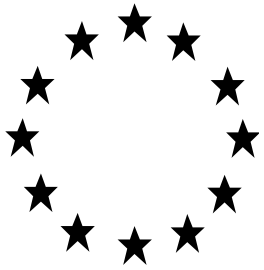
Regulation (EU) No 528/2012 concerning the making available on the market and use of biocidal products

Evaluation of active substances

Assessment Report



L(+) Lactic acid

Product-type 01
(Human hygiene)

January 2016

Germany

CONTENTS

1. STATEMENT OF SUBJECT MATTER AND PURPOSE

1.1. Procedure followed

This assessment report has been established as a result of the evaluation of the active substance L(+) Lactic acid as product-type 01 (Human Hygiene), carried out in accordance with Article 90(2) of Regulation (EU) No 528/2012 of the European Parliament and of the Council 22 May 2012 concerning the making available on the market and use of biocidal products (BPR), with a view to the possible approval of this substance.

On 29.08.2013, Germany competent authorities received a dossier from the applicant Purac Biochem. The Rapporteur Member State accepted the dossier as complete for the purpose of the evaluation on 05.02.2014.

On 05.02.2015, the Rapporteur Member State submitted to the Commission and the applicant a copy of the evaluation report, hereafter referred to as the competent authority report.

In order to review the competent authority report and the comments received on it, consultations of technical experts from all Member States (peer review) were organised by the Agency. Revisions agreed upon were presented at the Biocidal Products Committee and its Working Groups meetings and the competent authority report was amended accordingly.

1.2. Purpose of the assessment report

The aim of the assessment report is to support the opinion of the Biocidal Products Committee and a decision on the approval of L(+) Lactic acid for product-type 01, and, should it be approved, to facilitate the authorisation of individual biocidal products. In the evaluation of applications for product-authorisation, the provisions of Regulation (EU) No 528/2012 shall be applied, in particular the provisions of Chapter IV, as well as the common principles laid down in Annex VI.

For the implementation of the common principles of Annex VI, the content and conclusions of this assessment report, which is available from the Agency web-site shall be taken into account.

However, where conclusions of this assessment report are based on data protected under the provisions of Regulation (EU) No 528/2012, such conclusions may not be used to the benefit of another applicant, unless access to these data for that purpose has been granted to that applicant.

2. OVERALL SUMMARY AND CONCLUSIONS

2.1. Presentation of the Active Substance

2.1.1. Identity, Physico-Chemical Properties & Methods of Analysis

The active substance L(+) Lactic acid ($C_3H_6O_3$) is a carboxylic acid. L(+) Lactic acid and D(-) Lactic acid are the two optical isomers of the chiral substance Lactic acid.
The chemical name of the active substance L(+) Lactic acid is (S)-2-Hydroxypropanoic acid (according to IUPAC nomenclature). The substance is CAS and EC listed (CAS-No. 79-33-4, EC-No. 201-196-2). The minimum purity of the active substance as manufactured is ≥ 95.5% w/w.

Pure lactic acid is a crystalline solid. The active substance is marketed as an aqueous solution (88% / 93% L(+) Lactic acid), which appears as a colourless to yellow light brown liquid with a characteristic odour.

The melting point of pure lactic acid was determined to be 53.0°C, the boiling point for the pure lactic acid could not be determined, but was calculated to be 204.2°C. The relative density of L(+) Lactic acid is 1.213at 20°C. The calculated vapour pressure for pure L(+) Lactic acid is 0.4 Pa at 20°C. Pure L(+) Lactic acid is completely miscible with water and is highly soluble in methanol (78.6% w/w at 20°C). Pure L(+) Lactic acid has an octanol/water partition coefficient of -0.74 (T = 20 °C, degree of oligomerisation of non-extracted aqueous lactic acid solution n = 1). Higher degrees of oligomerisation of L(+) Lactic acid solutions (because of the existence of an equilibrium system of L(+) Lactic acid with several oligomers) result in higher partition coefficients (n = 1.36: log Pow = -0.42; n = 1.98: log Pow = -0.05).

For the detection and identification of the active substance L(+) Lactic acid a titration method is used in addition to chromatographical methods. The methods are described in Document III-A 4.1.

Relevant residues in food of plant and animal origin and in the environmental compartments arising from the application of L(+) Lactic acid are not expected. Therefore, residue analytical methods for L(+) Lactic acid in food of plant and animal origin, in soil, air, drinking and surface water are not required. Since L(+) Lactic acid is not classified as toxic or very toxic, analytical methods in body fluids and tissues are not required.

2.1.2. Intended Uses and Efficacy

The bactericidal activity of Lactic acid was investigated by studies performed with the biocidal product containing 3% lactic acid and 2.5% sodium laureth-2 sulfate (SLeS).

The biocidal product is intended to be used as a ready to use product directly on the hands as a disinfecting hand soap.

The performed tests provide reliable results for basic efficacy assessment. The following results could be derived from the studies:

The dummy product containing 3% Lactic Acid and 2.5% Sodium Laureth-2 Sulfate (SLeS) shows a basic bactericidal activity after a contact time of 5 minutes in a suspension test. Additionally it was shown that 2.5% SLeS is not effective if used alone. Therefore, a basic bactericidal activity of 3% Lactic Acid can be concluded although it cannot fully be excluded that a synergistic effect of SLeS exists. Studies demonstrating fungicidal or yeasticidal activity of the dummy product were not provided.

However, the studies performed are sufficient at the approval stage of the substance.

The information provided is only sufficient to show a basic efficacy of Lactic acid. This is accepted in the frame of the approval of the substance. Within the frame of product authorisation, essentially more information has to be provided: To support the claims further laboratory tests would be necessary. Additionally, further tests in the field of use have to be provided, also tests showing an activity against further organisms, inter alia fungi relevant for the specific field of use.

At least the tests listed in EN 14885 for the respective field of use or comparable tests have to be provided in the frame of product authorisation. As not for all possible label claims an EN norm exists, further tests might be necessary depending on the specific label claim.

Mode of action

In solution, lactic acid exists in a pH-dependent equilibrium between the undissociated and dissiociated form. Only in its undissociated state, the acid is able to pass the cells membrane. At a relatively low pH, the uncharged acid enters the cell. Inside the cell, the lactic acid dissociates due to the higher pH. The molecules remain inside the cell, because the resulting ions cannot pass the membrane. The pH inside the cell is lowered and metabolic reactions are inhibited. Further effects are also reported: Decrease of the membrane permeability for amino acids, organic acids, phosphates resulting in uncoupling of both substrate transport and oxidative phosphorylation from the electron transport system. Furthermore, an inhibition of the glycolysis is observed.

In addition, in order to facilitate the work of Member States in granting or reviewing authorisations, the intended uses of the substance, as identified during the evaluation process, are listed in Appendix II

2.1.3. Classification and Labelling

Classification and Labelling of L(+) Lactic acid

Table 2-1 Proposed classification of L(+) Lactic acid based on Regulation (EC) No 1272/2008

Classification	Hazard class, category, and statements	Wording
	Eye Dam. 1; H318 Skin Irrit. 2; H315	Causes serious eye damage Causes skin irritation

Table 2-2 Proposed labelling of L (+) lactic acid based on Regulation (EC) No 1272/2008

	Labelling	Wording
Pictograms	GHS05	
Signal Word	Danger	

Hazard statements	H315 H318	Causes skin irritation Causes serious eye damage
Precautionary statements	P264 P280 P302 + P352 P305 + P351 + P338 P310 P363	Wash … thoroughly after handling Wear protective gloves/protective clothing/eye protection/face protection IF ON SKIN: Wash with plenty of soap and water 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 Wash contaminated clothing before reuse

Remark:

The number of the Precautionary statements is quite big but they were all recommended in Annex I of Regulation (EU) No 1272/2008 based on the given Hazard statements.

Classification and Labelling of the biocidal product (dummy product)

Table 2-3 Proposed classification the biocidal product (dummy product) based on Regulation (EC) No 1272/2008

Classification	**Hazard class and category hazard statements**	**Wording**
	Eye Dam. 1; H318	Causes serious eye damage.

Table 2-4 Proposed labelling of the biocidal product (dummy product) based on Regulation (EC) No 1272/2008

	Labelling	**Wording**
Pictograms	GHS05	
Signal Word	Danger	
Hazard statements	H318	Causes serious eye damage
Precautionary statements	(P101) (P102)* P280 P305 + P351 + P338 + P310	If medical advice is needed, have product container or labelat hand Keep out of reach of children Wear protective gloves/protective clothing/eye protection/face protection. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact

	P310	lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.

*For non-professional use only

Summary & Conclusion:

Due to the calculation method the biocidal product (dummy product) has to be classified as Eye Dam. 1; H318.

2.2. Summary of the Risk Assessment

2.2.1. Human Health Risk Assessment

2.2.1.1. Effects assessment

L(+) Lactic acid is a naturally occurring alpha-hydroxy acid found in plants, animals, and humans. Major sources of L(+) Lactic acid in the human organism are endogenous production (e. g. via anaerobic catabolism of glycogen and glucose) production by gastrointestinal microorganisms and uptake via food. The production of L(+) Lactic acid as an intermediary metabolite in a 70 kg resting man is estimated to be in the range of 117-230 g/d but can be much higher during exercise. The mean daily per capita intake of L(+) Lactic acid and D(-) Lactic acid from milk and milk products has been estimated to be approximately 1 g in Switzerland (Walther, 2006). The estimated overall intake via food in the EU and the USA is estimated to be 1.65-2.76 g/person/day (DocIII6.2.01).

L(+) Lactic acid has been approved in the EU as a food additive without an ADI or upper limit (*quantum satis;* Dir. 95/2/EC), as a cosmetics ingredient, and as veterinary medicinal product without the requirement for MRL setting (EMEA 2008).

Except for acute toxicity, data on the toxicological profile of L(+) Lactic acid as submitted by the participant consist of published literature. Most of these data do not meet the quality standards of GLP and guideline studies, the reporting of the studies is often insufficient, in some cases only secondary literature is available. Thus, only few studies are to some extent suitable for risk assessment purposes, and it is not possible to address every endpoint necessary for a complete evaluation.

Furthermore, in older publications, it is often not reported if L(+) Lactic acid was used or the racemate of D and L isomers. D(-) Lactic acid is considered to be more toxic than L(+) Lactic acid: It is excreted less effectively by neonates and can cause lactate acidosis (Walther, 2006). Therefore, the use of racemate-derived data seems to be justified, as the results would overestimate the toxicity of L(+) Lactic acid.

In summary, the common core data set as required by Annex II of Dir. 98/8/EC was not sufficiently supported by toxicological data in the dossier submitted by the applicant. Nevertheless, based on the generally accepted low toxicity profile of L(+) Lactic acid, as well as the high baseline exposure of the general population by food and endogenous metabolism, the justification that submission of further toxicity studies is not necessary owing to the nature of this naturally occurring active substance found in plants, animals, and humans was considered acceptable to the RMS.

Absorption, Distribution, Excretion, and Metabolism

Lactate/lactic acid form an integral part of normal mammalian intermediary metabolism, produced by reduction of pyruvate. Physiological plasma levels in man range between 1 mM at rest and 10 mM during exercise. Very similar levels have been reported in other mammalian species. Monocarboxylate transport proteins (MCT) facilitate the distribution of lactate between organs, cells and subcellular organelles and may be involved in gastrointestinal lactate absorption and renal lactate elimination. Cytosolic and mitochondrial lactate dehydrogenases (LDH/mLDH) convert lactate into pyruvate, consuming NAD+ and producing NADH. Via stepwise metabolism involving oxaloacetate and phosphoenolpyruvate as intermediates, pyruvate is utilised for gluconeogenesis . Alternatively, metabolites of pyruvate (oxaloacetate, acetyl-CoA) are consumed in the tricarboxylic (citric) acid cycle (TCA, (2)) generating NADH, ATP and ultimately CO_2. Finally, pyruvate may be transaminated to the amino acid L-alanine (3). Gluconeogenesis occurs mainly in the liver and is energy-consuming. Increased cellular levels of lactate influence pathways of cellular metabolism, leading to a decrease in the generation of pyruvate from other sources such as glucose by reduction of glycogenolysis and glycolysis, or leading to enhanced gluconeogenesis (Gladden, 2004; Sterenborg, 2007). Total normal lactate turnover at rest has been determined as 1.6 – 2 g/kg bw/d in humans and as 2.3 – 3.5 and 4.9 – 8.1 in dogs and rats, respectively, supporting applicability of allometric scaling (Connor and Woods, 1982).

