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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Amber Core

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Amber Core

1. APPLICANT

Kao (Australia) Manufacturing Pty Ltd of 32 Walker Street NORTH SYDNEY NSW 2060 has submitted a standard notification statement in support of their application for an assessment certificate for Amber Core.

2. IDENTITY OF THE CHEMICAL

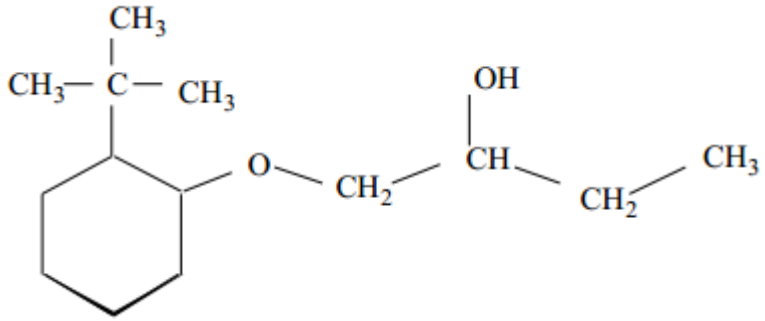
Chemical Name: 2-butanol, 1-[[2-(1,1-dimethylethyl)cyclohexyl]oxy]

Chemical Abstracts Service (CAS) Registry No.: 139504-68-0

Trade Name: Amber Core (P-#620)

Molecular Formula: $C_{14}H_{28}O_2$

Structural Formula:



Molecular Weight: 228.4

Method of Detection and Determination: Ultra Violet (UV), Infrared (IR), Nuclear Magnetic Resonance (NMR), Mass spectrum, Gas Liquid Chromatography (GLC)

Spectral Data:	UV, IR, NMR, Mass spectrum and GLC data were provided for the characterisation and identification of the notified chemical

Comments on chemical identity

The notified chemical is a well-defined simple hydroxy ether containing a cyclohexyl moiety. The primary impurity, which may be present at concentrations up to 14%, is 2-(2-tert-butyl cyclohexyloxy)-1 butanol, which is presumably formed in side reactions during synthesis of the notified chemical. The new chemical also contains up to 1% of an unidentified impurity.

The notifier provided comprehensive spectroscopic data such as infra red, UV/visible, NMR and mass spectroscopy of the new chemical, to identify the notified chemical. A GLC also accompanied the notification.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	clear colourless non-viscous liquid
Boiling Point:	270 - 283°C (Howes DA, 1992)
Specific Gravity:	0.934 at 20°C (Howes DA, 1992)
Vapour Pressure:	0.00619 kPa at 25°C (Howes DA, 1992)
Water Solubility:	45.7 mg/L at 20°C (Howes DA, 1992)
Henry's Law Constant:	30.7 $Pa.m^{-3}$/mole
Partition Co-efficient (n-octanol/water):	log P_{ow} = > 3.2 (Howes DA, 1992)
Hydrolysis as a Function of pH:	$T_{1/2}$ at pH 4.0 = 9 days at 25°C $T_{1/2}$ at pH 7.0 = 27 days at 25°C $T_{1/2}$ at pH 9.0 = 25 days at 25°C (Howes DA, 1992)
Adsorption/Desorption:	Log K_{oc} = 1.8 (see comment below)
Dissociation Constant:	not determined (see comment below)
Flash Point:	132°C (Howes DA, 1992)
Flammability:	non-flammable (Howes DA, 1992)

Autoignition Temperature:	not determined (Howes DA, 1992)
Explosive Properties:	non-explosive (Howes DA, 1992)
Reactivity/Stability:	not determined
Surface Tension:	54.0mN/m at 24°C (Howes DA, 1992)
Fat Solubility:	miscible with Standard Fat HB 307 at 37°C (Howes DA, 1992)

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 1, 2 and 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. There was little difference between the results for those solutions prepared by stirring for 1, 2 or 3 days prior to equilibration (solubility at 20°C was determined as 47.6, 44.9 and 47.6 mg/L, respectively), which indicates that the reported solubility is reliable. The combined recovery of chemical into the aqueous and non-aqueous phases was in excess of 95%.

The Henry's Law constant was determined from the molecular weight, measured vapour pressure and water solubility using the equation: H = MW (g/mole) x Vapour pressure (Pa)/Water solubility (g/L).

The degree of hydrolysis was determined at 50°C at pH 4, 7 and 9 over a 5-day test period. After 2.4 hours, the degree of hydrolysis was 8.6%, 10.7% and 5.1% respectively. After 5 days, the degree of hydrolysis was 40.4%, 50.4% and 45.4%, respectively. These results indicate a half-life of the notified chemical between one day and one year, under ambient environmental conditions. A second laboratory test report on hydrolysis accompanied the submission, investigating the temperature dependence of the degradation rate. The results from this study determine the half-life for hydrolysis at 25°C as 9 days at pH 4, 27 days at pH 7 and 25 days at pH 9. Again, the analysis was conducted using gas chromatography. While the compound contains no readily hydrolysable functionalities, it is probable that the observed degradation involved hydrolytic cleavage of the ether linkage.

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 reasonably high affinity for hydrocarbon like environments. Mass balance calculations on the quantities of new chemical partitioned into the n-octanol and water phases gave recovery of 101%. This indicates that the method used was appropriate for this determination.

Although an experimental test report was submitted, the adsorption coefficient K_{oc} at 25°C could not be determined using gas chromatography due to poor detection of the compound using the available UV detection system. Instead the value of K_{oc} was estimated from the molecular structure using a computer program (Syracuse Research Corp.). This furnished an estimated value for K_{oc} of 63.1. The corresponding value for Log K_{oc} is 1.8 and indicates that the chemical would probably not bind strongly to the organic component of soils and sediments.

The compound contains no functionalities capable of readily dissociating in aqueous media. The notifier indicated that dissociation constant data are not applicable. This justification was accepted.

The new chemical is completely miscible in fat at 37°C (Howes DA, 1992), which is in accord with the predominantly hydrocarbon nature of the material, and the relatively high value for Log P_{ow}.

