File No: LTD/1487

October 2010

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

9,12-Octadecadienoic acid (9Z,12Z)-, 2,3-dihydroxypropyl ester (INCI Name: Glyceryl Linoleate)

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (Cwlth) (the Act) and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by the Department of Health and Ageing, and conducts the risk assessment for public health and occupational health and safety. The assessment of environmental risk is conducted by the Department of Sustainability, Environment, Water, Population and Communities.

For the purposes of subsection 78(1) of the Act, this Full Public Report may be inspected at our NICNAS office by appointment only at Level 7, 260 Elizabeth St, SURRY HILLS NSW 2010.

This Full Public Report is also available for viewing and downloading from the NICNAS website or available on request, free of charge, by contacting NICNAS. For requests and enquiries please contact the NICNAS Administration Coordinator at:

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Director
NICNAS

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9,12-Octadecadienoic acid (9Z,12Z)-, 2,3-dihydroxypropyl ester (INCI Name: Glyceryl Linoleate)

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Key-Sun Laboratories Pty Ltd (ABN 73 080 150 312)
16 Jubilee Avenue
WARRIEWOOD NSW 2102

NOTIFICATION CATEGORY
Limited-small volume: Chemical other than polymer (1 tonne or less per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
No details are claimed exempt from publication.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
Variation to the schedule of data requirements is claimed for all the data required under the schedule of data requirements.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT
None

NOTIFICATION IN OTHER COUNTRIES
EU, Canada

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
Glyceryl Linoleate (containing the notified chemical at 40-56% purity)
Vitamin F Glyceryl Ester CLR (containing the notified chemical at 40-56% purity)
Yardley Skin Hydro Tissue Oil Spray Anti-Ageing (containing the notified chemical at ≤ 5%)
Yardley Skin Hydro Tissue Oil Spray Scars & Stretch Marks (containing the notified chemical at ≤ 5%)
Yardley Skin Hydro Tissue Oil Spray Uneven Skin Tones (containing the notified chemical at ≤ 5%)

CAS NUMBER
2277-28-3

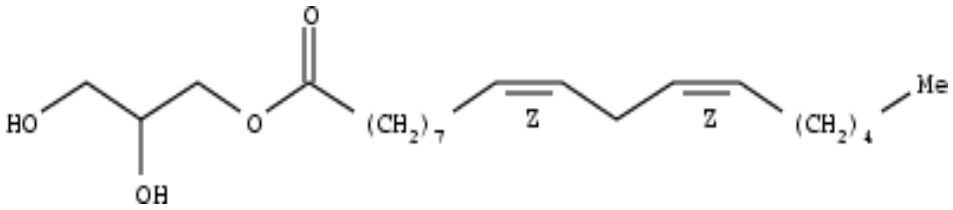
CHEMICAL NAME
9,12-Octadecadienoic acid (9Z,12Z)-, 2,3-dihydroxypropyl ester

OTHER NAME(S)
9,12-Octadecadienoic acid (Z,Z)-, 2,3-dihydroxypropyl ester
Linolein, 1-mono- (6CI, 7CI, 8CI)
(.+-.)-2,3-Dihydroxypropyl 9(Z),12(Z)-octadecadienoate
.alpha.-Glyceryl linoleate
.alpha.-Monolinolein
1-Glyceryl linoleate
1-Linoleylglycerol
1-Monolinolein
1-Monolinoleoyl-rac-glycerol
1-O-(9Z,12Z-Octadecadienoyl)glycerol
2,3-Dihydroxypropyl linoleate
3-O-(9Z,12Z-Octadecadienoyl)glycerol
Glycerol 1-monolinolate
Oleinate 288

MOLECULAR FORMULA

$C_{21}H_{38}O_4$

STRUCTURAL FORMULA



MOLECULAR WEIGHT
Mn = 354.52 Da.

ANALYTICAL DATA
Reference IR spectra were provided.

3. COMPOSITION

DEGREE OF PURITY 40-56%
The notified chemical is the major component of a mixture of the following fatty acid derivatives:

$<C_{16}$	0-1%
C_{16-0}	9-13%
C_{18-0}	2-5%
C_{18-1}	20-30%
C_{18-2}	**47-56% (including the notified chemical at 40-57%)**
C_{18-3}	4-10%
$>C_{18}$	1-3%

Note: The second number in subscript denotes the number of double bonds within that species.

HAZARDOUS IMPURITIES/RESIDUAL MONOMERS
None

NON HAZARDOUS IMPURITIES/RESIDUAL MONOMERS (>1% by weight)

Chemical Name C_{18-1} 9-Octadecenoic acid, 2,3-dihydroxypropyl ester, (Z)-
CAS No. 111-03-5 *Weight* 20-30%

Chemical Name C_{18-3} 9,12,15-Octadecatrienoic acid, 2,3-dihydroxypropyl ester, (Z,Z,Z)-
CAS No. 18465-99-1 *Weight* 4-10%

Chemical Name C_{16-0} Hexadecanoic acid, 2,3-dihydroxypropyl ester
CAS No. 542-44-9 *Weight* 9-13%

Chemical Name C_{18-0} Octadecanoic acid, 2,3-dihydroxypropyl ester
CAS No. 123-94-4 *Weight* 2-5%

Chemical Name C_{18-2} 9,12-Octadecadienoic acid.
CAS No. 112-80-1 *Weight* Approx. 0-1.5%

Chemical Name C_{18-2} 9,12-Octadecadienoic acid, diester with 1,2,3-propanetriol, (Z,Z)-
CAS No. 30606-27-0 *Weight* Approx. 0-5%.