Following application by gavage (oral), external L(+) Lactic acid is absorbed rapidly in rats with one half being removed from the GI-tract within 2-3 hours (Cori, 1930). Of 2 g/kg administered to rats via gavage, 42 % were converted into CO_2 and presumably exhaled within 6 hours (Andersen, 1998). Complete utilization of orally administered lactate has also been reported in dogs (Andersen, 1998). In humans, a volume of distribution of approx. 0.5 L/kg was determined after intravenous application of an unknown dose. 88 % of this dose was exhaled as CO_2 and the total turnover rate was 2.3 g/kg bw/d (Andersen, 1998), and thus similar to that reported above (Connor & Woods, 1982). Lactic acid that is not metabolised to CO_2 may be utilised for the synthesis of biomacromolecules, including glycogen or proteins (Cori & Cori, 1929; Andersen, 1998). Feeding of pigs and rats with a daily dose of 1.9 and 5.8 g/kg bw/d which is roughly equivalent to the lactic turnover rate at rest resulted only in a slight increase of L(+)-lactate plasma levels by 0.03 g/L (from 0.26 g/L) and 0.04 g/L (from 0.23 g/L), respectively. At the same time, elimination in urine was minimal with increases in L(+)-lactate concentrations by 0.02 and 0.07 g/L, corresponding to < 0.01 g/kg bw/d (less than 1 % of dose) at an estimated urine volume of 100 mL/kg bw/d (Everts et al., 2000). It can therefore be concluded, that the lactate turnover rate is tightly regulated and is not saturated at total lactate load of 200 % compared to the value at rest. In contrast, Abramson & Eggleton (1927) reported between 7 and 42 % renal excretion following bolus injection of 5.4 to 30 g/kg bw in dogs. Notably, the percentage excreted with urine was correlated to urine volume, suggesting glomerular filtration as the main mechanism under these conditions.

Although a OECD guideline study regarding the toxicokinetics of L(+) Lactic acid is not available, the wealth of data generated in animal and human studies can be brought in agreement and allows for adequate characterisation of the a.s.: Oral administration of lactic acid is followed by fast and practically complete absorption from the GI-tract with an absorption half-life in the order of 2-3 hours, even at high doses in the range of g/kg bw. Distribution occurs into a volume of approx. 0.5 L/kg bw and systemic L(+) Lactic acid is cleared rapidly at a rate (at rest) of approx. 1.8 g/kg bw/d in humans. In dogs and rats, normal clearance rates are approx. 3 and 6 g/kg bw/d, respectively. Absorbed L(+) Lactic acid adds to the plasma background level of around 1 mM at rest in humans and slightly higher values in animals. Metabolic conversion of L(+) Lactic acid into CO_2 or biomacromolecules (glycogen etc.) accounts for the majority of its clearance. Significant renal elimination was observed only following bolus injection of large doses, but not after protracted application such as infusion of feeding. Minimal increases in plasma lactic acid

concentrations following feeding of large doses that were in the range of the normal background turnover rate (i.e. ~ 5 g/kg in rats) suggest that the clearance capacity for lactic acid is significantly larger than this background turnover rate and that the enzymatic and transport processes involved are well regulated within this range.

Dermal absorption of various lactic acid formulations was tested on human and pig skin *ex vivo* over 6 hours (Andersen, 1998; Sah et al., 1998) and in rats *in vivo* over 3 days (Andersen, 1998). Data on the technical product was not provided. Depending on the formulation and the pH, dermal absorption *ex vivo* ranged from 10 to 30 % in human and from 7 to 32 % in pig skin. Lactic acid absorption was higher at pH 3 or 3.8 (lowest pH tested) than at pH 7 and was different depending on formulation, with a decrease in the order o/w > w/o/w > w/o. Dermal penetration of lactic acid from a 5 % o/w cream formulation through rat skin was 50 % in 3 days (Andersen, 1998). These data as well as the physicochemical properties of the technical product support the default value of 75 % dermal absorption as realistic worst-case assumption. According to the EFSA guidance on dermal absorption (2012) this default value should be used for products containing ≤ 5% active substance. For products containing > 5 % active substance the default value of 25 % should be used.

Acute Toxicity
L(+) Lactic acid is of low toxicity in the rat after oral, dermal, and inhalation exposure. The oral LD_{50} of lactic acid in the rat is 3543 mg/kg bw, the dermal LD_{50} in the rabbit is > 2000 mg/kg bw and the inhalation LC_{50} in the rat is 7.94 mg/L air x 4 h (aerosol, nose only exposure). Main effects observed in oral studies were ataxia, lethargy, prostration, irregular breathing and local irritation of the gastrointestinal tract. In a dermal study in the rabbit signs of corrosivity were observed. Weight loss in females, rapid, shallow breathing, hunched posture, and lacrimation were the main toxicological signs observed in an acute inhalation toxicity study.

Classification and labelling for acute toxicity according to Regulation (EC) No 1272/2008:
Not required

Skin irritation/corrosivity
Skin irritation/corrosivity studies with L(+) Lactic acid were performed in rabbits, guinea pigs, pigs, and humans and with a biobarrier/chemical detection system *in vitro*. In rabbits, full thickness destruction indicative of corrosivity was observed with 88 % L(+) Lactic acid (pH 1.83) and 50 % L(+) lactic acid. This result was confirmed by an in vitro Corrositex assay which revealed a biobarrier break through at a time of only 31 minutes of 90 % L(+) Lactic acid (< 3 min: R35; 3 min to 4 h: R34). No irritation or corrosivity was observed in rabbits when a 10 % aqueous dilution of L(+) Lactic acid was tested (Prinsen, 1995).
However, experience from humans and studies in guinea pigs, pigs, and humans revealed that these species are much less sensitive to dermal exposure to the a.s.. In these studies, L(+) Lactic acid was tested non-irritant in concentrations up to 88 % (pig, guinea pig (single exposure)) or irritant (human (concentrated), guinea pig (24 % and 80 %, repeated exposure)). Thus, from the patch test studies in humans, the RMS decided that the results from the rabbit which seems to be extremely sensitive to L(+) Lactic acid are an overestimate for humans and results of guinea pig (repeated exposure) and humans are relevant for the classification of L(+) Lactic acid in this case.

Eye irritation
Since concentrated L(+) Lactic acid has a pH < 2 no eye irritation studies in rabbits were performed due to animal welfare considerations. Instead, a chicken enucleated eye test (*in vitro*) was performed and revealed a highly damaging potential of L(+) Lactic acid of the eye (severe corneal opacity, corneal swelling and fluorescein retention).

Classification and labelling for skin and eye irritation according to Regulation (EC) No 1272/2008:
H315: Causes skin irritation
H318: Causes serious eye damage

Sensitisation
In a Buehler test with 9 inductions L(+) Lactic acid was non-sensitising (0/10 animals sensitised). Induction and challenge were performed with 80 % (100 % SY-83; first 2 inductions and challenge) and 24 % L(+) Lactic acid (30 % SY-83). While only slightly irritating in the range-finding studies, these concentrations proved to be highly irritating after repeated exposure. Irritation reactions were pinpoint pitting and eschar formation with only slight redness and were considered not to be sensitisation reactions as the reactions observed differed from usually observed sensitisation reactions and similar reactions were observed in naive control animals.
Furthermore, considering the high endogenous exposure and exposure via food it is highly unlikely that sensitisation to L(+) Lactic acid develops.

Classification and labelling for sensitisation according to Regulation (EC) No 1272/2008:
Not required

Short-term Toxicity
The results of the submitted study can only be used as a very rough approximation for a NOAEL for L(+) Lactic acid because the effects observed (decrease in food consumption and body weight gain) might be due to high calcium intake, palatability problems and/or malabsorption due to local gastrointestinal irritation (provoked by calcium or lactate). Thus, in the view of the RMS, it is inadequate for use of the obtained NOAEL for derivation of reference values.

Classification and labelling for short term toxicity according to Regulation (EC) No 1272/2008:
Not required

Genotoxicity

In vitro tests:

Two Ames tests revealed no genotoxic potential of L(+) Lactic acid (Ishidate et al. 1984 and Al-Ani & Al-Lami 1988) in the absence or presence of S9 mix. A chromosomal aberration assay (Ishidate et al. 1984) in Chinese hamster fibroblasts was negative, too. A chromosomal aberration assay (Morita et al. 1990) showed cytotoxicity and clastogenic effects at unphysiologically low pH of 5.7-6.7 of L(+) Lactic acid in Chinese hamster ovary cells. The authors judged L(+) Lactic acid as non-clastogenic and the results as "pseudo-positive". Overall, L(+) Lactic acid proved to be devoid of mutagenic or clastogenic effects at non-cytotoxic concentrations and pH in *in vitro* tests. Thus, and because of the high background exposure via food and endogenous metabolism, no further studies are required.

In vivo tests:

No studies submitted- not required.

Classification and labelling for genotoxicity according to Regulation (EC) No 1272/2008:
Not required

Chronic Toxicity/ Carcinogenicity
The results of the submitted study can only be used as a very rough approximation for a

NOAEL for L(+) Lactic acid because the effects observed (decrease in food consumption and body weight gain) might be due to high calcium intake, low water/food intake (no data presented in the publication) and/or malabsorption due to local gastrointestinal irritation (provoked by calcium or lactate). Thus, in the view of the RMS, it is inadequate to use the obtained NOAEL for derivation of reference values. Since no statistically significant differences in the tumour rates between control animals and calcium lactate treated animals were observed it can be assumed that lactate/lactic acid has no carcinogenic potential.

Classification and labelling for chronic toxicity / carcinogenicity according to Regulation (EC) No 1272/2008:
Not required

Reproduction Toxicity

Teratogenicity
Two publications investigating potential developmental effects of lactic acid are available. Colomina et al. investigated the developmental toxicity of 570 mg/kg bw/d lactic acid in mice. They observed a slight albeit not statistically significant decrease in foetal weight and a statistically significant delayed ossification of parietal bones which might be due to the decreased foetal weight. Thus, these findings were not considered as a substance-specific developmental toxicity effect (in accordance with Carney & Kimmel, 2007).

Fertility
No studies were submitted for this endpoint. However, in the view of the RMS no further studies are required, based on the fact that L(+) Lactic acid is an endogenous mammalian metabolite and a common, naturally occurring food constituent and physiological exposure and nutritional uptake is likely to exceed exposure via the biocidal product by far.

Classification and labelling for reproduction toxicity according to Regulation (EC) No 1272/2008:
Not required

Neurotoxicity
No studies on neurotoxicity of L(+) Lactic acid were submitted. From the high exposure to L(+) Lactic acid as natural food ingredient and food additive there are no concerns about a possible neurotoxic potential. Thus, in the view of the RMS no further studies are required.

Classification and labelling for neurotoxicity according to Regulation (EC) No 1272/2008:
Not required

Further Studies
None

Medical Data
A case report from a fatal accidental poisoning is available from the literature. A woman received ~33 g lactic acid (100 ml of a 33 % aqueous solution) via duodenum tube in a hospital. She reported immediate pain, vomited blood and had blood in the urine. She developed dyspnoea and cyanosis and died 12 h after administration. Necropsy revealed corrosion of the stomach and the duodenum with necroses, haemorrhages, bleeding, and thromboses of most blood vessels of the gastrointestinal tract. Tissue distribution 4 d post mortem revealed high lactic acid levels in the gastrointestinal tract.

Summary & Conclusion
L(+) Lactic acid is an endogenous alpha-hydroxy acid of generally low toxicity. Due to its acidity it is, however, considered to be a skin irritant and severe eye irritant.
Based on irritating effect, a **dermal NOAEC** for acute, medium-term and long-term exposure of **10 % L(+) Lactic acid** was derived from rabbit irritation/corrosion studies: 88 % and 50 % L(+) Lactic acid were corrosive in rabbits (88 % were irritant in human patch tests); 10 % were non-irritant in rabbits and guinea pigs (range-finding Buehler test). As the rabbit is the most sensitive species it seems to be reasonable to assume that this concentration would be without effect on human skin.

