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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Poirenate

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Poirenate

1. APPLICANT

Kao (Australia) Marketing Pty Ltd of Suite 403, 32 Walker St NORTH SYDNEY NSW 2060 has submitted a standard notification statement in support of their application for an assessment certificate for Poirenate and has not applied for any information relating to Poirenate to be exempt from publication in the Full Public Report and the Summary Report.

2. IDENTITY OF THE CHEMICAL

Chemical Name: ethyl 2-cyclohexyl propionate

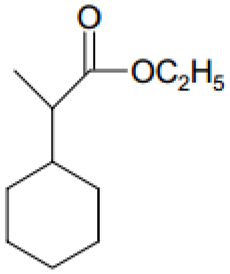
Chemical Abstracts Service (CAS) Registry No.: 2511-00-4

Other Names: Poirenate

Trade Name: Poirenate

Molecular Formula: $C_{11}H_{20}O_2$

Structural Formula:



Molecular Weight: 184.3

Method of Detection and Determination: ultraviolet-visible (UV/Vis), infrared (IR), nuclear magnetic resonance (NMR) and mass spectroscopy; gas liquid chromatography (GLC)

Spectral Data: UV/Vis: the notified chemical in ethanol exhibited an

absorbance peak at 220 nm
IR: the 10 strongest peaks were 2 980, 2 927, 2 853, 1 734, 1 449, 1 191, 1 173, 1 147, 1 059 and 402 cm^{-1}; the peak at 2 980 was ascribed to CH, that at 1 734 to C=O and that at 1 173 to C-O
NMR: ^{1}H-NMR was provided

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	colourless, non-viscous liquid
Boiling Point:	218-225°C at 101.3 kPa
Specific Gravity:	0.940
Vapour Pressure:	0.0219 ± 0.0008 kPa at 25°C
Water Solubility:	86.7 mg/L at 20°C
Henry's Law Constant:	46.5 Pa.m^3/mole - see notes below.
Partition Co-efficient (n-octanol/water):	log K_{ow} = 4.03 at 25°C - see notes below
Hydrolysis as a Function of pH:	26.1% after 2.4 h, and 58.6% after 5 days at 50°C and pH 7 - see notes below.
Adsorption/Desorption:	log K_{oc} = 3.02 by QSAR calculations - see notes below
Dissociation Constant:	no data provided - see notes below
Surface Tension:	not surface active - see notes below.
Fat Solubility:	totally miscible - see notes below.
Flash Point:	92°C (closed cup)
Flammability:	not flammable
Autoignition Temperature:	242°C
Explosive Properties:	not explosive

Comments on Physico-Chemical Properties

Water solubility was determined by stirring an excess of the test substance with 100 mL of distilled water at 30°C for 3 days, equilibrating for 1 day at 20°C, and then separating the aqueous and non aqueous layers in a separating funnel. The content of the new chemical in the aqueous phase was then determined by gas chromatography.

The Henry's law constant was calculated by the notifier from the molecular weight, the measured water solubility and vapour pressure through the equation -

H= MW(g/mole) x Vapour Pressure (Pa)/Water solubility (g/L).

The compound contains an ester linkage which is susceptible to hydrolysis. The rate of hydrolytic degradation of an aqueous solution containing 46.1 mg/L (half saturation concentration at 20°C) was determined at 50°C at pH 4, 7 and 9 over a 5 day period using EEC method C.10. After 5 days gas chromatographic analysis showed that around 57% of the original compound had hydrolysed under all three pH conditions. These data were interpreted to indicate a half life of between 1 day and 1 year at 25°C under usual environmental pH conditions.

The n-octanol/water partition coefficient was determined using the shake flask method, with analyses performed by gas chromatography. The determined value of log P_{ow} indicates the new chemical has high affinity for hydrocarbon like environments.

