5.3.0 Summary of the CPT results of the efficacy studies

Product name	***Culex***		***Aedes***		***Anopheles***		**Comments**
	Test results*	**PT****	**Test results***	**PT****	**Test results***	**PT****	
Gel 24.5% DEET	7h 53	**8**	4h 04	**4**	4-7h	**6**	
Gel 50% DEET	>12h	**12**	6h 14	**6**	nt***	**9**	Expert judgement used for PT against *Anopheles*
Spray 30% DEET	nt***	**6**	nt***	**3**	nt***	**4**	No tests provided, 20% spray-data used for PT
Spray 50% DEET	8h 56	**9**	4h 23	**4**	8.5h	**8**	
Roll On 30% DEET	nt***	**7**	nt***	**4**	nt***	**6**	No tests provided, 20% Roll On-data used for PT
Roll On 50% DEET	>12h	**12**	7h 08	**7**	nt***	**10**	Expert judgement used for CPT against *Anopheles*

* Mean complete protection time (CPT) calculated from the tests

** Average protection time as put on the Dutch label in whole hours

*** Not tested

Studies on *Culex quinquefasciatus* and *Aedes aegypti*

Simulated-use studies (arm-in-cage tests) on *Culex quinquefasciatus* and *Aedes aegypti* were performed according WHO guidelines (WHOPES 2009.4). The Mosquito Milk product was applied to the bare forearm between the wrist and elbow at a concentration of 1 ml test material per 600 cm^2. Eight volunteers exposed their treated forearm for 3 minutes in mosquito cages containing 200 hungry females every 30 minutes over 8-12 hours post

application. Before and after exposure of the treated arm, the readiness of mosquitoes to bite was assessed by inserting an untreated arm into the cage for 1 minute or until 10 probings/bites were counted (negative control). As a positive control DEET 20% was used. The results of these tests are summarized in Table 2.5.3.0.

The results of the arm-in-cage studies show (Table 2.5.3.0.) that Mosquito Milk DEET products repel *Culex quinquefasciatus* for periods of 6 to more than12 hours. The higher concentrations give the longest protection times. The roll on and gel products appear to give a somewhat longer protection time at comparable concentrations of DEET than the spray products, this can be caused by the formulation or the amount of product that was applied. Against *Aedes aegypti* the Mosquito Milk DEET products give protection times between 2 and 7 hours. The Mosquito Milk spray 30% DEET and Roll On 30% DEET products were not tested. The applicant proposed to use the protection times for the comparable 20% DEET Mosquito milk products (Please refer to the Product Assessment Report of the Mosquito Milk products of 9,5%-20% DEET products). *As this is a conservative estimation of the protection times the CA NL is of the opinion that this is acceptable.*

Studies on *Anopheles*
The efficacy data provided for Mosquito Milk DEET products against *Anopheles stephensi* include a variety of different clinical tests performed at the Institute of Tropical Medicine in Antwerp (ITMA) with different DEET products . Some of these studies show the efficacy against *Anopheles stephensi* in laboratory studies using mice, these were not used in the evaluations. Arm-in-cage studies on human volunteers (with 5-9 test persons) were done for some of the Mosquito Milk DEET products (see Table 2.5.3.0). Also a limited number of field trials with very low numbers of volunteers were done. The product was applied to different body parts. The applicant also refers to public literature to support the claim for efficacy against *Anopheles* species.

Because a solid series of tests with the Mosquito Milk DEET products were provided on Culex quinquefasciatus and Aedes aegypti and the data provided on the efficacy of Mosquito Milk DEET products against Anopheles stephensi is in line with these data and with the general data available on efficacy of DEET against Anopheles species, the CA NL is of the opinion that the data are acceptable and can be used as a basis to decide on protection times for Mosquito Milk DEET products against Anopheles species to be put on the label.

The summarized data on protection times from these tests are included into Table 2.5.3.0. Against *Anopheles stephensi* the protection times range from 4 to 10 hours. For some Mosquito Milk DEET products no tests were done and only general literature data were provided. In those cases the CA NL has decided on a protection time against *Anopheles* species to be put on the label, based on data provided for Mosquito Milk DEET products with comparable DEET concentrations but with different formulations. These are indicated in table 2.5.3.0 as " Expert judgement used for PT against *Anopheles".*

The results with Mosquito Milk DEET products against the different species are in compliance with the public literature data on repellency by DEET products against different mosquito species (Re-evaluation Decision document RRD2002-01, PMRA Canada, April 2002). These data show that *Aedes* species (yellow fever vectors), that are more aggressive in their behaviour than *Anopheles* (malaria vectors) and *Culex* species *(virus vectors*) are more difficult to repel and show shorter protection times. Culex species are generally most easily repelled by DEET and have the longest protection times.

Other information provided
In addition, a literature overview was provided with 11 DEET efficacy trials on other products with various DEET concentrations on other insect species such as flies, midges and chiggers, showing protection times from 2 hrs up to 2 weeks (B5.10.2, no original study reports send in).
The CA NL is of the opinion that these data are not sufficient to support a claim for protection against other insect species than mosquitoes.

Effect of added perfumes
A laboratory study was provided to assess whether removing the active ingredient N-diethly-3-methyl-benzamide (DEET) from a *Mosquito Milk* skin repellent formulation containing up to 1.75% perfume, would still give protection against biting mosquitoes.
The formulation without DEET was tested in a WHO arm-in-cage test, alongside the actual formulation containing 20% DEET against *C. quinquefasciatus*, on two female and two male volunteers. In the tests, the readiness of the mosquitoes to land and bite prior testing was 0.174 bites per second (mean) corresponding to 10.4 bites in 1 minute. Similar to the negative control, the formulation without DEET already failed during the first exposure at 5 minutes. All four volunteers received at least 2 bites within the first exposure. From these results it is concluded that the active ingredient DEET contained in the original formulation provides the protection against the biting mosquito, while the remainder of the formulation shows no protective effect. This is corroborated by the observation that the original formulation provided complete protection for up to 8 hours under the same experimental conditions.
It is therefore concluded by CA NL that Mosquito Milk perfume additives are not repellent at the tested concentration and are not to be considered active ingredients.

2.5.3.1 Dose

Use as topical application on exposed body parts, applied 1 time a day.
Apply sparingly on the uncovered parts of the body. Spread equally. Repeat application once if necessary and when allowed (see label instructions). For use on face, spray into palm of hand before applying.

The efficacy studies were done according to WHO-guidelines with a standard dose of 1 ml product per 600 cm^2. The 600 cm^2 roughly corresponds with a human male bare forearm. For the determination of the amount of product applied on the skin per application, the applicant refers to RIVM Report 320005002/2006: Pest control Products Fact Sheet, [redacted]. In Chapter 5: Insect repellents, p. 61 Dermal exposure: instant application model, it is argued that the default value and the amount of repellent applied per application is set at 6 g of product for adults (2 arms, 2 legs and face). This corresponds with the use dosage used in the arm-in-cage tests of about 1 ml per 600 cm^2 of skin (=one adult male arm). The amount of repellent used for a child of 10.5 months is defined to be 1.5 g product per application. The applied amount was derived using the agreed values for cosmetics such as suntan creams and body lotions. Therefore, extrapolation to relatively viscous formulations (gel, lotion, roll on and stick) is acceptable.

For spray application adults will have to pump 30 - 35 times in order to reach the proposed amount. For children, this is about 8 times. A small user test done by the applicant learned that this value is overestimated and that real use will be around 12 – 18 pumps per application. In addition, some of the product is lost with spray applications, hence not all of the product will reach the skin. Taking into account the above, it is clear that for spray applications, an amount of 6 g of product applied for adults and 1.5 g for children of 10.5 months is an overestimation for spray applications.

This topic was also discussed during the EU Technical Meetings concerning the active substance IR3535. For this comparable substance (insect repellent to be applied to human skin) it was agreed to use a lower amount of 3 g per application for adults. The applicant proposes to use the same principle also for DEET products.

The CA NL is of the opinion that a practical use dose between 3 and 6 grams of product per adult per application seems reasonable . For children up to 12 years the practical use dose will generally lie between 1 and 3 grams per application.

2.5.3.2 Mode of action

DEET repels biting and sucking insects without time delay. The mechanism of action of the active ingredients in insect repellents is not revealed yet; however, their effectiveness is determined experimentally.

2.5.3.3 Limitations

Repeat application of the product after swimming, showering or when the efficacy diminishes.

2.5.3.4 Resistance

There is no known instance of target insects developing resistance to DEET It is unlikely that resistance will occur for DEET, since there is only low selection pressure because the insects that are repelled do not die, and there are many other food sources available for these insects. Therefore, it is considered unnecessary to take actions to prevent development of resistance by target organisms.

2.5.4 Evaluation of the label claim

The applicant has provided a Dutch label. This has been adapted to our standards and to the standard SPC format. For each product an English and a Dutch SPC are provided.

2.5.5 General conclusions on efficacy

Considering that:

- simulated-use studies (arm-in-cage tests) on *Culex quinquefasciatus* and *Aedes aegypti* were done according WHO-guidelines and showed efficacy for the products tested
- additional efficacy data were provided for identical products against *Anopheles stephensi*
- the data provided allowed the determination of the average protection times for all the different Mosquito Milk DEET products

The CA NL is of the opinion that the following Mosquito Milk Deet products:

- *Mosquito Milk Gel 24.5% DEET*
- *Mosquito Milk Gel 50% DEET*
- *Mosquito Milk Spray 30% DEET*
- *Mosquito Milk Spray 50% DEET*
- *Mosquito Milk Roll On 30% DEET*
- *Mosquito Milk Roll On 50% DEET*

are effective in repelling mosquitoes (Culicidae) from human skin, when used according to the instructions on the label, providing the average protection times as given in Table 2.5.3.0.

2.6 Exposure assessment

2.6.1 Description of the intended use(s)

Mosquito Milk products are mosquito repellents based on DEET that should be applied to the skin of exposed body parts with the purpose to protect humans from mosquito bites. The product is for non-professional use.

Practical use dosages are between 3 and 6 grams of product per adult per application. The maximum application frequency is 1 time a day. The protection times of the various products are summarized in Table 2.5.3.0 and depend on the DEET concentration, the formulation and the mosquito species.

2.6.2 Assessment of exposure to humans and the environment

General information toxicology

The applicant has submitted an effect and exposure assessment for the Mosquito Milk DEET products. The human health exposure and risk assessment of the Mosquito Milk DEET products were examined by the Ctgb appropriately according to standard requirements. Studies with different Mosquito Milk DEET products have been provided. No new studies have been provided concerning the active substance and human health exposure. The products were not reference products in the EU-review program for inclusion of the active substance in Annex I of Directive 98/8/EC. The CA NL has revised this risk assessment for the human health aspect. See for more detail section 2.7.

General information environment

The environmental exposure and risk assessment of the Mosquito Milk DEET products from the applicant was examined according to standard requirements. No new studies have been provided concerning environmental exposure. The products were not reference products in the EU-review program for inclusion of the active substance in Annex I of Directive 98/8/EC. The applicant has submitted an effect and exposure assessment for the Mosquito Milk DEET products. The CA NL has revised this risk assessment for the environmental aspect. See for more detail section 2.8 below.

2.7 Risk assessment for human health

General information

Mosquito Milk DEET products are ready-to-use spray, roll on or gel products for non-professional use at a N,N-diethyl-*m*-toluamide (DEET) concentration of 24.5%, 30% and 50% w/w. During the active substance review process a product with an DEET concentration of 15% has been evaluated.

For these authorisation applications, no new studies were submitted with the active substance or concerning human exposure that were not already evaluated during the Annex I active review stage. Detailed data on the toxicity of the active substance can be consulted in Doc IIA of the final Assessment Report (March 2010) for DEET, PT19.

New studies were submitted with the products, because these products were not reference products in the EU-review program for approval of the active substance. These studies have

not been evaluated in the Assessment Report of DEET. The applicant has submitted studies with the products to address acute oral, dermal, skin and eye irritation (see 2.7.1.3 for results). For dermal absorption of DEET from the formulations the applicant provided a statement that the value of 20% used in the Assessment Report of DEET can be used in the risk assessment.

2.7.1 Hazard potential

2.7.1.1 Toxicology of the active substance

The toxicology of the active substance was examined extensively according to standard requirements. The results of this toxicological assessment can be found in the CAR. The threshold limits and labelling regarding human health risks listed in Annex 4 „Toxicology and metabolism" must be taken into consideration.

2.7.1.2 Toxicology of the substance(s) of concern

All products contain ethanol as a substance of concern. The highest content of ethanol in the formulations is 38.31.% (Mosquito Milk Roll On 50% DEET).

Ethanol is notified according to the biocides review programme (for PT1-4). A draft CA-report is not yet available. For ethanol a Council's Dutch Expert Committee on Occupational Standards (DECOS) evaluation (2006) is available. Although according to the EU-draft guidance on substances of concern a quantitative evaluation for ethanol is not necessary in the EU, the eCA NL performed a risk characterisation for ethanol based on the following List of Endpoints.

List of Endpoints
At the request of the Minister of Social Affairs and Employment of The Netherlands, the Health Council of the Netherlands has set health-based recommended occupational exposure limits for chemicals in air at the workplace in 2006. These recommendations were made by the Council's Dutch Expert Committee on Occupational Standards (DECOS). For ethanol at the workplace, DECOS calculated a health-based calculated occupational cancer risk value (HBC-OCRV) of 1300 mg/m^3, resulting in a breast cancer risk of 4 additional death cases per 1000 (4*10^{-3}) deaths for 40 years. In addition, DECOS recommended a short-term exposure limit (STEL) of 1900 mg/m^3 TWA 15 minutes and a skin notation, as dermal exposure can substantially contribute to the body burden of ethanol. In the report of DECOS it is stated that, as a worst case estimate, a penetration rate of 0.7 mg/cm^2/h can be used to calculate the internal dose after dermal exposure. Although there are no exact values available for dermal absorption of ethanol, values of 1-2% dermal absorption are usually used for ethanol based on studies and the penetration rate recommended by DECOS in the Netherlands. The EFSA guidance on dermal absorption (2012)[1] recommends the value of 25% for formulations containing >5% substance. Therefore the RMS has performed the risk assessment by considering two values for dermal absorption of ethanol: 25% and 1-2%.

Epidemiological studies suggest that consumption levels below 10-12 grams of ethanol per day will probably not cause liver cirrhosis. However, the Committee on Alcohol consumption and reproduction concluded that at these consumption levels effects on fertility and development may occur. Even long term oral exposure to levels of 1-12 gram ethanol per day might result in effects on the development (like increased incidence of spontaneous

[1] EFSA Guidance on dermal absorption. EFSA Journal 2012;10(4):2665

abortion, foetal death, pre-term delivery and decreased length of gestation) and fertility, according to the Committee on Alcohol consumption and reproduction. From the available meta-analysis and pooled studies, the committee concluded that drinking of one glass of alcoholic beverage per day the internal intake will be 10 gram ethanol.

Considering the fact that the maximal alcohol concentration in blood after one (oral) drink is approximately 10-100 times higher than the ethanol concentration in blood after inhalatory exposure to 1300 mg/m^3, DECOS was of the opinion that a HBC-OCRV of 1300 mg/m^3 is low enough to protect against these effects. Other toxic effect manifest themselves after exposure to higher exposure levels.

2.7.1.3 Toxicology of the biocidal product

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

GLP-compliant studies with the products have been submitted by the applicant to address acute oral and dermal toxicity, skin and eye irritation. The results of these studies are presented below.

Mosquito Milk Gel 24.5% DEET

Acute oral toxicity
The test item **Mosquito Milk Gel 24.5% DEET** was administered to a group of 6 female Sprague Dawley rats at the single dose of 2000 mg/kg body weight. The experimental protocol was compliant with the OECD guideline No. 423 and Directive 96/54/EC test method B.1tris.

No mortality occurred during the study. On the first day of the study, decreases in spontaneous activity (4/6), burrowing through the sawdust (1/6), and piloerection (3/6) were noted. The animals recovered a normal behaviour at 24 hours post-dose. The body weight evolution of the animals remained normal throughout the study. The macroscopical examination of the animals at the end of the study did not reveal treatment related change. In conclusion, the LD50 of the test item **Mosquito Milk Gel 24.5% DEET** is higher than 2000 mg/kg body weight by oral route in the rat.

According to the criteria for classification, packaging and labelling of dangerous substances and preparations in accordance with the EEC Directives 67/548, 2001/59 and 99/45, **Mosquito Milk Gel 24.5% DEET** must not be classified. No symbol or risk phrase is required. In accordance with the Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures, the test item must not be classified. No signal word or hazard statement is required.

Acute dermal toxicity
The test item **Mosquito Milk Gel 24.5% DEET** was applied onto the intact skin of 10 Sprague Dawley rats (5 males and 5 females) at the single dose of 2000 mg/kg body weight. The experimental protocol was compliant with the OECD guideline No. 402 and Directive 96/54/EC test method B.3.

No mortality occurred during the study. Neither cutaneous reactions nor systemic clinical signs related to the administration of the test item were observed. The body weight evolution

of the animals remained normal throughout the study. The macroscopical examination of the animals at the end of the study did not reveal treatment-related changes.

In conclusion, the LD50 of the test item **Mosquito Milk Gel 24.5% DEET** is higher than 2000 mg/kg body weight by dermal route in the rat.

According to the criteria for classification, packaging and labelling of dangerous substances and preparations in accordance with the EEC Directives 67/548, 2001/59 and 99/45, the test item **Mosquito Milk Gel 24.5% DEET** must not be classified. No symbol or risk phrase is required. In accordance with the Regulation (EC) No. 1272/2008, the test item must not be classified. No signal word or hazard statement is required.