Because of the very low systemic toxicity of L(+) lactic acid, derivation of any systemic toxicological reference dose was regarded unnecessary. Considering the intended uses, exposure is estimated to be clearly below endogenous production (>100 g/person/day) and dietary exposure (>1 g/person/day). Therefore, neither an ADI nor an ARfD have been set. Likewise, L-(+)-lactic acid has been approved in the EU as a food additive without an ADI or upper limit (*quantum satis;* Dir. 95/2/EC), as a cosmetics ingredient, and as veterinary medicinal product without the requirement for MRL setting (EMEA 2008).

Summarising the study results and all considerations above, the a.s. L(+) Lactic acid requires classification/labelling according to REGULATION (EC) NO 1272/2008:
Eye Dam. 1, H318; Skin Irrit. 2, H315

2.2.1.2. Exposure assessment

Exposure of Professionals

The primary professional use of the biocidal product (dummy product) is the application as hand-washing liquid soap by professional health care personnel. The soap is left on the skin for approx. 1 minute and then rinsed off with water.

Liquid soaps are rinse-off products that allow only for a short contact time. A default scenario for the use of liquid hand soaps has been incorporated into ConsExpo 4.1 and is used here to assess the dermal exposure. An exposure frequency of 10 uses per day is taken into account for the estimation. The estimated dermal exposure is **902 mg/day**.

It is expected that inhalation exposure is low as lactic acid has a low vapour pressure (10 Pa 25°C) and short exposure duration per day (max. 10 min). The generation of an inhalable mist during hand washing can be excluded. The concentration of lactic acid in air is estimated with ConsExpo 4.1.
The estimated inhalation 8-h TWA is **0.013 mg/m³**

A secondary exposure of a professional bystander is not applicable since the product is rinsed off after use.

Exposure of Non-Professionals

The primary non-professional use of the biocidal product (dummy product) is the application as hand-washing liquid soap in residential bathrooms.

Table 2-5 Summary of primary internal exposure of non-professional users (adult and child) to L(+) Lactic acid from the biocidal product (dummy product)

	Inhalation exposure (mg/kg bw/d)	Dermal exposure (mg/kg bw/d)	Oral exposure (non respirable) (mg/kg bw/d)	All routes (mg/kg bw/d)
Modelled data				
Adult: Handwashing Long-term exposure - internal dose	0.13	5.63	-	5.76
Child: Handwashing Long-term exposure - internal dose	0.35	14.1	0.19	14.7

Secondary Exposure

Secondary exposure to the biocidal product may occur via inhalation of persons not involved with the application, but present in the bath room. This exposure is covered by primary inhalation exposure of children (see above). Secondary exposure via dermal contact of persons not involved is considered very unlikely due to rinsing off the product. Oral exposure via hand-to-mouth contact is covered by primary exposure assessment (child).

2.2.1.3. Risk characterisation

Risk Assessment for Professionals

Systemic effects

Because of very low systemic toxicity of L(+) Lactic acid, derivation of any systemic toxicological reference dose was regarded not necessary, however, the exposure estimates are compared with endogenous production of L(+) Lactic acid to carry out the risk characterisation for systemic effects..

If the total internal body burden is lower than the reference dose (endogenous production), health risks leading to concern are not anticipated.

For scenario 1 (hand disinfection in hospitals – 3% a.s.) estimated uptake / endogenous production in below 100% and thus a safe is identified.

Local effects

Due to the acidity of L(+) Lactic acid irritation reactions of skin can arise from dermal exposure. As the concentration of 3% L(+) Lactic acid does not lead to classification for skin irritation/corrosion, there is no need for a quantitative or semi-quantitative risk assessment for local effects.

According to the risk characterisation the assessed exposure scenario hand disinfection with a liquid hand soap for the active substance (L)+Lactic acid does not lead to concern for professionals. It is essential to indicate, that the conclusion only applies to the active substance in the dummy product and not to other ingredients.

Safety Measures for Professionals

As for the product (liquid soap, 3 % a.s.) no concern was assessed for professional use, no risk reduction measures were derived. Under normal use conditions as hand soap, eye contact is not expected. This is in conflict with the recommendation of safety goggles (P280) on the label based on H318 (Causes serious eye damage) according to classification & labelling (Reg. No 1272/2008, annex I, tables 3.3.3 and 3.3.5). The use of safety goggles during hand wash is not a common and useful risk mitigation measure for professional health care personnel. However, for the approval of the active substance, this condition is acceptable since the provided product is a dummy product.

For product authorisation it is recommended that the composition of hand wash soaps for professionals avoids classification as Eye Dam. 1 (H318) as incidental eye contact could not be excluded.

Risk Assessment for Non-Professionals

No critical endpoints of systemic toxicity have been identified for L(+) Lactic acid. Primary and secondary exposure to this active substance by application of the biocidal product (dummy product) is considered low compared to endogenous formation (in maximum 0.1 %). Compared to minimum daily food intake the relative potential primary / secondary exposure is in maximum 12 %. Thus, it is concluded that exposure to L(+) Lactic acid by use of the biocidal product (dummy product) as a hand-washing soap does not reveal any risk to human health when considering systemic toxicity.

Safety Measures for Non-Professionals

Specific measures are not required. The biocidal product has to be labelled as prescribed in Regulation (EC) No 1272/2008.

Local Risk Assessment

Due to the content of L(+) Lactic acid the dummy product is classified with Danger; H318. For this hazard a quantitative risk assessment is not necessary. Risk mitigation measures triggered by this hazard are covered by the corresponding safety phrases or precautionary statements as provided in chapter 2.1.3.

This includes P280 (Wear eye protection/face protection.). Correct selection and use of personal protection equipment by non-professional users cannot be assumed. Biocidal products classified with H318 are not considered safe for the non-professional user unless the likelihood of eye exposure can be effectively minimised by product-integrated risk mitigation measures. Due to the application by hand washing, contact with eyes is likely, because washing of face cannot be excluded completely. Thus, a safe use of the dummy product by the non-professional user cannot be demonstrated. National authorisation is only possible if it can be shown for this or similar biocidal products (if intended for non-professional use) that classification as Eye Dam. 1 (H318) is not required or that the corresponding risk can be minimised by other risk mitigation measures than wearing PPE.
The concentration of L(+) lactic acid in the representative biocidal product (3 %) is below the dermal NOAEC (10 %).

2.2.2. Environmental Risk Assessment

The environmental risk characterisation is based on the concept of releases of the active substance (a.s.) to the environment taking into account all relevant life cycle stages. The derivation of predicted no effect concentrations (PNEC) for L(+) Lactic acid (Doc II-4) as well as the estimation of predicted environmental concentrations (PEC) resulting from the use of the biocidal dummy product (Doc II-8.3) in all relevant environmental compartments were performed according to the Technical Guidance Document (TGD) on Risk Assessment (EU, 2003) and to the Emission Scenario Document (ESD) for PT 1 (RIVM, 2004) and the results of the ad-hoc WG EE discussion at the BPC WG-Meeting ENV V/2014.

2.2.3. Fate and distribution in the environment

Biodegradation

A test on ready biodegradability was performed according to the Dutch Guidelines NEN 6633 and NEN 6634. The degradation of the a.s. after 20 days was 60 and 67% at concentrations of 2 and 4 mg/l, respectively. However, the level of degradation within 10 days cannot be assessed. Therefore L(+) Lactic acid is classified as readily biodegradable but failing 10-days window criterion. The resulting rate constant in the STP was set to k_{STP} = 0.3 /h.

Abiotic Degradation

L(+) Lactic acid possesses only one hydrolysable group the acid group. For hydrolysis of the acid group, the dissociation constant (pK) of 3.8 should be taken into account. As no further hydrolysable groups are available, no further data on hydrolysis is considered necessary. The UV-spectrum of L(+) Lactic acid shows that no absorbance in the wavelength range of 290-800 nm takes place. Therefore, L(+) Lactic acid cannot undergo direct photolysis in sunlight.
The vapour pressure of L(+) Lactic acid is 0.4 Pa at 20°C and direct evaporation is not expected, consequently. The Henry's constant (3.6×10^{-5} Pa $\times$ m^3/mol at 20°C) indicates low volatility from water. In air L(+) Lactic acid will be degraded by indirect photodegradation. The half-life of L(+) Lactic acid was estimated to be 2.71 d, which corresponds to a value of 3.91 d for the chemical lifetime in the troposphere.

Distribution and Mobility

A HPLC-screening test according to the OECD test guideline (TG) No. 121 was performed to estimate the K_{OC} of lactic acid. The retention time of L(+) Lactic acid in this test was lower than the retention time of the reference substance phenol with the known log K_{OC} of 1.32. Therefore it was concluded, that the log K_{OC} of L(+) Lactic acid is < 1.32 (K_{OC} < 20.9 L/kg). The RMS decided to use a rounded K_{OC} of 20 L/kg for the environmental exposure assessment. L(+) Lactic acid can be classified as substance with high mobility in soil.
The distribution in the sewage treatment plant was calculated by RMS using the SimpleTreat 3.0-model. Due to a lack of information on the fulfilment of the 10-day window criterion (rate constant for STP concluded by RMS: 0.3 /h) the following release fractions were assessed: to air 0.0%, water 32.5%, sludge 0.2% and degraded fraction 67.3%.

Bioaccumulation

Experimentally derived data on the bioaccumulation potential of the a.s. are not available neither for the aquatic nor the terrestrial compartment, respectively. Hence, the bioconcentration factors (BCF) for the aquatic compartment (BCF_{fish} = 0.048 L/kg) and the terrestrial compartment ($BCF_{earthworm}$ = 6.78 L/kg) were assessed on the basis of the log K_{OW} of -0.74 according to the standard equations given in the TGD on Risk Assessment (Doc. II-4). Since both BCFs as well as other indicators (e.g. surface tension) indicate a low bioaccumulation potential of the a.s. in the environment, experimental studies are not required.

2.2.4. Effects assessment

Aquatic Compartment

For the assessment of effects on the aquatic compartment, acute data for fish, invertebrates and algae are available. These data were derived from ecotoxicological studies submitted by the applicant, from a literature survey and from QSAR estimations, both conducted by RMS. Although the experimental studies on fish and invertebrates were considered to be invalid (RI = 3), algae were identified to be the most sensitive organisms with the aid of the QSAR estimations. Thus, the $PNEC_{water}$ was derived from the E_rC_{50} (3,900 mg a.s./L) that was assessed in a valid experimental study on the inhibition of algal growth (Doc. III-A7.4.1.3; RI = 2) by applying an assessment factor of 1,000.

$PNEC_{water}$ = 3.9 mg a.s./L

Sediment

Since no tests on the toxicity of L(+) Lactic acid on sediment dwelling organisms were provided, the PNEC for sediment was derived by applying the equilibrium partitioning method (EPM) according to the TGD on Risk Assessment (Doc. II-4).

$PNEC_{sed}$ = 4.8 mg a.s./kg ww

Inhibition of microbial activity (STP)

In a test on the respiration inhibition of activated sludge according to the OECD guideline 209, the NOEC was assessed to be ≥100 mg a.s./L (nominal), the EC_{50} >100 mg a.s./L (nominal). For the risk assessment a NOEC of 100 mg a.s./L was used as a worst case. For the derivation of the $PNEC_{microorganisms,\ STP}$ an assessment factor of 10 was applied in accordance with the TGD on Risk Assessment (Doc. II-4).

$PNEC_{microorganisms,\ STP}$ = 10 mg a.s./L

Terrestrial Compartment

Data to address the ecotoxicity of L(+) Lactic acid for terrestrial organisms were not submitted by the applicant since direct exposure as well as adsorption of the a.s. to soil is not expected to occur. Instead, a $PNEC_{soil}$ was calculated by applying the EPM according to the TGD on Risk Assessment (Doc. II-4).

$PNEC_{soil}$ of 1.9 mg a.s./kg ww

Atmosphere

L(+) Lactic acid is not considered to be used as fumigant. The vapour pressure of L(+) Lactic acid is 0.4 Pa at 20°C and the Henry constant is 3.6×10^{-5} indicating that direct evaporation and volatility from water are expected to be insignificant. In general, emissions of L(+) Lactic acid to the atmosphere are unlikely to occur. Due to an estimated half-life in the atmosphere of 2.71 d corresponding to 3.91 d for the chemical lifetime the potential for long-range transport of L(+) Lactic acid in air is indicated (ref. to Annex D of the Stockholm Convention on Persistent Organic Pollutants (17th May 2004): "… a chemical that migrates significantly through the air, its half-life in air should be greater than two days …"). However, according to the TGD on Risk Assessment (EU, 2003) effects on stratospheric ozone and acidification are not expected because L(+) Lactic acid does not contain halogens, nitrogen or sulphur substituents. L(+) Lactic acid shows no absorption bands in the so-called atmospheric window (range from 800 to 1200 nm). Therefore, L(+) Lactic acid has no global-warming potential.

