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AUSTRALIAN INDUSTRIAL CHEMICALS INTRODUCTION SCHEME (AICIS)

PUBLIC REPORT

Chemical in Emulgade® Sucro Plus

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals Act 2019* (the IC Act) and *Industrial Chemicals (General) Rules 2019* (the IC Rules) by following the *Industrial Chemicals (Consequential Amendments and Transitional Provisions) Act 2019* (the Transitional Act) and *Industrial Chemicals (Consequential Amendments and Transitional Provisions) Rules 2019* (the Transitional Rules). The legislations are Acts of the Commonwealth of Australia. The Australian Industrial Chemicals Introduction Scheme (AICIS) is administered by the Department of Health, and conducts the risk assessment for human health. The assessment of environmental risk is conducted by the Department of Agriculture, Water and the Environment.

This Public Report is available for viewing and downloading from the AICIS website. For enquiries please contact AICIS at:

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Executive Director
AICIS

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SUMMARY

The following details will be published on the AICIS website:

ASSESSMENT REFERENCE	APPLICANT(S)	CHEMICAL OR TRADE NAME	HAZARDOUS CHEMICAL	INTRODUCTION VOLUME	USE
STD/1739	BASF Australia Ltd.	Chemical in Emulgade® Sucro Plus	ND*	< 80 tonnes per annum	Emulsifier for use in personal skin and hair care products

*ND = not determined

CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard Classification
As only limited toxicity data were provided, the assessed chemical cannot be classified according to the *Globally Harmonised System of Classification and Labelling of Chemicals* (GHS), as adopted for industrial chemicals in Australia.

Human Health Risk Assessment
Under the conditions of the occupational settings described, the assessed chemical is not considered to pose an unreasonable risk to the health of workers.

When used in the proposed manner, the assessed chemical is not considered to pose an unreasonable risk to public health.

Environmental Risk Assessment
Based on the low hazard and reported use pattern, the assessed chemical is not considered to pose an unreasonable risk to the environment.

Recommendations

REGULATORY CONTROLS

CONTROL MEASURES

Occupational Health and Safety

- A person conducting a business or undertaking at a workplace should implement the following engineering controls to minimise occupational exposure to the assessed chemical during reformulation:
  - Enclosed/automated processes, where possible

- A person conducting a business or undertaking at a workplace should implement the following safe work practices to minimise occupational exposure during handling of the assessed chemical during reformulation:
  - Avoid contact with skin and eyes

- A person conducting a business or undertaking at a workplace should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the assessed chemical during reformulation:
  - Impervious gloves
  - Protective clothing

  Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

- A copy of the SDS should be easily accessible to employees.

- If products and mixtures containing the assessed chemical are classified as hazardous to health in accordance with the *Globally Harmonised System of Classification and Labelling of Chemicals* (GHS) as adopted for industrial chemicals in Australia, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation should be in operation.

Emergency procedures

- Spills or accidental release of the assessed chemical should be handled by physical containment, collection and subsequent safe disposal.

Disposal

- Where reuse or recycling are not appropriate, dispose of the assessed chemical in an environmentally sound manner in accordance with relevant Commonwealth, state, territory and local government legislation.

Regulatory Obligations

Specific Requirements to Provide Information
This risk assessment is based on the information available at the time of the application. The Executive Director may initiate an evaluation of the chemical based on changes in certain circumstances. Under Section 101 of the IC Act the applicant of the assessed chemical has post-assessment regulatory obligations to provide information to AICIS when any of these circumstances change. These obligations apply even when the assessed chemical is listed on the Australian Inventory of Industrial Chemicals (the Inventory).

Therefore, the Executive Director of AICIS must be notified in writing within 20 working days by the applicant or other introducers if:

- the final use concentration of the chemical exceeds 5% in personal skin and hair care products;
- the chemical is intended to be used in baby care products;
- the function or use of the chemical has changed from an ingredient in personal skin and hair care products or is likely to change significantly;
- the amount of chemical being introduced has increased, or is likely to increase, significantly;
- the chemical has begun to be manufactured in Australia;
- additional information has become available to the person as to an adverse effect of the chemical on human health, or the environment;
- further information has become available to the person as to the skin sensitisation effects of the chemical.

The Executive Director will then decide whether an evaluation of the introduction is required.

Safety Data Sheet
The SDS of the assessed chemical provided by the applicant was reviewed by AICIS. The accuracy of the information on the SDS remains the responsibility of the applicant.