Acute dermal irritation
The test item **Mosquito Milk Gel 24.5% DEET** was applied, as supplied, at the dose of 0.5 g, under semi-occlusive dressing during 4 hours on an undamaged skin area of 3 rabbits. The experimental protocol was compliant with the OECD guideline No. 404 and Directive 96/54/EC test method B.4.

No cutaneous reactions (erythema and oedema) were observed at any examination time (1, 24, 48 and 72 hours). The average scores for erythema and oedema at 24, 48 and 72 hours were 0.

The results obtained, under these experimental conditions, enable to conclude that **Mosquito Milk Gel 24.5% DEET** must not be classified, according to the criteria for classification, packaging and labelling of dangerous substances and preparations in compliance with the EEC Directives 67/548, 2001/59 and 99/45. No symbol or risk phrase is required. In accordance with the Regulation (EC) No. 1272/2008, the test item **must not be classified**. No signal word or hazard statement is required.

Acute eye irritation
The test item **Mosquito Milk Gel 24.5% DEET** was instilled as supplied, into the eye of 3 New Zealand rabbits at the dose of 0.1 mL. The experimental protocol was compliant with he OECD guideline No. 405 and Directive 96/54/EC test method B.5.

The ocular reactions observed during the study have been moderate to significant and partially reversible:
- at the conjunctivae level: a moderate to important redness, noted 1 hour after the test item instillation and totally reversible between days 6 and 10, associated with a moderate chemosis, noted 1 hour after the test item instillation and totally reversible between days 6 and 7.
- at the iris level: a congestion, noted 1 or 24 hours after the test item instillation and totally reversible between days 2 and 6.
- at the corneal level: a moderate corneal opacity, noted 24 hours after the test item instillation. The corneal opacity was totally reversible in two animals on day 4 or day 6 and remained on day 21 (last day of the test) in the last animal (slight intensity).
A corneal neovascularisation was noted between days 6 and 8 and between days 20 and 21 in one animal.

The average scores for cornea, iris, conjunctivae and chemosis at 24, 48 and 72 hours were 2, 0.77, 2.43 and 1.53, respectively.

In conclusion, taking into account the irreversibility of lesions observed, the results obtained, under these experimental conditions, enable to conclude that the test item MOSQUITO MILK

GEL 24.5% DEET must be classified R41 "Risk of serious damage to eyes", according to the criteria for the classification, packaging and labelling of dangerous substances in compliance with the EEC Directives 67/548, 2001/59 and 99/45. It must be characterised by the symbol “Xi” and the danger label “irritant”. In accordance with the Regulation (EC) No. 1272/2008, the test item must be classified in category 1 “irreversible effects on the eye”. The signal word “Danger” and hazard statement H318 “Causes serious eye damage” are required.

Mosquito Milk Gel 50% DEET

Acute oral toxicity
The test item was administered to a group of 3 female Sprague Dawley rats at the single dose of 2000 mg/kg body weight and then, to a group of 6 female Sprague Dawley rats at the single dose of 300 mg/kg body weight. The experimental protocol was compliant with the OECD guideline No. 423 and Directive 96/54/EC test method B.1tris.

The death of 2 rats treated at 2000 mg/kg b.w. (2/3) occurred at 22 hours 55 minutes post-dose and at 46 hours 40 minutes post-dose. The mortalities were preceded by absence of spontaneous activity, Preyer’s reflex, muscle tone, righting reflex, decrease in body temperature, bradypnea, partial ptosis and mydryasis. Furthermore tremors and piloerection were observed in one of the two animals.
Rigor mortis was noted in one animal before the necropsy. The macroscopical examinations of the dead animals revealed a thinning of the forestomach (2/2), black spots associated with a smoothing and thinning of the corpus (1/2), red coloration and thinning of the corpus (1/2). In the survival animal treated at 2000 mg/kg b.w. (1/3), decrease in spontaneous activity, muscle tone and myosis was observed on the first day of the test. The animal recovered a normal behaviour at 24 hours post-dose. The body weight evolution of the animal treated at 2000 mg/kg b.w. remained normal throughout the study. The macroscopical examination of the animal at the end of the study did not reveal treatment related change except a thickening of the corpus (1/1).

No mortality occurred in animals treated at 300 mg/kg b.w. No clinical signs related to the administration of the test item at 300 mg/kg b.w. were observed. The body weight evolution of the animals remained normal throughout the study. The macroscopical examination of the animals at the end of the study did not reveal treatment related change except a thickening of the forestomach in only one animal (1/6).

In conclusion, the LD50 of the test item is higher than 300 mg/kg and lower than 2000 mg/kg body weight by oral route in the rat.

According to the criteria for classification, packaging and labelling of dangerous substances and preparations in accordance with the EEC Directives 67/548, 2001/59 and 99/45, **Mosquito Milk Gel 50% DEET** must be classified R22 “Harmful if swallowed”. The item must be characterised by the symbol “Xn” and the warning label “Harmful”. In accordance with the Regulation (EC) No. 1272/2008, the test item must be classified in category 4. The signal word “Warning” and hazard statement H302 “Harmful if swallowed” are required.

Acute dermal toxicity
The test item was applied onto the intact skin of 10 Sprague Dawley rats (5 males and 5 females) at the single dose of 2000 mg/kg body weight. The experimental protocol was compliant with the OECD guideline No. 402 and Directive 96/54/EC test method B.3.

No mortality occurred during the study. Neither cutaneous reactions nor systemic clinical signs related to the administration of the test item were observed. The body weight evolution

of the animals remained normal throughout the study. The macroscopical examination of the animals at the end of the study did not reveal treatment-related changes.

In conclusion, the LD50 of the test item is higher than 2000 mg/kg body weight by dermal route in the rat.

According to the criteria for classification, packaging and labelling of dangerous substances and preparations in accordance with the EEC Directives 67/548, 2001/59 and 99/45, **Mosquito Milk Gel 50% DEET** must not be classified. No symbol or risk phrase is required. In accordance with the Regulation (EC) No. 1272/2008, the test item must not be classified. No signal word or hazard statement is required.

Acute dermal irritation
The test item was applied, as supplied, at the dose of 0.5 g, under semi-occlusive dressing during 4 hours on an undamaged skin area of 3 rabbits. The experimental protocol was compliant with the OECD guideline No. 404 and Directive 96/54/EC test method B.4.

A well defined erythema was noted in one animal 1 hour after the patch removal. This reaction was totally reversible on day 3.

The average scores for erythema and oedema at 24, 48 and 72 hours were 0.23 ane 0, respectively.

The results obtained, under these experimental conditions, enable to conclude that **Mosquito Milk Gel 50% DEET** must not be classified, according to the criteria for classification, packaging and labelling of dangerous substances and preparations in compliance with the EEC Directives 67/548, 2001/59 and 99/45. No symbol or risk phrase is required. In accordance with the Regulation (EC) No. 1272/2008, the test item must not be classified. No signal word or hazard statement is required.

Acute eye irritation
The test item was instilled as supplied, into the eye of three New Zealand rabbits at the dose of 0.1 mL. The experimental protocol was compliant with the OECD guideline No. 405 and Directive 96/54/EC test method B.

The ocular reactions observed during the study have been moderate to significant and partially reversible in the three animals:
- at the conjunctivae level: a moderate to important redness noted 24 hours after the test item instillation and totally reversible between days 14 and 21, associated with a moderate chemosis noted 1 hour after the test item instillation and totally reversible between days 7 and 14 in two
animals but still observed at the end of the observation time (day 21) in the last animal (moderate intensity);
- at the iris level: a congestion, noted 1 hour or 24 hours after the test item instillation, and totally reversible between days 3 and 8;
- at the corneal level: a moderate corneal opacity, noted 24 hours after the test item instillation, and totally reversible on day 3 in one animal but still observed on day 21 in the two others animals (slight to moderate intensity);
A corneal neovascularisation was noted from day 8 in two animals and was still observed on day 21.

The average scores for cornea, iris, conjunctivae and chemosis at 24, 48 and 72 hours were 1.77, 0.9, 2.47 and 2.0, respectively.

In conclusion, taking into account the irreversibility of lesions observed, the results obtained, under these experimental conditions, enable to conclude that **Mosquito Milk Gel 50% DEET** must be classified R41 "Risk of serious damage to eyes", according to the criteria for the classification, packaging and labelling of dangerous substances in compliance with the EEC Directives 67/548, 2001/59 and 99/45. It must be characterised by the symbol “Xi” and the danger label “irritant”. In accordance with the Regulation (EC) No. 1272/2008, the test item must be classified in category 1 “irreversible effects on the eye”. The signal word “Danger” and hazard statement H318 “Causes serious eye damage” are required.

Mosquito Milk Spray 30% DEET

For **Mosquito Milk Spray 30% DEET** studies with another formulation containing 50% DEET have been provided for classification and labelling purposes. As the formulation has a higher content of DEET and **Mosquito Milk Spray 30% DEET** does not contain any additional co-formulants which could potentially influence its human toxicological properties, the RMS Netherlands concluded that the studies with the formulation containing 50% DEET can be used for classification and labelling purposes of **Mosquito Milk Spray 30% DEET**.

Acute oral toxicity

A sample of the formulation containing 50% DEET was examined for acute oral toxicity in an experiment with female rats (limit test) according to Directive 96/54/EEC, method B.1 tris and OECD Guideline no. 423.

No mortality was observed after treatment with a 2000 mg/kg bw dose level. Clinical signs observed consisted of sluggishness, blepharospasm, tremors, ataxia, paralysis and salivation. Macroscopic examination of the surviving animals at the end of the observation period did not reveal any treatment-related gross changes.

According to the criteria for classification, packaging and labelling of dangerous substances and preparations in accordance with the EEC Directives 67/548, 2001/59 and 99/45, **Mosquito Milk Spray 30% DEET** must not be classified. No symbol or risk phrase is required. In accordance with the Regulation (EC) No. 1272/2008, the test item must not be classified. No signal word or hazard statement is required.

Acute dermal toxicity

A sample of the formulation containing 50% DEET was applied onto the intact skin of 10 Sprague Dawley rats (5 males and 5 females) at the single dose of 2000 mg/kg body weight. The experimental protocol was compliant with the OECD guideline No. 402 and Directive 96/54/EEC test method B.3.

No mortality occurred during the study. Neither cutaneous reactions nor systemic clinical signs related to the administration of the test item were observed. The body weight evolution of the animals remained normal throughout the study. The macroscopical examination of the animals at the end of the study did not reveal treatment-related changes.

In conclusion, the LD50 of the test item is higher than 2000 mg/kg body weight by dermal route in the rat. According to the criteria for classification, packaging and labelling of dangerous substances and preparations in accordance with the EEC Directives 67/548, 2001/59 and 99/45, **Mosquito Milk Spray 30% DEET** must not be classified. No symbol or risk phrase is required. In accordance with the Regulation (EC) No. 1272/2008, the test item must not be classified. No signal word or hazard statement is required.

Acute dermal irritation
A sample of the formulation containing 50% DEET was applied, as supplied, at the dose of 0.5 mL, under semi-occlusive dressing during 4 hours on an undamaged skin area of 3 rabbits. The experimental protocol was compliant with the OECD guideline No. 404 and Directive 96/54/EEC test method B.4.

A very slight erythema was noted on the treated areas in two animals 1 hour after the patch removal. These reactions were totally reversible on day 7. On the cutaneous structure, dryness was noted from day 3 in one animal. The skin recovered on day 14. The average scores at 24, 48 and 72 hours for erythema and edema were 0.67 and 0, respectively.

The results obtained, under these experimental conditions, enable to conclude that **Mosquito Milk Spray 30% DEET** must not be classified, according to the criteria for classification, packaging and labelling of dangerous substances and preparations in compliance with the EEC Directives 67/548, 2001/59 and 99/45. No symbol or risk phrase is required. In accordance with the Regulation (EC) No. 1272/2008, the test item must not be classified. No signal word or hazard statement is required.

Acute eye irritation
A sample of the formulation containing 50% DEET was tested for acute eye irritation properties in an experiment with three albino rabbits, according to EEC Directive 92/69/EEC, method B.5 and OECD Guideline no. 405.

The formulation caused moderate to severe signs of eye irritation in the three rabbits. At 13 days after treatment, all eye effects had cleared completely. The average scores at 24, 48 and 72 hours for cornea, iris, conjunctivae and chemosis were 1.78, 1, 2 and 2, respectively.

The results obtained, under these experimental conditions, enable to conclude that **Mosquito Milk Spray 30% DEET** must be classified R36 "Irritating to eyes"**,** according to the criteria for classification, packaging and labelling of dangerous substances and preparations in compliance with the EEC Directives 67/548, 2001/59 and 99/45. It must be characterised by the symbol “Xi” and the danger label “irritant”. In accordance with the Regulation (EC) No. 1272/2008, the test item must be classified in category 2 “irritating to eyes”. The signal word “Warning” and hazard statement H319 “Causes serious eye irritation” are required.

Mosquito Milk Spray 50% DEET

Acute oral toxicity
A sample of the formulation was examined for acute oral toxicity in an experiment with female rats (limit test), according to EEC Directive 96/54/EEC, method B.1 tris and OECD Guideline no. 423.

No mortality was observed after treatment with a 2000 mg/kg b.w. dose level. Clinical signs observed consisted of sluggishness, blepharospasm, tremors, ataxia, paralysis and salivation. Macroscopic examination of the surviving animals at the end of the observation period did not reveal any treatment-related gross changes.
Since all animals survived the 2000 mg/kg dose level, the oral LD50 is considered to be higher than 2000 mg/kg body weight.

According to the criteria for classification, packaging and labelling of dangerous substances and preparations in accordance with the EEC Directives 67/548, 2001/59 and 99/45, **Mosquito Milk Spray 50% DEET** must not be classified. No symbol or risk phrase is

required. In accordance with the Regulation (EC) No. 1272/2008, the test item must not be classified. No signal word or hazard statement is required.

Acute dermal toxicity
The test item was applied onto the intact skin of 10 Sprague Dawley rats (5 males and 5 females) at the single dose of 2000 mg/kg body weight. The experimental protocol was compliant with the OECD guideline No. 402 and Directive 96/54/EEC test method B.3.

No mortality occurred during the study. Neither cutaneous reactions nor systemic clinical signs related to the administration of the test item were observed. The body weight evolution of the animals remained normal throughout the study. The macroscopical examination of the animals at the end of the study did not reveal treatment-related changes.

In conclusion, the LD50 of the test item is higher than 2000 mg/kg body weight by dermal route in the rat.

According to the criteria for classification, packaging and labelling of dangerous substances and preparations in accordance with the EEC Directives 67/548, 2001/59 and 99/45, the test item **Mosquito Milk Spray 50% DEET** must not be classified. No symbol or risk phrase is required. In accordance with the Regulation (EC) No. 1272/2008, the test item must not be classified. No signal word or hazard statement is required.

Acute dermal irritation
The test item was applied, as supplied, at the dose of 0.5 mL, under semi-occlusive dressing during 4 hours on an undamaged skin area of 3 rabbits. The experimental protocol was compliant with the OECD guideline No. 404 and Directive 96/54/EEC test method B.4.

A very slight erythema was noted on the treated areas in two animals 1 hour after the patch removal. These reactions were totally reversible on day 7. On the cutaneous structure, dryness was noted from day 3 in one animal. The skin recovered on day 14. The average scores for erythema and oedema at 24, 48 and 72 hours were 0.67 and 0, respectively.

The results obtained, under these experimental conditions, enable to conclude that the test item **Mosquito Milk Spray 50% DEET** must not be classified, according to the criteria for classification, packaging and labelling of dangerous substances and preparations in compliance with the EEC Directives 67/548, 2001/59 and 99/45. No symbol or risk phrase is required. In accordance with the Regulation (EC) No. 1272/2008, the test item must not be classified. No signal word or hazard statement is required.

Acute eye irritation
A sample of the formulation was tested for acute eye irritation properties in an experiment with three albino rabbits, according to EEC Directive 92/69/EEC, method B.5 and OECD Guideline no. 405.
The test item caused moderate to severe signs of eye irritation in the three rabbits. At 13 days after treatment, all eye effects had cleared completely. The average scores at 24, 48 and 72 hours for cornea, iris, conjunctivae and chemosis were 1.78, 1, 2 and 2, respectively.

The results obtained, under these experimental conditions, enable to conclude that the test item **Mosquito Milk Spray 50% DEET** needs to be classified classified R36 "Irritating to eyes", according to the criteria for classification, packaging and labelling of dangerous substances and preparations in compliance with the EEC Directives 67/548, 2001/59 and 99/45. It must be characterised by the symbol “Xi” and the danger label “irritant”. In accordance with the Regulation (EC) No. 1272/2008, the test item must be classified in

category 2 “irritating to eyes”. The signal word “Warning” and hazard statement H319 “Causes serious eye irritation” are required.

For dermal absorption of DEET from the formulations the applicant provided a statement that the value of 20% used in the CAR of DEET can be used in the risk assessment.

The basis for the health assessment of the biocidal product is laid out in Annex 5 ”Toxicology – biocidal product”.

2.7.2 Exposure

Mosquito Milk DEET products are ready-to-use spray, roll on, lotion or stick products for non-professional use at a pure N,N-diethyl-*m*-toluamide (DEET) concentration of 25.3%, 30.9%, 31% and 48.5% w/w.