Secondary Poisoning
As indicated by the BCF_{fish} (0.048 L/kg) and the $BCF_{earthworm}$ (6.78 L/kg) as well as by the surface tension (70.7 mN/m), the bioaccumulation potential of L(+) Lactic acid and thus the risk of secondary poisoning is considered to be low.

Summary of PNECs

Table 2-6 Summary of the selected PNEC values used for the risk characterisation part

Environmental compartment	PNEC
$PNEC_{water}$	3.9 mg a.s./L
$PNEC_{sed}$	4.8 mg a.s./kg ww
$PNEC_{microorganism, STP}$	10 mg a.s./L
$PNEC_{soil}$	1.9 mg a.s/kg ww

2.2.5. PBT and POP assessment

The PBT assessment for L(+) Lactic acid was performed according to the guidance given in the TGD on risk assessment (EU, 2003) as well as following the REACH Regulation (EC) No. 1907/2006:

P criterion:	Half life > 40 d in freshwater or > 120 d in freshwater sediment or > 120 d in soil (according to the REACH legislation)
vP criterion:	Half life > 60 d in freshwater or > 180 d in freshwater sediment or > 180 d in soil (according to the REACH legislation)
B criterion:	BCF > 2000 L/kg
vB criterion:	BCF > 5000 L/kg
T criterion:	Long-term NOEC for freshwater organism < 0.01 mg/L or CMR or endocrine disrupting effects

L(+) Lactic acid is considered to be neither persistent (readily biodegradable but failing the 10-days window criterion) nor bioaccumulative (BCF_{fish} = 0.048 L/kg; $BCF_{earthworm}$ = 6.78 L/kg), nor does L(+) Lactic acid fulfil the toxicity criterion ($NOEC_{algae}$ = 1.1 g a.s./L). Hence, the P, vP as well as the B, vB and the T criterions are not fulfilled.

Conclusion:
The active substance L(+) Lactic acid is neither a PBT nor a vP/vB - candidate.

Assessment of Endocrine Disrupting Properties (ED)
There is no indication for endocrine disrupting properties of the a.s..

2.2.6. Exposure assessment

The biocidal dummy product, a ready to use hand soap containing 3% w/w lactic acid, is used for human hygiene skin and hand application. For the environmental exposure assessment of the biocidal product (b.p.) the following life cycle stages are selected to be relevant:

- production of a.s.,
- formulation of b.p.,
- professional use of the b.p. as a ready to use liquid solution, hand soap,

- private use of the b.p. as a ready to use liquid solution, hand soap.

The environmental release estimations and the PECs for the life cycle stages "production" and "formulation" can be found in Doc. II-8.3, but were not taken into account for the environmental risk assessment in accordance with the Biocidal Products Regulation (BPR, Regulation (EU) 528/2012).

The biocidal dummy product, a ready to use liquid solution containing 3% of L(+) Lactic acid is used as disinfectant hand soap. Hence, the b.p. will be applied indoors and thus, exposure of the environmental compartments surface water and sediment will occur via the Sewage Treatment Plant (STP). In addition, natural emissions of lactic acid to the aquatic compartment (via urine and faeces to STP) should be considered. According to Berkow (1981) a total excretion of lactic acid per day should be assumed for the emission calculation. The environmental compartments soil and groundwater may be affected by the application of sewage sludge on agricultural soil According to the ESD for PT 1 (RIVM, 2004) no exposure of the compartment air is foreseen and under consideration of the intrinsic properties of L(+) Lactic acid (see Doc. II-4, chapter 4.2.2) it is scientifically justifiable that the exposure of the air compartment is assumed as negligible.

In the Emission Scenario Document for PT 1 (RIVM, 2004) two types of intended uses are described: private and professional use. For both uses two emission scenarios for disinfectant hand soaps are presented: (1) based on tonnage and (2) based on consumption. According to the EU-Report on the Workshop for PT 1-6 (2008) both approaches shall be presented by RMS in the CA report. Based on the calculation of the break-even point the most suitable scenario should be used. The scenario based on consumption was chosen in both cases, the use of the dummy product in private households and the professional use in hospitals.To get a better understanding for the relation between the anthropogenic emission vs emission due to biocidal use RMS decided to calculate PEC values for both emission pathways.

Aggregated environmental Exposure Assessment

Article 19(2) of the new BPR (EU, 2012) states that "the evaluation […] shall take into account the following factors: […] (d) cumulative effects, (e) synergistic effects." This is further elaborated in Annex VI (common principles for the evaluation of biocidal products) where it is stated that the risks associated with the relevant individual components of the b.p. shall be assessed, taking into account any cumulative and synergistic effects. This refers to the environmental risk assessment of an a.s. which is contained in different products of the same Product Type (PT) or of different PTs.

L(+) Lactic acid is notified for inclusion in the Union list of active substances approved for use in biocidal products in PT 1, 2, 3, 4 and 6. For all mentioned PTs, DE is RMS. In the respective CA reports the following uses are considered: PT 1 – hand soap, PT 2 - disinfectant bathroom cleaner for private uses; PT 3 - non-medical teat dips disinfection (only STP-pathway assessed); PT 4 - disinfection of breweries (small, average and large sized brewery); PT 6 - a) manual washing-up liquid and b) fabric conditioner.

In RMS's opinion each of the above mentioned intended uses can lead to an overlap in time and space in different environmental compartments. The main entry paths into the environment are equal for all applications mentioned above (via STP), thus a combination of exposures to L(+) Lactic acid for all affected environmental compartments is both possible and realistic. Consequently, an environmental evaluation considering aggregated risks according to BPR is feasible in technical terms.

According to the "Decision tree on the need for estimation of aggregated exposure" (BIP6.7 Decision Tree Agg Expo), the requirement for aggregated exposure estimations was

checked for lactic acid. L(+) Lactic acid is also regulated in other regulatory areas (e.g. cosmetics regulation, food legislation). The amount of L(+) Lactic acid that is used annually for biocidal purposes amounts to 5% of the total production and import volume of L(+) Lactic acid in the EU in 2012. Thus, the biocidal use of L(+) Lactic acid accounts for less than 10% of the total production and import volume in the EU. The intended uses (hand soap, bathroom cleaner, teat dips disinfection, disinfection in breweries, manual washing-up liquid and fabric conditioner) are widely dispersive and do not represent a specific emission pattern. Consequently, it has been concluded that no aggregated exposure assessment for a.s. L(+) Lactic acid has to be performed.

2.2.7. Risk characterisation

Aquatic Compartment including Sediment

Table 2–7 PEC/PNEC ratios for the use of the b.p. in PT 1 as disinfectant handsoap for private use concerning STP, surface water and sediment

Compartment	PEC [µg a.s./L]	PNEC [µg a.s./L]	PEC / PNEC
STP	60.94	10,000	0.006
Surface water	6.09	3,900	0.002
Compartment	**PEC [µg a.s./kg]**	**PNEC [µg a.s./kg ww]**	**PEC / PNEC**
Sediment	7.41	4,820	0.002

Table 2–8 PEC/PNEC ratios for the use of the b.p. in PT 1 as disinfectant handsoap for professional use concerning STP, surface water and sediment

Compartment	PEC [µg a.s./L]	PNEC [µg a.s./L]	PEC / PNEC
STP	85.75	10,000	0.009
Surface water	8.77	3,900	0.002
Compartment	**PEC [µg a.s./kg]**	**PNEC [µg a.s./kg ww]**	**PEC / PNEC**
Sediment	10.68	4,820	0.002

The estimated PEC/PNEC ratios for sewage treatment plant, surface water as well as for sediment are below the trigger value of 1 (Table 2-11; Table 2-12). Thus, the private as well as the professional use of the biocidal dummy product indicate no unacceptable risk for the aquatic compartment.

Terrestrial Compartment including Groundwater

Table 2–9 PEC/PNEC ratios for the use of the b.p. in PT 1 as disinfectant handsoap for private use concerning soil and groundwater

Compartment	PEC [µg a.s./kg]	PNEC [µg a.s./kg ww]	PEC / PNEC
Soil	1.36	1,900	0.001
Compartment	**PEC [µg a.s./L]**	**Trigger value [µg/L][1]**	**Risk quotient[2]**
Groundwater	1.49	0.1	14.9

[1]Quality standard for pesticides and biocidal products according to Directive 2006/118/EC (Annex I)
[2] Prior to the refinement of the exposure assessment for groundwater with FOCUS PEARL

Table 2–10 PEC/PNEC ratios for the use of the b.p. in PT 1 as disinfectant handsoap for professional use concerning soil and groundwater

Compartment	PEC [µg a.s./kg]	PNEC [µg a.s./kg ww]	PEC / PNEC
Soil	1.95	1,900	0.001
Compartment	**PEC [µg a.s./L]**	**Trigger value [µg/L][1]**	**Risk quotient[2]**
Groundwater	2.15	0.1	21.5

[1]Quality standard for pesticides and biocidal products according to Directive 2006/118/EC (Annex I)
[2] Prior to the refinement of the exposure assessment for groundwater with FOCUS PEARL

The PEC/PNEC ratio for soil is below the trigger value of 1 for both intended uses of the b.p., while the concentration in groundwater exceeds the quality standard for pesticides and biocidal products according to Directive 2006/118/EC for drinking water (Table 2-13; Table 2-14). Thus, the groundwater assessment was refined at a second tier with the FOCUS PEARL model which considers potential mobility of L(+) Lactic acid in soils and the leaching behaviour to groundwater. It could be demonstrated that for one arable land scenario (Sevilla) and for all grassland scenarios the average concentration of L(+) Lactic acid closest to the 80th percentile is below the trigger value of 0.1 µg/L. According to the conclusion of the 47th CA meeting in July 2012 the risk for the groundwater compartment is acceptable if there is at least one safe scenario for each of both areas. Thus, the private as well as the professional use of the biocidal dummy product indicate no unacceptable risk for the terrestrial compartment.

Atmosphere

Due to the intended use of the b.p. and on the basis of the available substance information the environmental risk of L(+) Lactic acid for the atmosphere is assumed to be insignificant.

Aggregated Risk Assessment

Since the amount of L(+) Lactic acid that is used annually in biocidal products accounts for less than 10% compared to the annual production and import volume of L(+) Lactic acid in the EU, no aggregated risk assessment was performed.

Overall Conclusion to the Environment

Considering the intended uses (private and professional) of the biocidal dummy product containing 3% of L(+) Lactic acid (Product Type 1: Human hygiene) no unacceptable risk

for the environment is indicated. In addition, no potential for bioaccumulation and consequently no concern for secondary poisoning were identified. Moreover, L(+) Lactic acid is neither PBT nor vP/vB candidate.

For the authorisation of products, a study on ready biodegradability, in which the 10-days window criterion is assessed, may be submitted to allow an improved exposure assessment (especially for groundwater).

2.2.8. Assessment of endocrine disruptor properties

There is no indication for endocrine disrupting properties of the a.s.

2.3. Overall conclusions

The outcome of the assessment for L(+) Lactic acid in product-type 01 is specified in the BPC opinion following discussions at the 13th meeting of the Biocidal Products Committee (BPC). The BPC opinion is available from the ECHA web-site.

2.4. List of endpoints

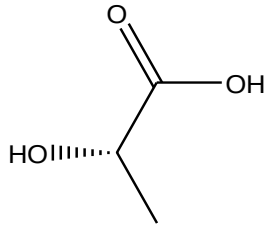
The most important endpoints, as identified during the evaluation process, are listed in Appendix I.