Chemical Name C_{18-1} 9-Octadecenoic acid, diester with 1,2,3-propanetriol, (Z)-
CAS No. 25637-84-7 *Weight* Approx. 0-3%.

Chemical Name	1,2,3-Propanetriol		
CAS No.	56-81-5	*Weight*	Approx. 0-1%

ADDITIVES/ADJUVANTS

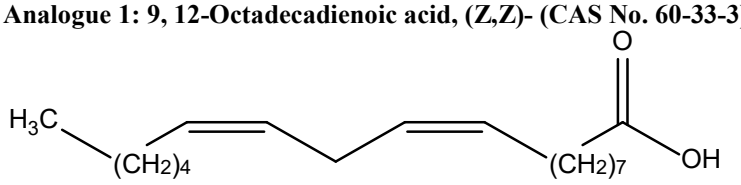
Chemical Name	Mixed tocopherols		
CAS No.	-	*Weight*	Approx. 0.1%

LOSS OF MONOMERS, OTHER REACTANTS, ADDITIVES, IMPURITIES
None

DEGRADATION PRODUCTS
None

Identity of Analogue Chemicals Used in Estimating the Physical, Chemical and Toxicological Properties of the Notified Chemical

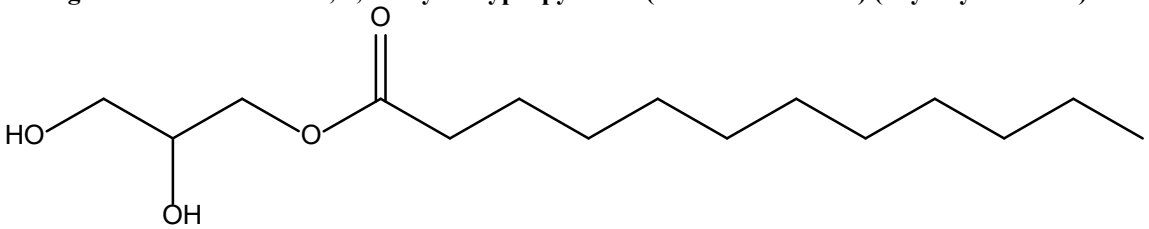
Analogue 1: 9, 12-Octadecadienoic acid, (Z,Z)- (CAS No. 60-33-3) (Linoleic acid)



MW = 280 Da.
Molecular formula: $C_{18}H_{32}O_2$

Analogue 1 is the fatty acid moiety of the notified chemical. In comparison to the notified chemical, it has a lower molecular weight and does not have the same potential for hydrogen bonding due to the absence of hydroxyl groups. Therefore, Analogue 1 is considered to provide a reasonable estimate of the lower limit of the boiling point of the notified chemical (see table below). Given that it has the same carbon chain length and double bond geometry as the fatty acid moiety of the notified chemical, it is anticipated to give a reasonable indication of the toxicity of the notified chemical.

Analogue 2: Dodecanoic acid, 2,3-dihydroxypropyl ester (CAS No. 142-18-7) (Glyceryl Laurate)



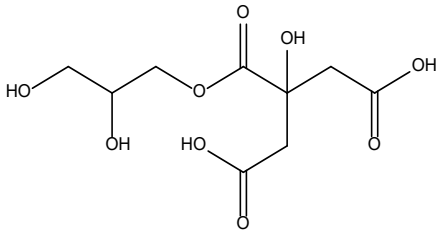
MW = 274 Da.
Molecular formula: $C_{15}H_{30}O_4$

Analogue 2 has a smaller, saturated carbon chain on the acid moiety compared to the notified chemical. It is expected to have similar potential for hydrogen bonding partly due to the presence of the glyceryl portion of the molecule common with the notified chemical. The lower molecular weight and absence of double bonds in Analogue 2 are not expected to result in significantly different toxicological properties compared to the notified chemical. In addition, it has a similar partition coefficient to the notified chemical (log Kow = 4.22) and thus its absorption characteristics (via the oral, dermal and inhalation routes) are expected to be similar.