LogK_{oc} was calculated from the value of logP_{ow} using the relationship - logK_{oc} = 0.49 x logP_{ow} + 1.05. This relationship is appropriate for compounds containing carboxylic acid ester groups, and is a member of a class of QSAR recommended by the EEC for calculating K_{oc} for various classes of organic compounds (European Commission, 1996a). The value for log K_{oc} as 3.02 indicates that the chemical would tend to partition into the organic component of soils and sediments, and become associated with these materials.

The compound contains no functionalities capable of dissociating or otherwise becoming ionised in aqueous media, and the notifier indicates that dissociation constant data are not applicable. Environment Australia concurs with this reasoning.

The new chemical is completely miscible in fat at 37°C (experimental report submitted), which is in accord with the predominantly hydrocarbon nature of the material, and the high value for log P_{ow}.

The material is not surface active, and the surface tension of an aqueous solution containing approximately 79 mg/L (90% saturation) of the test substance was 64.5 mN/m at 20°C (water = 72 mN/m).

Calculations based on the molecular structure using the quantitative structure activity relationships (QSARs) of the US Environment Protection Agency ASTER database (US Environment Protection Agency, 1998) furnished the following estimates for environmentally relevant physico-chemical parameters. Where comparison with data supplied by the notifier is possible, the agreement is reasonable except possibly for estimated rate of hydrolysis.

ASTER DATA (all calculated using QSARs)

Property	*QSAR estimate*
Boiling Point:	222°C
Vapour Pressure:	0.123 mm of Hg (16.4 Pa)
Water Solubility:	34.8 mg/L
Henry's Constant:	86.2 Pa.m/mole
log K_{ow}:	3.67
log K_{oc}:	3.33
Hydrolytic degradation half life:	more than 1 000 days

4. PURITY OF THE CHEMICAL

Degree of Purity: 99.4% (range: 95.0 – 99.9%)

Toxic or Hazardous Impurities:

Chemical Name	*CAS No.*	*Weight %*
2-cyclohexylpropyl ethyl ether	unknown	< 3.0%

Non-hazardous Impurities (> 1% by weight): unknown (< 2.0%)

Additives/Adjuvants: none

5. USE, VOLUME AND FORMULATION

The notified chemical is to be used as a fragrance enhancer in household, toiletry and cosmetic products. It will be imported as the pure substance at a rate of 0.5 tonnes in the first year rising by 0.5 tonnes/year for the next 4 years.

The notified chemical will be imported in sealed, unbreakable lacquered steel drums of 32 or 200 L capacity.

The notified chemical is blended into a formulated perfume at 0.1 – 5%, which is then incorporated into household products at a level of approximately 0.001 – 0.005%.

6. OCCUPATIONAL EXPOSURE

Waterside workers, forklift truck drivers and truck drivers will handle closed containers of the notified chemical. During transport or storage of drums containing the notified chemical occupational exposure may occur in the event of accidental spillage.

The chemical, in liquid form, is either manually or automatically charged to a mixer to be blended into a formulated perfume at a concentration of 0.1 – 5% which is then automatically filled into containers. The batch sizes were stated to be 25 kg, 50 kg, 100 kg, 500 kg or 1 tonne. The notifier states that quality control testing (sampling and analysis) by 3 workers takes 9 minutes per day. Compounding (blending) or discharge (filling of containers) is said to involve one worker for 5 minutes per day. During addition of the notified chemical to the mixer for production of the perfume formulation, exposure to spills is possible. Some exposure to the formulation could occur during quality control testing. The notifier states that solvent resistant gloves and safety glasses are worn during these processes. The mixing vessels are stated to retain 0.05% of the formulation (maximum 0.5 kg per batch) so that exposure during solvent washing to small amounts of the chemicals is possible.

Exposure to spills is possible during addition of the perfume formulation to other ingredients followed by blending into household products and during dispensing the products into their containers. Local exhaust ventilation is in place over the mixing vessels. The perfume formulation is added to the mixing vessel either manually or automatically by a single worker with automatic or manual discharge into containers (cartons, plastic bottles, plastic film). This is done at a number of customer sites although the details are not available. The perfume in incorporated into household products at approximately 0.1%.