Appendix I: List of endpoints

Chapter 1:Identity, Physical and Chemical Properties, Classification and Labelling

Active substance (ISO Name)	L(+) Lactic acid
Product-type	01 (Human Hygiene)

Identity

Chemical name (IUPAC)	(S)-2-Hydroxypropanoic acid
Chemical name (CA)	Propanoic acid, 2-hydroxy-, (2S)-
CAS No	79-33-4
EC No	201-196-2
Other substance No.	
Minimum purity of the active substance as manufactured (g/kg or g/l)	≥ 95.5% w/w Existence of an equilibrium system of L(+) Lactic acid with several oligomers
Identity of relevant impurities and additives (substances of concern) in the active substance as manufactured (g/kg)	Not applicable
Molecular formula	$C_3H_6O_3$
Molecular mass	90.08 g/mol
Structural formula	 (S)-2-hydroxypropanoic acid

Physical and chemical properties

Melting point (state purity)	53°C (pure, crystalline solid L(+) Lactic acid) Supercooled viscous: no melting until – 80°C (93% L(+) Lactic acid, equilibrium system)
Boiling point (state purity)	204.2 °C (calculated)(100 % L-(+)-Lactic acid) Not determinable (93 % L-(+)-Lactic acid, equilibrium system)
Thermal stability / Temperature of decomposition	Not applicable

Appearance (state purity)	Liquid (aqueous solution, 88 % / 93 % L-(+)-Lactic acid), colour ≤100 Apha, colourless to yellow light brown odour: characteristic
Relative density (state purity)	1.213 (T = 20 °C, 93 % L-(+)-Lactic acid, equilibrium system)
Surface tension (state temperature and concentration of the test solution)	70.7 mN/m (1 g/l 93 % L-(+)-Lactic acid, equilibrium system)
Vapour pressure (in Pa, state temperature)	0.4 Pa (T = 20 °C, 100 % L-(+)-Lactic acid, calculated) no scientific value of the vapour pressure result of a 93 % L-(+)-Lactic acid solution
Henry's law constant (Pa m^3 mol^{-1})	Because of the equilibrium system only hypothetical
Solubility in water (g/l or mg/l, state temperature)	completely miscible with water (100 % L-(+)-Lactic acid)
Solubility in organic solvents (in g/l or mg/l, state temperature)	78.6 % wt in Methanol 29 % wt in 2-Ethylhexanol 0.005 % wt in Hexane 39.9 % wt in Ethylacetate 0.11 % wt in Toluene 38.7 % wt in Diethylether 52.9 % wt in 2-Butanone (T = 20 °C, only the monomeric L-(+)-Lactic acid (free acid) is determined, oligomers are not considered, only rough estimation values)
Stability in organic solvents used in biocidal products including relevant breakdown products	Not applicable
Partition coefficient (log P_{OW}) (state temperature)	--0.74 (T = 20 °C, 100 % L-(+)-Lactic acid, degree of oligomerisation n = 1)

	-0.42 (T = 20 °C, degree of oligomerisation n = 1.36) -0.05 (T = 20 °C, degree of oligomerisation n = 1.98)0.74 (T = 20 °C, 100 % L-(+)-Lactic acid) The determination of the partition coefficient n-octanol/water of a 93 % L(+) Lactic acid solution is not scientific, because of the existence of an equilibrium system of L(+) Lactic acid with several oligomers (higher partition coefficients).
Dissociation constant	pKa = 3.86, T = 22.5 °C (crystalline L-(+)-Lactic acid)
UV/VIS absorption (max.) (if absorption > 290 nm state ε at wavelength)	Maximum absorption at 210 nm No absorption > 290 nm
Flammability or flash point	not applicable
Explosive properties	not applicable
Oxidising properties	not applicable
Auto-ignition or relative self ignition temperature	

Classification and proposed labelling

with regard to physical hazards	

with regard to human health

Proposed classification of L(+) Lactic acid based on Regulation (EC) No 1272/2008

	Hazard class, category, and statements	**Wording**
Classification	Eye Dam. 1, H318 Skin Irrit. 2, H315	Causes serious eye damage Causes skin irritation

Proposed labelling of L(+) Lactic based on Regulation (EC) No 1272/2008

	Labelling	**Wording**
Pictograms	GHS05	
Signal Word	Danger	

Hazard statements	H315 H318	Causes skin irritation Causes serious eye damage
Precautionary statements	P264 P280 P302 + P352 P305 + P351 + P338 P310 P363	Wash … thoroughly after handling Wear protective gloves/protective clothing/eye protection/face protection IF ON SKIN: Wash with plenty of soap and water 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 Wash contaminated clothing before reuse

Chapter 2:Methods of Analysis

Analytical methods for the active substance

Technical active substance (principle of method)	The determination of L(+) Lactic acid could be done with several titration methods. The validated titration method with sodium hydroxide respectively back titration with sulfuric acid is capable to determine free and, or total lactic acid. After derivatization the Methyl esters of S- and R-lactic acid are separated on a chiral GC column, and the ratio determined from the FID-generated peak surfaces areas. L(+) Lactic acid oligomers and cyclic dimers are determined by a UV/HPLC method.
Impurities in technical active substance (principle of method)	Organic acid impurities are determined and quantified by a GC/MS method based on derivatization of acids to methyl esters. Methyl esters of organic acids are separated on two different GC columns for a positive identification, and quantified from the FID-generated peak surfaces areas.

Analytical methods for residues

Soil (principle of method and LOQ)	Not applicable, no relevant residues expected
Air (principle of method and LOQ)	Not applicable, no relevant residues expected

Water (principle of method and LOQ)	Not applicable, no relevant residues expected
Body fluids and tissues (principle of method and LOQ)	Not applicable, no relevant residues expected
Food/feed of plant origin (principle of method and LOQ for methods for monitoring purposes)	Not applicable, no relevant residues expected
Food/feed of animal origin (principle of method and LOQ for methods for monitoring purposes)	Not applicable, no relevant residues expected

Chapter 3:Impact on Human Health

Absorption, distribution, metabolism and excretion in mammals

Rate and extent of oral absorption:	100%, rapid
Rate and extent of dermal absorption*:	Default values in the absence of data for the biocidal product: 25% for products containing > 5% a.s. 75 % for products containing ≤ 5% a.s. Values from studies with other formulations (rate dependent on pH and formulation): • 30-32 % at pH 3/3.8 (human (PEG-100 stearate, laureth-4) and pig (o/w emulsion) skin *ex vivo*); • 11 % at pH 3.8 (pig skin *ex vivo*, w/o emulsion) • 7-10 % at pH 7 (human (PEG-100 stearate, laureth-4) and pig (o/w emulsion) skin *ex vivo*) 50 % within 3 days (rat *in vivo*, o/w; pH not stated)
Distribution:	V_d ~ 0.5 L/kg bw, widely distributed
Potential for accumulation:	No evidence for accumulation
Rate and extent of excretion:	Predominantly metabolic elimination via CO_2 or synthesis of biomolecules (glucose, glycogen, amino acids, polypeptides); ~ 1.8 g/kg bw/d endogenous turnover rate at rest in humans; turnover capacity: > 200 % turnover rate at rest
Toxicologically significant metabolite(s)	None

* the dermal absorption value is applicable for the active substance and might not be usable in

product authorization

Acute toxicity

Rat LD_{50} oral	3543 mg/kg bw*
Rat LD_{50} dermal	> 2000 mg/kg bw*
Rat LC_{50} inhalation	> 7.94 mg/L air x 4 h* (aerosol, nose only)

Skin corrosion/irritation	Irritant (human patch test, single exposure (concentrated lactic acid); guinea pig, repeated exposure (≥ 24%)) **H315**
Eye irritation	Irritant (Chicken enucleated Eye test), Risk of serious damage to eyes **H318**
Respiratory tract irritation	
Skin sensitisation (test method used and result)	Not sensitising (Buehler)*

* 80 % L-(+)-lactic acid

Respiratory sensitisation (test method used and result)	

Repeated dose toxicity

Short term

Species / target / critical effect	Oral: no valid data, justification accepted Dermal (Buehler, guinea pig): local irritation effects: pinpoint pitting, eschar formation **H315**
Relevant oral NOAEL / LOAEL	No valid data, justification accepted
Relevant dermal NOAEL / LOAEL	Systemic effects: no data, justification accepted Local effects: < 24 % L(+) lactic acid
Relevant inhalation NOAEC	No data, justification accepted

Subchronic

Species/ target / critical effect	
Relevant oral NOAEL / LOAEL	
Relevant dermal NOAEL / LOAEL	

Relevant inhalation NOAEL / LOAEL	

Long term

Species/ target / critical effect	
Relevant oral NOAEL / LOAEL	
Relevant dermal NOAEL / LOAEL	
Relevant inhalation NOAEL / LOAEL	

Genotoxicity

Carcinogenicity

Species/type of tumour	Rat: no tumours observed
Relevant NOAEL/LOAEL	Rat: ~880 mg/kg bw/d (highest dose tested)

Reproductive toxicity

Developmental toxicity

Species/ Developmental target / critical effect	Mouse: no specific effects observed
Relevant maternal NOAEL	570 mg/kg bw/d (highest dose tested)
Relevant developmental NOAEL	570 mg/kg bw/d (highest dose tested)

Fertility

Species/critical effect	
Relevant parental NOAEL	
Relevant offspring NOAEL	
Relevant fertility NOAEL	

Neurotoxicity

Species/ target/critical effect	No data, not required

Developmental Neurotoxicity

Species/ target/critical effect	No data, not required

Immunotoxicity

Species/ target/critical effect	

Developmental Immunotoxicity

Species/ target/critical effect	

Other toxicological studies

No data, not required

Medical data

Case report, fatal accidental intoxication: Administration of ca. 30 g lactic acid by duodenal tube resulted in pain, vomiting, gastrointestinal haemorrhages, corrosion, bleeding and necroses of the duodenum; death within 12 h

Summary

	Value	Study	Safety factor
$AEL_{long\text{-}term}$	Not allocated – not necessary		
$AEL_{medium\text{-}term}$	Not allocated – not necessary		
$AEL_{short\text{-}term}$	Not allocated – not necessary		
ADI[1]	Not allocated – not necessary		
ARfD	Not allocated – not necessary		

MRLs

Relevant commodities	

Reference value for groundwater

According to BPR Annex VI, point 68	

Dermal absorption

Study (*in vitro/vivo*), species tested	
Formulation (formulation type and including concentration(s) tested, vehicle)	
Dermal absorption values used in risk assessment	

Acceptable exposure scenarios (including method of calculation)

Formulation of biocidal product	Not assessed by the rapporteur
Intended uses	
Industrial users	

[1] If residues in food or feed.

Professional users	Hand disinfection with a liquid soap (ready-to-use) by professional health care personnel Dermal Exposure: **902 mg/day (10 x hand wash per shift)** Model: ConsExpo approach in combination with Recommendation 1 of Adhoc Working Group Human Health Inhalation exposure: **0.013 mg/m^3 (8-h TWA for 10 x hand wash)**
Non-professional users	Hand-washing, bathrooms, **adults**; chronic ConsExpo 4.1: Inhalation model: Exposure to vapour: instantaneous release; Direct dermal contact with product; instant application (5.76 mg/kg bw/d, 0.4% of endogenous formation). Hand-washing, bathrooms, **children**, chronic ConsExpo 4.1: Inhalation model: Exposure to vapour: instantaneous release; Direct dermal contact with product; instant application; oral via hand-to-mouth after rinsing (1 % retention) (14.7 mg/kg bw/d, 0.4 of endogenous formation). Based on the classification as Eye dam. 1, H318 a safe use was not demonstrated.
General public	Inhalation exposure of persons not involved with the application, covered by primary exposure; dermal and oral exposure is considered unlikely
Exposure via residue in food	exposure via food is not a concern.
Combined Exposure	Combined exposure is considered acceptable due to strong endogenous formation and low toxicity of L-lactic acid.