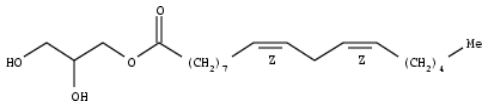
Analogue 3: **Mixture of 4 substances (concentrations unknown):**
(a) 1,2,3-Propanetricarboxylic acid, 2-hydroxy-, monoester with 1,2,3-propanetriol (CAS No. 36291-32-4) (Glyceryl Citrate),

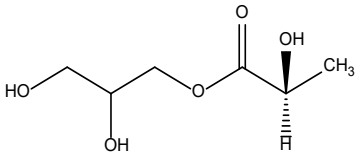
(b) Propanoic acid, 2-hydroxy-, (S)-, 1,2,3-propanetriyl ester (CAS No. Unassigned) (Glyceryl Lactate),
(c) [Notified chemical] (CAS No. 2277-28-3) (Glyceryl Linoleate) and
(d) 9-Octadecanoic acid, 2,3-dihydroxypropyl ester, (Z)- (CAS No. 111-03-5) (Glyceryl Oleate).

(a) Glyceryl Citrate

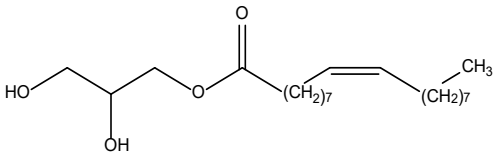


(b) Glyceryl Linoleate (Notified Chemical)





(c) Glyceryl Lactate



(d) Glyceryl Oleate

Analogue 3 is a mixture of 4 substances (at unspecified concentrations) with each substance containing 1,2,3-propanetriol as a common component of their structures. The mixture contains the notified chemical as well as other lower molecular weight esters with carboxylic acid, alcohol, straight chain alkyl and unsaturated alkyl functionalities. This mixture of chemicals is expected to provide an indication of the sensitisation and irritation potential of the notified chemical due to the functional groups in the notified chemical being common to at least one of the substances in this mixture. However, the different functional groups may result in different metabolic pathways and therefore, its suitability as an analogue to predict systemic toxicity is uncertain.

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20°C AND 101.3 kPa: Light yellow, oily liquid almost odourless

Property	Value	Data Source/Justification
Melting Point	14.5-45°C	Measured (CIR (2004), p.5)
Boiling Point	>230°C	Analogue 1
Density*	918-922 kg/m^3 at 20°C	MSDS
Vapour Pressure**	1.3x10^{-4} – 5.7 kPa	Estimated based on constituent chemicals
Water Solubility	3.0 × 10^{-5} g/L at 25°C	Estimated using WSKOW (v1.41)
Hydrolysis as a Function of pH	Not determined	The notified chemical contains hydrolysable functionality, however, based on its low predicted water solubility, hydrolysis is expected to be slow in the environmental pH range (4–9) at ambient temperature.
Partition Coefficient (n-octanol/water)	log K_{ow} = 6.19	Estimated using KOWWIN (v1.67). As the notified chemical is identified by modules in EPISuite (2009) as an ester, and not as a surfactant, it is accepted to be in the KOWWIN model domain.
Adsorption/Desorption	log K_{oc} = 3.46	Estimated using KOCWIN (v2.00)
Dissociation Constant	Not determined	The notified chemical does not contain functional groups that are expected to dissociate under typical environmental conditions
Particle Size	Not measured	The notified chemical is a liquid
Flash Point*	280°C	MSDS
Flammability	Not predicted to be	Estimated based on flash point

	flammable	
Autoignition Temperature	Not predicted to autoignite	Estimated based on flash point
Explosive Properties	Not predicted to be explosive	Estimated based on structure

* Data sourced from the MSDS for the product Vitamin F Glyceryl Ester CLR containing the notified chemical at 40-57% concentration.
** The estimated vapour pressure of the notified chemical is expected to be between the vapour pressure of its 2 constituent components: 9,12-Octadecadienoic acid (CAS No. 60-33-3) (INCI Name: Linoleic acid) = 5.7 kPa at 20ºC and 1,2,3-Propanetriol (CAS No. 56-81-5) (INCI Name: Glycerol) = 1.3×10^{-4} kPa at 25ºC

DISCUSSION OF PROPERTIES
Reactivity
The notified chemical is chemically stable and will not decompose under normal ambient conditions.

Dangerous Goods classification
Based on the estimated physical-chemical data in the above table the notified chemical is not classified according to the Australian Dangerous Goods Code (NTC, 2007). However the data above do not address all Dangerous Goods endpoints. Therefore consideration of all endpoints should be undertaken before a final decision on the Dangerous Goods classification is made by the introducer of the chemical.

5. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notified chemical will be imported by sea at up to 5% concentration in finished rinse-off and leave-on cosmetic products

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	1	1	1	1	1

PORT OF ENTRY
Sydney

IDENTITY OF RECIPIENTS
Key-Sun Laboratories Pty Ltd

TRANSPORTATION AND PACKAGING
Finished products containing the notified chemical at up to 5% concentration will be imported in aerosol cans (approx. 130 mL and 200 mL) or 200 g tubes or bottles. The containers will be packed in cardboard shippers and the shippers packed on pallets. The containers will be transported to the notifier's warehouse by road and then distributed to retail outlets for retail sale.

USE
The notified chemical will be used at concentrations of up to 5% in finished rinse-off and leave-on cosmetic products. Leave on products will also include those applied by aerosol spray.