ASSESSMENT DETAILS

1. APPLICANT AND APPLICATION DETAILS

APPLICANT(S)
BASF Australia Ltd (ABN: 62 008 437 867)
Level 12, 28 Freshwater Place
SOUTHBANK VIC 3006

APPLICATION CATEGORY
Standard: Chemical other than polymer (more than 1 tonne per year)

PROTECTED INFORMATION (SECTION 38 OF THE TRANSITIONAL ACT)
Data items and details taken to be protected information include: chemical name, specific other names, CAS number, molecular and structural formulae, molecular weight, analytical data, degree of purity, impurities, additives/adjuvants, import volume, identity of analogues and identity of overseas manufacturer.

VARIATION OF DATA REQUIREMENTS (SECTION 6 OF THE TRANSITIONAL RULES)
Schedule data requirements are varied for all physical and chemical properties, all human health endpoints and all environment endpoints.

PREVIOUS APPLICATION IN AUSTRALIA BY APPLICANT(S)
None

APPLICATION IN OTHER COUNTRIES
EU REACH (2018)

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
Emulgade® Sucro Plus (product containing the assessed chemical at > 70% by weight)

OTHER NAME(S)
Sucrose cetyl stearate

MOLECULAR WEIGHT
< 1000 g/mol

ANALYTICAL DATA
Reference NMR, IR, HPLC, GC and UV spectra were provided.

3. COMPOSITION

DEGREE OF PURITY
> 95%

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20 °C AND 101.3 kPa: Off-white to beige pellets (Emulgade® Sucro Plus containing the assessed chemical at > 70% by weight)

Property	*Value*	*Data Source/Justification*
Melting Range	≥ 33 to ≤ 68 °C	IULICD report
Boiling Point	> 200 °C at 101.3 kPa	IULICD report
Density	1029 kg/m^3 at 20 °C	IULICD report
Vapour Pressure	≤ 0.029 kPa at 20 °C	IULICD report
Water Solubility	6.46 mg/L at 20 °C	IUCLID report: calculated from the average of the water solubilities of the individual components of the assessed chemical as determined by flask method

Property	*Value*	*Data Source/Justification*
Hydrolysis as a Function of pH	Not determined	IUCLID report: contains hydrolysable functionality but not expected to hydrolyse in environmental conditions (pH 4-9) based on available data for a structurally similar chemical (Analogue 6)
Partition Coefficient (n-octanol/water)	log Pow = 3.6 at 20 °C	IUCLID report: estimated from solubility in water and n-octanol
Adsorption/Desorption	log K_{oc} > 3	IUCLID report: modelled using KOCWIN (v 2.00) of representative structures
Dissociation Constant	Not determined	Contain no dissociable functionality
Surface Tension	> 50.6 mN/m	IUCLID report
Particle Size	Not determined	Imported as solid pellets
Flash Point	205.5 °C at 103.3 kPa	IULICD report
Flammability	Not expected to be flammable	IULICD report
Autoignition Temperature	Not determined	Data lacking
Explosive Properties	Not determined	Contains no functional groups that would imply explosive properties
Oxidising Properties	Not determined	Contains no functional groups that would imply oxidative properties

DISCUSSION OF PROPERTIES
No detailed study reports were provided for the physical and chemical properties. An International Uniform Chemical Information Database (IUCLID) report was provided by the applicant that contains summary information for the related physico-chemical properties.

Reactivity
The assessed chemical is expected to be stable under normal conditions of use.

Physical Hazard Classification
Based on the submitted physico-chemical data depicted in the above table, the assessed chemical is not recommended for hazard classification according to the *Globally Harmonised System of Classification and Labelling of Chemicals (GHS),* as adopted for industrial chemicals in Australia.

5. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF ASSESSED CHEMICAL (100%) OVER NEXT 5 YEARS
The assessed chemical will not be manufactured in Australia. It will be imported by sea as a component of Emulgade Sucro Plus at > 70% by weight, as well as a component of finished skin and hair care products (including sun protection products) at concentration ≤ 5%.

MAXIMUM INTRODUCTION VOLUME OF ASSESSED CHEMICAL (100%) OVER NEXT 5 YEARS

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	< 10	< 20	< 40	< 60	< 80

PORT OF ENTRY
Melbourne and Sydney

IDENTITY OF RECIPIENTS
BASF Australia Ltd

TRANSPORTATION AND PACKAGING
The assessed chemical (at > 70% by weight in Emulgade® Sucro Plus) will be imported into Australia via ship in 25 kg plastic film bags. It will be transported by road to warehouses for storage. It will be distributed from these premises by road to a number of customers for reformulation into personal care products.