7. PUBLIC EXPOSURE

The notified chemical will enter the public domain as household products containing the notified chemical at a low concentration (approximately 0.001 – 0.005%). Although the public will make dermal and inhalational contact, and possibly eye contact with the notified chemical, exposure is likely to be negligible because of the low concentration of the notified chemical in the products. The potential for public exposure to the notified chemical during transport, reformulation and use of from disposal is assessed as negligible.

8. ENVIRONMENTAL EXPOSURE

Release

The new product is used to prepare perfume blends, which are subsequently blended into soaps, detergents, fabric softeners and other household products. The notifier indicated that these production activities would be performed by a number of different companies. However, it is expected that production activities will take place in purpose constructed facilities, and the notifier made the following estimates in respect of release to the environment during perfume blending and manufacture of the final products.

The notifier indicates that during blending of the perfume mixture, 0.05% of the new chemical is lost through washing out the mixing vessels, and on an annual basis this amounts to a maximum loss of 1.25 kg. The notifier also stated that material released in the plants as a result of equipment washing (and presumably any spillage) is sent with other waste to on site treatment facilities which may include unit operations such as dissolved air flotation and granulated carbon filters. It is stated in the notification that 94% (annually around 1.175 kg) of the new chemical would be removed from the waste water by this treatment and would become incorporated into the solid waste stream and incinerated. The treated waste water - containing the remaining 6% (annually around 75 g) of chemical is presumably discharged to the sewer systems.

The notifier indicates that no liquid waste streams are produced during production of the soap, detergent and other consumer products into which the perfume blend is added, but that around 0.01% of the new chemical (annually 250 g) may be lost as a consequence of steam cleaning the mixing vessels at product changeover. Presumably this would also be sent to the water treatment plant where 94% (annually 235 g) would become incorporated in solid residuals and be incinerated.

No reference to the quantities of chemical likely to be lost and released as a result of accidental spillage was made in the submission. However, it is estimated that 1% of total import quantity could be lost through accident, which amounts to an annual release of around 25 kg. If these spills are cleaned up with water then diverted to wastewater treatment at the manufacturing site where 94% of the chemical is removed and incinerated, an estimated 1.5 kg of chemical could be released from the manufacturing sites to sewage.

It is likely that the empty steel drums would be placed into landfill, and although no estimates of the amount of residual chemical left in the drums was presented in the application, it is estimated that this could amount to 0.05% of the import quantity, or around 1.25 kg per annum which would be placed into landfill.

However, the new chemical is a fragrance enhancer for use in domestic cleaning products, and consequently all will be eventually released into the environment as a result of normal product usage. It is expected that this release would be primarily to the sewage system, although due to the high vapour pressure, much would be expected to quickly volatalise and enter the atmosphere.

Empty containers of the consumer products are likely to contain some residual unused product, and these packages would be discarded with domestic garbage and be disposed of into landfill.

Fate

The notifier provided a laboratory report on the assessment of the biodegradation of Poirenate conducted in accordance with the OECD Test Guideline TG 301D (Closed Bottle Test). The results of this test indicated 13% loss of initial COD of the test material after 28 days, and accordingly Poirenate cannot be classed as readily biodegradable.

All the new chemical will eventually be released into the environment, and the majority could be expected to be discharged into sewerage systems. However, once released in this manner the relatively high vapour pressure indicates significant partitioning into the atmospheric compartment. For the proportion of the chemical which reaches sewage treatment plants (ie is not volatilised or otherwise destroyed during passage to the plant), the notifier presented the results of calculations from the Simple Treat Model (European Commission, 1996b). These estimates were based on the chemical having a calculated Henry's constant of 46 Pa.m^3/mole, a log P_{ow} = 4.0 and being not biodegradable. Results indicated that the chemical would be expected to partition into the air, water and sewer sludge compartments at levels of 28, 34 and 38%, respectively.