The material is marginally surface active, and the surface tension (European Economic Community (EEC), 1992) of an aqueous solution containing a concentration of the test substance of approximately 90% saturation, was 54.0 mN/m at 24°C (water = 71.75 mN/m).

Calculations based on the molecular structure using the quantitative structure activity relationships (QSAR) of the US Environment Protection Agency ASTER database (US Environment Protection Agency, 1998) furnished the following estimates for environmentally relevant physico-chemical parameters. There is a significant difference between the measured and predicted vapour pressure. This is reflected in the significant difference between the experimentally determined Henry's Law constant and that estimated by the QSAR model. Similarly, there is a significant difference between the measured rate of hydrolytic breakdown and that predicted by the ASTER model.

ASTER DATA (all calculated)

Property	*QSAR estimate*
Boiling Point:	289 °C
Vapour Pressure:	0.000373 mm of Hg (0.05 Pa)
Water Solubility:	18.5 mg/L
Henry's Constant:	0.62 $Pa.m^3$/mole
Log K_{ow}:	3.97
Log K_{oc}:	3.50
Hydrolytic degradation half life:	hydrolysis is unlikely.

4. PURITY OF THE CHEMICAL

Degree of Purity: 89% (85% - 100% range)

Impurities: 2-(2-tert-butyl cyclohexyloxy)-1-butanol – 14%
unknown component – 1%

Additives/Adjuvants: none

5. USE, VOLUME AND FORMULATION

The notified chemical, Amber Core, will not be manufactured in Australia. It will be imported and reformulated for use as a fragrance enhancer. The formulated fragrance enhancer containing between 5 and 15% is subsequently blended and incorporated into household, toiletry and cosmetic products. The end use concentration of Amber core will be between 0.04% to 0.23%.

Import volumes for Amber Core are as follows:

Year	*Amber Core in tonnes*
1	1.0
2	1.5
3	2.0
4	2.5
5	3.0

6. OCCUPATIONAL EXPOSURE

The notified chemical, Amber Core, will be imported in 30 and 200 L lacquered steel drums by shipment or air. Following importation, the notified chemical will be distributed to detergent, toiletries and cosmetic manufacturers for reformulation. The notified chemical will be reformulated together with other ingredients for use as a fragrance enhancer. The reformulated fragrance enhancer containing between 5 and 15% is subsequently blended into products such as soap, shampoo, detergent, fabric softener and other domestic products.

Waterside workers will unload the steel container containing the notified chemical and a forklift driver will move the containers into the storage area. Waterside and transport workers would not be exposed to the notified chemical under normal circumstances, as they will be handling only the closed containers of the notified chemical.

Frangrance enhancer formulation
The notified chemical will be compounded with other ingredients to produce a mixture for use as a fragrance enhancer. The notified chemical is weighed and charged to the mixing vessels either by manual or automated process. The notifier indicates that during manual blending,

one worker would be involved and may be exposed to the notified chemical for 2 to 3 minutes/day. The blending process is carried out in batch sizes of 25, 50, 100, 500 and 1000 kg. Three quality control personnel will be involved in checking the quality of the chemical, by sampling, analysis and odour evaluation. Quality control personnel will handle the notified chemical for 2 to 3 minutes/day/person or a total of 6 to 9 minutes/day for one person. After blending, the reformulated product is discharged into containers using an automated process. Workers are to wear butyl rubber gloves, protective clothing and safety glasses when handling the product containing the notified chemical during this process. Local exhaust ventilation is used in the reformulation area to control exposure to the notified chemical.

Blending into end-use products

The notifier states that the reformulated fragrance enhancer will be blended into other inngredients to form the final product. A single worker adds the reformulated enhancer directly to the mixing vessel. Discharge from the mixing vessel and final packing may be carried out using automated or manual processing depending on the nature of the end use product. The notifier provided no other details on the mechanisms involved in the incorporation of the reformulated fragrance enhancer to the end use products. Workers are to wear butyl or rubber gloves, protective clothing and safety glasses when manually adding the reformulated perfume enhancer into the mixing vessel. Personal protective equipment should also be worn during packaging, depending on the nature of the end-use product. Local exhaust ventilation is used in the product manufacturing area to control exposure to the notified chemical.

7. PUBLIC EXPOSURE

The notified chemical will enter the public domain at a low concentration (approximately 0.04 – 0.23%) in household products. Although the public will make dermal and inhalation 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 or from disposal is assessed as negligible.

8. ENVIRONMENTAL EXPOSURE

Release

The new product is used to prepare perfume blends, which would typically contain between 5 and 15% of the new chemical. These perfume mixes are subsequently blended into soaps, detergents, fabric softeners and other household products, which may contain between 0.04 and 0.23% of the chemical. The notifier indicates that these production activities will be performed by a number of different companies. However, it is expected that production will takes 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, only 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 only 1.5 kg. It was also stated that material released in the formulating 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 1.41 kg) of the new chemical would be removed from the wastewater by this treatment and would become incorporated into the solid waste stream then incinerated. The treated wastewater containing the remaining 6% (annually around 90 g) of chemical is presumably discharged to the sewerage systems.

The notification statement indicates that no liquid waste streams are produced during production of the soap, detergent and other consumer products containing the perfume blend. However, approximately 0.01% of the new chemical (annually 300 g) may be lost during steam cleaning the mixing vessels at product changeover. Presumably this would also be sent to the water treatment plant where the estimated 94% (annually 280 g) would become incorporated in solid residuals and 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 amounting to an annual release of between 25-30 kg, could be lost through accident. If these spills are cleaned up with water and diverted to wastewater treatment at the manufacturing site, again an estimated 94% (1.8 kg) of chemical could be released to the sewer.

The notifier states that the empty steel drums of the imported chemical will be sent for recycling. However, it is possible that the empty containers will be consigned to landfill. 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 approximately 1.5 kg per annum.