The assessed chemical will also be imported at up to 5% concentration in skin and hair care products including sun protection products in typical consumer-sized containers suitable for retail sale. The finished products will be transported by road to warehouses for storage prior to distribution.

USE
The assessed chemical will be used as an emulsifier at ≤ 5% concentration for personal care products including shampoo, conditioners, hair treatment and styling products, face creams, skin moisturisers, lip balms and sun protection products.

OPERATION DESCRIPTION
The assessed chemical as in Emulgade Sucro Plus will be distributed to formulators for reformulation into personal care products.

At the reformulation sites, Emulgade Sucro Plus containing the assessed chemical will be weighed and added to mixing tanks where it will be blended with water and other raw materials to form finished personal care products. The finished products containing the assessed chemical will be filled into retail packaging which may include plastic or glass containers, and plastic pump packs. Typical packaging volumes will range from 50 - 200 mL.

The assessed chemical may also be imported in finished personal care products at up to 5% concentration. The imported products containing the assessed chemical will be stored until they are transported to customer facilities in original importation packaging.

The finished personal care products containing the assessed chemical at concentrations of ≤ 5% may be used by consumers and professional workers (e.g. in beauty salons).

6. HUMAN HEALTH IMPLICATIONS

6.1. Exposure Assessment

6.1.1. Occupational Exposure

CATEGORY OF WORKERS

Category of Worker	*Exposure Duration (hours/day)*	*Exposure Frequency (days/year)*
Transport and storage	1 - 2	30 – 50
Reformulation	1 - 3	30 – 50
Retail workers	8 - 12	240
Salon professionals	8 - 12	240

EXPOSURE DETAILS
Transport and Storage
Exposure of transport and storage workers to the assessed chemical is not expected, except in the event of accidental spill or breach of container.

Reformulation
Dermal and ocular exposure to the assessed chemical at concentrations of > 70% is likely to be the main routes of potential exposure that may occur during transfer from the transport containers to the manufacturing equipment. Exposure to the assessed chemical at concentration ≤ 5% in finished products may occur during connection and disconnection of filling equipment, quality control, packaging, and maintenance and cleaning of manufacturing equipment.

The applicant states that exposure to the assessed chemical is expected to be minimised through the use of local exhaust ventilation, automated equipment and closed systems for reformulation and suitable personal protective equipment (PPE) such as safety glasses, safety shoes, impervious gloves and coveralls.

End use
It is not expected that retail workers will be exposed to the assessed chemical except in the event of unexpected spills from damaged packaging.

Dermal exposure to the assessed chemical at concentrations of ≤ 5% may occur in professions where the services provided involve the application of personal care products to clients (e.g. workers in beauty salons). Accidental ocular exposure may also occur. Exposure to the assessed chemical is expected to be reduced through the use of good hygiene practices. Such professionals may use PPE to reduce repeated exposure, but this is not expected to

occur in all workplaces. Where PPE is used, exposure is expected to be of a similar or lesser extent than that experienced by consumers using products containing the assessed chemical.

6.1.2. Public Exposure

Public exposure to the assessed chemical is expected to be widespread and frequent through repeated use of personal care products containing the assessed chemical at concentrations up to 5%. Exposure to the assessed chemical will vary depending on individual use patterns. The principal route of exposure will be dermal, while accidental ocular and oral exposure are also possible. Use of skin care products is expected to give the highest single exposure.

Data on typical use patterns of product categories in which the assessed chemical may be used are shown in the following tables and these are based on information published in various literature (Cadby *et al*., 2002; Loretz *et al.,* 2006; ACI, 2010; SCCS, 2012;). For the purposes of the exposure assessment, Australian use patterns for the various product categories are assumed to be similar to those in Europe. A dermal absorption (DA) rate of 100% was assumed for the assessed chemical for calculation purposes. For the inhalation exposure assessment, a 2-zone approach was used (Earnest, Jr, 2009; Rothe *et al*., 2011; Steiling *et al*., 2014). An adult inhalation rate of 20 m^3/day (enHealth, 2012) was used and it was conservatively assumed that the fraction of the assessed chemical inhaled is 50%. A lifetime average female body weight (BW) of 70 kg (enHealth, 2012) was used for calculation purposes.