OPERATION DESCRIPTION
The notified chemical will be imported by sea at up to 5% in finished rinse-off and leave-on cosmetic products. The finished cosmetic products containing the notified chemical at up to 5% will be transported from the wharf and stored in a warehouse before transferring products to customer's distribution depots. From these depots, the products will be transported to retail outlets for sale to consumers as well as health and beauty salons. Workers in hair and beauty salons will directly apply finished products containing the notified chemical at up to 5% concentration to clients.

6. HUMAN HEALTH IMPLICATIONS

6.1 Exposure assessment

6.1.1 Occupational exposure

NUMBER AND CATEGORY OF WORKERS

Category of Worker	*Number*	*Exposure Duration (hours/day)*	*Exposure Frequency (days/year)*
Transport and Storage	10	4	12
Store Persons	2	4	12
End Users	3×10^5	8	365

EXPOSURE DETAILS

Transport and Storage

Exposure to the notified chemical during transport and storage is not anticipated except in case of an accident leading to release.

Use of finished personal care products

Occupational exposure is possible for workers in hair and beauty salons using products containing the notified chemical at ≤ 5% concentration. Dermal exposure is expected to be extensive given that cosmetic, skin and hair care products containing the notified chemical will be applied directly to the skin and hair. Inhalation exposure is possible given a number of products will be applied by spray. Accidental ocular exposure may also occur as a result of spray application.

Although the level and route of exposure will vary depending on the method of application and work practices employed, extensive dermal exposure is expected in some occupational settings. This exposure is likely to be greater than that expected for the public (see below).

6.1.2. Public exposure

Public exposure to the notified chemical is expected to be widespread and frequent through daily use of cosmetic, skin and hair care products containing the notified chemical at concentrations up to 5%. Exposure to the notified chemical will vary depending on individual use patterns. The principal route of exposure will be dermal, while inhalation and ocular exposure are also possible given a number of the products will be applied by spray. Accidental ingestion from the use of these types of products is also possible from facial use.

Dermal exposure

Dermal exposure to the notified chemical in Australia has been estimated using the Scientific Committee on Consumer Products' (SCCP's) Notes of Guidance for the Testing of Cosmetic Ingredients and their Safety Evaluation and applying the following assumptions:

- Bodyweight of 60 kg for females (SCCP, 2006);
- Concentration of the notified chemical in leave-on and rinse-off cosmetic products = 5%;
- 100% dermal absorption (SCCP, 2006);
- An individual uses all product types containing the notified chemical.

Product(s) used	*Use level for each product*	*Retention factor*	*Systemic Exposure (mg/kg bw/day)*
Rinse-off products			
Facial cleanser[1]	2.5g x 2 applications/day	0.01	0.83
Shampoo	8.0g x 1 application/day	0.01	1.33
Conditioner	14.0g x 0.28 applications/day	0.01	0.65
Shower gel	5.0g x 2 applications/day	0.01	1.67
Makeup remover	2.5g x 2 applications/day	0.10	8.33
Hair styling products	5.0g x 2 applications/day	0.10	16.67
Total rinse-off product exposure =			29.49
Leave-on products			
Body Lotion	8.0g x 1 application/day	1.0	133.33
Face Cream	0.8g x 2 applications/day	1.0	26.67
General purpose cream	1.2 g x 2 applications/day	1.0	40
Total leave-on product exposure =			200.00
Total (rinse-off + leave-on x conc. in each product = 229.49 mg/kg bw/day x 5%)			**11.47**

[1] RIVM (2006)

The above exposure estimate was produced using highly conservative assumptions and is expected to reflect a worst-case scenario. However, in reality, the level of exposure is expected to be lower than 11.47 mg/kg bw/day as it is assumed that consumers would not use all these products to the extent shown above, and dermal absorption may be less than 100%.

6.2. Human health effects assessment

The results from toxicological investigations conducted on Vitamin F Glyceryl Ester CLR containing the notified chemical at <60% concentration are summarised in the table below as well as reported toxicological results for Analogue 1, 2 and 3.

Endpoint	*Notified chemical (<60%)*	*Analogue 1* Linoleic Acid	*Analogue 2* Glyceryl Laurate	*Analogue 3* Mixture of: Glyceryl Citrate, Glyceryl Lactate, Glyceryl Linoleate and Glyceryl Oleate
Rat, acute oral toxicity (LD50)	> 5 mL/kg bw[1]	-	> 53.4 mL/kg bw[2] > 20,000 mg/kg bw[2]	> 2000 mg/kg bw[2]
Rat, acute dermal toxicity (LD50)	-	-	-	> 2000 mg/kg bw[2]
Rat, acute inhalation toxicity	-	Low-grade respiratory irritation reported at 10%[2]	-	-
Rabbit, skin irritation	Non-irritating[3] (at 3% in paraffin oil)	-	Irritating at 20%[2] Slightly irritating (undiluted)[2]	Slightly irritating[2]
Rabbit, eye irritation	Slightly irritating[4]	-	Slightly irritating[2]	Non-irritating[2]
Guinea pig, skin sensitisation	No evidence of sensitisation[5]	-	No evidence of sensitisation[2]	No evidence of sensitisation[2]
Human, repeat insult patch test	No evidence of sensitisation at 50%[2]	-	No evidence of sensitisation at 25%[2] Inadequate evidence of sensitisation at 50%[2]	-
Rat, repeat inhalation exposure (1 hour/day for 14 days in 3 weeks)	-	-	NOAC = 280 mg/m^3 (2)	-
Rat, repeat dose oral toxicity	-	-	NOAEL = 25% concentration in diet (10 weeks)[2]	-
Rat, chronic oral toxicity	-	-	NOAEL = ~10-11% concentration in diet (1 year)[2]	-
Mutagenicity – bacterial reverse mutation (AMES)	-	Negative[6]	-	Negative[2]