Mckay Level 1 calculations from the ASTER database (US Environment Protection Agency, 1998) indicate that when released to the environment, the chemical would partition primarily to the atmosphere. The Mckay model assumes an equilibrium is established between all phases. In the environment an equilibrium state will not be reached as chemical which reaches the atmosphere will be effectively removed from the system (by diffusion into the atmosphere or blown away by wind). The partitioning into the various environmental compartments resulting from this model is –

Atmospheric compartment	94.58%
Soil compartment	1.17%
Sediment compartment	1.09%
Water compartment	3.16%
Aquatic biota compartment	0.00%

Considering the assumptions and approximations inherent in both these estimation models, the differences between the two sets of results cannot be considered surprising or contradictory, and both methodologies indicate significant partitioning to the atmosphere.

Once released to the atmosphere it is considered that the chemical would be rapidly decomposed through photolytically promoted free radical reactions. Hence, over time the sediment/water and water/air partitioning will be driven toward the loss of the chemical to the atmosphere. In the atmosphere it is likely that the substance will be degraded through reaction with hydroxyl radicals (through hydrogen abstraction mechanisms), and a calculation based on OECD methods (Organisation for Economic Co-operation and Development, 1992) indicates that in the troposphere the new chemical would react in this manner with a rate constant estimated as 12.3×10^{-12} cm^3 /molecule/sec. Rate constants of this order are indicative of reasonably quickly degradation (Organisation for Economic Co-operation and Development, 1992), and the compound is not expected to persist in the atmosphere.

The new chemical is hydrophobic in character with $\log P_{ow} = 4.03$, and estimated $\log K_{oc} = 3.02$; consequently when released into the sewer system some may remain associated with the organic component of the particulate matter present in the raw sewage, and eventually become incorporated into sediments. Here it would be slowly degraded through biological and abiotic processes to water, carbon dioxide and methane.

Residual chemical disposed of into landfill with empty drums, discarded consumer packaging or with residual solids derived from water treatment at the production facilities would also be expected to volatalise and enter the atmosphere. However, some chemical may remain adsorbed to soil particles, and in this situation would be expected to be slowly destroyed by similar mechanisms to those operating in sediments. Any waste material containing the notified chemical placed into compost facilities could also be expected to be destroyed through aerobic and anaerobic biological degradation processes. Incineration of the material would produce water vapour and oxides of carbon.

Although the ASTER calculations mentioned above also provide an estimate of 316 for the bioaccumulation factor for the compound in fish (fathead minnow), as it is relatively volatile and hydrophobic the new chemical is not expected to have prolonged residence times in the aquatic compartment, and is consequently not expected to bioaccumulate.

9. EVALUATION OF TOXICOLOGICAL DATA

9.1 Acute Toxicity

Summary of the acute toxicity of Poirenate (approximately 98-99% pure; liquid)

Test	*Species*	*Outcome*	*Reference*
acute oral toxicity	rat	LD_{50} > 5 000 mg/kg	(Allan, 1992a)
acute dermal toxicity	rat	LD_{50} > 2 000 mg/kg	(Allan, 1992b)
acute inhalation toxicity	rat	LC_{50} > 5.4 mg/L	(Jackson, 1994)
skin irritation	rabbit	slight to moderate irritant	(Liggett, 1992a)
eye irritation	rabbit	slight irritant	(Liggett, 1992b)
skin sensitisation	guinea pig	not a sensitiser	(Parcell, 1992)

9.1.1 Oral Toxicity (Allan, 1992a)

Species/strain:	rat/Sprague-Dawley
Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	gavage
Clinical observations:	piloerection and increased salivation were observed in all rats within five minutes of dosing; piloerection persisted and was accompanied at later intervals of day 1 by hunched posture, abnormal gait, lethargy, decreased respiratory rate, dropping of the upper eyelid and pallor of the extremities; recovery of all rats, as judged by external appearance and behaviour, was complete by day 3; body weight gain was not affected by treatment
Mortality:	none

Morphological findings:	none
Test method:	Directive 84/449/EEC (OJ No. L251) Part B Method B.1 (European Economic Community, 1984)
LD_{50}:	> 5 000 mg/kg
Result:	the notified chemical was of very low acute oral toxicity in rats