Cosmetic products (Dermal exposure):

Product type	Amount (mg/day)	C (%)	RF	Daily systemic exposure (mg/kg bw/day)
Body lotion	7820	5.000	1	5.5857
Face cream	1540	5.000	1	1.1000
Hand cream	2160	5.000	1	1.5429
Fine fragrances	750	5.000	1	0.5357
Deodorant (non–spray)	1500	5.000	1	1.0714
Shampoo	10460	5.000	0.01	0.0747
Conditioner	3920	5.000	0.01	0.0280
Shower gel	18670	5.000	0.01	0.1334
Hand wash soap	20000	5.000	0.01	0.1429
Hair styling products	4000	5.000	0.1	0.2857
Total				**10.5004**

C - concentration; RF - retention factor.
Daily systemic exposure = (Amount × C × RF × dermal absorption)/body weight

Hairspray (Inhalation exposure):

Product type	Amount (g/use)	C (%)	Inhalation rate (m^3/day)	Exposure duration zone 1 (min)	Exposure duration zone 2 (min)	Fraction inhaled (%)	Volume zone 1 (m^3)	Volume zone 2 (m^3)	Daily systemic exposure (mg/kg bw/day)
Hairspray	9.89	5	20	1	20	50	1	10	**0.1472**

C = maximum proposed concentration of assessed chemical
Total daily systemic exposure = Daily systemic exposure in Zone 1 [(amount × C × inhalation rate × exposure duration (zone 1) × fraction inhaled)/(volume (zone 1) × body weight)] + Daily systemic exposure in Zone 2 [(amount × C × inhalation rate × exposure duration (zone 2) × fraction inhaled)/(volume (zone 2) × BW)]

The worst-case scenario estimation using these assumptions is for a person who is a simultaneous user of all products listed in the above table that contain the assessed chemical at the maximum intended concentrations specified by the applicant in various product types. This would result in a combined internal dose of 10.65 mg/kg bw/day for the assessed chemical. It is acknowledged that inhalation exposure to the assessed chemical from use of other cosmetic (in addition to hair spray) may occur. However, the combination of the conservative hair spray inhalation exposure assessment parameters used and the aggregate exposure from use of the dermally applied products (using a conservative 100% dermal absorption rate), are sufficiently protective to cover additional inhalation exposure to the assessed chemical from use of other spray cosmetic products containing it with low exposure.

6.2. Human Health Effects Assessment

The results from toxicological investigations conducted on the assessed chemical and analogues that are considered likely to have similar toxicological characteristics to the assessed chemical are summarised in the following table.

No detailed study reports were submitted for the toxicological endpoints. An IUCLID report was provided by the applicant that contains summary information of the related toxicological properties.

Endpoint	*Test substance*	*Result and Assessment Conclusion*
Acute oral toxicity – rat	Analogues 1 and 2	LD50 > 2000 mg/kg bw; low toxicity
Skin irritation – *in vitro* EpiDerm™	Assessed chemical*	non-irritating
Eye irritation – *in vitro* EpiOcular™	Assessed chemical*	non-irritating
Skin sensitisation – Repeated Insult Patch Test	Assessed chemical*	skin reactions seen in 1 of 104 subjects at 50% concentration
Repeat dose oral toxicity – rat, 13 weeks/90 days	Analogues 2 and 3	NOAEL = 3240-5500 mg/kg bw/day
Mutagenicity – bacterial reverse mutation	Assessed chemical*	non mutagenic
Genotoxicity – *in vitro* Mammalian Cell Gene Mutation	Analogue 4	non genotoxic
Genotoxicity – *in vitro* Chromosome aberration	Analogue 4	non genotoxic
Carcinogenicity	Analogue 2	non carcinogenic
Reproductive and developmental toxicity – rat	Analogue 5	NOAEL = 1000 mg/kg bw/day

* tested at concentration > 70% as in Emulgade® Sucro Plus

While only limited information has been provided on the assessed chemical as summarised in the above table, the toxicological characteristics that are associated with sucrose and alkyl esters of fatty acids are publicly available (CIR 2013, CIR 2017).

Toxicokinetics, Metabolism and Distribution
The potential for dermal absorption of the assessed chemical is expected to be limited by the low water solubility (6.46 mg/L at 20 °C). Following oral administration, sucrose and alkyl esters of fatty acids are expected to be mainly hydrolysed into the corresponding sucrose or alcohol and fatty acid in the gastrointestinal tract prior to absorption. Studies in rats, dogs and humans indicate that only small amounts of unhydrolysed sucrose mono-esters were absorbed with a majority of incompletely hydrolysed sucrose esters excreted in faeces. There is no evidence of tissue accumulation of absorbed sucrose mono-esters. The hydrolysis products of the esters are expected to be further metabolised to carbon dioxide in physiological pathways including the citric acid cycle, sugar and lipid synthesis (IUCLID report).