Chapter 4: Fate and Behaviour in the Environment

Route and rate of degradation in water

Hydrolysis of active substance and relevant metabolites (DT_{50}) (state pH and temperature)	No hydrolysis
pH 5	
pH 9	
Other pH: *[indicate the value]*	
Photolytic / photo-oxidative degradation of active substance and resulting relevant metabolites	Not applicable, no absorption maximum > 290nm

Readily biodegradable (yes/no)	Yes, but 10-day window cannot be assessed
Inherent biodegradable (yes/no)	
Biodegradation in freshwater	
Biodegradation in seawater	
Non-extractable residues	
Distribution in water / sediment systems (active substance)	
Distribution in water / sediment systems (metabolites)	

Route and rate of degradation in soil

Mineralization (aerobic)	
Laboratory studies (range or median, with number of measurements, with regression coefficient)	
DT_{50lab} (20°C, aerobic):	
DT_{90lab} (20°C, aerobic):	
DT_{50lab} (10°C, aerobic):	
DT_{50lab} (20°C, anaerobic):	
degradation in the saturated zone:	
Field studies (state location, range or median with number of measurements)	
DT_{50f}:	
DT_{90f}:	
Anaerobic degradation	
Soil photolysis	
Non-extractable residues	
Relevant metabolites - name and/or code, % of applied a.i. (range and maximum)	
Soil accumulation and plateau concentration	

Adsorption/desorption

Ka , Kd Ka_{oc} , Kd_{oc} pH dependence (yes / no) (if yes type of dependence)	K_{OC} was estimated by HPLC-screening test according to the OECD test guideline (TG) No. 121: K_{OC} < 20.9 L/kg → RMS used the rounded value of 20 L/kg for K_{OC} for environmental exposures calculations Not stated in the HPLC-screening test

Fate and behaviour in air

Direct photolysis in air	
Quantum yield of direct photolysis	
Photo-oxidative degradation in air	tropospherical half-life of Lactic acid: 2.71 d (reaction with OH radicals; OH radical concentration = 5 x 10^5 OH radicals/cm^3, global 24-hours-mean)
Volatilization	Henry's law constant indicates low volatility

Reference value for groundwater

According to BPR Annex VI, point 68	

Monitoring data, if available

Soil (indicate location and type of study)	
Surface water (indicate location and type of study)	
Ground water (indicate location and type of study)	
Air (indicate location and type of study)	

Chapter 5: Effects on Non-target Species

Toxicity data for aquatic species (most sensitive species of each group)

Species	Time-scale	Endpoint	Toxicity
Fish			
Oncorhynchus mykiss (Salmo gairdneri) *Lepomis macrochirus*	96 h	Mortality	(LC_{50} = 130 mg a.s./L)[1] (LC_{50} =130 mg a.s./L)[1]
QSAR		Mortality	LC_{50} = 177 g a.s./L
Invertebrates			
Daphnia magna	48 h	Mortality	(EC_{50} = 156 mg a.s./L)[1]
QSAR		Mortality	EC_{50} = 78.8 g a.s./L
Algae			
Selenastrum capricornutum	70.5 h	Growth inhibition	(E_rC_{50} = 3.9 g a.s./L)[1] (NOE_rC = 1.1 g a.s./L)
QSAR		Growth inhibition	21.3 g a.s./L

Microorganisms			
Activated sludge from municipal sewage treatment plant (treating predominantly domestic sewage)	3 h, static	Respiration inhibition	EC_{50} > 100 mg a.s./L (nominal) NOEC ≥ 100 mg a.s./L (nominal)

[1)] Effect values are considered to be related to low pH and were thus not taken into account for PNEC derivation

Chapter 6: Other End Points

Residues in food and feed from the intended use of lactic acid in PT1 biocidal products are not expected. Therefore, dietary exposure of humans from the use of lactic acid as a biocide of PT1 can be excluded. In addition to its proposed biocidal use, lactic acid is used as a food additive (in Germany under Zusatzstoff-Zulassungsverordnung) and a VMP (under Regulation (EWG) 2377/90). No MRL`s exist for these uses.

Appendix II: List of Intended Uses

Lactic acid is a bactericide which is intended to be used directly on the hands as a disinfecting hand soap.

Object and/or situation (a)	**Member State or Country**	**Product name**	**Organisms controlled** (c)	**Formulation**		**Application**			**Applied amount per treatment**			**Remarks:** (m)
				Type (d-f)	Conc. of as (i)	method kind (f-h)	number min max (k)	interval between applications (min)	g as/L min max	water L/m^2 min max	g as/m^2 min max	
bactericide	EU	dummy product	Bacteria, fungi and yeast	Liquid	3%	Ready for use hand soap to be used directly on the hands	Maximum of 20 times per day for approx. 1 minute	No label restrictions	3g / event 3% lactic acid			

Appendix III: List of studies

Data protection is claimed by the applicant in accordance with Article 60 of Regulation (EU) No 528/2012.

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/No)	Owner
Doc II A3	Abramson, H.A., Eggleton, P.	1927	The utilization of intravenous sodium r-lactate. I. Excretion by kidneys and intestines. J. Biol. Chem. 75: 745-752.	No	Published
Doc II A3	Carney, E.W, Kimmel, C.A	2007	Interpretation of skeletal variations for human risk assessment: delayed ossification and wavy ribs. Birth Defect Research (Part B) 80:473-496.	No	Published
Doc II A3*	Colomina, M.T, Gomez, M., Domingo, J.L., LLobet, J.M., Corbella, J.	1992	Concurrent ingestion of lactate and aluminum can result in developmental toxicity in mice. Res Comm Chem Pathol Pharmacol 77(1):95-106.	No	Published
Doc II A3	Cori, C.F., Cori, G.T.	1929	Glycogen formation in the liver from d- and l-lactic acid. J. Biol. Chem. 81: 389-403.	No	Published
Doc II A3	Cori, G.T.	1930	Studie on intestinal absorption. I. The absorption of lactic acid. J. Biol. Chem. 87: 13-18.	No	Published
Doc II A3	D'Amour, F.E.	1934	Effects of feeding sodium bicarbonate or lactic acid upon the sex ratio in rats. Science 79(2038):61-62.	No	Published
Doc II A3	EFSA	2012	Guidance on Dermal Absorption, EFSA Panel on Plant Protection Products and their Residues (PPR), EFSA Journal 2012;10(4):2665	No	Published
Doc II A3	EMEA	2008	Status on MRL procedures. MRL assessments in the context of Council Regulation (EEC) No. 2377/90. http://www.emea.europa.eu/pdfs/vet/mrls/076599en.pdf	No	Published
Doc II A3	EC	1995	European Parliament and Council Directive No. 95/2/EC of 20 February 1995 on food additives other than colours and sweeteners.	No	Published

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/No)	Owner
			http://ec.europa.eu/food/fs/sfp/addit_flavor/flav11_en.pdf		
Doc II A3	Fühner, H.	1932	Milchsäure-Vergiftung, tödliche, medizinale. Arch Toxicol 3(1):71-74	No	Published
Doc II A3	Gladden, L.B.	2004	Lactate metabolism: a new paradigm for the third millennium. J Physiol. 558:5-30.	No	Published
Doc II A3	Hagenfeldt, L., Hagenfeldt, K.	1972	Gas chromatographic-mass spectrometric analysis of organic acids in amniotic fluid. Clin Chim Acta 42:219-224.	No	Published
Doc II A3*	Sah, A., Mukherjee, S., Wickett, R.R.	1998	An in vitro study of the effect of formulation variables and product structure on percutaneous absorption of lactic acid. J Cosmet Sci 49:257-273.	No	Published
Doc II A3	Sims, C.J., Fujito, D.T., Burholt, D.R., Dadok, J., Giles, H.R., Wilkinson, A.	1993	Quantification of human aminiotic fluid constituents by high resolution proton nuclear magnetic resonance (NMR) spectroscopy. Prenatal Diagnosis 13:473-480.	No	Published
Doc II A3	Walther, B.	2006	Milchsäure in Lebensmitteln und ihre Bedeutung für die menschliche Ernährung. Technisch-wissenschaftliche Information, ALP Science 2006, Nr. 505.	No	Published
Doc II A3*	York, M., Griffiths, H.A., Whittle, E., Basketter, D.A.	1996	Evaluation of a human patch test for the identification and classification of skin irritation potential. Contact Dermatitis 34:204-212.	No	Published
Doc II A4	EC	2000	Technical Guidance Document in support of the Directive 98/8/EC concerning the placing of biocidal products on the market, Guidance on data requirements for active substances and biocidal products (TNsG) , October 2000	No	Publication
Doc II A4	EC	2003	Technical Guidance Document in support of Commission Directive 93/67/EEC on Risk	No	Publication

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/No)	Owner
			Assessment for new notified substances, Part II; Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances and Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market. EUR 20418 EN/2		
Doc II A4	EU	2007	Regulation (EC) No 1272/2008 of the European Parliament and on the Council of 16 December 2008 on classification, labelling and packing of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006	No	Publication
Doc II A4	Hooftman, R.N.	1992	Evaluation of the toxicity of lactic acid and lactates to aquatic organisms; TNO Report nr. IMW-R 92/256	Yes	Purac
Doc II A4	Lyman et al.	1983	Handbook of chemical property estimation methods, McGraw-Hill Inc.; New York	No	Publication
Doc II A4	McCall, P.J. et al	1981	Measurement of Sorption Coefficients of organic Chemicals and their use in Environmental Fate Analysis; Test protocols for Environmental Fate & Movement of Toxicants (1981); Proceedings of Symposium AOAC, 21.-22.10.1980, Washington, DC	No	Publication
Doc II A4	OECD	2000	OECD 106 "Adsorption -- Desorption Using a Batch Equilibrium Method"	No	Publication
Doc II A4	OECD	2001	OECD 121 "Estimation of the Adsorption Coefficient (Koc) on Soil and on Sewage Sludge using High Performance Liquid Chromatography (HPLC)"	No	Publication
Doc II A4	OECD	1984	OECD 202 "Daphnia sp., Acute Immobilisation Testand Reproduction Test"	No	Publication
Doc II A4	OECD	1992	OECD 301D "Ready Biodegradability"	No	Publication

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/No)	Owner
Chap. 4	Saha, N.C. et al.	2006	Comparative toxicity of three organic acids to freshwater organisms and their impact on aquatic ecosystems; Human and Ecological Risk Assessment, Vol. 12, No. 1: pp 192-202	No	Publication
Doc II A4	Sansone, F.J. et al.	1987	Adsorption of short-chain organic acids onto nearshore marine sediments; Geochim Cosmochim Acta, Vol. 51, pp. 1889-96	No	Publication
Doc II A4	The Netherlands	1987	NEN 6633 "Water-Determination of Oxygen Demand (COD)" Dutch Guideline	No	Publication
Doc II A4	The Netherlands	1991	NEN 6634 "Water-Determination of Biochemical Oxygen Demand after n days (BOD)" Dutch Guideline	No	Publication
Doc II A4	UNEP	2004	Stockholm Convention on Persistent Organic Pollutants (POP), entered into force 17 May 2004	No	Publication
Doc II A4	US EPA	1997	US EPA standard 660/3-75-009 "Methods of acute toxicity test with fish, macroinvertebrates and amphibians"	No	Publication
Doc II B6.5	EC	1999	Directive 1999/45/EC - classification, packaging and labelling of dangerous preparations	No	Publication
Doc II B6.5	EC	2008	REGULATION (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006	No	Publication
Doc II B8	EC	2003	Technical Guidance Document in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Part II; Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances and Directive 98/8/EC of the European Parliament and of the Council concerning the placing	No	Publication

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/No)	Owner
			of biocidal products on the market. EUR 20418 EN/2		
Doc II B8	EC	2004	Supplement to the methodology for risk evaluation of biocides Environmental Emission Scenarios for biocides used as human hygiene biocidal products (Product type 1)	No	Publication
Doc II B8	OECD	2008	OECD Series on emissions scenario document; Number 18: Emissions scenario document for insectides, acaricides and products to control other arthropods for household and professional uses	No	Publication
Doc II B8	Holten, C.H.	1971	Lactic acid; properties and chemistry of lactic acid and derivates, Verlag Chemie; Weinheim/Bergstr., Germany	No	Publication
Doc II B8	Berkow, R.	1982	The Merck Manual of Diagnosis and Therapy, Merck Sharp & Dohme Research Laboratiories, Merck & Co., Inc. Rahway, N.J., 14. Edition	No	Publication
Doc II B8	CA Meeting	2008	EU Workshop PT 1-6 Report, document: "CA-Nov08-Doc[1].6.3 - Workshop Report PT1-6_CA_31_final_track_ changes"	No	No owner
Doc II B8	Lyman et al.	1983	Handbook of chemical property estimation methods, McGraw-Hill Inc.; New York	No	Publication
Doc II B8	McCall, P.J. et al	1981	Measurement of Sorption Coefficients of organic Chemicals and their use in Environmental Fate Analysis; Test protocols for Environmental Fate & Movement of Toxicants (1981); Proceedings of Symposium AOAC, 21.-22.10.1980, Washington, DC	No	Publication
Doc II B8	EC	2003	FOCUS Surface water scenarios in the EU evaluation process under 91/414/EEC; SANCO/4802/2001-rev.2 final	No	Publication
Doc II B8	EC	2000	FOCUS groundwater scenarios in the EU review of active substances ". Report of the	No	Publication