9.1.2 Dermal Toxicity (Allan, 1992b)

Species/strain:	rat/Sprague-Dawley
Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	the notified chemical, a liquid, was spread evenly over an area of approximately 25 cm^2 and covered with an occlusive dressing for 24 hours
Clinical observations:	no signs; no signs of dermal irritation
Mortality:	none
Morphological findings:	none
Test method:	Directive 84/449/EEC (OJ No. L251) Part B Method B.3 (European Economic Community, 1984)
LD_{50}:	> 2 000 mg/kg
Result:	the notified chemical was of low acute dermal toxicity in rats

9.1.3 Inhalation Toxicity (Jackson, 1994)

Species/strain:	rat/Sprague-Dawley
Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	snout only exposure to (liquid) aerosol (77% within respirable range) for 4 hours

Clinical observations: exaggerated respiratory movements on day 0; food consumption for males of the test group slightly reduced on day 1

Mortality: none

Morphological findings: none

Test method: OECD guideline TG 403 (Organisation for Economic Co-operation and Development, 1995-1996)

LC_{50}: > 5.40 mg/L

Result: the notified chemical was of very low acute inhalation toxicity in rats

9.1.4 Skin Irritation (Liggett, 1992a)

Species/strain: rabbit/New Zealand White

Number/sex of animals: 3/unspecified

Observation period: 12 days

Method of administration: 0.5 mL of the notified chemical applied under a 625 mm^2 gauze pad under occlusive dressing for 4 hours

Test method: Directive 84/449/EEC (OJ No. L251) Part B Method B.4 (European Economic Community, 1984)

Result: very slight erythema with very slight to slight oedema was observed in all three animals; well-defined erythema was seen in one animal on day 3 only; desquamation of the *stratum corneum* (sloughing) was seen in all three animals, in two from day 7 to day 11 and in one on days 10 and 11 only

the notified chemical was a slight to moderate skin irritant in rabbits

9.1.5 Eye Irritation (Liggett, 1992b)

Species/strain: rabbit/New Zealand White

Number/sex of animals: 3/unspecified

Observation period: 7 days

Method of administration: 0.1 mL of the notified chemical into the conjunctival sac of one eye

Test method: Directive 84/449/EEC (OJ No. L251) Part B Method B.5 (European Economic Community, 1984)

Result: no corneal or iridal effects were observed; all rabbits exhibited moderate redness and mild chemosis of the conjunctiva 1 hr post-instillation and slight redness at day 1 which persisted to day 2 in one rabbit; no other effects were seen up to 7 days post-instillation

the notified chemical was slight eye irritant in rabbits

9.1.6 Skin Sensitisation (Parcell, 1992)

Species/strain: guinea pig/Dunkin-Hartley

Number of animals: 20 test; 10 controls

Induction procedure: 3 pairs of intradermal injections in the scapular region as follows:

- Freund's Complete Adjuvant (FCA) diluted 1:1 with water;
- Poirenate, 20% (v/v) in Alembicol D
- Poirenate, 20% (v/v) in FCA and Alembicol D 1:1

six days after the above treatment, topical induction was performed by first treating the area which received the injections with 0.2 mL of 10% (w/w) sodium lauryl sulphate in petrolatum; twenty-four hours later a 8 cm^2 filter paper patch soaked with 0.4 mL Poirenate was applied to this area under occlusive dressing for 48 hours; controls animals were similarly treated but without the notified chemical

Challenge procedure: 14 days after topical induction, sites on the left flank of each test animal were treated with neat Poirenate or a 50% (v/v) solution in Alembicol D under occlusive dressing for 24 hours; control

	animals were similarly treated but without the notified chemical
Challenge outcome:	no erythema or oedema was observed in any test animal on the challenge sites at 24, 48 or 72 hours after patch removal
Test method:	Directive 84/449/EEC (OJ No. L251) Part B Method B.6 (European Economic Community, 1984)
Result:	the notified chemical was not a skin sensitiser in guinea pigs