Acute Toxicity
No acute toxicity data is provided for the assessed chemical. Based on the structure of the assessed chemical, it is not expected to present a concern for acute toxicity effects via the oral route. Data from Analogue 1 (with LD50 > 2,000 mg/kg bw) indicates that the structurally similar assessed chemical is likely to have low acute oral toxicity in rats. This is supported by results of a sub-chronic repeat dose toxicity study (see *Repeated Dose Toxicity* below) of Analogue 2 indicating an LD50 > 3420 mg/kg bw in rats.

No information on acute dermal or inhalation toxicity for the assessed chemical or its analogues was provided.

Irritation and Sensitisation
In an *in vitro* skin irritation study performed using a reconstructed human epidermis model (according to OECD TG 439) the assessed chemical was not considered to be corrosive or irritating to the skin. This is supported by observations from a human repeat insult patch test (HRIPT, see below).

In an *in vitro* eye irritation assay, conducted according to OECD TG 492 using the EpiOcular™ test model, the assessed chemical was not considered to be irritating to the eye.

The HRIPT on the assessed chemical indicated that 1 subject, in a total of 104 subjects who completed the test, developed positive skin reactions when the chemical was tested at 50% concentration. During the induction phase, the assessed chemical was diluted in Cetiol CC (dicaprylyl carbonate) and applied at 0.2 mL under occlusive conditions by a 3/4 × 3/4 square inch (~ 1.9 × 1.9 cm^2) patch to the skin of the back for 24 hours each time and 3 times per week for a total of 9 applications. Approximately 2 weeks after the final treatment, a challenge patch was applied at a site adjacent to the original patch site. The results recorded 103 subjects with negative reactions and 1 with positive skin reactions indicative of irritation or sensitisation (IUCLID report).

Although the potential for the chemical to induce skin sensitisation is not considered to be high when it is used in personal care products at a maximum concentration of 5%, the possibility for the assessed chemical to cause allergic skin reactions at high concentrations (> 50%) cannot be ruled out. However, structural analysis of the assessed chemical did not reveal known skin sensitisation structural alerts.

Repeated Dose Toxicity
Available information on sucrose and alkyl esters of fatty acids (CIR 2013, CIR 2017) indicates that the assessed chemical is unlikely to cause systemic toxicity effects following repeated exposure.

In a 2 year combined oral chronic toxicity/carcinogenicity study in rats (similar to OECD TG 453), no observed adverse effect levels (NOAELs) were established by the study authors for Analogue 2 as 1970 mg/kg bw/day for males and 2440 mg/kg bw/day for females. The analogue chemical was administered to rats in the diet equivalent to 394 (low dose), 1160 (mid dose) and 1970 (high dose) mg/kg bw/day in males and 480 (low dose), 1440 (mid dose) and 2440 (high dose) mg/kg bw/day in females. No treatment related mortality was reported in the first 12 months of the study period. Decreased weight gain was reported in the high dose male group at weeks 3-6, 8, 10 and 17-49. Haematological examinations revealed elevated mean corpuscular haemoglobin (MCV) in females at week 13 in all dose groups and at weeks 39, 78 and 104 in the high dose group. Relative lung weights were increased in females in the high dose group. However, these effects were reported as incidental changes in haematology/clinical chemistry (IUCLID report).

In a sub-chronic 13 week study on Analogue 2, oral NOAELs were established by the study authors as 3240 mg/kg bw/day for male and 3430 mg/kg bw/day for female rats. Analogue 2 was administered to rats in daily diet equivalent to 636 (low dose), 1900 (mid dose) and 3240 (high dose) mg/kg bw/day in males and 666 (low dose), 1950 (mid dose) and 3430 (high dose) mg/kg bw/day in females. No treatment related mortality was reported in the study period. An increase in food consumption was noted in the male high dose group near the end of the treatment period. A prolongation of activate partial thromboplastin time (APPT) was reported in the female high dose group. Ketone bodies were decreased in the urine of the male high dose group. There were some kidney weight reductions reported in some males at all treatment doses but these were not considered by the study authors to be treatment related (IUCLID report).