The new chemical is a fragrance enhancer for use in domestic cleaning products, so all will eventually be released into the environment following normal product use. However, it is expected that this will be release primarily to the sewerage system. Due to the appreciable volatility of the notified chemical, a proportion of it would also be expected to enter the atmosphere.

Empty containers of the consumer products are likely to contain some residual unused product. These packages will be disposed of via domestic garbage to landfill.

Fate

The notifier provided a laboratory report on the assessment of the biodegradation of Amber Core conducted in accordance with the OECD Test Guideline TG 301C (Tobeta Y, 1992).

Results indicated 5% loss of initial chemical oxygen demand (COD) of the test material after 28 days, and accordingly, Amber Core cannot be classified as readily biodegradable.

The new chemical will eventually be released into the environment, and the majority is expected to be discharged into sewerage systems. However, once released in this manner, the notified chemical will slowly volatilise and a fraction will partition in the atmosphere. For the proportion of the chemical which reaches sewage treatment plants (ie not volatilised or otherwise destroyed during passage to the plant), the notifier presented estimates from the SimpleTreat Model (European Commission, 1996). These were based on the chemical having a calculated Henry's Law constant of 30.7 Pa.m^3/mole, Log P_{ow} = 3.2 and being not biodegradable. Results indicated that the chemical would be expected to partition in air, water and sewer sludge compartments at 44, 50 and 6%, respectively.

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

Atmospheric compartment	8.05%
Soil compartment	27.93%
Sediment compartment	26.07%
Water compartment	37.88%
Aquatic biota compartment	0.02%

Considering the assumptions and approximations inherent in both models, particularly in respect of the significantly different Henry's Law constant and partition coefficient used in each model, the differences between the two sets of results are not surprising. If higher values of Log P_{ow} were used in the SimpleTreat Model, a lower proportion partitioning to the atmosphere would be predicted.

Once released to the atmosphere it is considered that the chemical would be quickly 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). A calculation based on OECD methods (Organisation for Economic Cooperation and Development, 1992) indicates that in the troposphere the new chemical would react in this manner, with an estimated rate constant of 46.85 x 10^{-12} cm^3/molecule/sec. Rate constants of this order are

indicative of reasonably fast degradation (Organisation for Economic Cooperation and Development, 1992), and the compound is not expected to persist in the atmosphere.

The new chemical is hydrophobic with Log P_{ow} >3.2, and estimated Log K_{oc}=1.8; consequently when released into the sewerage 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 to landfill within empty drums, discarded consumer packaging or within residual solids derived from water treatment at the production facilities, would also be expected to volatilise and enter the atmosphere. However, some chemical may remain adsorbed to soil particles, and 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 is also expected to be destroyed through aerobic and anaerobic biological degradation processes. Incineration of the material will produce water vapour and oxides of carbon.

The ASTER calculations mentioned above provide an estimate of 543 for the bioaccumulation factor for the compound in fish (fathead minnow). However, as the chemical is relatively volatile and hydrophobic, it is not expected to have either prolonged residence times in the aquatic compartment or to bioaccumulate.

9. EVALUATION OF TOXICOLOGICAL DATA

9.1 Acute Toxicity

Summary of the acute toxicity of Amber Core (containing approximately 89-99% pure; liquid).

Test	*Species*	*Outcome*	*Reference*
acute oral toxicity	rat	> 2 000 mg/kg	(Chida T, 1992)
acute dermal toxicity	rat	> 2 000 mg/kg	(Allan SA, 1992)
skin irritation	rabbit	slight irritant	(Liggett MP, 1992b)
eye irritation	rabbit	slight to moderate irritant	(Liggett MP, 1992a)
skin sensitisation	guinea pig	non-sensitiser	(Parcell BI, 1992)

9.1.1 Oral Toxicity (Chida T, 1992)

Species/strain:	rats/Sprague-Dawley
Number/sex of animals:	5/sex
Dose:	2 000 mg/kg
Observation period:	14 days
Method of administration:	10 mL/kg of test substance in 0.5% Tween 80, in 0.5% carboxymethylcellulose (CMC)-sodium aqueous solution by gavage
Test method:	Japanese Ministry of Health and Welfare (Japanese Ministry of Health and Welfare, 1989)
Clinical observations:	no signs of systemic toxicity
Mortality:	nil
Morphological findings:	none
LD_{50}:	> 2 000 mg/kg
Result:	the notified chemical was of very low acute oral toxicity in rats

9.1.2 Dermal Toxicity (Allan SA, 1992)

Species/strain:	rat/Sprague-Dawley Crl.CD (SD) BR VAF
Number/sex of animals:	5/sex
Observation period:	14 days
Dose:	2 000 mg/kg
Method of administration:	2.14 mL/kg of test substance administered as supplied and held under occlusive dressing; after 24 hours, the treated area was washed with warm water and blotted dry with absorbent paper.
Test method:	EEC Directive 84/449/EEC, Annex V, Method B3 (European Economic Community (EEC), 1993a)

Clinical observations:	no signs of systemic toxicity
Mortality:	nil
Morphological findings:	none
Dermal irritation:	no dermal irritation was observed in any animal tested
LD_{50}:	> 2 000 mg/kg
Result:	the notified chemical was of low dermal toxicity in rats

9.1.3 Inhalation Toxicity

Study not conducted.