9.2 Repeated Dose Toxicity (Edwards, 1992)

Species/strain: rat/Charles River Crl:CD SD BR VAF plus

Number/sex of animals: 5/sex/group

Method of administration: poirenate in corn oil was administered by gavage

Dose/Study duration::

control:	0	mg/kg/day	for 28 days
low dose:	15	"	"
mid dose:	150	"	"
high dose:	1 000	"	"

Clinical observations: occasional salivation in mid dose rats; salivation in high dose rats was persistent from day 2

Clinical chemistry/Haematology

clinical chemistry: statistically significant increases in glutamic pyruvic transaminase and glutamic oxaloacetic transaminase in high dose males

haematology: statistically significant decrease in lymphocyte count in high dose males

Organ weights: statistically significant increases in relative liver weights in high dose males and in both absolute and relative liver weights in high dose females; liver weights were significantly higher in low and mid dose females; it was argued that mean values at the low and mid doses were within the historical background range (5% percentile: 10.4 g; 95% percentile: 16.1 g compared to 15.5 g and 15.7 g for low and mid dose females, respectively)

Macroscopic findings: enlarged livers in the majority of high dose animals

Histopathology: minimal hepatocyte enlargement in males and females of the high dose group

Test method: Directive 84/449/EEC (OJ No. L251) Part B Method B.7 (European Economic Community, 1984)

Result: the target organ was identified as the liver; enlarged livers correlated with minimal hepatocyte enlargement and increases in transaminase levels in males at the high dose; these liver changes were judged to be of minor importance and adaptive in nature; the NOEL was judged to be 15 mg/kg/day on the basis of salivation in rats at mid and high dose

9.3 Genotoxicity

9.3.1 *Salmonella typhimurium* Reverse Mutation Assay (Jones & Kitching, 1992)

Strains: TA 1535, TA 1537, TA 1538, TA 98 and TA 100

Concentration range: 0, 1.5, 5, 15, 50 and 150 μg/plate

Test method: OECD guideline TG 471 (Organisation for Economic Co-operation and Development, 1995-1996)

Result: toxicity of the notified chemical was noted at 500 and 5 000 μg/plate so the top dose was reduced to 150 μg/plate for assaying induced mutation; no increase in the number of prototrophic (histidine-independent) back mutants was observed up to the top dose in the presence or absence of metabolic activation provided by Aroclor-induced rat liver microsomal preparations (S9 fraction); negative and positive controls gave the expected responses

9.3.2 Chromosomal Aberrations in Human Lympocytes *in vitro* (Jones et al., 1992)

Cells: lymphocytes from healthy human male donors, stimulated to divide with phytohaemagglutinin (PHA)

Treatment regime: Aroclor 1254-induced rat liver microsomal preparations (S9 fraction) were added to cultures treated for 16 or 24 hours with 0, 50, 200 or 400 µg/mL of the notified chemical; cultures without S9 were treated at 0, 25, 100 or 200 µg/mL for 16 hours; 100 cells were examined per dose level

Test method: OECD guideline TG 473 (Organisation for Economic Co-operation and Development, 1995-1996)

Result: no increase in the number of chromosomal aberrations (either including or excluding gaps) occurred in cultures treated with the notified chemical relative to controls in either the presence or absence of rat liver S9 fraction; positive and negative controls gave the expected responses

9.4 Overall Assessment of Toxicological Data

The notified chemical was of very low acute oral and inhalation toxicity (LD_{50} > 5 000 mg/kg for oral toxicity; LC_{50} > 5.4 mg/L for inhalation toxicity) and of low acute dermal toxicity (LD_{50} > 2 000 mg/kg) in rats. It was a slight to moderate skin irritant and a slight eye irritant in rabbits. No skin sensitisation was observed in guinea pigs when the dose for induction was a minimum of 20%.

The liver was identified as the target organ in a 28-day oral repeat dose study in rats with effects observed at the high dose of 1 000 mg/kg/day. The NOEL was 15 mg/kg/day.