[1] IBR (1973a)
[2] CIR (2004)
[3] IBR (1976)
[4] IBR (1973b)
[5] IBR (1977)
[6] NTP (2010)

Toxicokinetics
The notified chemical is expected to be readily absorbed via the oral route and hydrolysed to Glycerol and Linoleic acid. These species may then react with fatty acids to form triglycerides (CIR, 2004).

The notified chemical is expected to be absorbed dermally, particularly into the stratum corneum, though its deeper penetration may be limited. Reports on Analogue 2 indicate that it has the potential to enhance the skin penetration of other chemicals (CIR, 2004). The Cosmetic Ingredient Review Panel (CIRP) has recommended that other glyceryl monoesters (such as the notified chemical) also be considered as skin penetration enhancers.

Upon inhalation, the notified chemical may be absorbed across the respiratory tract epithelium. It may then be retained in the lungs for some time. Any effects and distribution in the respiratory system are dependent upon the aerodynamic diameter of the aerosol droplets.

Toxicology
The notified chemical (at <60% concentration) was found to be of low acute oral toxicity and analogue chemicals were also found to be of low acute oral toxicity. Acute dermal toxicity was low in Analogue 3, however its relevance to the notified chemical is inconclusive due to the unknown concentrations of different substances in the mixture.

No acute inhalation toxicity data were provided for the notified chemical or the analogues.

Inhalation of the notified chemical may cause some irritation to the respiratory tract based on the results of a study using Analogue 2 at 10% in aerosol form (CIR, 2004).

The notified chemical was considered to have the potential to be a skin irritant at 100% based on reported test results for Analogue 2, although the notified chemical was not a skin irritant at 5% in paraffin oil. It was also found to have the potential to be slightly irritating to the eye based on tests on the notified chemical itself.

The notified chemical is not expected to be a skin sensitiser based on a test on the notified chemical and analogue chemicals in guinea pigs. In addition, the CIRP reports that glyceryl monoesters, such as the notified chemical, are not expected to be photosensitisers or cause photoallergenicity (CIR, 2004).

The notified chemical is not expected to cause systemic toxicity following repeated oral exposure to concentrations up to 25% based on 2 studies on Analogue 2. A repeat dose inhalation toxicity study on Analogue 2 in rats for 14 days reported no observed effects at concentrations up to 280 mg/m^3. No local or systemic toxicity effects were reported.

The notified chemical is not expected to be a mutagen based on the results of AMES tests on Analogues 1 and 3 and the CIRP considers glyceryl monoesters they reviewed, including the notified chemical, to be non-genotoxic and non-carcinogenic (CIR, 2004).

Health hazard classification
Based on the available data on the notified chemical and analogue chemicals, the notified chemical cannot be classified as hazardous according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004).

6.3. Human health risk characterisation

6.3.1. Occupational health and safety
Employees in hair and beauty salons will experience extensive dermal exposure as well as inhalation and accidental ocular exposure during application of products containing the notified chemical at ≤ 5% by hand or spray. If these employees use products containing the notified chemical for personal use as well as in a work setting their level of exposure would be higher than that of consumers. Studies on the notified chemical and reports on analogue chemicals indicate that there is potential for skin and eye irritation when used at higher concentrations. However, exposure to the notified chemical at low concentrations (≤ 5%) in cosmetic products is not expected to result in skin or eye irritation.

Inhalation exposure is not expected to be as significant for employees in hair and beauty salons as for the clients whose face will be directly exposed to the spray generated by spray-on cosmetic products containing

the notified chemical at ≤ 5% as described below (section 6.3.2. Public Health).

The risk of toxicity following repeated inhalation exposure is not anticipated to be unacceptable based on the NOAC reported in the repeat dose inhalation study as described below (section 6.3.2. Public Health).

Overall, based on the available data, the notified chemical is not considered to pose an unacceptable risk to occupational health at concentrations up to 5% in cosmetic products.

6.3.2. Public health

Members of the public will experience widespread and frequent dermal and perhaps inhalation exposure to the notified chemical through daily use of cosmetic products (≤ 5%) applied directly to the skin and hair. Accidental ocular exposure may also occur, however, at this concentration, the notified chemical is not expected to cause skin or eye irritation.