9.1.4 Skin Irritation (Liggett MP, 1992b)

Species/strain:	rabbit/New Zealand white
Number/sex of animals:	3/male
Observation period:	5 days
Method of administration:	0.5 mL of test substance as supplied was applied to the shaved test site and held under semi-occlusive dressing; after 4 hours residual test substance was removed by washing the treatment site with warm water; test sites were examined for evidence of irritation and graded at approximately 30 minutes, and 24, 48 and 72 hours after treatment; additional reading were done on day 5
Test method:	EEC Directive 84/449/EEC, Annex V, Method B4 (European Economic Community (EEC), 1993b)

Draize scores (Draize, 1959):

	Animal #		
Time after treatment (hours)	***1***	***2***	***3***
Erythema[(1)]			
30 minutes	2	1	2
24	1	1[A]	1
48	1	1[A]	1[A]
72	1	1[A]	1[A]
96	0	0	0
Oedema			
30 minutes	1	1	1
24	1	0	0
48	0	0	0
72	0	0	0
96	0	0	0

[(1)] see Attachment 1 for Draize scales
[A] dryness and sloughing of the epidermis

Skin Irritation: very slight to well defined erythema with or without slight oedema were observed in all animals; dryness and sloughing of the epidermis was observed in two animals between 24 and 72 hours; skin reactions appeared normal by 96 hours

Result: the notified chemical was slightly irritating to the skin of rabbits

9.1.5 Eye Irritation (Liggett MP, 1992a)

Species/strain: rabbit/New Zealand White

Number/sex of animals: 3/female

Observation period: 7 days

Method of administration: 0.1 mL of test substance was instilled into the lower everted lid of one eye of each animal and eyelids were held together for one second; the other eye served as the control; treated eyes were examined for irritation and graded after 1, 24, 48

and 72 hours, and 4 and 7 days after instillation

Test method: EEC Directive 84/449/EEC, Part B, Method B5 (European Economic Community (EEC), 1993d)

Draize scores (Draize, 1959) of unirrigated eyes:

	Time after instillation											
Animal	***1 hour***		***1 day***		***2 days***		***3 days***		***4 days***		***7 days***	
Cornea[1]	***o***		***o***		***o***		***o***		***o***		***o***	
1	D		1		1		1		0		0	
2	D		1		2		2		1		0	
3	D		1		1		1		1		0	
Iris												
1	0		0		0		0		0		0	
2	0		0		0		0		0		0	
3	0		0		0		0		0		0	
Conjunctiva	***r***	***c***	***r***	***c***	***r***	***c***	***r***	***c***	***r***	***c***	***r***	***c***
1	2	1	2	1	1	0	1	0	0	0	0	0
2	2	1	1	0	1	1	1	1	0	0	0	0
3	2	1	1	0	1	0	1	0	0	0	0	0

[1] see Attachment 1 for Draize scales
o = opacity r = redness c = chemosis D = dulling of the cornea

Unirrigated eyes: dulling of the cornea was observed in all animals one hour after instillation; corneal opacity developed on day 1 and persisted to day 4 in two animals; corneal effects returned to normal by day 7 in all animals

no iridal inflammation was observed

diffuse crimson colour of the conjunctiva with or without swelling was observed in all animals; conjunctival effects returned to normal by day 4

Result: the notified chemical was slight to moderate irritant to the eyes of rabbits

9.1.6 Skin Sensitisation (Parcell BI, 1992)

Species/strain:	guniea pig/Dunkin Hartley
Number of animals:	30/females: 20 tests and 10 controls
Test method:	EEC Directive 84/449/EEC, Part B, Method B6 (European Economic Community (EEC), 1993c)
Induction procedure:	
test group: day 0	*Intradermal induction* 1.1mL of the following solutions were injected in 3 pairs on the scapular region of 20 animals: a) Freunds Complete Adjuvant (FCA) and distilled water (50:50) b) 20% (v/v) test substance in Alembicol D c) 20% (v/v) test substance in 50:50 FCA and Alembicol D injection sites were examined at 24 and 72 hours after injection
day 7	*Topical induction* preliminary investigation indicated that the maximum concentration of the test substance as supplied did not produce skin irritation, therefore, the injection sites were pre-treated with sodium lauryl sulphate in petrolatum before the test substance was applied 1.2 mL of 10% sodium lauryl sulphate in petrolatum was gently rubbed on the previously injected scapular region of 20 animals; after 24 hours, the filter paper containing 0.4 mL of the test substance, as supplied, was held in place by an occlusive dressing for 48 hours treated sites were examined at 0, 24 and 48 hours after topical application
control group: day 0	*Intradermal injection* intradermal injection was performed using similar procedure as for the test animals but without the test substance

Topical application

day 7 — topical application followed the same procedure as for test animals except that test substance was not applied to the intradermal injection sites

Challenge procedure:

day 21 — 0.2 ml of test substance, as supplied, and 50% (v/v) test substance in Alembicol D were applied on the anterior and posterior site on a flank of each treated animal, respectively; the filter paper containing the test substance was held in place by occlusive dressing for 24 hours; test sites were examined at 24, 48 and 72 hours after test substance application

Challenge outcome:

	Test animals			***Control animals***		
Challenge concentration	***24 hours****	***48 hours***	***72 hours***	***24 hours***	***48 hours***	***72 hours***
As supplied	**0/20	0/20	0/20	0/10	0/10	0/10
50%	0/20	0/20	0/20	0/10	0/10	0/10

* time after patch removal
** number of animals exhibiting positive response

Result: the notified chemical was not a skin sensitiser to the skin of guinea pigs

9.2 Repeated Dose Toxicity (Takahashi K, 1992)

Species/strain: rat/Sprague-Dawley Crj.CD (SD)

Number/sex of animals: test group: 6/sex/group
control group: 6/sex
recovery group: 6/sex

Method of administration: gavage

Dose/Study duration:

Test:	1 mL of test substance at 20, 140 and 1 000 mg/kg/day in 0.5% Tween 80 in 0.5% CMC-sodium aqueous solution for 28 days
Low dose:	20 mg/kg/day
Mid dose:	140 mg/kg/day
High dose:	1 000 mg/kg/day
Control:	1 mL of 0.5% Tween 80 in 0.5% CMC-sodium aqueous solution
Recovery group (test):	1 mL of test substance at 1 000mg/kg/day in 0.5% Tween 80 in 0.5% CMC-sodium aqueous solution
Recovery group (control):	1 mL of 0.5% Tween 80 in 0.5% CMC-sodium aqueous solution
	recovery group animals were kept for 14 day recovery period following termination of treatment

Test method: The Japanese Guidelines applied to Industrial Chemicals in Japan (JGAIC, 1986)

Mortality: nil

Clinical observations:

Test group:	all animals in all groups showed increased in body weights, food consumption and water consumption similar to the control and recovery groups
mid dose:	salivation was observed in one male on and after 22 days of treatment and in one female on and after 24 days of treatment; salivation disappeared within 40 minutes
high dose:	salivation in both sexes on and after 5 days of treatment

Recovery group: no salivation was observed in the test or control group

Haematology

Test group:

high dose: in males, increased in platelet counts and decreased in haemoglobin concentration, mean corpuscular haemoglobin concentration and prothrombin time were observed; in females, leukocyte count was increased

Recovery test group: in males, platelet and reticulocyte counts were increased while in females, hemoglobin concentration and leukocyte counts were decreased

the various changes in the haematological parameters tested on animals of the treated and control groups did not exceed the range of historical data for the testing laboratory and therefore the above changes were considered to be of minor toxicological importance

Clinical chemistry:

Test group:

low dose: in females, increased albumin and decreased chloride was observed

high dose: in males, decreased aspartate amino transferase (AST) and albumin globulin ratio were observed

in females, decreased glucose and chloride, and increased total protein and albumin were observed

in both sexes, increased γ-glutamyl-p-nitroanilide substrate, total cholesterol and calcium were observed

Recovery test group: in females, decreased alkaline phosphatase (ALP) and albumin globulin ratio, and increased total cholesterol were observed

the decrease in AST in males in high dose test

group and the decrease in ALP in females in high dose recovery group were not dose-related and therefore considered to be not related to liver injury and of minor toxicological importance

Urinalysis:

Test group:	
mid dose:	in females, increase in potassium was observed
high dose:	in females, increased potassium was observed, while in males, decreased ketone was observed
	in both sexes, increased urine volume and decreased urobilinogen and specific gravity were observed
Recovery test group:	acidification of urine and decreased protein in males were observed; in females the changes in pH and ketone were not considered significant since these changes were not dose-related

Organ Weights:

Test group:	
high dose:	both absolute and relative liver weights were increased in both sexes
Recovery test group:	relative liver weight was increased in both sexes, and absolute and relative kidney weights were increased in males

Gross pathology:

Test group:	
mid-dose:	renal discolouration was observed in two males
high dose:	renal doscolouration was observed in all males; brownish colouration of the liver were observed in all males and in four females
Recovery test group:	renal discolouration was observed in one male

Histopathology:

Test group:

low dose: slight effects on the renal tubular epithelium including hyaline droplets was observed in all treated males

mid dose: moderate renal tubular effects were observed including various sized hyaline droplets in the cytoplasm and widespread lesions of the renal tubular epithelium; basophilic change in the cortex of the renal tubular epithelium was also found in one animal

high dose: in males, bile pigments in hepatocyte and connective tissue, bile plugs in interlobular bile duct, and inflammation of the bile duct (cholangitis) consisting mainly of lymphocytic infiltration were found; moderate renal tubular effects were observed including various sized hyaline droplets in the cytoplasm and widespread lesions of the renal tubular epithelium; basophilic change in the cortex of the renal tubular epithelium, accompanied by mitosis was found in two animals

diffuse hypertrophy of hepatocytes with eosinophilic and granular cytoplasm was found in both sexes

Control group: slight effects on the renal tubular epithelium including hyaline droplets was observed in all control males

Recovery test group: the cytoplasm of the renal tubular epithelium was filled with various sized hyaline droplets and widespread lesions; bile pigments in connective tissue, bile plugs in interlobular bile duct, and inflammation of the bile duct (cholangitis) with a tendency to recover were found at the end of the recovery period; basophilic change similar to those observed in the high dose test group were found at the end of the recovery period

Result:

There were no deaths observed in all groups. Body weight and, food and water consumption of all dose groups were increased in a similar fashion to control and recovery groups.

Histological examination of the kidney, revealed hyaline droplets of various sizes in male animals in all groups. However, hyaline droplets in renal tubular epithelium may occur spontaneously in male rats but not in females or other species. In the control and low dose groups, slight changes in the renal tubular epithelium were found while moderate changes were observed in mid and high dose groups. The changes in the mid and high dose groups were considered to be treatment related, although of minor toxicological importance, since the changes had tended to return to normal after treatment. The basophilic change of the renal tubular epithelium, accompanied by mitosis, found at the end of the treatment and recovery periods, and the increase in kidney weight at the end of the recovery period, were considered to be a regenerative response.

The histological findings in the liver in the high dose males suggested intrahepatic failure of bile flow (cholestasis) and were believed to be secondary effect resulting from inflammation of the bile duct (cholangitis). These findings diminished during the recovery period but persisted until the end. γ - GTP and total cholesterol were also increased in both sexes of the high dose group. γ - GTP may be increased following obstruction of bile ducts and also an induction of liver enzymes. Therefore, the increase in γ - GTP may be related to an induction of liver enzymes.

The decrease in specific gravity, ketone and urobilinogen found in the urine of high dose animals were considered to be associated with the increase in water consumption needed to excrete the large amount of test substance. Urinary potassium was also increased in mid and high dose females but not males. This increase in potassium was not observed in the serum. The effect was related to the increase in urine volume.

The various changes in the haematological parameters found at the end of the treatment were considered of minor importance since they were within the range of historical controls.

Salivation was observed in both sexes in high-dose group and in one male of the mid-dose group. This was considered to be related to reflex reaction to stimulation during test substance administration since it occurred just before and after test substance administration.

The No Observed Effect Level (NOEL) was concluded to be 20 mg/kg based on the salivation and hyaline droplets in the renal tubular epithelium observed at 140 mg/kg and 1 000 mg/kg, and hepatocyte hypertrophy, inflammation of the bile ducts and stasis of bile flow observed at 1 000 mg/kg.