Product name	**DEET content (%w/w)***	
	TGAI	PAI
Mosquito Milk Gel 24.5% DEET	26.0	25.3
Mosquito Milk Gel 50% DEET	50	48.5
Mosquito Milk Spray 30% DEET	31.9	30.9
Mosquito Milk Spray 50% DEET	50	48.5
Mosquito Milk Roll On 30% DEET	31.9	31.0
Mosquito Milk Roll On 50% DEET	50	48.5

** TGAI = technical active ingredient with a minimum purity of 97%; PAI = pure active ingredient. Values rounded to a maximum of three significant digits.*

The intended use of the products is exclusively by dermal application. The exposure assessment is based on an application frequency of 1-2 times per day. Dermal route is the main path of exposure, but contributions to exposure via inhalation of the product during application of the repellent spray and via hand to mouth contact are possible.

In the CAR of DEET it has been concluded that inhalation exposure cannot be fully ruled out and therefore a recommendation on ventilation is considered necessary. Moreover, based on the vapour pressure of DEET of 0.11 Pa at 20 ºC and 0.23 Pa at 25 ºC, respiratory exposure can potentially occur. The product can be applied indoors and outdoors. Therefore, the products which won’t be applied by spraying should be labelled with the safety phrases S23 according to Directive 1999/45/EC or P260 according to Regulation 1272/2008/EC (“Do not breathe **vapour**”) and S51 according to Directive 1999/45/EC or P271 according to Regulation 1272/2008/EC (“Use only outdoors or in a well-ventilated area”). Moreover, the products which will be applied by spraying should be labelled with the safety phrases S23 according to Directive 1999/45/EC or P260 according to Regulation 1272/2008/EC (“Do not breathe **spray**”) and S51 according to Directive 1999/45/EC or P271 according to Regulation 1272/2008/EC (“Use only outdoors or in a well-ventilated area”).

Oral exposure by hand-to-mouth transfer is not considered to be a significant route of exposure because the smell and taste of DEET acts as a self deterrent against this type of activity. More importantly, all products contain an ingredient that acts as a strong deterrent for ingestion (Bitrex). However, the efficacy of Bitrex was discussed at a Technical Meeting where it was concluded that Bitrex may not be effective in preventing ingestion in all age groups, in particular children < 12 years old. Therefore the oral route is still considered to be possible and the calculations for hand to mouth transfer are included by the RMS in the worst

case exposure calculations. The potential for exposure to DEET is summarized in the table below.

Potential for exposure to DEET:

Exposure path	Industrial use	Professional use	General public	Via the environment
Inhalation	-	-	X	-
Dermal	-	-	X	-
Oral	-	-	X	-

2.7.2.1 Exposure of professional users

The products are not intended for professional use.

2.7.2.2 Exposure of non-professional users and the general public

In Annex 7 "Safety for non-professional operators and the general public", the results of the exposure calculations for the active substance for the non-professional user are laid out.

Active substance DEET:
A user survey study has been performed in the USA involving human use and exposure to insect repellents containing DEET ([redacted], 1990 (III-A6.14)). This study is part of the data package for DEET and is presented in Doc III of the final CAR. The human health exposure scenario for adult consumers at the 75th percentile of use, applying the representative product containing DEET as an insect repellent was used for the risk characterizations. The use of the 75th percentile was considered acceptable since the user study had a large number of study subjects and the measured exposure was similar to the default exposure value of the TNsG. In this study, the average active ingredient content was estimated to be 26.1%. The 75th percentile of human dermal exposure per application of the formulation containing 26.1% DEET is estimated to be 1.5 g active substance for males, 1.0 g for females, 1.66 g for children aged 13-17 years and 1.42 g for children aged <12 years based on the results of the survey study. Daily exposure for different age groups was calculated by considering a body weight of 70, 60, 62.8 and 25.5 kg for males, females, children > 12 years of age and children <12 years of age, respectively. The same values for body weight were also used in the CAR of DEET.

Exposure due to hand to mouth transfer has also been included in the calculations as a worst-case approach. According to the TNsG on human exposure, part II, 2002 it is expected that adults will ingest the amount applied to fingers. The surface of the fingers is approximately 4% of the treated body surface. The oral exposures are for the age groups 13-17 years and < 12 years are calculated for the whole hands, i.e. approximately 8% of the treated body surface (head, arms, hands, legs and feet according to [redacted], 2002).

A dermal absorption value of 20% was used to calculate internal exposure in humans.

Substance of concern ethanol:
The highest exposure to ethanol is expected for the formulation with the highest ethanol content (Mosquito Milk Roll On 50% DEET). Based on the USA user survey study with DEET-containing repellants the 75th percentile of human dermal exposure per application is estimated to be 5.7 g product for males, 3.8 g product for females, 6.4 g product for children aged 13-17 years and 5.4 g product for children aged <12 years. As a consequence for Mosuito Milk Roll On 50% DEET with the highest ethanol concentration of 38.31% the 75th

percentile of external dermal exposure per application is estimated to be 2.18 g ethanol for males, 1.46 g ethanol for females, 2.45 g ethanol for children aged 13-17 years and 2.07 g ethanol for children aged <12 years.

Indirect exposure of general public
The degree of indirect exposure is considered negligible as the primary route of exposure is direct application to the skin.

2.7.2.3 Exposure to residues in food

The application of the DEET products does not result in residues to which consumers might become exposed.

2.7.3 Risk Characterisation

2.7.3.1 Risk for Professional Users

The products are not intended for professional use.

2.7.3.2 Risk for non-professional users and the general public

Active substance DEET:
It was decided at TM I and II 2009 that risk characterisation for DEET products should be performed for two daily applications and by using the 75th percentile of human dermal exposure based on the USA survey study. When using this method the estimated exposures for different contents of DEET in the products after dermal application in percentages of the $AEL_{repeated\ dermal}$ for adult males, adult females, children >12 years and < 12 years are presented in Table 1.

Table 1. The ratio of the estimated dermal exposure to $AEL_{repeated\ dermal}$ for different contents of DEET in the formulations. Two applications per day have been considered.

Risk Characterisation Ratio*	**25.3% DEET**	**30.9% DEET**	**31% DEET**	**48.5% DEET**
Dermal				
Male:	1.01	1.24	1.24	1.95
Female:	0.79	0.96	0.93	1.51
>12 yr:	1.25	1.53	1.53	2.36
<12 yr:	2.63	3.21	3.22	5.05

Taking into account only **dermal** exposure, the use of the product with 25.3% DEET, **Mosquito Milk Gel 24.5% DEET**, 2 times per day is considered acceptable for adults. The use of the products with 30.9% and 31% DEET, **Mosquito Milk Spray 30% DEET** (pure a.i. 30.9%) and **Mosquito Roll On 30% DEET** (pure a.i. 31.0%) 2 times per day is considered acceptable for adults.
The use of the products with 48.5% DEET, **Mosquito Milk Roll On 50% DEET**, **Mosquito Milk Spray 50% DEET** and **Mosquito Milk Gel 50% DEET** 2 times per day is not considered acceptable for any age group.

The restriction of the product use to maximal use once per day was considered to be one of possible risk management measures. Therefore daily exposures for different contents of DEET in the products following a single exposure have also been calculated by the RMS. The results are presented in table 2.

Table 2. The ratio of the estimated dermal exposure to $AEL_{repeated\ dermal}$ for different contents of DEET in the formulations. One application per day has been considered.

Risk Characterisation Ratio*	**25.3% DEET**	**30.9% DEET**	**31% DEET**	**48.5% DEET**
Dermal				
Male:	0.51	0.62	0.62	0.97
Female:	0.40	0.48	0.48	0.76
>12 yr:	0.63	0.76	0.77	1.20
<12 yr:	1.32	1.61	1.61	2.53

If only dermal exposure is considered, the use of the product with 25.3% DEET, **Mosquito Milk Gel 24.5% DEET**, once per day is considered acceptable for adults and children > 12 years old. The use of the products with 30.9% and 31% DEET, **Mosquito Milk Spray 30% DEET** (pure a.i. 30.9%) and **Mosquito Roll On 30% DEET** (pure a.i. 31%) once per day is considered acceptable for adults and children > 12 years old. The use of the products with 48.5% DEET, **Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 50% DEET** and **Mosquito milk gel 50% DEET**, once per day is only acceptable for adults.

Additionally, reverse reference calculations in Annex 7 show how many times per day the formulation with the lowest content of DEET (25.3% DEET) can be applied dermally without exceeding the AELs. If only dermal exposure is considered, to exceed the $AEL_{repeated\ dermal}$ of 8.2 mg/kg bw/day, a formulation with the lowest content of DEET (25.3% DEET) can be applied 1.98, 2.53, 1.60 and 0.76 times per day for adult male, adult female, child >12 years and <12 years respectively. Thus for children the application of all formulations twice per day is not considered acceptable.

As a worst-case approach, the eCA NL has also performed the assessment of the oral exposure, considering potential ingestion of 4% of the total applied product by adults (amount on fingers) and a potential ingestion of 8% of the total applied product by children > 12 years old. For children < 12 years old, a separate assessment of oral exposure was considered unnecessary by the eCA NL, as no acceptable risks have been identified for this age group by considering dermal exposure only.
The resulting oral exposure estimates were compared with $AEL_{acute\ oral}$ of 0.75 mg/kg bw/day. From the calculation given in Annex 7 it can be seen that higher risk characterization ratios are calculated for oral exposure in comparison with dermal exposure. The reverse dose calculations in Annex 7 show that for a formulation with the lowest content of DEET (25.3% DEET) only 3.6%, 4.6% and 2.9% of the estimated external dose per application at the 75th percentile of use for males, females and children >12 years respectively can be ingested before an $AEL_{acute\ oral}$ of 0.75 mg/kg bw/day is exceeded. If as a worst-case an ingestion of 4% of the applied product is considered for adults and an ingestion of 8% of the applied product for the age group 13-17 years, the exposure area in adults and children > 12 years old would have to be reduced to avoid exceeding the AEL. However, in the PA-MRFG meeting it has been agreed that labelling instructions with the intent to reduce the treated skin area are not accepted as an adequate risk mitigation measure; thus this restriction cannot be considered by the eCA NL.

In the CAR of DEET it was concluded that the oral dose is likely to be largely overestimated given the short half life after oral exposure in dogs and rats and the rapid achievement of C_{max}. Furthermore, the hand to mouth behaviour is more frequent in small children, and considering the presence of Bitrex in the formulation, it was concluded in the CAR that the contribution of oral exposure for children > 2 years old and adults is considered negligible. Respectively, an age limit of 2 years is proposed in the CAR of DEET as a cut-off for considering oral exposure. As a consequence the contribution of oral exposure is considered to be negligible for adults and children> 12 years old.

Substance of concern ethanol:
Based on the survey study the 75th percentile of human dermal exposure per application of the formulation with the highest ethanol content (Mosquito Milk Roll On 50% DEET) is estimated to be 2.18 g ethanol for males, 1.46 g ethanol for females, 2.45 g ethanol for children aged 13-17 years and 2.07 g ethanol for children aged <12 years. Although the exact dermal absorption percentage is unknown, the values of 1-2% are usually used in the Netherlands based on studies and the penetration rate recommended by DECOS. The EFSA Guidance on dermal absorption recommends a value of 25% for formulations containing > 5% substance. If as a worst-case 25% dermal absorption is considered, the expected internal dermal exposure to ethanol will be 5.5% (0.25 x 2.18/10) x 100%) of the expected ethanol intake by drinking one glass of alcoholic beverage (10 g ethanol per day) for males, 3.7% for females, 6.1% for children aged 13-17 years and 5.2% for children aged <12 years. The 1-2% dermal absorption percentages result in internal dermal exposure of 0.22-0.44% of the expected ethanol intake by drinking one glass of alcoholic beverage (10 g ethanol per day) for males, 0.15-0.3% for females, 0.25-0.5% for children aged 13-17 years and 0.21-0.42% for children aged <12 years. Based on these results the RMS NL concludes that no unacceptable risk results from the presence of ethanol as a substance of concern in the formulations.

Conclusions
Because the products are intended for intentional exposure on skin and to be used by the general public, including elderly, children and unhealthy subjects, a conservative approach should be taken when approving products. Special care should also be taken when approving products for use in children <12 years old. When approving products, recommendations on ventilation should apply since the inhalational fraction is excluded in the risk characterisation calculations. Therefore, the products which won't be applied by spraying should be labelled with the safety phrases S23 according to Directive 1999/45/EC or P260 according to Regulation 1272/2008/EC ("Do not breathe spray") and S51 according to Directive 1999/45/EC or P271 according to Regulation 1272/2008/EC ("Use only outdoors or in a well-ventilated area"). Moreover, the products which will be applied by spraying should be labelled with the safety phrases S23 according to Directive 1999/45/EC or P260 according to Regulation 1272/2008/EC ("Do not breathe spray") and S51 according to Directive 1999/45/EC or P271 according to Regulation 1272/2008/EC ("Use only outdoors or in a well-ventilated area").

The use of the product with 25.3% DEET, **Mosquito Milk Gel 24.5% DEET**, twice per day is considered acceptable for adults. The product may not be used more than once a day on children > 12 years old. The product must not be used on children < 12 years old. The restriction "Do not use more than once a day on children > 12 years old. "Do not use on children < 12 years old " has to be written on a prominent position on the label. As **Mosquito Milk Gel 24.5% DEET** won't be applied by spraying, it should be labelled with the safety phrases S23 according to Directive 1999/45/EC or P260 according to Regulation 1272/2008/EC ("Do not breathe vapour") and S51 according to Directive 1999/45/EC or P271 according to Regulation 1272/2008/EC ("Use only outdoors or in a well-ventilated area") due to the vapour pressure of DEET.

The use of the products with 30.9% and 31% DEET **Mosquito Milk Spray 30% DEET** (pure a.i. 30.9%) and **Mosquito Roll On 30% DEET** (pure a.i. 31%) twice per day is considered acceptable for adults. The products may not be used more than once a day on children >12 years old. The products must not be used in children < 12 years old. The restriction "Do not use more than once a day on children > 12 years old. Do not use on children < 12 years old" has to be written on a prominent position of the label. As **Mosquito Milk Spray 30% DEET** will be applied by spraying, it should be labelled with the safety phrases S23 according to Directive 1999/45/EC or P260 according to Regulation 1272/2008/EC ("Do not breathe spray") and S51 according to Directive 1999/45/EC or P271 according to Regulation 1272/2008/EC ("Use only in well ventilated areas"). As **Mosquito Roll On 30% DEET** won't be applied by spraying, it should be labelled with the safety phrases S23 according to Directive 1999/45/EC or P260 according to Regulation 1272/2008/EC ("Do not breathe vapour") and S51 according to Directive 1999/45/EC or P271 according to Regulation 1272/2008/EC ("Use only outdoors or in a well-ventilated area") due to the vapour pressure of DEET.

The use of the products with 50% DEET **Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 50% DEET** and **Mosquito Milk Gel 50% DEET** once per day is considered acceptable for adults. The products must not be used on children < 17 years old. The restriction "Do not use more than once a day. Do not use on children (<17 years old)" has to be written on a prominent position of the label. As **Mosquito Milk Spray 50% DEET** will be applied by spraying, it should be labelled with the safety phrases S23 according to Directive 1999/45/EC or P260 according to Regulation 1272/2008/EC ("Do not breathe spray") and S51 according to Directive 1999/45/EC or P271 according to Regulation 1272/2008/EC ("Use only outdoors or in a well-ventilated area"). As **Mosquito Milk Roll On 50% DEET** and **Mosquito Milk Gel 50% DEET** won't be applied by spraying, they should be labelled with the safety phrases S23 according to Directive 1999/45/EC or P260 according to Regulation 1272/2008/EC ("Do not breathe vapour") and S51 according to Directive 1999/45/EC or P271 according to Regulation 1272/2008/EC ("Use only outdoors or in a well-ventilated area") due to the vapour pressure of DEET.

Furthermore, the instructions for use for all products must contain the following indications:

- Avoid contact with eyes, mucous membranes and damaged skin.
- Use only outdoors or in a well-ventilated area and do not inhale the product
- Keep this product away from children.

2.7.3.3 Risk for consumers via residues

The acute or chronic exposure to residues in food resulting from the intended uses is unlikely to cause a risk to consumers. Regarding consumer health protection, there are no objections against the intended uses. The restriction "Avoid contact with food" has to be written on a prominent position on the label.

2.8 Risk assessment for the environment

2.8.1 Effect Assessment

No studies were submitted with the request for product authorisation that were not already evaluated during the Annex I active review stage for the active substance nor for the

products. Detailed data on the fate and distribution of DEET in the environment and the effect of the active substance on environmental organisms can be consulted in Doc IIA of the final Assessment Report (March 2010) for N,N-diethyl-*m*-toluamide (DEET, PT19). Fate and effects data are only provided in this Assessment Report for the parent structure, as DEET is ready biodegradable and no major (>10%) transformation products were formed in studies of hydrolysis and aquatic phototransformation.

The PNEC derivation is also described in detail in the Assessment Report for diethyl-*m*-toluamide (DEET), section 4.3.1 of Doc IIA and a summary is included in the table below.

Table 2.8.1-1 Summary of the PNECs derived for DEET in the different compartments.

Compartment	Organism	Endpoint	AF	PNEC
Freshwater	Green algae (*Selenastrum capricornutum*)	ErC_{50} = 43 mg/L	1000	0.043 mg/L
STP	Microorganisms from an activated sludge	EC_{50} > 1000 mg/L	100	10 mg/L
Sediment	Sediment-dwelling organisms	Equilibrium partitioning	-	0.0741 mg/kg ww
Soil	Green algae (*Selenastrum capricornutum*)	Equilibrium partitioning	-	0.0379 mg/kg ww

PNECs were not calculated for the air compartment, as there are no data on biotic effects in the atmosphere. Furthermore, DEET is not expected to be subject to long range air transport (half life is less than 2d), or contribute to global warming (although the substance has a vapour pressure (0.23 Pa) higher than 0.01 Pa, the Henry´s law constant is low (3.93E-3 $Pa*m^3/mol$ and DT50 is less than 2d; cf the TNsG on Annex I inclusion), ozone depletion in the stratosphere (atmospheric lifetime is <<1 year, and it does not contain Cl, Br or F substituents) or acidification (the AP, Acidification Potential is low[2]).