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/No)	Owner
			FOCUS Groundwater Scenarios Workgroup, EC Document Reference SANCO/321/2000 Rev.2		
Doc II B8	EU	2012	Biocidal Products Regulation (BPR), 528/2012/EU concerning the making available on the market and use of biocidal products	No	Publication
Doc II B8	EC	2002	TNsG on Annex I inclusion. Technical Notes for Guidance in Support of Directive 98/8/EC of the European Parliament and the Council Concerning the Placing of Biocidal Products on the Market. Principles and Practical Procedures for the inclusion of active substances in Annexes I, IA and IB, April 2002	No	Publication
Doc II C13	EC	2004	Supplement to the methodology for risk evaluation of biocides Environmental Emission Scenarios for biocides used as human hygiene biocidal products (Product type 1)	No	Publication
Doc II C13	EC	2006	Groundwater Directive (GWD), Council Directive 2006/118/EG on the protection of groundwater against pollution and deterioration	No	Publication
Doc II C13	EC	2006	REACH-VO Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the registration, authorisation and restriction of chemicals (REACH) establishing a European Chemicals Agency amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC, Commission Directives 91/155/EEC, 93/105/EC and 2000/21/EC	No	Publication
Doc II C13	EC	2003	Technical Guidance Document in support of Commission	No	Publication

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/No)	Owner
			Directive 93/67/EEC on Risk Assessment for new notified substances, Part II; Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances and Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market. EUR 20418 EN/2		
Doc II C13	EC	2000	FOCUS groundwater scenarios in the EU review of active substances ". Report of the FOCUS Groundwater Scenarios Workgroup, EC Document Reference SANCO/321/2000 Rev.2	No	Publication

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/ No)	Owner
A2-01 Included in the confidential part	Black, J.	2002	Letter to Purac concerning the identity of SY-83. Entek corporation, no number. Not GLP, not published	Y	Purac
A3.1.1-01	Van Dongen, A.P.M.	2006a	Expert Statement. Melting point of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.1.1-02	Holten, C.H.	1971a	Lactic acid. Properties and Chemistry of Lactic Acid and Derivates. Chapter IV: Physical properties. Verlag Chemie GmbH, Weinheim/Bergstr. Germany. Not GLP, published.	N	-
A3.1.1-03	Rahmani, R.	2002	The chiral resolution of lactic acid and sodium lactate. Student report. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.1.2-01	Van Dongen, A.P.M.	2006b	Expert Statement. Boiling point of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.1.2-02 is a cross reference to A3.1.1-02	Holten, C.H.	1971a	Lactic acid. Properties and Chemistry of Lactic Acid and Derivates. Chapter IV: Physical properties. Verlag Chemie GmbH, Weinheim/Bergstr. Germany. Not GLP, published.	N	-
A3.1.2-03	PURAC	No date	Physical properties of lactic acid. Purac internal data.. Purac, no report no. Not GLP, unpublished	Y	Purac
A3.1.2-04	EPIsuite	No date	Results of the EPIWIN calculation.	Y	Purac

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/ No)	Owner
			Generated with the program EPIsuite v3.20 (February 2007). US Environmental Protection Agency. Not GLP, not published		
A3.1.3-01	Van Dongen, A.P.M.	2006c	Expert Statement. Liquid Density of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.1.3-02 is a cross reference to A3.1.1-02	Holten, C.H.	1971a	Lactic acid. Properties and Chemistry of Lactic Acid and Derivates. Chapter IV: Physical properties. Verlag Chemie GmbH, Weinheim/Bergstr. Germany. Not GLP, published.	N	-
A3.1.3-03	Korevaar, L.	1996	Physical properties lactic acid solutions Purac internal report Purac report no. 95-80 Not GLP	Y	Purac
A3.2-01	Van Dongen, A.P.M.	2006d	Expert Statement. Vapour pressure of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.2.1-01	Van Dongen, A.P.M.	2006e	Expert Statement. Henry's law contant of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.2.1-02 Is a cross-reference to A3.1.2-04	EPIsuite	No date	Results of the EPIWIN calculation. Generated with the program EPIsuite v3.20 (February 2007). US Environmental Protection Agency. Not GLP, not published	Y	Purac
A3.4-01	Van Dongen, A.P.M.	2006f	Expert Statement. Spectra of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/ No)	Owner
A3.4-02	Holten, C.H.	1971b	Lactic acid. Properties and Chemistry of Lactic Acid and Derivatives. Chapter VI: Spectra. Verlag Chemie GmbH, Weinheim/Bergstr. Germany. Not GLP, published.	N	-
A3.4-03	Holten, C.H.	1971c	Lactic acid. Properties and Chemistry of Lactic Acid and Derivates. Chapter XIX: Stability of Crystalline L-(+)-Lactic Acid. Verlag Chemie GmbH, Weinheim/Bergstr. Germany. Not GLP, published.	N	-
A3.5-01	Van Dongen, A.P.M.	2007a	Expert Statement. Solubility of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.5-02 is a cross reference to A3.1.1-02	Holten, C.H.	1971a	Lactic acid. Properties and Chemistry of Lactic Acid and Derivates. Chapter IV: Physical properties. Verlag Chemie GmbH, Weinheim/Bergstr. Germany. Not GLP, published.	N	-
A3.5-03	Van Krieken, J.	1993	Phasediagram water / L(+)-lactic acid Purac Internal report. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.6-01	Van Dongen, A.P.M.	2007b	Expert Statement. Dissociation constant (pKa) of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.6-02	Holten, C.H.	1971d	Lactic acid. Properties and Chemistry of Lactic Acid and Derivates. Chapter V: Physical chemistry. Verlag Chemie GmbH, Weinheim/Bergstr. Germany. Not GLP, published.	N	-

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/ No)	Owner
A3.6-03	Heesen, G.J.	1970	Bepaling van de zuursterkte van melkzuur en lactoylmelkzuur Purac Internal report. Purac, no report no. Not GLP, unpublished.	N	Purac
A3.7-01 is a cross reference to A3.5-01	Van Dongen, A.P.M.	2007a	Expert Statement. Solubility of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.7-02	Van Krieken, J.	1993	Solubility of lactic acid crystals in organic solvents Purac Internal report. Purac, report no. 115 Not GLP, unpublished.	Y	Purac
A3.9-01	Van Dongen, A.P.M.	2007c	Expert Statement. Partition Coefficient Octanol/water of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.9-02 Is a cross-reference to A3.1.2-04	EPIsuite	No date	Results of the EPIWIN calculation. Generated with the program EPIsuite v3.20 (February 2007). US Environmental Protection Agency. Not GLP, not published	Y	Purac
A3.9-03	European Chemicals Bureau	2000	IUCLID dataset L(+) lactic acid European Chemicals Bureau IUCLID-file European HPV program Not GLP. published	N	-
A3.10-01	Van Dongen, A.P.M.	2007d	Expert Statement. Stability of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.10-02	Lobbes, R.P.	1998	Stress-testing of lactic acid Purac internal report Purac, no report no. Not GLP, unpublished	Y	Purac

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/ No)	Owner
A3.12-01 is a cross reference to A3.1.1-02	Holten, C.H.	1971a	Lactic acid. Properties and Chemistry of Lactic Acid and Derivates. Chapter IV: Physical properties. Verlag Chemie GmbH, Weinheim/Bergstr. Germany. Not GLP, published.	N	-
A3.13-01	Van Dongen, A.P.M.	2007e	Expert Statement. Surface tension of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.13-02 is a cross reference to A3.1.1-02	Holten, C.H.	1971a	Lactic acid. Properties and Chemistry of Lactic Acid and Derivates. Chapter IV: Physical properties. Verlag Chemie GmbH, Weinheim/Bergstr. Germany. Not GLP, published.	N	-
A3.13-03 is a cross-reference to A3.1.3-03	Korevaar, L.	1996	Physical properties lactic acid solutions Purac internal report Purac report no. 95-80 Not GLP	Y	Purac
A3.14-01	Van Dongen, A.P.M.	2007f	Expert Statement. Viscosity of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac
A3.14-02 is a cross reference to A3.1.1-02	Holten, C.H.	1971a	Lactic acid. Properties and Chemistry of Lactic Acid and Derivates. Chapter IV: Physical properties. Verlag Chemie GmbH, Weinheim/Bergstr. Germany. Not GLP, published.	N	-
A3.14-03	Korevaar, L.	1996	Physical properties lactic acid solutions	Y	Purac

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/ No)	Owner
is a cross reference to A3.1.3-03			Purac internal report Purac report no. 95-80 Not GLP		
A3.17-01 Is a cross reference to A3.10-01	Van Dongen, A.P.M.	2007d	Expert Statement. Stability of L(+) lactic acid. Purac expert statement. Purac, no report no. Not GLP, unpublished.	Y	Purac
A4.1-01	Holten, C.H.	1971e	Lactic acid. Properties and Chemistry of Lactic Acid and Derivates. Chapter XVIII: Analytical chemistry. Verlag Chemie GmbH, Weinheim/Bergstr. Germany. Not GLP, published.	N	-
A4.1-02	Anonymous	1968	Milchsäure, Acidium lacticum. Deutsches Arzneibuch, 7th edition, Deutscher Apotheker-Verlag, Stuttgart, Govi-Verlag GmbH, Frankfurt, p. 680-681. Not GLP, published	No	-
A4.1-03	Klein, J.	2001	Assay of Lactic acid. Purac Document no. AMLAC009 Not GLP, unpublished	Yes	Purac
A4.1-04	Klein, J.	2000	Standardization of 1N hydrochloric acid Purac Document no. AMSTD002 Not GLP, unpublished	Yes	Purac
A4.1-05	Klein, J.	2000	Standardization of 1N sodium hydroxide Purac Document no. AMSTD003 Not GLP, unpublished	Yes	Purac
A4.2-01	Klein, J.	2007	Lactic acid in earth Purac Document no. AMENV001 Not GLP, unpublished	Yes	Purac
A5-01	Alakomi, H.-L., Skyttä, E., Saarela, M., Mattila-Sandholm, T., Latva-Kala, K.,	2000	Lactic acid permeabilizes Gram-negative bacteria by disrupting the outer membrane. Applied and Environmental Microbiology, Vol. 66, No.5,	N	-

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/ No)	Owner
	Helander, I.M.		p.2001-2005. Not GLP, published.		
A6.1.1-01*		1984	Acute oral LD50 study in rats using SY-83 Toxicogenics Inc. Report nr. 410-1369 GLP, Unpublished	Y	Purac
A6.1.1-02		1983	Acute oral toxicity study in rats using SY-83 at a dose level of 5 grams per kilogram of body weight Toxicogenics Inc. Report nr. 410-1353 GLP, Unpublished	Y	Purac
A6.1.1-03		1998	Acute oral toxicity study with manganese-L-lactate in rats TNO Report nr. V98.598 GLP, Unpublished	Y	Purac
A6.1.1-04		1998	Acute oral toxicity study with magnesium-L-lactate in rats TNO Report nr. V98.597 GLP, Unpublished	Y	Purac
A6.1.1-05		1998	Acute oral toxicity study with ferrous-L-lactate in rats TNO Report nr. V98.410 GLP, Unpublished	Y	Purac
A6.1.2-01*		1983	cute dermal toxicity study in rabbits using SY-83 at a dose level of 2 grams per kilogram of body weight Toxicogenics Inc. Report nr. 410-1354 GLP, Unpublished	Y	Purac
A6.1.3-01*		1987	Acute inhalation toxicity study of SY-83 in the rat Microbiological Associated Inc. Report nr. I-7083.112 GLP, Unpublished	Y	Purac
A6.1.4-01*		1996	Chicken Enucleated Eye Test with three samples of lactic acid; an alternative to the Draize eye irritation test with albino rabbits TNO Report nr. V96.157GLP, Unpublished	Y	Purac
A6.1.4-02		1983	Primary dermal irritation study in	Y	Purac