9.3 Genotoxicity

9.3.1 *Salmonella typhimurium* Reverse Mutation Assay (Nishitomi T, 1992a)

Strains:	*Salmonella typhimurium* TA1535, TA1537, TA100, TA 98 and *Escherichia coli* WP2 *uvr*A
Metabolic activation system:	liver microsomal fraction S9 from rats pretreated with Phenobarbital (PB) and 5,6-benzoflavone (BF)
Experimetal design:	mutation assay was performed twice on the same bacterial strains (*S. typhimurium* and *E coli*) using the following concentrations: *without metabolic activation S9:* *S. typhimurium* treated with 2.4. 4.9, 9.8, 20, 39, 78 and 156 µg test substance/plate vehicle control: dimethylsulfoxide (DMSO) positive controls:2-(2-furyl) -3-(5-nitro-2-furyl) acrylamide (AF-2) Sodium azide (NaN3) 9 – Aminoacridine (9AA) *E coli* treated with 313, 625, 1 250, 2 500 and 5 000 µg test substance/plate vehicle control: DMSO positive control: N-ethyl-N'-nitro-N-nitrosoguanidine (ENNG) *with metabolic activation S9:* S9; *S. typhimurium* treated with 4.9, 9.8, 20, 39, 78, 156, 313, 625, 1 250 µg test substance/plate vehicle control: DMSO positive controls: Benzo [*a*] pyrene (BP) 2-Aminoanthracene (2-AA) *E coli* treated with 313, 625, 1 250, 2 500 and 5 000 µg test substance/plate vehicle control: DMSO

	positive control: 2-AA
Test method:	similar to OECD guideline TG 471 and TG 472 (Organisation for Economic Cooperation and Development, 1983c), (Organisation for Economic Cooperation and Development, 1983a)
Comment:	control plates in each test (untreated and vehicle) produced revertant colonies within the normal range of the testing laboratory background positive control, with or without metabolic activation in each test, produced marked increases in the number of revertant colonies the test substance in each test exhibited toxicity at higher doses in the absence and presence of metabolic activation; no increases in the number of revertant colonies on plates containing the test substance compared to the control plates were observed for any of the bacterial strains at any dose with or without metabolic activation
Result:	the notified chemical was considered to be non-mutagenic in the bacterial strains tested either with or without metabolic activation

9.3.2 Chromosome Aberration Assay in Chinese Hamster Lung (CHL) cells (Nishitomi T, 1992b)

Species/strain:	CHL/IU
Metabolic activation system:	liver microsomal fraction (S9) from rats pretreated with PB and BF
Test method:	similar to OECD guideline TG 473 (Organisation for Economic Cooperation and Development, 1983b)

Experimental design:

experiment 1 (cytotoxicity test):	duplicate cultures were used for each dose level
	direct assay
24-hour harvest:	24-hour continuous exposure to 40, 60, 80, 100, 120 and 140 µg/ml of test substance prior to cell harvest
48-hour harvest	48-hour continuous exposure to 20, 40, 60, 80, 100 and 120 µg/ml of test substance prior to cell harvest
vehicle control:	DMSO
positive control:	Mitomycin C (MMC)
	metabolic activation assay
without metabolic activation:	6-hour continuous exposure to 40, 60, 80, 100, 120 and 140 µg/ml of test substance followed by a treatment-free incubation period of 18 hours prior to cell harvest
with metabolic activation:	6-hour continuous exposure to 62.5, 125, 250, 500 and 1 000 µg/ml of the test substance and S9-mix followed
positive control:	BP
experiment 2 (chromosomal aberration test):	duplicate cultures were used for each dose level
	direct assay
24-hour harvest:	24-hour continuous exposure to 25, 50 and 100 µg/ml of the test substance prior to cell harvest
48-hour harvest:	48-hour continuous exposure to 22.5, 45 and 90 µg/ml of the test substance prior to cell harvest
vehicle control:	DMSO

positive control:	MMC - 0.03 µg/ml
	metabolic activation assay
without metabolic activation:	6-hour continuous exposure to 25, 50 and 100 µg/ml of test substance followed by a treatment-free incubation period of 18 hours prior to cell harvest
with metabolic activation:	6-hour continuous exposure to 175, 350 and 700 µg/ml of the test substance and S9-mix followed by a treatment-free incubation period of 18 hours prior to cell harvest
	due to cell toxicity observed at the maximum dose level (700 µg/ml) on experiment 1, two dose levels of 650 and 700 µg/ml were used in experiment 2
positive control:	BP – 20 µg/ml

Comment:

experiment 1 (cytotoxicity test):	*direct assay*
24 and 48-hour harvest:	50% inhibitory dose for cell growth at 24 and 48-hour harvest was determined to be 84 and 85 µg/ml, respectively
	metabolic activation assay
with and without metabolic activation:	50% inhibitory dose for cell growth with and without metabolic activation was determined to be 93 and 632 µg/ml, respectively
experiment 2 (chromosomal aberration test):	
	direct assay
24 and 48-hour harvest:	no dose-related increases in the frequency of chromosomal aberrations were observed at any dose tested

		metabolic activation assay
	with and without metabolic activation:	no dose-related increases in the frequency of chromosomal aberrations were observed at any dose tested with or without metabolic activation S9; the required number of metaphases was not achieved at a maximum dose level of 700 µg/ml in experiment 1, therefore dose levels of 650 and 700 µg/ml were used in experiment 2
	vehicle control:	cultures produced chromosomal aberrations within the expected range (≤ 1%)
	positive controls:	both positive controls produced significant increases in the frequency of chromosomal aberrations
Result:		the test substance did not induce significant increases in the frequency of chromosomal aberrations or in the number of polyploid cells in CHL cells with or without metabolic activation provided by rat liver S9 fraction; the test substance is non-clastogenic to CHL cells *in vitro*

9.4 Overall Assessment of Toxicological Data

No inhalation studies have been performed on the notified chemical. The notifier made a claim for variation on the schedule data requirements for an acute inhalation study, since the notified chemical is in the form of a very slightly volatile liquid, (vapour pressure 0.00619 kPa at 25°C), hence inhalation exposure is anticipated to be low. The claim for variation was accepted on the basis of this reasoning.