Some product categories are expected to involve spraying of aerosols directly onto the facial area, thus resulting in significant inhalation exposure. There is an indication that inhalation of aerosol spray products may result in some irritation to the respiratory tract (based on a study on Analogue 2 at 10% concentration). Such effects are not expected when the notified chemical is present at concentrations up to 5% in aerosols. No effects were reported in a repeat dose inhalation study in rats exposed to Analogue 2 for 14 1-hour exposure throughout a 3-week period and therefore, a margin of exposure from repeat inhalation exposure could not be determined.

A maximum systemic exposure of 11.47 mg/kg bw/day was estimated from dermal exposure. A dermal NOEL is not available to estimate the MoE from dermal exposure. However, a one-year repeat dose oral toxicity study has shown no adverse effects in rats with up to ~11% concentration of Analogue 2 in the diet.

Overall, based on the available data, the notified chemical is not considered to pose an unacceptable risk to public health at concentrations up to 5% in cosmetic products.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1 Environmental Exposure

RELEASE OF CHEMICAL AT SITE

The notified chemical will be imported as a component of finished cosmetic products. Accidental spills during transport are expected to be collected with inert material and disposed of to landfill.

RELEASE OF CHEMICAL FROM USE

The notified chemical is a component in rinse-off and leave-on cosmetic products. Therefore, it is expected that the majority of the imported quantity of notified chemical will be released to the sewer.

RELEASE OF CHEMICAL FROM DISPOSAL

Residue of the notified chemical in empty containers (1%) and expired wastes are likely either to share the fate of the container and be disposed of to landfill, or to be washed to the sewer when containers are rinsed before recycling.

7.1.2 Environmental fate

No environmental fate data were submitted. However, the notified chemical is predicted to be readily biodegradable by modules of the estimation program BIOWIN (v4.10) (US EPA, 2009), and a related oleochemical ester was found to be readily biodegradable when tested under OECD biodegradability test guidelines (Willing, 2001). The majority of the imported quantity of notified chemical will be disposed of to sewer where most is expected to partition to the sludge due to its hydrophobicity. Although the notified chemical has a moderate molecular weight and a high calculated log K_{ow} (6.19), calculations with BCFBAF (v3.00) (US EPA, 2009) indicate a low bioconcentration potential (BCF = 236.8 L/kg wet-wt). Sludge containing the notified chemical may be disposed of to landfill or used for soil remediation where it is not expected to be mobile based on the estimated high log K_{oc} (3.46). Notified chemical in sludge, soil or landfill is expected to degrade through biotic and abiotic processes to form water and oxides of carbon.

7.1.3 Predicted Environmental Concentration (PEC)

The following Predicted Environmental Concentrations (PEC) have been calculated assuming that all of the imported quantity of notified chemical is released to sewer and up to 89% is removed from waste water by sewage treatment processes before discharge to surface waters on a nationwide basis.

Predicted Environmental Concentration (PEC) for the Aquatic Compartment		
Total Annual Import/Manufactured Volume	1,000	kg/year
Proportion expected to be released to sewer	100%	
Annual quantity of chemical released to sewer	1,000	kg/year
Days per year where release occurs	365	days/year
Daily chemical release:	2.74	kg/day
Water use	200.0	L/person/day
Population of Australia (Millions)	21.161	million
Removal within STP	89%	**Mitigation**
Daily effluent production:	4,232	ML
Dilution Factor - River	1.0	
Dilution Factor - Ocean	10.0	
PEC - River:	0.065	µg/L
PEC - Ocean:	0.0065	µg/L

The removal of up to 89% of the notified chemical from influent during sewage treatment plant (STP) processes is predicted based on 11% degradation and 77% partitioning to sludge (SimpleTreat; European Commission, 2003).

Partitioning to biosolids in STPs Australia-wide may result in an average biosolids concentration of 5.114 mg/kg (dry wt). Biosolids are applied to agricultural soils, with an assumed average rate of 10 t/ha/year. Assuming a soil bulk density of 1500 kg/m^3 and a soil-mixing zone of 10 cm, the concentration of the notified chemical may approximate 0.034 mg/kg in applied soil. This assumes that degradation of the notified chemical occurs in the soil within 1 year from application. Assuming accumulation of the notified chemical in soil for 5 and 10 years under repeated biosolids application, the concentration of notified chemical in the applied soil in 5 and 10 years may approximate 0.17 mg/kg and 0.34 mg/kg, respectively.

Notified chemical that is not removed from waste water during STP processes may be released to the environment in STP effluent. 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 notified 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 0.065 µg/L may potentially result in a soil concentration of approximately 0.4316 µg/kg. Assuming accumulation of the notified chemical in soil for 5 and 10 years under repeated irrigation, the concentration of notified chemical in the applied soil in 5 and 10 years may be approximately 2.158 µg/kg and 4.316 µg/kg, respectively. However, due to the expected biodegradability of the notified chemical, these calculated values represent maximum concentrations only.