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/ No)	Owner
			rabbits using SY-83 Toxicogenics Inc. Report nr. 410-1355GLP, Unpublished		
A6.1.4-03		1986	Acute dermal irritation/corrosion test with lactic acid (50%) in albino rabbits TNO Report nr. V86.015/250067 GLP, Unpublished	Y	Purac
A6.1.4-04		1995	Acute dermal irritation/corrosion study with a 10% aqueous solution of lactic acid in albino rabbits TNO Report nr. V95.387 GLP, Unpublished	Y	Purac
A6.1.4-05		1996	Acute dermal irritation/corrosion study with Purac BF S36 and Purac BF S/30 in albino rabbits TNO Report nr. V96.677 GLP, Unpublished	Y	Purac
A6.1.4-06		1987	Acute dermal irritation/corrosion study with lactic acid (88%) in pigs TNO Report nr. V87.405/270419 GLP, Unpublished	Y	Purac
A6.1.4-07		1987	Acute dermal irritation/corrosion study with lactic acid (50%) in pigs TNO Report nr. V87.406/270419 GLP, Unpublished	Y	Purac
A6.1.4-08		1986	Lactic acid Q88: a skin corrosivity test in guinea pigs Inveresk Research International Report nr. 3625 GLP, Unpublished	Y	Purac
A6.1.4-09		1996	In vitro skin irritation study in rabbit and human skin organ cultures after 30 minutes exposure to lactic acid and lactic acid esters TNO Report nr. V96.636	Y	Purac
A6.1.4-10	Harbell, J.W.	1994	Corrositex Continuous Time Monitor Assay Microbiological Associates Inc. Report nr. A000449 Not GLP, Unpublished	Y	Purac
A6.1.4-11*	Andersen, F.A.	1997	Safety assessment of glycolic	N	-

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/ No)	Owner
			acid, ammonium, calcium, potassium, and sodium glycolate, methyl, ethyl, ptopyl, and butyl glycolate, and lactic acid, ammonium calcium, potassium, sodium, and TEA-lactate, methyl, ethyl, isopropyl, and butyl lactate, and lauryl, myristyl, and cetyl lactate Cosmetic Ingredients Review, final report. International Journal of Toxicology, Vol.17, Suppl.1 Not GLP, Published		
A6.1.5-01*		1986	Dermal sensitization study in guinea pigs with SY-83 American Biogenics Corporation, Report nr. 480-2750 GLP, Unpublished	Y	Purac
A6.2-01	Sterenborg, I.	2007	Lactic acid as biocidal active substance. Statement to address requirements of Directive 98/8/EC. ENVIRON report nr. PU-LBD-20070039Not GLP, Unpublished	Y	Purac
A6.2-02	Miller, B.F., Fattor, J.A., Jacobs, K.A., Horning, M.A., Navazio, F., Lindinger, M., I., and Brooks, G.A.	2002	Lactate and glucose interactions during rest and exercise in men: effect of exogenous lactate infusion. Journal of Physiology, Vol.544, Nr.3, p.963-975 Not GLP, Published	N	-
A6.2-03	Philp, A., Macdonald, A.L., Watt, P.W.	2005	Lactate – a signal coordinating cell and systemic function. The Journal of Experimental Biology, Vol.208, p.4561-4575 Not GLP, Published	N	-
A6.2-04	Connor, H. Woods, H.F	1982	Metabolic acidosis. Pitman Books Ltd London (Ciba Foundation symposium 87) p. 214-234 Not GLP, Published	N	-
A6.4-01	Matsushima, Y., Onodera, H., Nagaoka, T., Todate, A., Shibutani, M.,	1989	Subchronic Oral Toxicity study of Calcium lactate in F344 Rats Bulletin of the National Institute of Hygienic Sciences, Tokyo (Eisei Shikenjo Hokuku) Vol. 107: pp	N	-

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A6.5-01	Maekawa, A., Matsushima, H., Onodera, H., Shibutani, M., Yoshida, J., Kodama, Y., Kurokawa, Y., Hayashi, Y.	1991	Long-term carcinogenicity/carcinogenicity study of calcium lactate in F344 rats Food and Chemical Toxicology, Vol. 29, No. 9: pp 589-594 Not GLP, Published	N	-
A6.6-01 Is a cross-reference to A6.1.4-11	Andersen, F.A.	1997	Safety assessment of glycolic acid, ammonium, calcium, potassium, and sodium glycolate, methyl, ethyl, ptopyl, and butyl glycolate, and lactic acid, ammonium calcium, potassium, sodium, and TEA-lactate, methyl, ethyl, isopropyl, and butyl lactate, and lauryl, myristyl, and cetyl lactate Cosmetic Ingredients Review, final report. International Journal of Toxicology, Vol.17, Suppl.1 Not GLP, Published	N	-
A6.6-02*	Ishidate, M. Jr., Sofuni, T., Yoshikawa, K., Hayashi, M., Nohmi, T., Sawada, M., Matsuoaka, A.	1984	Primary mutagenicity screening of food additives currently used in Japan. Food Chem. Tox. Vol. 22, p. 623-636 Not GLP, Published	N	-
A6.6.1-01	Demerec, M., Bertani, G., Flint, J.	1951	A survey of chemicals for mutagenic action on E.coli The American Naturalist, Vol. 85, no. 821: pp 119-136 Not GLP, Published	N	-
A6.6.1-02*	Al-Ani, F.Y., Al-Lami, S.K.	1988	Absence of mutagenic activity of acidity regulators in the Ames Salmonella/microsome test. Mutation Research, Vol. 206, p. 467-470 Not GLP, Published	N	-
A6.6.2-01	Morita, T., Takeda, K., Okumura, K.	1990	Evaluation of clastogenicity of formic acid, acetic acid and lactic acid on cultured mammalian cells. Mutation Research, Vol. 240, p.	N	-

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			195-202. Not GLP, Published		
A6.7-01 Is a cross reference to A6.5-01	Maekawa, A., Matsushima, H., Onodera, H., Shibutani, M., Yoshida, J., Kodama, Y., Kurokawa, Y., Hayashi, Y.	1991	Long-term carcinogenicity/carcinogenicity study of calcium lactate in F344 rats Food and Chemical Toxicology, Vol. 29, No. 9: pp 589-594 Not GLP, Published	N	-
A6.7-02 Is a cross-reference to A6.1.4-11	Andersen, F.A.	1997	Safety assessment of glycolic acid, ammonium, calcium, potassium, and sodium glycolate, methyl, ethyl, ptopyl, and butyl glycolate, and lactic acid, ammonium calcium, potassium, sodium, and TEA-lactate, methyl, ethyl, isopropyl, and butyl lactate, and lauryl, myristyl, and cetyl lactate Cosmetic Ingredients Review, final report. International Journal of Toxicology, Vol.17, Suppl.1 Not GLP, Published	N	-
A7.1.1.2.1-01	Hanstveit, A.O., Pullens, M.A.H.L.	1993	BOD and COD of the product L(+) lactic acid according to EC Test Guidelines C.8 and C.9 TNO Report nr. IMW-R 92/018 GLP, Unpublished	Y	Purac
A7.1.1.2.1-02	Bowmer, C.T., Hooftman, R.N., Hanstveit, A.O., Venderbosch, P.W.M., Van der Hoeven, N.	1998	The ecotoxicity and the biodegradability of lactic acid, alkyl lactate esters and lactate salts Chemosphere, Vol. 37, No. 7, pp. 1317-1333 Not GLP, Published	N	-
A7.1.3	Baltussen, E.	2008	Estimation of the adsorption coefficient (Koc) of lactic acid 93% aq on soil and on sewage sludge using high performace liquid chromatography (HPLC) Notox Document 489046 GLP, Unpublished	Y	Purac
A7.1.3	Sansone, F.J., Andrews, C.C., Okamoto, M.Y.	1987	Adsorption of short-chain organic acids onto nearshore marine sediments	N	-

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/ No)	Owner
			Geochim Cosmochim Acta, Vol. 51, pp. 1889-96 Not GLP, Published		
A7.4.1.1-01		1992	The acute toxicity of L(+) lactic acid to Brachydanio rerio (OECD Guideline No. 203) TNO Report nr. IMW-91-0076-02 GLP, Unpublished	Y	Purac
A7.4.1.1-02		1984	Acute toxicity of SY-83 to rainbow trout (Salmo gairdneri) ABC Inc. Report nr. #32147 GLP, Unpublished	Y	Purac
A7.4.1.1-03		1984	Acute toxicity of SY-83 to bluegill sunfish (Lepomis macrochirus) ABC Inc. Report nr. #32146 GLP, Unpublished	Y	Purac
A7.4.1.1-04	Hooftman, R.N.	1992	Evaluation of the toxicity of lactic acid and lactates to aquatic organisms TNO Report nr. IMW-R 92/256 Not GLP, Unpublished	Y	Purac
A7.4.1.1-05	Saha, N.C., Bhunia, F., Kaviraj, A.	2006	Comparative toxicity of three organic acids to freshwater organisms and their impact on aquatic ecosystems Human and Ecological Risk Assessment, Vol. 12, No. 1: pp 192-202 Not GLP, Published	N	-
A7.4.1.1-06 Is a cross-reference to A7.1.1.2.1-02	Bowmer, C.T., Hooftman, R.N., Hanstveit, A.O., Venderbosch, P.W.M., Van der Hoeven, N.	1998	The ecotoxicity and the biodegradability of lactic acid, alkyl lactate esters and lactate salts Chemosphere, Vol. 37, No. 7, pp. 1317-1333 Not GLP, Published	N	-
A7.4.1.2-01	Hooftman, R.N., Kauffman-Van Bommel, J.A., Van Drongelen-Sevenhuijsen, D.	1992	The acute toxicity of L(+) lactic acid to *Daphnia magna* (OECD Guideline No. 202, 48h) TNO Report nr. IMW-91-0076-01 GLP, Unpublished	Y	Purac
A7.4.1.2-02	Forbis, A.D., Burgess, D.,	1984	Acute toxicity of SY-83 to Daphnia magna	Y	Purac

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/ No)	Owner
	Georgie, L.		ABC Inc. Report nr. #32148 GLP, Unpublished		
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A7.4.1.2-04 Is a cross-reference to A7.4.1.1-04	Hooftman, R.N.	1992	Evaluation of the toxicity of lactic acid and lactates to aquatic organisms TNO Report nr. IMW-R 92/256 Not GLP, Unpublished	Y	Purac
A7.4.1.2-05 Is a cross-reference to A7.4.1.1-05	Saha, N.C., Bhunia, F., Kaviraj, A.	2006	Comparative toxicity of three organic acids to freshwater organisms and their impact on aquatic ecosystems Human and Ecological Risk Assessment, Vol. 12, No. 1: pp 192-202 Not GLP, Published	N	-
A7.4.1.3-01	Hanstveit, A.O., Oldersma, H.	1992	Effect of L(+) lactic acid on the growth of the alga Selenastrum capricornutum (OECD 201) TNO Report nr. IMW-91-0076-05 GLP, Unpublished	Y	Purac
A7.4.1.3-02 Is a cross-reference to A7.1.1.2.1-02	Bowmer, C.T., Hooftman, R.N., Hanstveit, A.O., Venderbosch, P.W.M., Van der Hoeven, N.	1998	The ecotoxicity and the biodegradability of lactic acid, alkyl lactate esters and lactate salts Chemosphere, Vol. 37, No. 7, pp. 1317-1333 Not GLP, Published	N	-

Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/ No)	Owner
A7.4.1.3-03 Is a cross-reference to A7.4.1.1-04	Hooftman, R.N.	1992	Evaluation of the toxicity of lactic acid and lactates to aquatic organisms TNO Report nr. IMW-R 92/256 Not GLP, Unpublished	Y	Purac
A7.4.1.4-01	Bouwman, L.M.	2007	Activated sludge respiration inhibition test with PURAC HS 88 NOTOX Project nr. 483211 GLP, Unpublished	Y	Purac
A7.5.3.1.1-01		1984	An acute oral toxicity study in the bobwhite with SY-83 Wildlife International Ltd. Report nr. 203-103 Not GLP, Unpublished	Y	Purac
A7.5.3.1.2-01		1984	A dietary LC50 study in the bobwhite with SY-83 Wildlife International Ltd. Report nr. 203-101 Not GLP, Unpublished	Y	Purac
A7.5.3.1.2-02		1984	A dietary LC50 study in the mallard with SY-83 Wildlife International Ltd. Report nr. 203-102 Not GLP, Unpublished	Y	Purac
A7.5.4.1-01	Dingledine, J.	1985	A dermal contact LD50 study in honey bees with SY-83 Wildlife International Ltd. Report nr. 203-108 Not GLP, Unpublished	Y	Purac
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Section No / Reference No	Author(s)	Year	Title. Source (where different from company) Company, Report No. GLP (where relevant) / (Un)Published	Data Protection Claimed (Yes/ No)	Owner
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IIIB 5.10	Van der Vossen, J.M.B.M.	2010	Report concerning the bactericidal activity of two solutions TNO, Letter MG/2010-0295 VOJ-ovh, April 22, 2010 Not GLP, unpublished	Yes	Purac