The notified chemical was not mutagenic in bacteria or clastogenic in human lymphocytes *in vitro.*

The notified chemical would be determined to be hazardous according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* in terms of skin irritancy (National Occupational Health and Safety Commission, 1994a), considering the persistent irritant effects seen in the three animals tested.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The notifier provided the following ecotoxicity data in support of their application. The ecotoxicity tests were performed in accordance with OECD Test Guidelines.

Test	***Species***	***Results (Measured)***
Acute Toxicity [OECD 203]	*Oncorhynchus mykiss* (Rainbow trout)	LC_{50}(96 h) = 8.6 mg/L NOEC(96 h) = 6.2 mg/L
Acute Immobilisation [OECD 202]	*Daphnia magna*	EC_{50}(48 h) = 1.1 mg/L NOEC(48 h) = 0.30 mg/L

The tests on rainbow trout were performed using solutions of the test material in a semi-static (renewal) system over a 96 hour period at a controlled temperature of 14°C. The water was removed daily and replaced with fresh water containing the respective concentrations of the test material. Five solutions of the chemical with measured concentrations of 6.2, 12, 26, 42, and 84 mg/L were tested, together with one control. Solution analysis was conducted daily by extraction with dichloromethane followed by gas chromatographic determination of the extracted test chemical.

Ten fish were tested at each concentration, and during these tests the pH of the test solutions was always between 6.8 and 7.1, while dissolved oxygen levels were always between 5.3 and 10.0 mg/L.

The tests results indicate that the material Poirenate is moderately toxic to the rainbow trout with a 96 hour LC_{50} of 8.6 mg/L determined using the method of Thompson and Weil (Thompson & Weil, 1952). The responses listed in the raw data were such that Probit analysis was not possible, but it is likely that the 96 hour LC_{50} would lie between 6.2 and 12 mg/L. Sublethal effects observed during the fish test included loss of equilibrium, lethargy and swimming on the bottom of the test vessels.

The acute immobilisation tests on Daphnia were performed using solutions of the test material in a static non renewal system over a 48 hour period at a controlled temperature of 21°C. Five solutions of the chemical with measured concentrations of 0.30, 0.94, 1.6, 2.9 and 5.9 mg/L were tested, together with one control. Solution analysis was conducted daily by extraction with dichloromethane followed by gas chromatographic determination of the extracted test chemical.

Ten Daphnia were tested at each concentration, with each test performed in duplicate. During these tests the pH of the test solutions was always between 7.1 and 7.6, while dissolved oxygen levels (measured for the control only) were always between 8.4 and 8.6 mg/L. The criteria for deciding on immobilisation was if the animals were unable to swim after gentle agitation of the test vessel. Test results indicate that the material Poirenate is moderately toxic to Daphnia with a 48 hour EC_{50} of 1.1 mg/L determined using the method of Thompson and Weil (Thompson & Weil, 1952). Probit analysis on the raw data confirmed this result (EC_{50} = 1.37 mg/L, with the 95% confidence limits between 1.08 and 1.68 mg/L).

The QASR calculations of the ASTER database (US Environment Protection Agency, 1998) also furnished a predicted LC_{50} = 1.7 mg/L for acute toxicity to Fathead minnow.

The notifier did not provide laboratory reports on the effect of the chemical on Daphnia reproduction or algal growth, since these studies had not been conducted. However, this deficiency was acknowledged and some calculated estimates comparing the Predicted

Environmental Concentration (worst case scenario) with Predicted No Effect Concentration (taken as 1/1000 of the Daphnia EC_{50}) were presented.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The majority of the new chemical is an ingredient of domestic cleaning formulations and most of the material would eventually be released into domestic sewage systems as a consequence of product use. However, due to the volatility of the material, a high proportion is expected to enter the atmosphere and degraded through reactions with hydroxyl radicals.