7.2. Environmental effects assessment

No experimental ecotoxicological data were submitted. As the log K_{ow} of the notified chemical is >5, the neutral organics structure-activity relationship (SAR) from the ECOSAR suite of models should be used to estimate endpoints (Clements, 1996). The modelled estimates (ECOSAR (v1.00), neutral organics SAR; US EPA, 2009) for the chronic endpoints of the notified chemical are tabulated below.

Endpoint	*Predicted Result*	*Assessment Conclusion*
Chronic toxicity		
Fish	ChV‡ (30 d) = 0.008 mg/L	Very toxic to fish with long lasting effects
Daphnia	ChV‡ (16 d) = 0.013 mg/L	Toxic to aquatic invertebrates with long lasting effects
Algae	ChV‡ = 0.133 mg/L†	Harmful to algae with long lasting effects†

‡ ChV (Chronic Value) = $(LOEC \times NOEC)^{½}$
†The chemical may not be soluble enough to measure this predicted algal toxicity.

Oleochemical esters related to the notified chemical were found to have low acute aquatic toxicity (LC/EC50 values >> 100 mg/L) (Willing, 2001). Additionally, the notified chemical is expected to have limited bioavailability based on its high predicted log K_{ow} of 6.19 and low water solubility (3.0×10^{-5} g/L). Therefore, no acute effects on aquatic biota are predicted for the notified chemical at its water saturation concentration (ECOSAR (v1.00), US EPA, 2009). Classification should only be based on toxic responses observed in the soluble range and, therefore, the notified chemical is not formally classified for acute aquatic hazard under the Globally Harmonised System of Classification and Labelling of Chemicals (GHS) (United Nations, 2009).

The long-term hazard classifications for the notified chemical were determined by comparison of the calculated chronic values ($ChV = (LOEC \times NOEC)^{½}$) and the limiting NOEC values defined for each GHS classification. For example, the 30 d ChV for fish is estimated to be 0.008 mg/L and the $NOEC_{fish}$ must therefore be <0.008 mg/L. As the $NOEC_{fish}$ is less than the NOEC for Chronic Category 1 (≤ 0.01 mg/L), and is predicted to be rapidly degradable, the notified chemical can be classified as very toxic to fish with long lasting effects.

Therefore, based on its chronic fish toxicity, the notified chemical is formally classified under the Globally Harmonised System of Classification and Labelling of Chemicals as 'Chronic Category 1; Very toxic to aquatic life with long lasting effects'.

7.2.1 Predicted No-Effect Concentration

The predicted no-effect concentration (PNEC) has been calculated from the estimated chronic fish toxicity of the notified chemical and an assessment factor of 50. A more conservative assessment factor of 50 is appropriate in this case as although chronic endpoints ($ChV = (LOEC \times NOEC)^{½}$) for three trophic levels were reliably estimated by the neutral organics SAR (ECOSAR (v1.00); US EPA, 2009), these chronic endpoints are not no-observed effect concentrations (NOECs).

Predicted No-Effect Concentration (PNEC) for the Aquatic Compartment		
EC50 (Alga).	0.008	mg/L
Assessment Factor	50	
PNEC:	0.16	µg/L

7.3. Environmental risk assessment

Based on the above PEC and PNEC values, the following Risk Quotient (Q) has been calculated:

Risk Assessment	*PEC µg/L*	*PNEC µg/L*	*Q*
Q - River:	0.06	0.16	0.405
Q - Ocean:	0.01	0.16	0.040

The risk quotient for discharge of treated effluents containing the notified chemical to riverine environments indicates a relatively narrow safety margin as a result of the estimated high chronic toxicity of this chemical. However, the notified chemical is likely to have very limited aquatic exposure based on the expected efficient removal of the chemical from waste water by sorption to sewage sludge and biodegradation. Notified chemical released to surface waters is expected to disperse and degrade, and have low bioavailability to aquatic biota. Therefore, the notified chemical is not expected to pose a risk to the environment based on the reported use in cosmetics and at the maximum annual importation volume.

8. CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard classification

Based on the available data on the notified chemical and analogue chemicals, the notified chemical is not classified as hazardous according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004).

The classification of the notified chemical using the Globally Harmonised System for the Classification and Labelling of Chemicals (GHS) (United Nations 2003) is presented below. This system is not mandated in Australia and carries no legal status but is presented for information purposes.

	Hazard category	*Hazard statement*
Aquatic environment	Chronic Category 1	Very toxic to aquatic life with long lasting effects

Human health risk assessment

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

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

Environmental risk assessment

On the basis of the PEC/PNEC ratio and the reported use pattern, the notified chemical is not expected to pose a risk to the environment.

Recommendations

CONTROL MEASURES

Occupational Health and Safety

- No specific engineering controls, work practices or personal protective equipment are required for the safe use of the notified chemical itself, however, these should be selected on the basis of all ingredients in the formulation.

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

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

- If products and mixtures containing the notified chemical are classified as hazardous to health in accordance with the *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(2004)] workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Disposal

- The notified chemical should be disposed of to landfill.