The available avian acute lethality data are not appropriate for extrapolation to chronic dietary uptake conditions (cf TGD II3.8.3.5). PNECs were therefore not calculated for oral uptake from the food chain (to quantify the risk of secondary poisoning). No further avian data were required, because DEET has a low potential for bioconcentration and bioaccumulation (log Kow <3; cf TGD II3.8.2).

2.8.2 Exposure Assessment

Major emissions from the application of mosquito repellents result from indoor showering, bathing or laundry with emission via the STP to surface water and sediment (waste phase). Direct emission to surface water and sediment can result from outdoor showering or bathing after application of the product on the skin (waste phase).
Emission to fresh water is expected to be worst case. Therefore risk for the marine environment is considered covered by the freshwater risk assessment.
For the proposed applications emissions during the application phase and the service life of the products are also considered less relevant and these routes are therefore not assessed.

<u>Indirect emission</u>

[2] De Leeuw F. 1993. Assessment of the atmospheric hazards and risks of new chemicals: Procedures to estimate ”hazarard potentials”. Chemosphere 27(8): 1313-1328. AP=(MWSO2/MWDEET)*(nN+ nCl + nF + 2*nS)/2= (64.06/191.28)*1/2 = 0.17).

The water compartment (both inland and marine) is expected to be indirectly exposed to DEET mainly from STP effluents, and because of the physiochemical character of the substance, the emissions will continue to primarily remain in this compartment (supported by level III fugacity modelling). The most relevant environmental compartment of concern for DEET is therefore the aquatic.
According to a usage study described in [redacted] (section III-B6.6(2) of the final CAR of DEET), on average 1.2 g of active ingredient of a repellent containing 20% DEET is consumed per application, of which 0.9 g (75%) is applied to the skin and 0.3 g (25%) to the clothes. One can also assume some of the product to be "spilled" during application (a direct release to the air compartment) and absorbed by the skin during the "leave on phase
In IC5, UC36 (cosmetic odour agents; p 226 in the TGD II), 5% of the applied amount (for substances having vapour pressure below 100 Pa) is assumed to be emitted to the air. This figure was therefore adopted. All absorbed DEET (6.4%) is assumed to be metabolized (and excreted primarily as urine metabolites). Therefore, the rest of the initially applied dose (88.7%) is assumed to be released to the STP (see Figure 1).

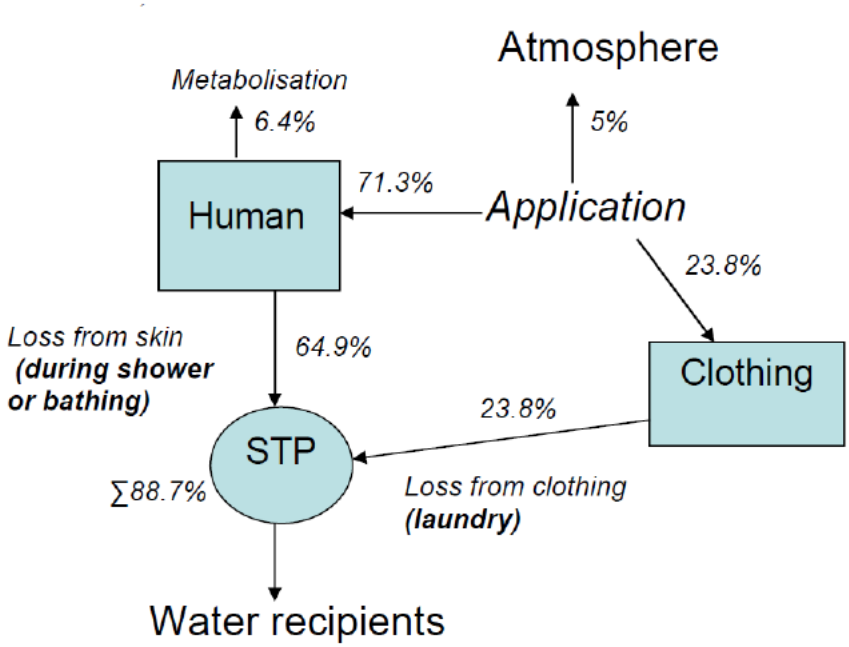

Figure 1 **Assumed flows of DEET into the STP and environment. All percentages are referring to the initially applied dose.**

Final environmental exposure will to a large extent depend on whether households are connected to STPs equipped with at least secondary (biological) treatment. Other efficient treatment processes include ozonation and PAC (Powdered Activated Carbon) addition, although these are more common in drinking water treatment[3].
In the following sections, PECs are derived by using the Emission Scenario Document (ESD) for PT 1 (Human hygiene products)[4]and equations in the TGD Part II (since there is not yet

[3] In a study of simulated treatment processes on spiked raw water samples for drinking water use, the most efficient DEET removal process was ozonation, although high reduction also can be achieved by PAC addition (dose dependent). The simulated treatment processes compared were chemical (Alum coagulation, Ferric coagulation, Softening), PAC treatment and oxidation (chlorination and ozonation). Westerhoff et al. 2005. Fate of endocrine-disruptor, pharmaceutical and personal care product chemicals during simulated drinking water treatment processes. Environ Sci Technol 39: 6649-6663

[4] Environmental Emission Scenarios for biocides used as human hygiene biocidal products (Product type 1). European Commission DG ENV/RIVM. Jan 2004. [TMI 04-env-item4-PT1.doc]

an ESD developed for PT 19). These calculations are based on data on amount consumed by individuals. The TNsG on human exposure sets a default value for the amount of dermally applied repellent product to 6 g. Estimated PEC values are compared to monitoring data found in some recent publications in scientific peer reviewed journals.

Direct emission

At the Technical Meeting I 2009 several member states had questions about possible direct emissions due to swimming for this kind of products.
DE presented a swimming scenario at TM II 2011 (draft CAR for lauric acid) and proposed to include this scenario in the ESD for PT19 which DE is drafting. DE requested other member states to submit data on natural swimming lakes in order to revise the swimming scenario for inclusion in the draft ESD for PT19.
As a second tier NL has recently developed a swimming scenario based on data from the more isolated freshwater swimming lakes to which officially the function 'swimming water' is assigned and has recently submitted these data to DE for inclusion in the future PT19 ESD. Both the DE and NL swimming scenarios are applied in this PAR.

2.8.2.1 PEC_{STP}, $PEC_{surface\ water}$ and $PEC_{sediment}$ – indirect emission

PEC_{STP} and local concentrations in surface water (Clocalwater, or $PEC_{surface\ water}$) were calculated using the ESD for PT1 because there is no corresponding ESD for PT 19 yet. However, PT1 includes biocidal products used for human hygiene purposes and DEET is the active ingredient of insect repellents used by the general public. As such, the Mosquito Milk DEET products can for exposure modelling purposes be considered as a "leave on" Personal Care Product (PCP) and would thus fit into this scenario.
According to the calculation formula for emission rate to STP (cf table 4.2 in ESD for PT1), Elocalwater (Emission rate to wastewater (standard STP), kg/d), i.e. the inflow of DEET to an STP during an emission episode, can be calculated from the formula:

$$E_{localwater} = N_{local} * N_{appl} * F_{inh} * F_{water} * Q_{formappl} * C_{formweight} * F_{penetr} * 10^{-6}$$

If using the input values in table 2.8.1.2-1, $Elocal_{water}$ is 1.39-2.67 kg/d for the Mosquito Milk DEET products when applied once a day and 2.79-3.42 kg/d when applied twice a day. These values are used as input for the PT1 scenario in EUSES 2.1.2.

Table 2.8.1.2-1 Input values used to estimate Elocalwater (Emission rate to wastewater) in accordance with ESD for PT 1.

Input parameters (abbrev.)	Explanations	Input value	Reference doe. III/remark
N_{local}	Number of inhabitants feeding one STP	10 000	Default according to ESD PT1 and TGD Part II
N_{appl}	Number of applications per day	1-2	According to the list of intended uses, the product is applied 1-2 times per day (except for the products containing 50% w/w DEET which are applied only once a day). Applying 2 applications per day for the calculation is a worst case assumption since the calculated exposure reflects the use of all inhabitants using the product (and it may be considered less likely that all users would apply the product at the maximum number per day). For comparison, calculations are performed for the products when applied once or twice per day.

F_{inh}	Fraction of inhabitants using product	0.37	According to the final CAR for DEET 37% (F_{inh} = 0.37) of the population is using any insect repellent.
F_{water}	Fraction released to wastewater	0.887	See figure 1
$Q_{formappl}$	Consumption of product per application	6 g	The TNsG on human exposure sets a default value for the amount of dermally applied repellent product to 6 g.
$C_{formweight}$	Amount of active substance in product	253-485 g/kg	i.e. 25.3-48.5% (information submitted by the applicant)
F_{penetr}	Market share of products applied for this purpose	0.28	According to the final CAR for DEET (Default value in ESD for PT 1 is 0.5.)

Table 2.8.2.1-2 summarises the concentrations in STP effllluent as well as the PECs in surface water and sediment.

Table 2.8.2.1–2 PEC_{STP}, $PEC_{surface\ water}$ and $PEC_{sediment}$ for indirect emission to surface water and sediment via the STP due to body cleaning and washing of treated clothes.

Amount of a.s. in product (g/kg)	PEC_{STP} (mg/L)	$PEC_{surface\ water}$ (mg/L)	$PEC_{sediment}$ (mg/kg ww)
Application once a day			
253	$8.76x10^{-2}$	$8.76x10^{-3}$	$1.51x10^{-2}$
309	$1.07x10^{-1}$	$1.07x10^{-2}$	$1.85x10^{-2}$
310	$1.08x10^{-1}$	$1.08x10^{-2}$	$1.86x10^{-2}$
485	$1.68x10^{-1}$	$1.68x10^{-2}$	$2.90x10^{-2}$
Application twice a day			
253	$1.76x10^{-1}$	$1.76x10^{-3}$	$3.03x10^{-2}$
309	$2.15x10^{-1}$	$2.15x10^{-2}$	$3.71x10^{-2}$
310	$2.16x10^{-1}$	$2.16x10^{-2}$	$3.72x10^{-2}$

2.8.2.2 $PEC_{surface\ water}$ and $PEC_{sediment}$ – direct emission

The estimation of the local PECs for the aquatic compartment only includes surface water and sediment for the “swimming”-pathway because of direct entry of b.p. in the environment.

DE swimming scenario (Tier 1)

In general the calculation based on the given equations in EU TGD (2003):

- PEClocal_surfacewater according to equation 48, chapter 2.3.8.3, EU TGD (2003);
- PEClocal_sediment according to equation 50, chapter 2.3.8.4, EU TGD (2003),

but some values are substituted depending on the chosen scenario “e.g. swimming”.

Germany made a proposal to calculate the local concentrations in water for the swimming emission route. This proposal is based on the equations of the EU TGD (2003) and on a specific scenario developed by Germany that simulates the release of an active substances into natural and artificial lakes by swimming of persons treated with biocidal product. Germany developed this new scenario because the specific use pattern of biocidal products in PT19 wherefore no applicable emission scenario was found in the available ESD’s.

- As a worst case assumption the lake is set to 1 million m³ (1 000 000 000 L). This is seen as representative for a medium quarry pond and for natural and other freshwater lakes for swimming.

- For the worst case estimation the average number of persons, who are swimming at the same day in one lake or pond while using the biological product is set to 20 (Fmainsource = 0.002).
- The fraction of the product which is emitted to the water is set to 1 in the proposed scenario.
- The rate constant for the biodegradability is set according to Table 7 (EU TGD, 2003) to k = 0.047 d^{-1} for surface water. DEET is readily biodegradable therefore formation of metabolites is considered as not relevant.
- The time of swimming during the year is limited by the temperature of the air and the water, therefore it was estimated that swimming will take place for 1 hour a day on 150 days per year as a maximum limit.
- For PEC localwater three situations are calculated: concentration in STP influent (C localinf), local concentration in water (C localwater) after 1 day and annual concentration in water (C localwater_annual) after 150 days.

Calculation steps:

1) Calculation of „Elocalwater“ according to equation No. 5 of EU TGD.
   As specific data for the use of b.p. are available (e.g. amount of b.p. used per person and application), the daily emission to the lake Elocal, water can be simply estimated by: Number of applications per day x amount of b.p. used per application x mean amount of a.s. in the b.p.

The TNsG on human exposure sets a default value for the amount of dermally applied repellent product to 6 g. According to the list of intended uses, the product is applied 1-2 times per day (except for the products containing 50% w/w DEET which are applied only once a day). Applying 2 applications per day for the calculation is a worst case assumption since the calculated exposure reflects the use of all inhabitants using the product (and it may be considered less likely that all users would apply the product at the maximum number per day). For comparison, calculations are performed for the products when applied once or twice per day.

$Elocal_{water}$ is 0.03-0.06 kg/d for the Mosquito Milk DEET products when applied once a day and 0.06-0.07 kg/d when applied twice a day.

2) Calculation of „C localinf“ according to modification of equation No. 32 of EU TGD, where „EFFLUENTstp“ is replaced by the volume of the lake Vwaterbody = 1,000,000,000 L/d
   C localinf = Elocalwater / Vwaterbody

3) Calculation of „C $local_{water}$“ according to the modified equation no. 7.16 from the OECD emission scenario document for PT 8 (wood preservatives) for the release into a static water body (input of a.s. for 1 day):

$$Clocal_{water} := \frac{Elocal_{water}}{V_{waterbody} \cdot k} \cdot \left[1 - \frac{\left[1 - e^{\left(- T_{1d} \cdot k \right)} \right]}{T_{1d} \cdot k} \right]$$

With k = rate constant for biodegradation in surface water = 0.047 d^{-1}
Vwaterbody = 1,000,000,000 L
T1d = 1 d

4) Calculation of „C $local_{water}$_annual“ according to the modified equation no. 7.16 from the OECD emission scenario document for PT 8 (wood preservatives) for the release into a static water body (continuously input of a.s. for one season):

$$Clocal_{water\_ann} := \frac{Elocal_{water}}{V_{waterbody} \cdot k} \cdot \left[1 - \frac{\left[1 - e^{\left(- T_{emission} \cdot k \right)} \right]}{T_{emission} \cdot k} \right]$$

With k = rate constant for biodegradation in surface water
Vwaterbody = 1,000,000,000 L
Temission = 150 d

Calculation of the PEC in the sediment according to the equation no. 50 of the TGD:

$$PEClocal_{sed} = \frac{K_{susp\text{-}water}}{RHO_{susp}} \cdot PEClocal_{water} \cdot 1000 \qquad (50)$$

Explanation of symbols

$PEClocal_{water}$	concentration in surface water during emission episode	[mg.l^{-1}]	eq. (48)
$K_{susp\text{-}water}$	suspended matter-water partitioning coefficient	[m^3.m^{-3}]	eq. (24)
RHO_{susp}	bulk density of suspended matter	[kg.m^{-3}]	eq. (18)
$PEClocal_{sed}$	predicted environmental concentration in sediment	[mg.kg^{-1}]	

$PEC_{surface\ water}$ used for the risk assessment is selected by comparing the three local concentrations and choosing the highest value calculated $Clocal_{inf}$ or $Clocal_{water}$ or $Clocal_{water\_annual}$ representing the worst-case situation. As the highest values were obtained for $Clocal_{water\_annual}$ these concentrations were used as $PEC_{surface\ water}$ for the risk assessment, see Table 2.8.2.2-1.

Table 2.8.2.2–1 $Clocal_{inf}$, $Clocal_{water}$, $Clocal_{water\_annual}$ for direct emission to surface water due to swimming.

Amount of a.s. in product (g/kg)	$Clocal_{inf}$ (mg/L)	$Clocal_{water}$ (mg/L)	$Clocal_{water\_annual}$ (mg/L)
Application once a day			
253	$3.04x10^{-5}$	$1.51x10^{-5}$	$5.54x10^{-4}$
309	$3.71x10^{-5}$	$1.85x10^{-5}$	$6.77x10^{-4}$
310	$3.72x10^{-5}$	$1.85x10^{-5}$	$6.79x10^{-4}$
485	$5.82x10^{-5}$	$2.90x10^{-5}$	$1.06x10^{-3}$
Application twice a day			
253	$6.07x10^{-5}$	$3.02x10^{-5}$	$1.11x10^{-3}$
309	$7.42x10^{-5}$	$3.69x10^{-5}$	$1.35x10^{-3}$
310	$7.44x10^{-5}$	$3.70x10^{-5}$	$1.36x10^{-3}$

Table 2.8.2.2-2 summarises the PECs in surface water and sediment for direct emission to surface water and sediment due to swimming based on the German swimming scenario.

Table 2.8.2.2–2 $PEC_{surface\ water}$ and $PEC_{sediment}$ for direct emission to surface water and sediment due to swimming based on the German swimming scenario including biodegradation.

Amount of a.s. in product (g/kg)	$PEC_{surface\ water}$ (mg/L)	$PEC_{sediment}$ (mg/kg ww)
Application once a day		
253	$5.54x10^{-4}$	$9.55x10^{-4}$
309	$6.77x10^{-4}$	$1.17x10^{-3}$

310	$6.79x10^{-4}$	$1.17x10^{-3}$
485	$1.06x10^{-3}$	$1.83x10^{-3}$
Application twice a day		
253	$1.11x10^{-3}$	$1.91x10^{-3}$
309	$1.35x10^{-3}$	$2.33x10^{-3}$
310	$1.36x10^{-3}$	$2.34x10^{-3}$

NL swimming scenario (Tier 2)

There are 450 official swimming locations in the Netherlands which are owned by one of the 19 regional waterboards and concern the more isolated lakes. There are an additional 220 official swimming locations owned by Rijkswaterstaat (the executive arm of the Dutch Ministry of Infrastructure and the Environment), these locations concern swimming locations along side rivers etcetera.