In a sub-chronic 90 day rat repeat dose oral toxicity study on Analogue 3, a NOAEL was established by the study authors as 5500 mg/kg bw/day. Analogue 3 was administered to rats in daily diet equivalent to 1800, 3600 and 5500 mg/kg bw/day for males and 2000, 3900 and 6100 mg/kg bw/day for females. No treatment related mortality was reported in the study period. No toxicologically relevant changes to clinical observation, body weight gains, ophthalmic examination, haematology, clinical chemistry, urinalysis, organ weights, histopathology or male and female reproductive assessments were reported (IUCLID report).

Mutagenicity/Genotoxicity
Based on the structure of the assessed chemical it is unlikely to present a concern for genotoxic effects. This is supported by the results reported from *in vitro* and *in vivo* studies on sucrose and alkyl esters of fatty acids, fatty acids and alcohols (CIR 2017; OECD 2006).

The assessed chemical was found to be negative in a bacterial reverse mutation assay in *Salmonella typhimurium* strains TA 1535, TA 1537, TA 98, TA 100 and TA 102 at concentrations of 33-5000 µg/plate with or without metabolic activation. Analogue 4 was found to be negative in an *in vitro* mammalian gene mutation assay using mouse lymphoma (L5178Y) cells and an *in vitro* mammalian chromosome aberration assay using primary peripheral human lymphocytes (IUCLID Report).

Carcinogenicity
In the 2 year combined oral chronic toxicity/carcinogenicity study on Analogue 2 (mentioned above in *Repeat Dose Toxicity*) the test substance was not considered carcinogenic in Fischer rats. For the total period of 24 moths, the survival rates for males in the control, low, mid and high dose groups were 72, 68, 70 and 68% respectively. The survival rates for females in the same order were 76, 70, 70 and 66%. Either non-neoplastic or neoplastic histopathological examinations did not reveal any carcinogenic effects in the test animals. However, approximately half of non-surviving animals in each group (including the control group) had large granular lymphocyte leukaemia associated with macroscopic observations including an enlarged spleen or liver surface abnormalities. These effects were not attributed by the study authors to be treatment related (IUCLID report).

Toxicity for Reproduction
Available information on sucrose esters of fatty acids (CIR 2017) indicates that the assessed chemical is unlikely to present a notable concern for reproduction/developmental toxicity.

In a combined repeat dose toxicity study with reproduction/development toxicity screening assay (according to OECD TG 422) Analogue 5 was administered to rats by oral gavage at 250, 500 and 1000 mg/kg bw/day for 45 days in males and 41 to 55 days in females (14 days before mating until Day 3 of lactation). In males of the 1000 mg/kg bw/day group, actual weight of the thymus was increased; however no abnormality was recorded in the organ during the histopathology examination. This finding was not observed in females. Offspring sex ratio was found significantly different between the control and the 1000 mg/kg bw/day groups. A NOAEL of 1000 mg/kg bw/day was established by the study authors based on the absence of adverse effects to reproductive performance and development in the parental animals and their offspring, respectively (IUCLID report).

Health Hazard Classification
As only limited toxicity data were provided, the assessed chemical cannot be classified according to the *Globally Harmonised System of Classification and Labelling of Chemicals* (GHS), as adopted for industrial chemicals in Australia.

6.3. Human Health Risk Characterisation

6.3.1. Occupational Health and Safety

Reformulation
Dermal and ocular exposure of workers to the assessed chemical (at > 70% concentration) may occur during reformulation processes. Given that the exposure of workers is expected to be minimised through the use of engineering controls and workers wearing PPE, the risk to workers from use of the assessed chemical is not considered to be unreasonable.

End-use
Workers involved in professions where the services provided involve the application of personal care products containing the assessed chemical at ≤ 5% concentration to clients (e.g. hairdressers and beauty salon workers) may be exposed to the assessed chemical. The risk to these workers is expected to be of a similar or lesser extent than that experienced by consumers using products containing the assessed chemical (see Section 6.3.2.).

Under the conditions of the occupational settings described, the assessed chemical is not considered to pose an unreasonable risk to the health of workers.

6.3.2. Public Health
Structurally similar sucrose and alkyl esters are commonly used cosmetic ingredients, with relatively high usage concentrations having been reported (CIR 2013, CIR 2017). At the proposed usage concentration of ≤ 5% assessed chemical in personal care products, acute toxicity effects are not expected. The main routes of exposure will be dermal; however, ocular exposure is also possible during the use of the personal care products. Dermal absorption of the assessed chemical is expected to be limited. Adverse systemic effects from repeated use of the assessed chemical in personal care products at the proposed concentration are not expected.