Amber Core exhibited very low acute oral toxicity and low acute dermal toxicity in rats with LD_{50} of > 2 000 for both administration routes. It is a slight skin irritant and slight to moderate eye irritant in rabbits. The eye irritant study showed: slight to moderate corneal effects; slight to moderate conjunctival redness; slight conjunctival chemosis and no iris inflammation. The corneal opacity persisted up to 4 days in 2 animals. The skin irritant study showed slight to moderate erythema, which persisted up to 72 hours. However, the Draize scores (Draize, 1959) did not warrant the classification of the notified chemical as an eye or skin irritant according to the NOHSC Approved Criteria for Classifying Hazardous Substance (National Occupational Health and Safety Commission, 1994a). The notified chemical was not a skin sensitiser in guinea pigs.

Repeated oral administration of Amber Core to rats over a 28-day period suggests that the

kidney and liver may be target organs. Histological examination of the kidneys of mid-dose and high-dose treated males showed a moderate occurrence of hyaline droplets in the renal tubular epithelium, compared with a slight occurrence in control and low dose groups. At high dose levels, histological examination of the liver revealed evidence of bile flow stasis and bile duct inflammation. Salivation on and after treatment was observed in one male at mid-dose and in both sexes at high dose levels. No adverse health effects were detected at 20 mg/kg/day, therefore the No Observed Effect Level (NOEL) is 20 mg/kg/day.

The notified chemical was non-mutagenic in a bacterial mutation assay. It did not induce significant increases in the frequency of chromosomal aberrations in CHL cells with or without metabolic activation. The notified chemical was found to be non-clastogenic to CHL cells *in vitro*.

Based on the animal studies summarised above, Amber Core would not be classified as a hazardous substance according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1994a).

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*	*Reference*
acute toxicity [OECD 203]	*Oncorhynchus mykiss* (Rainbow trout)	LC_{50}(96 h) = 4.1 mg/L NOEC (96 h) = 1.8 mg/L	(Douglas MT, 1992b)
Acute Immobilisation [OECD 202 Part 1]	*Daphnia magna*	EC_{50}(48 h) = 5.9 mg/L NOEC(48 h) = 3.2 mg/L	(Douglas MT, 1992a)
Chronic Exposure Reproduction [OECD 202 Part 2]	*Daphnia magna*	EC_{50}(21 day) = 2.4 mg/L NOEC(21 day) = 1.4 mg/L	(Bell G, 1995b)
Inhibition of Algal Growth [OECD 201]	*Selanastrum capricornatum*	E_bC_{50}(72 h) = 5.6 mg/L NOEC(72 h) = 1.5 mg/L $E_\mu C_{50}$(0-72 h) = 12 mg/L	(Bell G, 1995a)
Inhibition of Bacterial Respiration [OECD 209]	Activated sludge bacteria	IC_{50}(3 h) > 100 mg/L	(Tobeta Y, 1992)

- NOEC - no observable effect concentration
- LC_{50} – median lethal concentration
- E_bC_{50} – calculated concentration of test substance which results in a 50% reduction of biomass b relative to control
- $E_\mu C_{50}$ – calculated concentration of test substance which results in a 50% reduction of growth rate μ relative to control
- IC_{50} – median inhibition concentration

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 1.1, 1.8, 3.3, 5.0 and 11 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 approximately 7.5, while dissolved oxygen levels were always between 9.7 and 9.9 mg/L.

The tests results indicate that Amber Core is moderately toxic to the rainbow trout, with a 96 hour LC_{50} of 4.1 mg/L determined using the method of Thompson and Weil (Thompson WR & Weil CS, 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 3.3 and 5.0 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-renewable system over a 48-hour period at a controlled temperature of 21°C. Nine solutions of the chemical with measured concentrations of 0.071, 0.15, 0.24, 0.43, 0.83, 1.7, 3.2, 5.6 and 9.9 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 8.1 and 8.2, while dissolved oxygen levels (measured for the control only) were always between 8.1 and 8.5 mg/L. The criterion for deciding on immobilisation was if the animals were unable to swim after gentle agitation of the test vessel. The tests results indicate that Amber Core is moderately toxic to *Daphnia*, with a 48 hour EC_{50} of 5.9 mg/L determined using the method of Thompson and Weil (Thompson WR & Weil CS, 1952). Probit analysis on the raw data confirmed this result (EC50 = 5.7 mg/L, although the 95% confidence limits could not be calculated).

A chronic study on *Daphnia* was also reported in the submission. This study was conducted over a 21 day period at 20 ± 1°C, with measured concentrations of the test substance between 0.054 and 4.8 mg/L. Ten *Daphnia* were tested at each concentration, with each test performed in quadruplicate. The test media was renewed three times per week, with daily analyses for the test chemical performed on both the fresh and spent solutions. The data were analysed by the methods of Berkson (Berkson J, 1944) and results are tabulated above. During the test there were no apparent differences between the surviving parental *Daphnia* and those of the control group.

A test on the inhibition of algal growth was conducted on *Selanastrum capricornutum* over a 72 hour incubation period at 24°C, with measured concentrations of the test material of 0.66, 1.5, 2.8, 5.6 and 14 mg/L, together with one control. The measured test concentrations were between 82 and 106% of nominal at 0 hours, and between 30 and 53% nominal after 72 hours, indicating some adsorption of the test material by the algal mass. The results show that the new chemical is moderately toxic to this species of green algae.

The test on inhibition of bacterial respiration was conducted with activated sludge suspended in an artificial sewage medium composed of meat extract, peptone and salts in dechlorinated tap water having a hardness measured as 200-250 mg/L $CaCO_3$, and pH approximately 7.6 at 20.4 ± 0.6°C. The activated sludge bacteria were exposed to a range of concentrations of the test material. There was no discernible effect on the rate of oxygen uptake by the activated sludge bacteria up to the limits of chemical water solubility (30.7 mg/L) or with suspensions containing up to 100 mg/L. The reference material used in these tests (3,5-dichlorophenol) produced 82% inhibition at 32 mg/L.
The QSAR calculations of the ASTER database (US Environment Protection Agency, 1998)

also furnished predicted acute toxicity LC_{50} data for several fish species. The LC_{50} data results are: Rainbow trout (1.45 mg/L); Fathead minnow (3.8 mg/L); Bluegill (3.1 mg/L); and Channel catfish (1.6 mg/L). These calculations also furnished an acute LC_{50} of 2.3 mg/L for immobilisation of *Daphnia* and a maximum acceptable toxicant concentration (MATC) of 0.5 mg/L for Fathead minnow. These results are in reasonable accord with the experimental data.