The swimming lakes from waterboards are included in the data analysis as these concern the more isolated swimming lakes. For each waterboard approx. 5-10 swimming locations have been selected, the total number of swimming lakes selected is 72, considered representative for all Dutch natural swimming waters. Parameters collected are the average and high number of swimmers pr day during the period of access (swimming season from 1 May till 30 September) and the volume of the swimming area or of the entire lake. The water depth in the swimming area is estimated to be 1.5 m if not reported and in case a chain with balls borders the swimming area. According to the Dutch "protocol zwemwaterlocaties in binnenwater" (protocol swimming locations in inland waters) a swimming area should be delineated at a depth of 1.5 m in case the swimming area is defined.

Deep lakes can be stratified and thus only a certain part of the lake is susceptible to mixing. Information on which water volume of the lake gets mixed is mostly lacking and therefore mixing of the entire water volume of a lake is assumed in the data analysis.

Please be aware that mixing/dilution can have a big impact on the PECs for the water and sediment compartments.

It is assumed that 1% of the swimmers uses a repellent and that the entire amount of a single application applied is washed off daily during swimming. The TNsG on human exposure sets a default value for the amount of dermally applied repellent product to 6 g. According to the list of intended uses, the product is applied 1-2 times per day (except for the products containing 50% w/w DEET which are applied only once a day). For comparison, calculations are performed for the products when applied once or twice per day.

Using these data the 10 percentile, 90 percentile and average $PEClocal_{water}$ with and without degradation (TWA 30 days) was calculated, referring to 90%, 10% and 50% of the swimming waters. For these $PEClocal_{water}$ the $PEClocal_{sediment}$ was calculated with the equilibrium partitioning method according to equation no. 50 of the TGD, see Table 2.8.2.2-3.

Table 2.8.2.2–3 90 percentile $PEC_{surface\ water}$ and $PEC_{sediment}$ for direct emission to surface water and sediment from swimming based on 30 days TWA concentrations. Calculations are based on the Dutch swimming scenario.

	90 percentile $PEClocal_{water}$ (TWA 30 days, mg/L)			
Amount of a.s. in product (g/kg)	**High density swimmers in lake**	**High density swimmers in swimming area**	**Average density swimmers in lake**	**Average density swimmers in swimming area**
Application once a day				
253	$6.69x10^{-3}$	$5.35x10^{-2}$	$2.24x10^{-3}$	$1.58x10^{-2}$
309	$8.17x10^{-3}$	$6.54x10^{-2}$	$2.74x10^{-3}$	$1.93x10^{-2}$
310	$8.20x10^{-3}$	$6.56x10^{-2}$	$2.75x10^{-3}$	$1.94x10^{-2}$
485	$1.28x10^{-2}$	$1.03x10^{-1}$	$4.30x10^{-3}$	$3.03x10^{-2}$
Application twice a day				
253	$1.34x10^{-2}$	$1.07x10^{-1}$	$4.49x10^{-3}$	$3.17x10^{-2}$
309	$1.63x10^{-2}$	$1.31x10^{-1}$	$5.48x10^{-3}$	$3.87x10^{-2}$
310	$1.64x10^{-2}$	$1.31x10^{-1}$	$5.50x10^{-3}$	$3.88x10^{-2}$
	90 percentile $PEClocal_{sediment}$ (mg/kg wwt)			
Amount of a.s. in product (g/kg)	**High density swimmers in lake**	**High density swimmers in swimming area**	**Average density swimmers in lake**	**Average density swimmers in swimming area**
Application once a day				
253	$1.15x10^{-2}$	$9.22x10^{-2}$	$3.86x10^{-3}$	$2.72x10^{-2}$
309	$1.41x10^{-2}$	$1.13x10^{-1}$	$4.72x10^{-3}$	$3.33x10^{-2}$
310	$1.41x10^{-2}$	$1.13x10^{-1}$	$4.74x10^{-3}$	$3.34x10^{-2}$
485	$2.21x10^{-2}$	$1.78x10^{-1}$	$7.41x10^{-3}$	$5.22x10^{-2}$
Application twice a day				
253	$2.31x10^{-2}$	$1.84x10^{-1}$	$7.74x10^{-3}$	$5.46x10^{-2}$
309	$2.81x10^{-2}$	$2.26x10^{-1}$	$9.45x10^{-3}$	$6.67x10^{-2}$
310	$2.83x10^{-2}$	$2.26x10^{-1}$	$9.48x10^{-3}$	$6.69x10^{-2}$

2.8.2.3 Exposure monitoring – data published in the open literature

Publications in scientific peer reviewed journals regarding DEET concentrations in the environment were used to compare the calculated values with measured data.
Before making comparisons between measured and modelled data one needs to be aware of the uncertainty associated with measured values, due to temporal and spatial variation. Temporal fluctuations are of special concern when it comes to PEC estimations of DEET; the highest values expected during peak bug season. There may also be geographical variations. These monitoring data should therefore only be regarded as examples of DEET concentrations found in order to evaluate the calculated PEC values, not as substitutes.
The highest surface freshwater concentration found in a study of 56 american streams was 1.1 µg/L, which is 209 times lower than the worst case $Clocal_{water}$ of 0.23 mg/L, see table 2.8.2.2-3.

A few data on DEET in American raw waste water influents (150 and 365 ng/L) have been found in the open literature ([redacted] 2006)[5]. These values are at least 4685 times lower than the lowest concentration in influent calculated (1.71 mg/L).

[5] Snyder et al, 2006. Role of membranes and activated carbon in the removal of endocrine disruptors and pharmaceuticals. Desalination. In press.

DEET concentrations in Norwegian and German STP effluents (10-60 ng/L and 130 ng/L respectively)[6], are at least 1692 times lower than what was estimated through model calculations (0.22 mg/L). The Norwegian data are from an STP without biological treatment whereas the German data are from an STP with biological treatment. The DEET concentrations found in the German influent was 0.21 µg/L, before the biological treatment step, which is more than 8143 times lower than estimated from the calculations.

Table 2.8.2.3-1 Environmental monitoring data for DEET from open peer reviewed scientific literature.

Area information	Analytical information	Concentrations found	Reference
Seawater North Sea Sampling locations mostly coastal	Polymeric sorbent extraction + GC-MS LOQ: 26 pg/L Sampling period: June-July 1998 2x10L samples at 5m depth 15 sampling locations	Highest values 1.09 and 1.06 ng/L respectively [found in the German Bight; (53°40.00'N; 06°25.00'E) and (54°15.00'N; 07°48.00'E)] DEET was detected in all but two samples.	[redacted] 2002.
Seawater Tromsø Sound (Norway), (into which sewage is discharged)	Glass fibre filtration, sorbent extraction + GC/MS LOQ: 0.20 ng/L Sampling period: 2002 (most samples taken in April, the rest in October) 2.5L samples. 12 sampling locations	Range: 0.4-13 ng/L (STP data: 10 and 60 ng/L in April and October respectively)	[redacted] 2004. [Ref no. 8066] Chemosphere 56: 583-592
Surface freshwater Las Vegas Wash, a waterway receiving tertiary treated municipal effluent from the city of Las Vegas, NV.	Whole water (incl dissolved and particulate phases) Solid Phase Extraction + LC/MS/MS 1L samples 3 replicates Reporting level: 1.0 ng/L	Average: 40 ng/L	[redacted]. 2003.

[6] Ref no 8066. Weigel et al. 2004. Determination of selected pharmaceuticals and caffeine in sewage and seawater from Tromsø/Norway with emphasis on ibuprofen and its metabolites. Chemosphere 56: 583-592

Area information	Analytical information	Concentrations found	Reference
Surface freshwater 56 streams across the USA, some bias to streams downstreams intense urbanization and livestock	Whole water (incl dissolved and particulate phases) Continuous Liquid- Liquid Extraction + GC/MS Sampling period: 2000 Reporting level: 40 ng/L[a] Duplicate composite samples (from 4-6 vertical profiles)	Highest value: 1.1 µg/L (measured at urban site) Median concentration: 0.05 µg/L (all sites) Frequency of detection: 73.2%	[redacted]. 2002

[a] Reporting level: lowest concentration standard that could be quantitated reliably. Initially set to 0.04 µg/l, and then revised to 0.08 µg/l, but lower contrations reported if GC/MS criteria (retention time and abundance of three characteristic ions in the same ratio as that of standard) were met. [redacted] 2005.

Compared to monitoring data from STP influents/effluents all estimated values are conservative. Similarly, the estimated values were in the range of, or above the peak maximum measured concentration in fresh surface water.

DEET has been on the Dutch market for > 3 years (authorised since 1986). This period is sufficiently large to consider the market share to be established. DEET is included in the list of substances of concern relevant for surface water at drinking water abstraction points as established by VEWIN/CTGB. This list is based on monitoring data for eight Dutch drinking water abstraction periods and measured during period 2008-2012.
The active substance DEET was detected at several drinking water abstraction points in surface waters in the Netherlands. However, exceeding of the drinking water limit occurred only occasionally. Based on the available data it can be concluded that the 90th percentile of the measurements over the period 2008-2012 is below the drinking water limit of 0.1 µg/L and for five out of eight drinking water abstraction points even below the detection limit of 0.02 µg/L, see Table 2.8.2.3-2.

Table 2.8.2.3-2 Monitoring data for DEET at Dutch drinking water abstraction points from surface water in the period 2008 – 2012

Abstraction point	Number of measurements above detection limit/ Number of measurements [n/N]	Number of measurements above drinking water limit/ Number of measurements [n/N]	Overall 90-percentile [µg/L]
Andijk	0/52	0/52	< d.l.*
Nieuwegein	8/65	0/65	< d.l.
Amsterdam-Rijn kanaal (Nieuwersluis)	21/52	0/52	< d.l.
Brakel	30/100	1/100	0.03
Heel	17/59	1/59	0.05
Petrusplaat/Keizersveer	42/103	1/103	0.06
Scheelhoek/Stellendam	7/35	0/35	< d.l.
Drentsche Aa (De Punt)	0/125	0/125	< d.l.

*d.l: detection limit, in general the detection limit for DEET is 0.02 µg/L

Furthermore, the RIVM did not include this active substance on the recommended list of surface water to be monitored for drinking water from surface water[7] because all measured concentrations in the Rhine and Meuse were below the drinking water limit of 0.1 µg/L. From the general scientific knowledge collected by the CTGB about the products and their active substance, the CTGB concludes that there are no concrete indications for concern about the consequences of these products for surface water from which drinking water is produced when used in compliance with the directions for use. The standards for surface water destined for the production of drinking water are met.

2.8.2.4 PEC_{soil} and $PEC_{groundwater}$ – indirect emission

The estimation of the local PECs for the terrestrial compartment includes soil and groundwater:

- PEC_{soil} according to equation 66, chapter 2.3.8.5, EU TGD (2003);
- $PEC_{porewater}$ according to equation 68, chapter 2.3.8.6, EU TGD (2003) as a first worst-case estimation.

The estimation of releases to the soil compartment premises calculation of predicted concentrations of the a.s. in dry sewage sludge as part of a.s. load leaving a STP. Accumulation of the acute substance may occur when sludge is applied over consecutive years for persistent substances. Table 2.8.2.4-1 summarises the concentration in dry sewage sludge C_{sludge} as well as the PECs in soil and porewater.

Table 2.8.2.4–1 Csludge, PEC_{soil} and $PEC_{groundwater}$ for indirect emission to soil and groundwater due to body cleaning and washing of treated clothes.

Amount of a.s. in product (g/kg)	C_{sludge} (mg/kg)	PEC_{soil} (µg/kg ww)	$PEC_{porewater\ grassland}$ (µg/L)	$PEC_{porewater\ agricultural\ soil}$ (µg/L)
Application once a day				
253	7.20	5.72	0.76	2.65
309	8.80	9.11	1.21	3.24
310	8.83	9.14	1.21	3.25
485	13.81	14.29	1.90	5.08
Application twice a day				
253	14.41	14.91	1.98	5.30
309	17.60	18.21	2.42	6.47
310	17.65	18.27	2.42	6.49

The calculated PECs for porewater were addressed further by the RMS as they exceed the drinking water limit for groundwater of 0.1 µg/L. PECgw for the nine FOCUS groundwater scenarios, as developed for plant protection products, were calculated. Model used, input data and assumptions are shown in Table 2.8.2.4-2. The overall assumption being that the only exposure route to groundwater is via the application of sludge from STPs.

[7] Bakker, J. Biociden in oppervlaktewater voor drinkwaterproductie, National Institute of Public Health and the Environment, RIVM report 601712007, 2010, Bilthoven, The Netherlands.

Table 2.8.2.4–2 Summary of data used and assumptions made to calculate PECgroundwater for DEET in FOCUS scenarios.

Parameter	Value
Model used:	FOCUS PEARL ver. 4.4.4.
Years of simulation:	26 (including 6 yrs “warming-up” period)
Application rate:	0.036-0.088 kg/ha[a]
Application method:	To the soil surface
Date of application:	1 October annually for 20 years[b]
Molar mass:	191.3 g/mol
Vapour pressure:	0.23 Pa (25°C)
Water solubility:	11200 mg/L (25°C)
Kom:	25.1 L/kg[c]
Freundlich exponent 1/n:	0.9 (FOCUS default)
DT_{50} soil	30 days (12°C)[d]
Coefficient for uptake in plants:	0 (worst-case assumption)

a Calculated from SimpleTreat output concentration of DEET in dry sewage sludge of 7.20-17.65 mg/kg (see table 2.8.2.4-1), and application of 5000 kg dry sludge/ha and year to agricultural land (at a single event as suggested in the TGD, Part II 2.3.8.5).

b Autumn application assumed to represent a worst-case situation.

c Calculated from Koc as 43.3/1.724.

d In accordance with EUSES/TGD, Part II 2.3.6.5, for ready biodegradable substances.

The resulting PECgw (as FOCUS standard output; 80th percentile annual average PECgw at 1 m depth) are shown in Table 2.8.1.4-3. These results show that the predicted groundwater concentrations of DEET following the intended use of this substance are <0.1 µg/L for all FOCUS scenarios for the Mosquito Milk DEET products containing 253 g/kg, 309 g/kg, 310 g/kg and 485 g/kg DEET in case applied once a day.
For the Mosquito Milk DEET products containing 253 g/kg, 309 g/kg and 310 g/kg DEET the predicted groundwater concentrations are > 0.1 µg/L for the scenario Piacenza in case applied twice a day.

Table 2.8.2.4-3 80th precentile annual average PEC of DEET in groundwater (at 1 m depth) calculated for nine FOCUS scenarios, assuming application of sewage sludge from STP to land.

		PECgw, µg/L		
Scenario	**253 g/kg a.s. in product**	**309 g/kg a.s. in product**	**310 g/kg a.s. in product**	**485 g/kg a.s. in product**
Application once a day				
Chateaudun	< 0.001	< 0.01	< 0.1	< 0.01
Hamburg	< 0.1	< 0.1	< 0.1	< 0.1
Jokioinen	< 0.01	< 0.01	< 0.01	< 0.01
Kremsmuenster	< 0.01	< 0.1	< 0.1	< 0.1
Okehampton	< 0.1	< 0.1	< 0.1	< 0.1
Piacenza	< 0.1	< 0.1	< 0.1	<0.1
Porto	< 0.1	< 0.1	< 0.1	< 0.1
Sevilla	< 0.001	< 0.001	< 0.001	< 0.01
Thiva	< 0.001	< 0.01	< 0.01	< 0.01
Application twice a day				
Chateaudun	< 0.01	< 0.01	< 0.01	-
Hamburg	< 0.1	< 0.1	< 0.1	-
Jokioinen	< 0.01	< 0.1	< 0.1	-

		PECgw, µg/L		
Scenario	**253 g/kg a.s. in product**	**309 g/kg a.s. in product**	**310 g/kg a.s. in product**	**485 g/kg a.s. in product**
Application once a day				
Kremsmuenster	< 0.1	< 0.1	< 0.1	-
Okehampton	< 0.1	< 0.1	< 0.1	-
Piacenza	**0.104**	**0.138**	**0.138**	-
Porto	< 0.1	< 0.1	< 0.1	-
Sevilla	< 0.01	< 0.01	< 0.01	-
Thiva	< 0.01	< 0.01	< 0.01	-

As agreed at the Technical Meeting I in 2009, the Netherlands submitted available groundwater monitoring data on DEET to the RMS. In addition to a report[8] (in Dutch) presenting the results from screening the presence of 149 pesticides and some biocides in groundwater at 189 locations in the Netherlands in 2007, the results on DEET were also presented in an Excel file. Hence, details with regard to DEET from this monitoring program appear not to be available in the open literature. The monitoring data were collected by two provinces and two drinking water companies from the Southern part of the Netherlands. The majority of the samples were taken during July-December. DEET was the substance that was found above the detection limit (0.01 µg/L) at the highest number of occasions (30%). In 189 samples from 189 groundwater monitoring points 57 samples had a concentration >0.01 ug/L, and out of these three samples (1.6%) were above the drinking water limit, i.e. > 0.1 ug/L (range was 0.36-1.48 µg/L). The report also referred to monitoring data from 2003 during which DEET was found above the detection limit in 5% of the samples, and in no sample concentrations >0.1 µg/L were measured.