The ecotoxicity data indicates that the new chemical is moderately toxic to those aquatic species against which it was tested. However, based on annual imports of 2.5 tonne, all of which is eventually released to sewer, the daily release on a nationwide basis is 6.8 kg/day. Assuming a national population of 18 000 000 and that each person contributes an average 150 L/day to overall sewage flows, the predicted concentration in sewage effluent on a nationwide basis is estimated as 2.5 μg/L. When released to receiving waters the concentration is generally understood to be reduced by a further factor of at least 10, and so the Predicted Environmental Concentration is around 0.25μg/L. This is nearly four orders of magnitude less than the demonstrated toxicity to the Daphnia (EC_{50} = 1.1 mg/L), the most sensitive species against which the new chemical was tested.

The chemical is hydrophobic with log P_{ow} = 4.03 which would indicate significant affinity for the organic component of soils and sediments. The Simple Treat and Mckay Level 1 calculations mentioned above also indicate that due to the relatively high vapour pressure much of the chemical would partition into the atmosphere and be destroyed by reactions with hydroxy free radicals. Nevertheless, it is likely that some of the chemical would become bound to soils and sediments, and here is expected to be slowly degraded to water, carbon dioxide and methane through biological processes. These mechanisms would operate to continuously remove the chemical from the environmental compartments, and that overall environmental concentrations would be unlikely to increase with prolonged release of the chemical.

The above considerations indicate minimal hazard to the environment when the new chemical is used as a component of domestic products in the manner indicated by the notifier. However, it should be appreciated that the new compound will be used in perfume formulations with two similar chemicals (these the subjects of NA/634 and NA/635), which will be present in the products at similar levels, and consequently the safety margin for environmental hazard will be reduced by a factor of approximately 10. Algae and chronic Daphnia tests are only available for the chemical addressed in the report on NA/634, and the chronic test shows that chemical (ie NA/634) to be less toxic than the acute result for either the present chemical (NA/633) or that of NA/635.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

On the basis of the submitted toxicological data the notified chemical is unlikely to exhibit acute or subchronic toxicity, is not likely to be a skin sensitiser and is not likely to be genotoxic. However, it may be a slight eye irritant and slight to moderate skin irritant. The notified chemical would be classified as hazardous according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* in terms of skin irritancy (National Occupational Health and Safety Commission, 1994a), based on persistent irritant effects.

The risk of adverse health effects to workers involved in transport and storage is considered to be minimal except in the case of accidental spillage, in which case there may be a risk of eye or skin irritancy. There is a risk of eye or skin irritancy during manual addition of the notified chemical to vessels used for formulating perfume for household products, during sampling for quality control purposes and during system maintenance. The risk of these effects is likely to be highest during addition of the chemical to vessels where it will be undiluted but may be minimal thereafter as the maximum concentration of the chemical in the formulated perfume is stated by the notifier to be 5%. The risk of eye or skin irritancy during automatic packaging is likely to be negligible. The notifier states that workers will use organic solvent resistant gloves, such as butyl rubber gloves, and safety glasses; processes will occur under local exhaust ventilation.

There is a small risk of eye or skin irritancy during manual addition of the perfume formulation to vessels used to blend household products. Once the products are mixed, the risk of irritancy resulting from exposure to the notified chemical is likely to be negligible as it is present in very small amounts. Workers conducting quality control testing, machine maintenance and package filling will be at an equivalent low risk.

Similarly, the public will most likely be exposed to the notified chemical only through contact with household products containing it. The risk of eye or skin irritancy in these circumstances is negligible.

13. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 1994b).

This MSDS was provided by the applicant as part of the notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

14. RECOMMENDATIONS

To minimise occupational exposure to the notified chemical the following guidelines and precautions should be observed:

- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992);

- Industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987);

- Impermeable gloves should conform to AS/NZS 2161.2 (Standards Australia/Standards New Zealand, 1998);

- All occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994);

- Spillage of the notified chemical should be avoided. Spillage should be cleaned up promptly with absorbents which should then be put into containers for disposal;

- Good personal hygiene should be practised to minimise the potential for ingestion;

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

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, secondary notification of the notified chemical shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. If annual imports of the notified chemical exceed 10 tonnes, then full test results and reports on the effects of the chemical on Daphnia reproduction and on the inhibition of algal growth will be required.

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