In the HRIPT mentioned above, 1 of the 104 volunteers developed skin reactions indicative of irritation or sensitisation at 50% concentration of the assessed chemical. However, when used at a maximum concentration of 5% in personal care products, the assessed chemical is unlikely to cause skin concern.

When used in personal skin and hair care products at a maximum concentration of 5%, the assessed chemical is not considered to pose an unreasonable risk to public health.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1. Environmental Exposure

RELEASE OF CHEMICAL AT SITE

The assessed chemical will be imported as a component of a product for reformulation, or as a component of finished personal care products. It is unlikely that there will be any significant release to the environment from transport and storage, except in the case of accidental spills and leaks. In the event of spills, the product containing the assessed chemical is expected to be collected with inert material and disposed of to landfill in accordance with local government regulations.

The reformulation process will involve mixing and blending operations that are expected to be mostly automated and occur within a fully enclosed environment. The process will be followed by automated filling of the finished products into end-use containers. Wastes containing the assessed chemical generated during reformulation include equipment wash water, residues in empty import containers and spilt materials. Wastes may be collected and released to sewers or disposed of to landfill in accordance with state and local government regulations.

RELEASE OF CHEMICAL FROM USE

The assessed chemical is expected to be released to the aquatic compartment through sewers during its use in various personal care products.

RELEASE OF CHEMICAL FROM DISPOSAL

A small portion of the assessed chemical may remain in end-use containers once the consumer products are used up. Wastes and residues of the assessed chemical in empty containers are likely to either share the fate of the containers and be disposed of to landfill, or be released to the sewer system when containers are rinsed before recycling through an approved waste management facility.

7.1.2. Environmental Fate

Following its use in personal care products, the assessed chemical is expected to be primarily released into the sewer system and treated at sewage treatment plants (STPs) before release to surface waters nationwide.

The assessed chemical is not readily biodegradable but inherently biodegradable (52-59 % degradation over 60 days in OECD TG 301B test, IUCLID report). In the STP the chemical is expected to be partially removed via biodegradation and partitioning to the sludge based on estimated log Koc. The assessed chemical is not expected to bioaccumulate based on its log Kow and the metabolism of sugar esters by enzymatic hydrolysis (IUCLID report).

Some of the assessed chemical may remain in the end use and bulk containers, which are either recycled or disposed of to landfill. In surface waters and landfill, the assessed chemical is expected to eventually degrade into water and oxides of carbon.

7.1.3. Predicted Environmental Concentration (PEC)

The use pattern will result in most of the assessed chemical being washed into the sewer. The predicted environmental concentration (PEC) has been calculated assuming the worst-case scenario with 100% release of the assessed chemical into sewer systems nationwide over 365 days per annum. The extent to which the assessed chemical is removed from the effluent in STP processes based on the properties of the assessed chemical has not been considered for this scenario, and therefore no removal of the assessed chemical during sewage treatment processes is assumed. The PEC in sewage effluent on a nationwide basis is estimated as follows:

Predicted Environmental Concentration (PEC) for the Aquatic Compartment		
Total Annual Import/Manufactured Volume	80,000	kg/year
Proportion expected to be released to sewer	100	%
Annual quantity of chemical released to sewer	80,000	kg/year
Days per year where release occurs	365	days/year
Daily chemical release:	219.18	kg/day
Water use	200.0	L/person/day
Population of Australia (Millions)	24.386	Million
Removal within STP	0	%

Daily effluent production:	4,877	ML
Dilution Factor – River	1.0	
Dilution Factor – Ocean	10.0	
PEC – River:	44.94	µg/L
PEC – Ocean:	4.49	µg/L

STP effluent re-use for irrigation occurs throughout Australia. The agricultural irrigation application rate is assumed to be 1000 L/m^2/year (10 ML/ha/year). The assessed chemical in this volume is assumed to infiltrate and accumulate in the top 10 cm of soil (density 1500 kg/m^3). Using these assumptions, irrigation with a concentration of 44.94 µg/L may potentially result in a soil concentration of approximately 299.6 µg/kg. Since the assessed chemical is inherently biodegradable, accumulation in soil is unlikely.

7.2. Environmental Effects Assessment

The results from ecotoxicological investigations (IUCLID report) conducted on the assessed chemical are summarised in the table below.