In the Netherlands, surplus sludge of public STPs is not applied for fertilization and soil improvement of agricultural soil. Therefore, leaching to groundwater is not expected and thus monitoring data for groundwater are not required for the Dutch authorisation of the Mosquito Milk DEET products.

2.8.2.5 PEC_{Soil} and $PEC_{groundwater}$ – direct emission

In the scenario for the swimming pathway the terrestrial compartment is not exposed and therefore not assessed.

2.8.2.6 PEC_{air}

The active substance DEET is moderately volatile. The vapour pressure is 0.11 Pa at 20°C. A Henry's law constant of 3.93×10^{-3} Pa m^3 mol^{-1} is reported, confirming its relatively low volatility.

AOPWIN model calculation estimates that DEET in the atmosphere reacts with photochemically produced hydroxyl radicals in air, with a half-life of 0.634 days (24 hr day; 0.5×10^6 OH/cm^3). This calculated half life is below the trigger of < 2 days that is used as cut-off value to identify chemicals that could be of potential concern for with the potential for long-range transport through the atmosphere. As the substance unlikely shows significant long-range transport, it is considered of no concern for ozone depletion.

Criteria for the examination of environmental risks to air are not specified in the form of a numerical standard. Therefore, effects on air quality only are taken into account when adverse effects are foreseen. The assessment of potential impacts on air quality, yet, is aimed to minimize the risk for stratospheric ozone depletion. There are no indications that

[8] [redacted] (2008) Brede screening Bestrijdingsmiddelen Maasstroomgebied 2007. Royal Haskoning, pp 71.

this substance contributes to depletion of the ozone layer and the compounds are furthermore not listed as 'controlled substance' listed in Annex I of Regulation (EC) No 1005/2009 of the European Parliament, the environmental risk to air is considered acceptable.

2.8.2.7 Primary and secondary poisoning of birds and mammals

As the log K_{ow} is < 3 (2.4), a risk for bioconcentration and biomagnification is not expected (conform the biomagnification trigger value proposed for K_{ow} in the TGD).
As DEET is not bioaccumulative and the concentrations in surface water are low, the risk for the primary and secondary poisoning is considered acceptable.

2.8.3 Risk Assessment

The risk characterisation for the environment is the comparison of the toxicity of the substance to the exposure estimates. Both aspects were already discussed in section 2.8.1 and 2.8.2, respectively, and only the relevant values are summarised below.

2.8.3.1 Aquatic compartment (incl. sediment and STP)

The PNEC values for the water compartment and STP microorganisms were calculated from toxicity data by using recommended assessment factors, see section 2.8.1. The PNEC for STP microorganisms is 10 mg/L which is based on and EC_{50} > 1000 mg/L and an assessment factor of 100.
Because only three acute aquatic tests were performed, all on freshwater species, the assessment factor for the freshwater compartment was 1000. For the sediment compartment, there are no toxicity data available. The low Koc value indicates that sorption to sediment is not likely. Nevertheless, a PNEC value of 0.0741 mg/kg ww for sediment has been calculated based on the equilibrium partitioning theory and PNECwater of 0.043 mg/L. As both the PEC and PNEC for sediment are based on equilibrium partioning with the PEC and PNEC for surface water, the risk assessment for the aquatic environment covers the surface water and sediment compartments.

Indirect emission

Even when making worst case assumptions for the local environment, none of the PEC/PNEC ratios exceed 1, see table 2.8.3.1-1.

Table 2.8.3.1–1 PEC/PNEC ratios for indirect emission to the aquatic environment via the STP due to body cleaning and washing of treated clothes.

Amount of a.s. in product (g/kg)	PEC (mg/L)	PNEC (mg/L)	PEC/PNEC
Microorganisms in STP - application once a day			
253	$8.76x10^{-2}$	10	$8.76x10^{-3}$
309	$1.07x10^{-1}$	10	$1.07x10^{-2}$
310	$1.08x10^{-1}$	10	$1.08x10^{-2}$
485	$1.68x10^{-1}$	10	$1.68x10^{-2}$
Microorganisms in STP - application twice a day			
253	$1.76x10^{-1}$	10	$1.76x10^{-2}$
309	$2.15x10^{-1}$	10	$2.15x10^{-2}$
310	$2.16x10^{-1}$	10	$2.16x10^{-2}$
Aquatic environment - application once a day			
253	$8.76x10^{-3}$	0.043	$2.04x10^{-1}$
309	$1.07x10^{-2}$	0.043	$2.49x10^{-1}$
310	$1.08x10^{-2}$	0.043	$2.51x10^{-1}$
485	$1.68x10^{-2}$	0.043	$3.91x10^{-1}$

Aquatic environment - application twice a day			
253	$1.76x10^{-2}$	0.043	$4.09x10^{-1}$
309	$2.15x10^{-2}$	0.043	$5.00x10^{-1}$
310	$2.16x10^{-2}$	0.043	$5.02x10^{-1}$

Direct emission

In Tables 2.8.3.1-2, 2.8.3.1-3 and 2.8.3.1-4 the PEC/PNEC ratios for direct emission to surface water and sediment due to swimming are indicated, the PECs were calculated using both the swimming scenarios developed by Germany and The Netherlands for the future PT19 ESD.

TIER 1:

The PEC/PNEC ratios for both surface water and sediment are < 1 for PECs calculated with the German scenario for Mosquito Milk products containing 253, 309, 310 and 485 g/kg DEET and applied once or twice per day.

Table 2.8.3.1–2 PEC/PNEC ratios for direct emission to the aquatic environment due to swimming based on the German swimming scenario including biodegradation (– first tier).

Amount of a.s. in product (g/kg)	PEC (mg/L)	PNEC (mg/L)	PEC/PNEC
Application once a day			
253	$5.54x10^{-4}$	0.043	$1.29x10^{-2}$
309	$6.77x10^{-4}$	0.043	$1.57x10^{-2}$
310	$6.79x10^{-4}$	0.043	$1.58x10^{-2}$
485	$1.06x10^{-3}$	0.043	$2.47x10^{-2}$
Application twice a day			
253	$1.11x10^{-3}$	0.043	$2.58x10^{-2}$
309	$1.35x10^{-3}$	0.043	$3.14x10^{-2}$
310	$1.36x10^{-3}$	0.043	$3.16x10^{-2}$

TIER 2

In ≥50% of the swimming areas the PEC/PNEC ratios for both surface water and sediment are > 1 for PECs calculated with the Dutch scenario for the Mosquito Milk products containing 309 and 310 g/kg DEET and applied twice a day for a **high density of swimmers** in the swimming area. This high density of swimmers, however, is expected to occur sporadically (3 to 5 times per year in the Netherlands) when there are exceptional high air and water temperatures. Furthermore, the DT50 of DEET is 15 days at 12°C (which is used for the calculations) but degradation will be more rapid at higher water temperatures, not unusual in shallow swimming areas warmed by the sun during the swimming season. During release the PEC/PNEC ratios are thus expected to be above 1 just for a short period of time and therefore the risk to aquatic and sediment organisms is considered acceptable for the Mosquito Milk products containing 253, 309, 310 and 485 g/kg DEET and applied once or twice a day.

On basis fo the average density swimmers in more than 90% of the swimming areas in natural waters the PEC/PNEC ratio is below 1 (only in maximum 6 of the 72 investigated areas, the PEC/PNEC=1 ratio is exceeded). It appears that these are rather open areas where mixing of the water with the remaining non swim area will rapidly lower the exposure concentrations to acceptable levels.

Table 2.8.3.1–3 90 percentile (30 d TWA) PEC/PNEC ratios for direct emission to the aquatic environment (swimming areas in natural lakes) due to

swimming based on the Dutch swimming scenario calculated with a DT50 of 15 days at 12°C (second tier).

Scenario	90th percentile PEC (mg/L)	PNEC (mg/L)	PEC/PNEC	Number out of 72 lakes with PEC/PNEC > 1
253 g/kg a.s. in product - application once a day				
High density swimmers in lake	6.69×10^{-3}	0.043	1.56×10^{-1}	0
High density swimmers in swimming area	5.35×10^{-2}	0.043	**1.24**	14
Average density swimmers in lake	2.24×10^{-3}	0.043	5.21×10^{-2}	0
Average density swimmers in swimming area	1.58×10^{-2}	0.043	3.67×10^{-1}	3
309 g/kg a.s. in product – application once a day				
High density swimmers in lake	8.17×10^{-3}	0.043	1.90×10^{-1}	0
High density swimmers in swimming area	6.54×10^{-2}	0.043	**1.52**	19
Average density swimmers in lake	2.74×10^{-3}	0.043	6.37×10^{-2}	0
Average density swimmers in swimming area	1.93×10^{-2}	0.043	4.49×10^{-1}	3
310 g/kg a.s. in product - application once a day				
High density swimmers in lake	8.20×10^{-3}	0.043	1.91×10^{-1}	0
High density swimmers in swimming area	6.56×10^{-2}	0.043	**1.53**	19
Average density swimmers in lake	2.75×10^{-3}	0.043	6.40×10^{-2}	0
Average density swimmers in swimming area	1.94×10^{-2}	0.043	4.51×10^{-1}	3
485 g/kg a.s. in product - application once a day				
High density swimmers in lake	1.28×10^{-2}	0.043	2.98×10^{-1}	2
High density swimmers in swimming area	1.03×10^{-1}	0.043	**2.40**	35
Average density swimmers in lake	4.30×10^{-3}	0.043	1.00×10^{-1}	0
Average density swimmers in swimming area	3.03×10^{-2}	0.043	7.05×10^{-1}	3
253 g/kg a.s. in product - application twice a day				
High density swimmers in lake	1.34×10^{-2}	0.043	3.12×10^{-1}	2
High density swimmers in swimming area	1.07×10^{-1}	0.043	**2.49**	35
Average density swimmers in lake	4.49×10^{-3}	0.043	1.04×10^{-1}	0
Average density swimmers in swimming area	3.17×10^{-2}	0.043	7.37×10^{-1}	3
309 g/kg a.s. in product - application twice a day				
High density swimmers in lake	1.63×10^{-2}	0.043	3.79×10^{-1}	5
High density swimmers in swimming area	1.31×10^{-1}	0.043	**3.05**	40
Average density swimmers in lake	5.48×10^{-3}	0.043	1.27×10^{-1}	0
Average density swimmers in swimming area	3.87×10^{-2}	0.043	9.00×10^{-1}	6
310 g/kg a.s. in product - application twice a day				
High density swimmers in lake	1.64×10^{-2}	0.043	3.81×10^{-1}	5
High density swimmers in swimming area	1.31×10^{-1}	0.043	**3.05**	40
Average density swimmers in lake	5.50×10^{-3}	0.043	1.28×10^{-1}	0

Scenario	90th percentile PEC (mg/L)	PNEC (mg/L)	PEC/PNEC	Number out of 72 lakes with PEC/PNEC > 1
Average density swimmers in swimming area	$3.88x10^{-2}$	0.043	$9.02x10^{-1}$	6

2.8.3.2 Terrestrial compartment

For the soil compartment, there are no toxicity data available. The low Koc value indicates that sorption to soil is not likely. Nevertheless, PNEC values have been calculated based on equilibrium partitioning theory and PNECwater.

Even when making worst case assumptions for the local environment, none of the PEC/PNEC ratios exceed 1.

Table 2.8.3.2–1 PEC/PNEC ratios for indirect emission to soil due to body cleaning after product use and washing of treated clothes.

Amount of a.s. in product (g/kg)	PEC_{soil} (µg/kg ww)	PNEC (µg/kg ww)	PEC/PNEC
Application once a day			
253	5.72	37.9	$1.51x10^{-1}$
309	9.11	37.9	$2.40x10^{-1}$
310	9.14	37.9	$2.41x10^{-1}$
485	14.29	37.9	$3.77x10^{-1}$
Application twice a day			
253	14.91	37.9	$3.93x10^{-1}$
309	18.21	37.9	$4.80x10^{-1}$
310	18.27	37.9	$4.82x10^{-1}$

2.8.3.3 Groundwater compartment

In the EUSES modelling the porewater PEC in agricultural soil was above 1 µg/L. This result was further addressed by the RMS by calculating PECgw at 1 m soil depth for nine FOCUS groundwater scenarios in FOCUS PEARL v. 4.4.4 model, assuming that sludge from STP is applied to agricultural soil.

The predicted groundwater concentrations of DEET following the intended use of this substance are <0.1 µg/L for all FOCUS scenarios for the Mosquito Milk DEET products containing 253 g/kg, 309 g/kg, 310 g/kg and 485 g/kg DEET in case applied once a day.

. For the Mosquito Milk DEET products containing 253 g/kg, 309 g/kg and 310 g/kg DEET the predicted groundwater concentrations are > 0.1 µg/L for the scenario Piacenza in case applied twice a day.

Finally, monitoring data from The Netherlands indicate that DEET may have a potential to leach to groundwater. In 189 samples of groundwater in 2007, DEET was detected at >0.01 µg/L in 57 samples (30%) and in 3 of these samples (1.6%) concentrations were reported as >0.1 µg/L (range 0.36-1.48 µg/L).

2.8.3.4 Atmosphere

Although PEC/PNEC ratios could not be calculated, the physiochemical properties of DEET do not suggest that this substance will pose a significant threat to the atmospheric environment, see section 2.8.2.6.

2.8.3.5 Primary poisoning and secondary poisoning (non compartment specific effects relevant to the food chain)

Primary poisoning of birds and mammals due to intake of the product is not expected to be relevant. Considering the low acute toxicity of DEET to birds (LD50 1375 mg/kg bw) and the

type of use intake by birds and mammals of the active substance via water is considered as negligible.
Although PEC/PNEC ratios could not be calculated, it can be concluded that no risk for secondary poisoning has been identified based on the low BCF value, see section 2.8.2.7.

2.9 Measures to protect man, animals and the environment

The instructions for use must contain the following indications:

Mosquito Milk Gel 24.5% DEET:
- Do not use more than once a day
- Do not use on children < 12 years old

Mosquito Milk Roll On 30% DEET:
- Do not use more than once a day
- Do not use on children < 12 years old

Mosquito Milk Spray 30% DEET:
- Do not use more than once a day
- Do not use on children < 12 years old
- Do not breathe spray
- Use only outdoors or in a well-ventilated area

Mosquito Milk Roll On 50% DEET:
- Do not use more than once a day.
- Do not use on children (< 17 years old)

Mosquito Milk Spray 50% DEET:
- Do not use more than once a day.
- Do not use on children (< 17 years old)
- Do not breathe spray
- Use only outdoors or in a well-ventilated area

Mosquito Milk Gel 50% DEET:
- Do not use more than once a day.
- Do not use on children (< 17 years old)

In the assessment report for Annex 1 inclusion the following Elements to be taken into account by Member States when authorising Products are defined:
a. Member states may require monitoring methods for analysing residues of DEET in the air compartment might be required for authorisation of DEET containing biocidal products, whose use pattern result in significant exposure to the air compartment.
b. Member states may need to consider inclusion of DEET in national programs for monitoring groundwater.
c. Member states should address any potential for direct exposure to surface water as a consequence of swimming etc, which has not been assessed at the European level.

Ad. a: The opinion of the Ctgb is that is it not needed to design monitoring methods for analysing residues of DEET in the air compartment as the calculated half life of DEET is below the trigger of < 2 days that is used as cut-off value to identify chemicals that could be of potential concern for with the potential for long-range transport through the atmosphere. The substance unlikely shows significant long-range transport, and it is considered of no concern for ozone depletion.

Ad. b: In the Netherlands, surplus sludge of public STPs is not applied for fertilization and soil improvement of agricultural soil. Therefore, emission to soil and groundwater of this type of use is considered as negligible and thus monitoring data for groundwater are not required for the Dutch authorisation of the Mosquito Milk DEET products.

Ad. c: The exposure and risk for surface water due to swimming is assessed in the current assessment report using both the German and Dutch swimming scenarios to be implemented in the future ESD for PT19.

Additionally the Ctgb would like to stress that in order to gain information on the use of repellents by consumers a usage study representative for the different member states in European market needs to be carried out. Furthermore, DEET should be included in national programs for monitoring of surface water.

For the measures to protect humans we refer to the “elements to be taken into account by Member States when authorising products” from the Assessment Report and inclusion directive 2010/51/EC for DEET which shall be duly taken into consideration for a clear labelling of Mosquito Milk DEET products.

3 Proposal for decision

The Dutch CA is of the opinion that sufficient information has been provided to verify the outcome and conclusions, and grants the authorisation of Mosquito Milk Gel 24,5% DEET, Mosquito Milk Gel 50% DEET, Mosquito Milk Spray 30% DEET, Mosquito Milk Spray 50% DEET, Mosquito Milk Roll On 30% DEET, Mosquito Milk Roll On 50% DEET.

The Mosquito Milk products have been evaluated as insect repellents that should be applied to the skin of exposed body parts with the purpose to protect humans from mosquito bites.

Based on the assessment, the Dutch CA concludes that these products can be safely used by non-professional users according to the use instructions of the SPC.