Emergency procedures

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

Regulatory Obligations

Secondary Notification
This risk assessment is based on the information available at the time of notification. The Director may call for the reassessment of the chemical under secondary notification provisions based on changes in certain circumstances. Under Section 64 of the *Industrial Chemicals (Notification and Assessment) Act (1989)* the notifier, as well as any other importer or manufacturer of the notified chemical, have post-assessment regulatory obligations to notify NICNAS when any of these circumstances change. These obligations apply even when the notified chemical is listed on the Australian Inventory of Chemical Substances (AICS).

Therefore, the Director of NICNAS must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under Section 64(1) of the Act; if
  - the importation volume exceeds one tonne per annum notified chemical; or
  - the notified chemical is imported as a raw ingredient;

or

(2) Under Section 64(2) of the Act; if
  - the function or use of the chemical has changed from an ingredient of cosmetic products at > 5%, or is likely to change 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 occupational health and safety, public health, or the environment.

The Director will then decide whether a reassessment (i.e. a secondary notification and assessment) is required.

Material Safety Data Sheet
The MSDS of the notified chemical (and products containing the notified chemical) provided by the notifier were reviewed by NICNAS. The accuracy of the information on the MSDS remains the responsibility of the applicant.

APPENDIX A: TOXICOLOGICAL INVESTIGATIONS

B.1. Irritation – skin

TEST SUBSTANCE: Vitamin F Glyceryl Ester CLR (<60% notified chemical) at 5% concentration in paraffin oil (= 3% notified chemical)

METHOD
- Species/Strain: Rabbit/New Zealand White
- Number of Animals: 6
- Vehicle: Paraffin oil
- Observation Period: 72 hours
- Type of Dressing: Occlusive
- Remarks - Method: Variations from OECD TG 404 include:
  - no observation at 48 hours post-treatment,
  - an additional treatment area was abraded prior to treatment and
  - immobilisation of the animals for 24 hours following application.

  However, these were not considered to substantially affect the test results.

RESULTS

Lesion	*Mean Score**	*Maximum Value*	*Maximum Duration of Any Effect*	*Maximum Value at End of Observation Period*
Erythema/Eschar	0	0	0	0
Oedema	0	0	0	0

*Calculated on the basis of the scores at 24, and 72 hours for ALL animals.

Remarks - Results: No signs of irritation were observed during the test.

CONCLUSION: The notified chemical is non-irritating to the skin under the conditions of the test.

TEST FACILITY: IBR (1976)

B.2. Irritation – eye

TEST SUBSTANCE: Vitamin F Glyceryl Ester CLR (<60% notified chemical)

METHOD: Draize (1952)
- Species/Strain: Rabbit/New Zealand Albino
- Number of Animals: 6
- Observation Period: 7 days
- Remarks - Method: An English translation of the test report was not provided

RESULTS

Lesion	*Mean Score**	*Maximum Value*	*Maximum Duration of Any Effect*	*Maximum Value at End of Observation Period*
Conjunctiva: redness	0.67	3	<48 hrs	0
Conjunctiva: chemosis	0	0	0	0
Conjunctiva: discharge	0	0	0	0
Corneal opacity	0	0	0	0
Iridial inflammation	0	0	0	0

*Calculated on the basis of the scores at 24, 48, and 72 hours for ALL animals.

Remarks - Results: The test substance was reported to produce level 2 conjunctival redness in all animals 1 hour following treatment and level 3 conjunctival redness in all animals 3 hours following treatment. However, the redness had reduced to level 2 in all animals 24 hours following treatment and no

effects were reported at 48 hours following treatment.

CONCLUSION The notified chemical is slightly irritating to the eye.

TEST FACILITY IBR (1973b)

B.3. Skin sensitisation

TEST SUBSTANCE Vitamin F Glycerin Ester CLR (<60% notified chemical)

METHOD Deutsche Gesellschaft für Fettwissenschaft E.V., Fachgruppe XI; wissenschaftliche Kosmetik

Species/Strain Guinea pig/Pirbright

PRELIMINARY STUDY Not conducted

MAIN STUDY

Number of Animals Test Group: 10 Control Group: 5

INDUCTION PHASE Induction Concentration (topical): Undiluted Vitamin F Glycerin Ester CLR (<60% notified chemical)

Signs of Irritation Not reported

CHALLENGE PHASE

1st challenge topical: Undiluted Vitamin F Glycerin Ester CLR (<60% notified chemical)

Remarks - Method A treatment area on the left flank of each animal was shaved and 0.5 mL of the undiluted test substance was applied to the area with a glass rod each day for 10 days. Fourteen days after the last treatment all animals (including controls) were challenged on a separate shaved area of the skin and the skin reactions graded 24- and 48-hours after challenge.

RESULTS

Animal	*Challenge Concentration*	*Number of Animals Showing Skin Reactions after: 1st challenge*	
		24 h	*48 h*
Test Group	Test substance undiluted	0/6	0/6

CONCLUSION Under the conditions of the test, there was no evidence of skin sensitisation cause by application of the notified chemical.

TEST FACILITY IBR (1977)

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