Endpoint	*Result*	*Assessment Conclusion*
Fish Toxicity	96 h LL50 > 120 mg/L WAF*	Not harmful to embryonic stages of zebrafish at the limit of water solubility
Daphnia Toxicity	48 h EL50 > 100 mg/L WAF*	Not harmful to aquatic invertebrate at the limits of water solubility
Algal Toxicity	72 h ErL50 > 100 mg/L WAF*	Not harmful to algae at the limits of water solubility
Inhibition of Bacterial Respiration	3 h IC10 > 1000 mg/L[§]	Not inhibitory to microbial respiration in STPs
Toxicity to earthworms	14 d LC50 > 1000 mg/kg soil dry weight[¥]	Not harmful to earthworms

*WAF: Water Accommodated Fraction was prepared with a single concentration at a loading rate of 100-120 mg/L. Loading concentrations were calculated for the whole test substance which contained 84.1% of the assessed chemical.
§ Test substance containing 84.1% of the assessed chemical
¥ Test substance containing 83.1% of the assessed chemical

In addition, an acute fish toxicity test conducted on Analogue 7 (96 h LC50 = 3100 mg/L, IUCLID report) supports the premise of low fish toxicity of this class of chemicals.

Based on the ecotoxicological endpoints obtained for the chemical, it is not expected to be harmful to aquatic life. The chemical is not formally classified under the *Globally Harmonised System of Classification and Labelling of Chemicals* (GHS) for acute and chronic toxicities (United Nations, 2017).

7.2.1. Predicted No-Effect Concentration

The predicted no-effect concentration (PNEC) for aquatic and terrestrial organisms has not been calculated as the chemical is not harmful to aquatic and terrestrial life.

7.3. Environmental Risk Assessment

Based on the low hazard and reported use pattern, the assessed chemical is not considered to pose an unreasonable risk to the environment.

BIBLIOGRAPHY

ACI (2010) Consumer Product Ingredient Safety, Exposure and risk screening methods for consumer product ingredients, 2nd Edition, American Cleaning Institute, Washington DC

Cadby et al. (2002) Cadyby, P.A., Troy, W.R., Vey, M.G.; Consumer Exposure to Fragrance Ingredients: Providing Estimates for Safety Evaluation, Regulatory Toxicology and Pharmacology 36 (2002) 246-252

CIR (2013) Amended Safety Assessment of Alkyl Esters as Used in Cosmetics, Washington DC 20036-4702

CIR (2017) Safety Assessment of Saccharide Esters as Used in Cosmetics, Washington DC 20036-4702

ECHA (2014) Guidance on Information Requirements and Chemical Safety Assessment Chapter R.7c: Endpoint specific guidance Version 2.0, European Chemicals Agency, Helsinki

enHealth (2012) Australian Exposure Factor Guide, companion document to: Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards, EnHealth, Commonwealth of Australia

Earnest CW Jr. (2009) A Two-Zone Model to Predict Inhalation Exposure to Toxic Chemicals in Cleaning Products, MScEng thesis, The University of Texas at Austin

Loretz, L, Api, AM, Barraj, L, Burdick, J, Davis, DA, Dressler, W, Gilberti, E, Jarrett, G, Mann, S, Pan, YHL, Re, T, Renskers, K, Scrafford, C, Vater, S (2006) Exposure Data for Personal Care Products : Hairspray, spray perfume, liquid foundation, shampoo, body wash, and solid antiperspirant, Food and Chemical Toxicology, 44:2008-2018.

OECD (2006) SIDS Initial Assessment Profile. Long Chain Alcohols (C6-22 primary aliphatic alcohols), OECD

Rothe H, Fautz R, Gerber E, Neumann L, Rettinger K, Schuh W, Gronewold C (2011) Special aspects of cosmetic spray evaluations: Principles on inhalation risk assessment. Toxicology Letters, 205:97-104

SCCS (2012) Notes of Guidance for testing of Cosmetic Ingredients and Their Safety Evaluation (8th revision). European Commission - Scientific Committee on Consumer Safety.

Steiling W, Bascompta M, Carthew P, Catalano G, Corea N, D'Haese A, Jackson P, Kromidas L, Meurice P, Rothe H, Singal M (2014) Principle considerations for the risk assessment of sprayed consumer products. Toxicology Letters, 227:41-49.

United Nations (2009) Globally Harmonised System of Classification and Labelling of Chemicals (GHS), 3rd revised edition. United Nations Economic Commission for Europe (UN/ECE), <http://www.unece.org/trans/danger/publi/ghs/ghs_rev03/03files_e.html >