4 Annexes:

1. **Summary of product characteristics: see separate documents**
2. **List of studies reviewed**
3. **Analytical methods residues – active substance**
4. **Toxicology and metabolism –active substance**
5. **Toxicology – biocidal products**
6. **Safety for professional operators**
7. **Safety for non-professional operators and the general public**
8. **Residue behaviour**

Annex 1: Summary of product characteristics

See separate documents, for each product is available:

SPC in English

SPC in Dutch

Annex 2: List of studies reviewed

List of new data[9] submitted in support of the evaluation of the active substance

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
						Yes	No	Yes	No
A4.2	01	[redacted]	2013	DEET: Validation of Methodology for the Determination of Residues in Air Huntingdon Life Sciences Report RQN0001 GLP Unpublished	[redacted]	☒	☐	☒	☐

List of new data submitted in support of the evaluation of the biocidal products

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
						Yes	No	Yes	No
B3.4	01	[redacted]	2007a	Some physico-chemical properties of "muggenmelk roll-on" Source: TNO Defence, Security and Safety Report no: TNO-DV 2007 C047 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐

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

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
B3.4.1	01	[redacted]	2011o	"Mosquito Milk Gel 24.5% DEET" Flash Point Source: Seibersdorf Labor GmbH Report no:SL-LT-146/11 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐
	02	[redacted]	2011q	"Mosquito Milk Gel 50% DEET" Flash Point Source: Seibersdorf Labor GmbH Report no: SL-LC-008/12 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐
	03	[redacted]	2013a	"Mosquito Milk Spray 30% DEET": Flash Point Source: Seibersdorf Labor GmbH Report no: SL-LC-018/13 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐
	04	[redacted]	2011f	"Mosquito Milk Spray 50% DEET" Flash Point Source: Seibersdorf Labor GmbH Report no: SL-LC-002/12 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐
	05	[redacted]	2011l	"Mosquito Milk Roll On 50% DEET" Flash Point Source: Seibersdorf Labor GmbH Report no: SL-LC-011/12 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
B3.4.2	01	[redacted]	2011p	"Mosquito Milk Gel 24.5% DEET" Auto-Ignition Temperature Source: Seibersdorf Labor GmbH Report no: SL-LT-147/11 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐
	02	[redacted]	2011r	"Mosquito Milk Gel 50% DEET" Auto-Ignition Temperature Source: Seibersdrof Labor GmbH Report no: SL-LC-009/12 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐
	03	[redacted]	2011g	"Mosquito Milk Spray 50% DEET" Auto-Ignition Temperature Source: Seibersdorf Labor GmbH Report no: SL-LC-003/12 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐
	04	[redacted]	2011m	"Mosquito Milk Roll On 50% DEET" Auto-Ignition Temperature Source: Seibersdorf Labor GmbH Report no: SL-LC-012/12 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
B3.6	01	[redacted]	2006a	Some physico-chemical properties of "Muggenmelk Spray" Source: TNO Defence, Security and Safety Report no: TNO-DV2 2006 C040 GLP: Yes Unpublished	[redacted]	☐	☒	☒	☐
	02	[redacted]	2013b	"Mosquito Milk Spray 30% DEET": Relative Density source: Seibersdorf Labor GmbH GLP: Yes unpublished	[redacted]	☐	☒	☒	☐
	03	[redacted]	2011h	"Mosquito Milk Spray 50% DEET" Relative Density Source: Seibersdorf Labor GmbH Report no: SL-LC-001/12 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐
	04	[redacted]	2011n	"Mosquito Milk Roll On 50% DEET" Relative Density Source: Seibersdorf Labor GmbH Report no: SL-LC-010/12 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
	05	[redacted]	2006b	Some physico-chemical properties of "muggenmelk gel" Source: TNO Defence, Security and Safety Report no: TNO-DV2 2006 C039 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐
	06	[redacted]	2011s	"Mosquito Milk Gel 50% DEET" Relative Density Source: Seibersdorf Labor GmbH Report no: SL-LC-007/12 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐
B3.7	01	[redacted]	2013b	Stability tests on Mosquito Milk Spray 30% DEET Source: Jaico RDP nv Report no: 9 juli 2013 Not to GLP Unpublished	[redacted]	☐	☒	☒	☐
	02	[redacted]	2013c	Stability tests on Mosquito Milk Roll On 50% DEET Source: Jaico RDP nv Report no: 9 juli 2013 Not to GLP Unpublished	[redacted]	☐	☒	☒	☐
	03	[redacted]	2011	Stabiliteitsstudie NG-29 Source: Medgenix Benelux Report no: DOC-QA-23 GLP: Yes unpublished	[redacted]	☐	☒	☒	☐

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
	04	[redacted]	2013e	Stability tests on the finished product Mosquito Milk Roll On 30% DEET Source: Jaico RDP nv Report no: 9 juli 2013 Not to GLP Unpublished	[redacted]	☐	☒	☒	☐
	05	[redacted]	2013f	Accelerated stability tests on Mosquito Milk Spray 50% DEET Source: Jaico RDP nv Report no: 9 juli 2013 Not to GLP Unpublished	[redacted]	☐	☒	☒	☐
	06	[redacted]	2013g	Accelerated stability tests on Mosquito Milk Gel 24.5% DEET Source: Jaico RDP nv Report no: 9 juli 2013 Not to GLP Unpublished	[redacted]	☐	☒	☒	☐
	07	[redacted]	2013h	Accelerated stability tests on Mosquito Milk Gel 50% DEET Source: Jaico RDP nv Report no: 9 juli 2013 Not to GLP Unpublished	[redacted]	☐	☒	☒	☐

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
B4.1	01	[redacted]	1995	Identification and Quantification of the active ingredient N,N-diethyl-m-toluamide Source: jaico RDP nv Report no: SOP 10.1/B Not to GLP Unpublished	[redacted]	☐	☒	☒	☐
B5.10.1	01	[redacted]	2012	Summary of the Efficacy Trials on Mosquito Milk Spray 30% DEET	[redacted]	☐	☒	☒	☐
	02	[redacted]	2011	Summary of the Efficacy Trials on Mosquito Milk Spray 50% DEET	[redacted]	☐	☒	☒	☐
	03	[redacted]	2011	Summary of the Efficacy Trials on Mosquito Milk Gel 24.5% DEET	[redacted]	☐	☒	☒	☐
	04	[redacted]	2011	Summary of the Efficacy Trials on Mosquito Milk Gel 50% DEET	[redacted]	☐	☒	☒	☐
	05	[redacted]	2011	Summary of the Efficacy Trials on Mosquito Milk Roll On 30% DEET					
	06	[redacted]	2011	Summary of the Efficacy Trials on Mosquito Milk Roll On 50% DEET					
B5.10.1.1	01	[redacted]	2011	Laboratory efficacy evaluation of the mosquito repellent Mosquito Milk Spray DEET 50% against Culex quinquefasciatus	[redacted]	☐	☒	☒	☐

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
	02	[redacted]	2011	Laboratory efficacy evaluation of the mosquito repellent Mosquito Milk Gel DEET 24.5% against Culex quinquefasciatus	[redacted]	☐	☒	☒	☐
	03	[redacted]	2011	Laboratory efficacy evaluation of the mosquito repellent Mosquito Milk Gel DEET 50% against Culex quinquefasciatus	[redacted]	☐	☒	☒	☐
	04	[redacted]	2011	Laboratory efficacy evaluation of the mosquito repellent Mosquito Milk Roll On DEET 50% against Culex quinquefasciatus	[redacted]	☐	☒	☒	☐
B5.10.1.2	01	[redacted]	2011	Laboratory efficacy evaluation of the mosquito repellent Mosquito Milk Spray DEET 50% against Aedes aegypti	[redacted]	☐	☒	☒	☐
	02	[redacted]	2011	Laboratory efficacy evaluation of the mosquito repellent Mosquito Milk Gel DEET 24.5% against Aedes aegypti	[redacted]	☐	☒	☒	☐
	03	[redacted]	2011	Laboratory efficacy evaluation of the mosquito repellent Mosquito Milk Gel DEET 50% against Aedes aegypti	[redacted]	☐	☒	☒	☐
	04	[redacted]	2011	Laboratory efficacy evaluation of the mosquito repellent Mosquito Milk Roll On DEET 50% against Aedes aegypti	[redacted]	☐	☒	☒	☐
B5.10.1.3	01	[redacted]	2011	Efficacy tests Mosquito Milk @ ITMA Mosquito Milk Spray 50% DEET	[redacted]	☐	☒	☒	☐

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
	02	[redacted]	2011	Efficacy tests Mosquito Milk @ ITMA Mosquito Milk Gel 24.5 % DEET	[redacted]	☐	☒	☒	☐
B5.10.1.3.1	01	[redacted]	1994	Comparative Mosquito Repellent test between two Finnish commercial products and Jaico Mosquito Milk	[redacted]	☐	☒	☒	☐
	02		2010	Repellents experiment As_20100910 Test Report	[redacted]	☐	☒	☒	☐
	03		2010	Repellents experiment As_20100803 Test Report	[redacted]	☐	☒	☒	☐
	04		2005	Repellents experiment As_20051109 Test Report	[redacted]	☐	☒	☒	☐
	05		1987	Repellent effect of the product "Mosquito Milk (Muggenmelk)" to mosquitoes (preliminary observations)	[redacted]	☐	☒	☒	☐
	06		1999	Mosquito Repellent Activity	[redacted]	☐	☒	☒	☐
B5.10.1.3.10	01	[redacted]	1989	Vergelijking van verschillende repellent produkten	[redacted]	☐	☒	☒	☐
B5.10.1.3.12	01	[redacted]	1993	Comparative Mosquito Repellent test between four experimental Jaico Products	[redacted]	☐	☒	☒	☐
B5.10.1.3.13	01	[redacted]	1994	Comparative Mosquito Repellent test between two Jaico Products	[redacted]	☐	☒	☒	☐
B5.10.1.3.14	01	[redacted]	1994	Comparison between Mosquito Repellent Activities of Formulation T and Mosquito Milk (Jaico)	[redacted]	☐	☒	☒	☐

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
	02		1994	Comparison between Mosquito Repellent Activities of Formulation T and Mosquito Milk (Jaico)	[redacted]	☐	☒	☒	☐
B5.10.1.3.15	01	[redacted]	1994	Mosquito Repellent Activity of Mosquito Milk (Jaico)	[redacted]	☐	☒	☒	☐
B5.10.1.3.16	01	[redacted]	1995	Comparative Mosquito Repellent Test between two Portuguese commercial products and Jaico Mosquito Milk	[redacted]	☐	☒	☒	☐
B5.10.1.3.17	01	[redacted]	1995	Mosquito Repellent Activity of Mosquito Milk (Jaico)	[redacted]	☐	☒	☒	☐
B5.10.1.3.18	01	[redacted]	1995	Comparative Mosquito Repellent Test between one commercial product, two experimental suspensions and Jaico Mosquito Milk	[redacted]	☐	☒	☒	☐
B5.10.1.3.19	01	[redacted]	1996	Comparative Mosquito Repellent Test between products “Yellow”, “Green” and Muggenmelk Roller	[redacted]	☐	☒	☒	☐
B5.10.1.3.2	01	[redacted]	1994	Comparative Mosquito Repellent test between two Jaico products	[redacted]	☐	☒	☒	☐
	02		2010	Repellents experiment As 20080226 Test Report	[redacted]	☐	☒	☒	☐
	03		1987	Comparative repellent effect of the product “Mosquito Milk (Muggenmelk)” and “Mot Mygg” to mosquitoes (preliminary observations)	[redacted]	☐	☒	☒	☐
	04		2010	Repellents experiment As 20080226 Test Report	[redacted]	☐	☒	☒	☐

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
B5.10.1.3.20	01	[redacted]	1997	Deugdelijkheid van Jaico Muggenmelk (Roller 50ml)	[redacted]	☐	☒	☒	☐
B5.10.1.3.21	01	[redacted]	2002	Report of repellent experiment As_20020813	[redacted]	☐	☒	☒	☐
B5.10.1.3.22	01	[redacted]	2002	Report of repellent experiment As_20021015	[redacted]	☐	☒	☒	☐
B5.10.1.3.23	01	[redacted]	1997	Repellent effect on local mosquitoes with human subjects	[redacted]	☐	☒	☒	☐
B5.10.1.3.24	01	[redacted]	2008	Mission Report Camargue 6-10 October 2008	[redacted]	☐	☒	☒	☐
B5.10.1.3.3	01	[redacted]	1994	Comparative Mosquito Repellent test between “Pick Out” and “Jaico Mosquito Milk”	[redacted]	☐	☒	☒	☐
	02	[redacted]	1988	Comparative repellent effect of the product “Mosquito Milk (Muggenmelk)” and “Sketolene” to mosquitoes (preliminary observations)	[redacted]	☐	☒	☒	☐
B5.10.1.3.4	01	[redacted]	1995	Repellent effect of Jaico “Muggenmelk” (spray) against local mosquitoes belonging to Culex sp. On a human volunteer	[redacted]	☐	☒	☒	☐
	02		1988	Comparative repellent effect of the product “Mosquito Milk (Muggenmelk)” and “Everglades” to mosquitoes (preliminary observations)	[redacted]	☐	☒	☒	☐
B5.10.1.3.5	01	[redacted]	2008	Repellents experiment As_20080226 Test Report	[redacted]	☐	☒	☒	☐

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
	02		1988	Comparative repellent effect of the product "Mosquito Milk (Muggenmelk)" and "Off" to mosquitoes (preliminary observations)		☐	☒	☒	☐
B5.10.1.3.6	01		1988	Comparative repellent effect of the product "Mosquito Milk (Muggenmelk)" and "Aerogard" to mosquitoes (preliminary observations)		☐	☒	☒	☐
B5.10.1.3.7	01		1988	Comparative repellent effect of the product "Mosquito Milk (Muggenmelk)", "Tabard Lotion" (origin South Africa) and Bayer product Jasmine (origin Thailand) to mosquitoes (preliminary observations)		☐	☒	☒	☐
B5.10.1.3.8	01		1988	Vergelijking van verschillende repellent produkten		☐	☒	☒	☐
B5.10.1.3.9	01		1988	Essai Comparatif de Répulsif		☐	☒	☒	☐
B5.10.1.4	01		2008	The presence of Plant Oils: background.		☐	☒	☒	☐
	02		2008	The presence of Plant Oils: background.		☐	☒	☒	☐
B5.10.2	01		2011	International Literature Overview Efficacy Trials on Other Insect Species		☐	☒	☒	☐
B5.10.3	02		2012	Laboratory study to assess the repellent activity of Mosquito Milk perfume for use in a skin repellent formulation		☐	☒	☒	☐

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
B6.1.1	01	[redacted]	2011	Evaluation of acute oral toxicity in rats with the test item: Mosquito Milk Gel 24.5% DEET	[redacted]	☐	X	X	☐
	02	[redacted]	2011	Evaluation of acute oral toxicity in rats with the test item: Mosquito Milk Gel 50% DEET	[redacted]	☐	X	X	☐
	03	[redacted]	2004	Acute oral toxicity study with Jaico Muggenmelk 50% in rats	[redacted]	☐	X	X	☐
	04	[redacted]	2011	Evaluation of acute oral toxicity in rats with the test item: Mosquito Milk Roll On 50% DEET	[redacted]	☐	X	X	☐
B6.1.2	01	[redacted]	2011	Evaluation of acute dermal toxicity in rats with the test item: Mosquito Milk Gel 24.5% DEET	[redacted]	☐	X	X	☐
	02	[redacted]	2011	Evaluation of acute dermal toxicity in rats with the test item: Mosquito Milk Gel 50% DEET	[redacted]	☐	X	X	☐
	03	[redacted]	2011	Evaluation of acute dermal toxicity in rats with the test item: Mosquito Milk Spray 50% DEET	[redacted]	☐	X	X	☐
	04	[redacted]	2011	Evaluation of acute dermal toxicity in rats with the test item: Mosquito Milk Roll On 50% DEET	[redacted]	☐	X	X	☐
B6.2.1	01	[redacted]	2011	Assessment of acute dermal irritation with the item: Mosquito Milk Gel 24.5% DEET	[redacted]	☐	X	X	☐
	02	[redacted]	2011	Assessment of acute dermal irritation with the item: Mosquito Milk Gel 50% DEET	[redacted]	☐	X	X	☐

Section No	Reference No	Author	Year	Title	Owner of data	Letter of Access		Data protection claimed	
	03	[redacted]	2011	Assessment of acute dermal irritation with the item: Mosquito Milk Spray 50% DEET	[redacted]	☐	X	X	☐
	04	[redacted]	2011	Assessment of acute dermal irritation with the item: Mosquito Milk Roll On 50% DEET	[redacted]	☐	X	X	☐
B6.2.2	01	[redacted]	2011	Assessment of acute eye irritation with the item: Mosquito Milk Gel 24.5% DEET	[redacted]	☐	X	X	☐
	02	[redacted]	2011	Assessment of acute eye irritation with the item: Mosquito Milk Gel 50% DEET	[redacted]	☐	X	X	☐
	03	[redacted]	2004	Acute eye irritation/corrosion study with Jaico Muggenmelk 50% in albino rabbits	[redacted]	☐	X	X	☐
	04	[redacted]	2011	Assessment of acute eye irritation with the item: Mosquito Milk Roll On 50% DEET	[redacted]	☐	X	X	☐

Annex 3: Analytical methods residues – active substance

DEET

The analytical methods for residues are taken from the CA report to support the inclusion of DEET in annex I of Directive 98/8/EC. Where relevant, some additional remarks/information are given in italics.

Analytical methods for residues

Soil (principle of method and LOQ)	DEET: LC-MS/MS with 1 transition (LOQ: 0.01 mg/kg)
Air (principle of method and LOQ)	*DEET: LC-MS/MS (LOQ 0.225µg/m³)**
Water (principle of method and LOQ)	DEET: LC-MS/MS (LOQ: 0.1 µg/L in surface water)
Body fluids and tissues (principle of method and LOQ)	DEET in blood plasma: HPLC-UV (LOQ 49.4µg/L) No confirmatory method is provided. No further data is required as DEET is not classified as toxic or highly toxic.
Food/feed of plant origin (principle of method and LOQ for methods for monitoring purposes)	Not required as the use pattern of DEET will not result in any contact with food or feeding stuffs.
Food/feed of animal origin (principle of method and LOQ for methods for monitoring purposes)	Not required as the use pattern of DEET will not result in any contact with food or feeding stuffs.

** new data; see paragraph 2.3.2*

Annex 4: Toxicology and metabolism –active substance

DEET

Threshold Limits and other Values for Human Health Risk Assessment

Summary			
	Value	Study	SF
AEL repeated dermal (general public)	8.2 mg/kg bw/day*	8-week study (dogs, oral capsule)	100
AEL acute oral (general public)	0.75 mg/kg bw/day	90 day study (rat dermal)	100
*Corrected for a dermal absorption of approximately 82 % in the rat			

Inhalative absorption	No data
Oral absorption	>80% based on urinary, faecal and tissue content (in the rat). In rats, 85-91% of administered radioactivity was found in urine.
Dermal absorption	Dermal rat approx. 82% (based on urinary excretion, faeces content, tissue content and skin). Humans: <20% based on urinary excretion, faecal and skin content, corrected for recovery). No information was provided on inhalational absorption.

Classification	
with regard to toxicological data (according to the criteria in Dir. 67/548/EEC)	Class of danger: Xn R phrases: 22 - 36/38
with regard to toxicological data (according to the criteria in Reg. 1272/2008)	Pictogram: GHS07 Signal word: Warning Acute Tox. 4, H302; Eye Irrit. 2, H319; Skin Irrit. 2, H315.

Annex 5: Toxicology – biocidal product

Mosquito Milk Gel 24.5% DEET:

General information

Formulation Type	gel
Active substance(s) (incl. content)	DEET (25.3%)
Category	PT19

Acute toxicity, irritancy and skin sensitisation of the preparation (Annex IIIB, point 6.1, 6.2, 6.3)	
Rat LD50 oral (OECD 423)	> 2000 mg/kg bw
Rat LD50 dermal (OECD 402)	> 2000 mg/kg bw
Rat LC50 inhalation (OECD 403)	No study was submitted
Skin irritation (OECD 404)	Not irritating
Eye irritation (OECD 405)	Risk of serious damage to eyes (R41) Causes serious eye damage (H318)
Skin sensitisation (OECD 429; LLNA)	No study was submitted

Classification and labelling proposed for the preparation with regard to toxicological properties (Annex IIIB, point 9)	
Directive 1999/45/EC	Xi Irritant R41 S2 S23 S26 S46 S51 DPD11
Regulation 1272/2008/EC	GHS05 Danger H318 P101 P102 P103 P260 P270 P271 P305+P351+P338+P310 EUH208

Mosquito Milk Gel 50% DEET:

General information

Formulation Type	gel
Active substance(s) (incl. content)	DEET (48.5%)
Category	PT19

Acute toxicity, irritancy and skin sensitisation of the preparation (Annex IIIB, point 6.1, 6.2, 6.3)	
Rat LD50 oral (OECD 423)	300 mg/kg bw < LD50 < 2000 mg/kg bw (Harmful if swallowed R22; H302)
Rat LD50 dermal (OECD 402)	> 2000 mg/kg bw
Rat LC50 inhalation (OECD 403)	No study was submitted
Skin irritation (OECD 404)	Not irritating

Acute toxicity, irritancy and skin sensitisation of the preparation (Annex IIIB, point 6.1, 6.2, 6.3)	
Eye irritation (OECD 405)	Risk of serious damage to eyes (R41) Causes serious eye damage (H318)
Skin sensitisation (OECD 429; LLNA)	No study was submitted

Classification and labelling proposed for the preparation with regard to toxicological properties (Annex IIIB, point 9)	
Directive 1999/45/EC	Xn Harmful R22 R41 S2 S13 S23 S26 S46 S51 DPD11
Regulation 1272/2008/EC	GHS05, GHS07 Danger H302 H318 P101 P102 P103 P260 P270 P271 P301+P310 P305+P351+P338+P310 EUH208

Mosquito Milk Spray 30% DEET:

General information

Formulation Type	spray
Active substance(s) (incl. content)	DEET (30.9%)
Category	PT19

Acute toxicity, irritancy and skin sensitisation of the preparation (Annex IIIB, point 6.1, 6.2, 6.3)	
Rat LD50 oral (OECD 423)	> 2000 mg/kg bw
Rat LD50 dermal (OECD 402)	> 2000 mg/kg bw
Rat LC50 inhalation (OECD 403)	No study was submitted
Skin irritation (OECD 404)	Not irritating
Eye irritation (OECD 405)	Moderate to severe signs of eye irritation Irritating (R36) Causes serious eye irritation (H319)
Skin sensitisation (OECD 429; LLNA)	No study was submitted

Classification and labelling proposed for the preparation with regard to toxicological properties (Annex IIIB, point 9)	
Directive 1999/45/EC	Xi Irritant R36 S2

	S23 S46 S51
Regulation 1272/2008/EC	GHS07 Warning H319 P101 P102 P103 P260 P270 P271 P305+P351+P338

Mosquito Milk Spray 50% DEET:

General information

Formulation Type	spray
Active substance(s) (incl. content)	DEET (48.5%)
Category	PT19

Acute toxicity, irritancy and skin sensitisation of the preparation (Annex IIIB, point 6.1, 6.2, 6.3)	
Rat LD50 oral (OECD 423)	> 2000 mg/kg bw
Rat LD50 dermal (OECD 402)	> 2000 mg/kg bw
Rat LC50 inhalation (OECD 403)	No study was submitted
Skin irritation (OECD 404)	Not irritating
Eye irritation (OECD 405)	Moderate to severe signs of eye irritation Irritating (R36) Causes serious eye irritation (H319)
Skin sensitisation (OECD 429; LLNA)	No study was submitted

Classification and labelling proposed for the preparation with regard to toxicological properties (Annex IIIB, point 9)	
Directive 1999/45/EC	Xi Irritant R36 S2 S23 S46 S51 DPD11
Regulation 1272/2008/EC	GSH07 Warning H319 P101 P102 P103 P260 P270 P271 P305+P351+P338 EUH208

Mosquito Milk Roll On 30% DEET:
General information

Formulation Type	Liquid with a roll-on applicator

Active substance(s) (incl. content)	DEET (31%)
Category	PT19

Acute toxicity, irritancy and skin sensitisation of the preparation (Annex IIIB, point 6.1, 6.2, 6.3)	
Rat LD50 oral (OECD 423)	> 2000 mg/kg bw
Rat LD50 dermal (OECD 402)	> 2000 mg/kg bw
Rat LC50 inhalation (OECD 403)	No study was submitted
Skin irritation (OECD 404)	Not irritating
Eye irritation (OECD 405)	Risk of serious damage to eyes (R41) Causes serious eye damage (H318)
Skin sensitisation (OECD 429; LLNA)	No study was submitted

Classification and labelling proposed for the preparation with regard to toxicological properties (Annex IIIB, point 9)	
Directive 1999/45/EC	Xi Irritant R41 S2 S23 S26 S46 S51
Regulation 1272/2008/EC	GHS05 Danger H318 P101 P102 P103 P260 P270 P271 P305+P351+P338+310

Mosquito Milk Roll On 50% DEET:

General information

Formulation Type	Liquid with a roll-on applicator
Active substance(s) (incl. content)	DEET (48.5%)
Category	PT19

Acute toxicity, irritancy and skin sensitisation of the preparation (Annex IIIB, point 6.1, 6.2, 6.3)	
Rat LD50 oral (OECD 423)	> 2000 mg/kg bw
Rat LD50 dermal (OECD 402)	> 2000 mg/kg bw
Rat LC50 inhalation (OECD 403)	No study was submitted
Skin irritation (OECD 404)	Not irritating
Eye irritation (OECD 405)	Risk of serious damage to eyes (R41) Causes serious eye damage (H318)
Skin sensitisation (OECD 429; LLNA)	No study was submitted

Classification and labelling proposed for the preparation with regard to toxicological properties (Annex IIIB, point 9)	
Directive 1999/45/EC	Xi Irritant R41 S2

	S23 S26 S46 S51 DPD11
Regulation 1272/2008/EC	GHS05 Danger H318 P101 P102 P103 P260 P270 P271 P305+P351+P338+P310 EUH208

Annex 6: Safety for professional operators

Products are not intended for professonal use.

Annex 7: Safety for non-professional operators and the general public

General information	
Formulation Type	Spray, liquid with a roll on applicator, gel
Active substance(s) (incl. content)	DEET 25.3%, 30.9%, 31% and 48.5%
Category	PT19

Data base for exposure estimation	
according to	Appendix: Toxicology and metabolism – active substance/CAR

Exposure scenarios for intended uses (Annex IIIB, point 6.6)	
Primary exposure	Non-professional users (consumers; adults and children)
Secondary exposure, acute	Not relevant
Secondary exposure, chronic	Not relevant

specific information

Product name	DEET content (%w/w)*	
	TGAI	PAI
Mosquito Milk Gel 24.5% DEET	26.0	25.3
Mosquito Milk Gel 50% DEET	50	48.5
Mosquito Milk Spray 30% DEET	31.9	30.9
Mosquito Milk Spray 50% DEET	50	48.5
Mosquito Milk Roll On 30% DEET	31.9	31.0
Mosquito Milk Roll On 50% DEET	50	48.5

** TGAI = technical active ingredient with a minimum purity of 97%; PAI = pure active ingredient. Values rounded to a maximum of three significant digits.*

The internal dermal exposure is calculated according to the following formula:

Internal dermal dose a.s. = (Number of applications) × (amount of product (75th percentile based on survey data)) × (content a.s.) × (% dermal absorption) / body weight

The internal oral exposure is calculated based on the following formula:

Internal oral dose a.s. = (Number of applications) × (Amount of product (75th percentile based on survey data)) × (content a.s.) × (% ingested amount) / body weight

The number of applications is considered to be two (first tier) or one (second tier) per day. For dermal absorption the value of 20% is used for DEET based on the CAR. Oral absorption is considered to be 100% as a worst-case approach. The % of the ingested amount is considered to be 4% for adults (product on fingers) and 8% for children (product on hands).

Primary exposure for two applications for adults and children:

Internal exposure for two applications	25.3% DEET	30.9% DEET	31% DEET	48.5%
Dermal* (mg/kg bw/day)				
Male (0.329 mg/kg bw/day per 1%)	8.32	10.17	10.20	15.96
Female (0.255 mg/kg bw/day per 1%)	6.45	7.88	7.65	12.37
>12 yr (0.405 mg/kg bw/day per 1%)	10.25	12.51	12.56	19.64
<12 yr: (0.853 mg/kg bw/day per 1%)	21.58	26.36	26.44	41.37

Oral** (mg/kg/bw/day)				
Male (0.066 mg/kg bw/day per 1%)	1.67	2.04	2.05	3.20
Female (0.051 mg/kg bw/day per 1%)	1.29	1.58	1.58	2.47

**Based on the 75th percentile of human use rate ([redacted], 1990) and considering two applications per day corrected for a conservative dermal absorption of 20% in humans and body weights of 70 kg for male adult, 60 kg for female aduls, 62.8 kg for children >12 years old and 25.5 kg for children < 12 years old. For clarity, in the first column the exposure values per 1% DEET based on theresults of the user survey study are given.*
*** Internal oral exposure is calculated by considering adults ingesting 4% of the external dermal dose (product on fingers) and children ingesting 8% of the external dermal dose (product on hands). Oral exposure is considered to be 100% as a worst-case approach. For clarity, in the first column the exposure values per 1% DEET based on the results of the user survey study are given.*

Risk characterisation ratio per two applications for adults and children (internal exposure)

Risk Characterisation Ratio*	25.3% DEET	30.9% DEET	31% DEET	48.5% DEET
Dermal				
Male:	1.01	1.24	1.24	1.95
Female:	0.79	0.96	0.93	1.51
>12 yr:	1.25	1.53	1.53	2.36
<12 yr:	2.63	3.21	3.22	5.05
Oral				
Male:	2.23	2.72	2.73	4.27
Female:	1.72	2.11	2.11	3.29

** Based on the 75th percentile of human use rate ([redacted], 1990) and considering two applications per day corrected for a conservative dermal absorption of 20% in humans and body weights of 70 kg for male adult, 60 kg for female aduls, 62.8 kg for children >12 years old and 25.5 kg for children < 12 years old. The $AEL_{repeated\ dermal}$ of 8.2 mg/kg bw/da is used for the calculation of the RCR after dermal exposure. The $AEL_{acute\ oral}$ of 0.75 mg/kg bw/day is used for the calculation of the RCR after oral exposure.*

Primary exposure for one application for adults and children:

Internal exposure for one application	25.3% DEET	30.9% DEET	31% DEET	48.5%
Dermal* (mg/kg bw/day)				
Male (0.164 mg/kg bw/day per 1%)	4.15	5.07	5.08	7.95
Female (0.128 mg/kg bw/day per 1%)	3.24	3.96	3.97	6.21
>12 yr (0.203 mg/kg bw/day per 1%)	5.14	6.27	6.29	9.85
<12 yr: (0.427 mg/kg bw/day per 1%)	10.80	13.19	13.24	20.71
Oral (mg/kg/bw/day)**				
Male (0.033 mg/kg bw/day per 1%)	0.83	1.02	1.02	1.60
Female (0.026 mg/kg bw/day per 1%)	0.66	0.80	0.81	1.26
>12 yr (0.081 mg/kg bw/day per 1%)	2.05	2.50	2.51	3.93
<12 yr (0.171 mg/kg bw/day per 1%)	4.33	5.28	5.30	8.29

**Based on the 75th percentile of human use rate ([redacted], 1990) and considering one applications per day corrected for a conservative dermal absorption of 20% in humans and body weights of 70 kg for male adult, 60 kg for female aduls, 62.8 kg for children >12 years old and 25.5 kg for children < 12 years old. For clarity, in the first column the exposure values per 1% DEET based on theresults of the user survey study are given.*

*** Internal oral exposure is calculated by considering adults ingesting 4% of the external dermal dose (product on fingers) and children ingesting 8% of the external dermal dose (product on hands). Oral exposure is considered to be 100% as a worst-case approach. For clarity, in the first column the exposure values per 1% DEET based on the results of the user survey study are given.*

Risk characterisation ratio per application for adults and children (internal exposure)

Risk Characterisation Ratio*	25.3% DEET	30.9% DEET	31% DEET	48.5% DEET
Dermal				
Male:	0.51	0.62	0.62	0.97
Female:	0.40	0.48	0.48	0.76
>12 yr:	0.63	0.76	0.77	1.20
<12 yr:	1.32	1.61	1.61	2.53
Oral				
Male:	1.11	1.36	1.36	2.13
Female:	0.88	1.07	1.08	1.68
>12 yr:	2.73	3.33	3.35	Not calculated**

** Based on the 75th percentile of human use rate ([redacted], 1990) and considerin gone application per day corrected for a conservative dermal absorption of 20% in humans and body weights of 70 kg for male adult, 60 kg for female aduls, 62.8 kg for children >12 years old and 25.5 kg for children < 12 years old. The $AEL_{repeated\ dermal}$ of 8.2 mg/kg bw/da is used for the calculation of the RCR after dermal exposure. The $AEL_{acute\ oral}$ of 0.75 mg/kg bw/day is used for the calculation of the RCR after oral exposure.*
*** No separate assessment of potential oral exposure for children was performed, as no acceptable risks have been identified for this age group if only dermal exposure was considered.*

Reverse reference scenario for one application per day for adults and children*

	External dermal exposure per application (mg/kg bw/day)	Internal dermal exposure per application (mg/kg bw/day)	$AEL_{acute\ oral}$/External dermal exposure	$AEL_{repeated\ dermal}$/ Internal dermal exposure
25.3% DEET				
Male:	20.75	4.15	0.036	1.98
Female:	16.2	3.24	0.046	2.53
>12 yr:	25.75	5.14	0.029	1.60
<12 yr:	54	10.80	Not calculated**	0.76
30.9% DEET				
Male:	25.35	5.07	0.030	1.62
Female:	19.8	3.96	0.038	2.07
>12 yr:	31.35	6.27	0.024	1.31
<12 yr:	65.95	13.19	Not calculated**	0.62
31% DEET				
Male:	25.4	5.08	0.030	1.61
Female:	19.85	3.97	0.038	2.07
>12 yr:	31.45	6.29	0.024	1.30
<12 yr:	66.2	13.24	Not calculated**	0.62

48.5% DEET				
Male:	39.75	7.95	0.019	1.03
Female:	31.05	6.21	0.024	1.32
>12 yr:	49.25	9.85	Not calculated**	0.83
<12 yr:	103.55	20.71	Not calculated**	0.40

**Based on the 75th percentile of human use rate [redacted], 1990) and considering one application per day corrected for a conservative dermal absorption of 20% in humans and body weights of 70 kg for male adult, 60 kg for female aduls, 62.8 kg for children >12 years old and 25.5 kg for children < 12 years old. The internal dermal exposure is compared with the $AEL_{repeated\ dermal}$ of 8.2 mg/kg bw/day. To estimate how much DEET applied to the skin can be ingested without exceeding the $AEL_{acute\ oral}$, the external dermal exposure is compared with the $AEL_{acute\ oral}$ of 0.75 mg/kg bw/day (considering 100% oral absorption this value also represents internal oral exposure).*

*** No separate assessment of potential oral exposure for children was performed, as no acceptable risks have been identified for this age group if only dermal exposure was considered.*

Conclusion:

Exposure of non-professionals and the general public to the biocidal products containing 25.3%-48.5% DEET as active substance is considered acceptable, if the biocidal product is used as intended and all safety advices are followed.

Annex 8: Residue behaviour

The acute or chronic exposure to residues in food resulting from the intended uses is unlikely to cause a risk to consumers. Regarding consumer health protection, there are no objections against the intended uses.