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 sewerage systems as a consequence of product use. However due to the volatility of the material, a high proportion is expected to enter the atmosphere.

The ecotoxicity data indicates that the new chemical is moderately toxic to test aquatic species. However, based on annual imports of 3.0 tonne, all of which is eventually released to sewer, the daily release on a nationwide basis is 8.2 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 3.04 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 approximately 0.3 µg/L. This is nearly four orders of magnitude less than the demonstrated chronic toxicity to *Daphnia* (EC_{50} = 2.4 mg/L), the most sensitive species against which the new chemical was tested.

The chemical is hydrophobic with Log P_{ow} > 3.2, indicating significant affinity for the organic component of soils and sediments. The SimpleTreat and Mackay 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 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 the 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.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified chemical exhibited very low acute oral toxicity and low dermal toxicity in rats with LD_{50} values of > 2 000 for both administration routes. The notified chemical may be a slight skin and slight to moderate eye irritant. However, the Draize scores did not warrant the classification of the notified chemical as an irritant according to the NOHSC Approved

Criteria for Classifying Hazardous Substances (National Occupational Health and Safety Commission, 1994a). It is not likely to be a skin sensitiser. In a 28-day oral repeat-dose toxicity, the No Observable Effect Level (NOEL) was determined to be 20 mg/kg/day. The notified chemical was non-mutagenic in a bacterial mutation assay and was found be non-clastogenic to CHL cells *in vitro*.

Waterside, warehouse and transport workers could only be exposed to the notified chemical, in the event of damage to packaging. In this case, although exposure may occur, the risk of adverse effects is low.

During fragrance enhancer formulation, workers involved in weighing and manual addition of the undiluted notified chemical into the mixing vessel have the highest chance of dermal and eye exposure to the notified chemical. Workers involved in other processes, such as quality control testing and equipment maintenance, may experience dermal and eye exposure to the notified chemical to a lesser extent, since after blending it is present at lower concentrations, between 5 to 15 %. Packaging is carried out using automated processes therefore worker exposure is likely to be negligible. The notifier states that workers will use protective equipment including butyl rubber gloves, protective clothing and safety glasses. All the processes involved in the fragrance enhancer formulation will also be under local exhaust ventilation.

Workers may also experience eye and dermal exposure during addition of formulated perfume enhancer with other ingredients to form end use household products. However, exposure to the notified chemical is expected to be low because of the low chemical concentration and the use of protective equipment. Once the ingredients are mixed, the risk of skin or eye irritancy resulting from exposure to the notified chemical is likely to be negligible, since the notified chemical is present in household products at very low concentrations, between 0.04 to 0.23%. Workers involved in quality control testing, equipment maintenance and packaging are expected to be of equivalent low risk. Workers should wear butyl or rubber gloves, protective clothing and safety glasses when manually adding the reformulated perfume enhancer into the mixing vessel. Personal protective equipment should also be worn during packaging, depending on the nature of the end-use product. Local exhaust ventilation is used in the product manufacturing area to control exposure to the notified chemical.

The notifier submitted information on predicted workplace exposure using the EASE software model[1]. Exposure was estimated for both mixing of the notified chemical with other components to form the perfume enhancer and mixing the perfume enhancer containing the notified chemical with other components of the end-use product. During mixing of the notified chemical and assuming 'non-dispersive' use, with no aerosol generation, and local exhaust ventilation in use, the model predicts that for workers with no protective clothing, dermal exposure will be low and inhalation exposure in the range of 0.5 to 3 ppm, 8–hour Time Weighted Average (TWA).

[1] EASE (Estimation and Assessment of Substance Exposure), an inhalation and dermal exposure model developed by the UK Health and Safety Executive.

During mixing of the end use products and assuming 'inclusion onto matrix', with no aerosol generation and local exhaust ventilation in use, the model predicts that for workers with no protective clothing, dermal exposure will be low and inhalation exposure again in the range of 0.5 to 3 ppm, 8–hour TWA.

The use of protective equipment will further control exposure to the notified chemical. No further details on the model calculations were provided.

The physico-chemical properties of the notified chemical, namely the low water solubility and high partition coefficient, suggest that skin absorption may occur. However, the low vapour pressure suggests that inhalation exposure is not likely. The health risk associated with the use pattern of the notified chemical will be low based on the chemical hazard and predicted low levels of exposure. On the basis of the submitted toxicological data, the notified chemical is not determined to be a hazardous substance according to the NOHSC Approved Criteria for Classifying Hazardous Substances (National Occupational Health and Safety Commission, 1994a).

Although the public will most likely be exposed to the notified chemical, the risks associated with exposure are considered to be negligible. The public will only be exposed to household products containing low amounts of the notified chemical.

13. RECOMMENDATIONS

To minimise occupational exposure to Amber Core 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) and AS 3765.1 (Standards Australia, 1990);
- Impermeable gloves should conform to AS/NZS 2161.2 (Standards Australia, 1998);
- All occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994);
- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should 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.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in a format consistent 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.

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. No other specific conditions are prescribed.

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Attachment 1

The Draize Scale for evaluation of skin reactions is as follows:

Erythema Formation	*Rating*	*Oedema Formation*	*Rating*
No erythema	0	No oedema	0
Very slight erythema (barely perceptible)	1	Very slight oedema (barely perceptible)	1
Well-defined erythema	2	Slight oedema (edges of area well-defined by definite raising	2
Moderate to severe erythema	3	Moderate oedema (raised approx. 1 mm)	3
Severe erythema (beet redness)	4	Severe oedema (raised more than 1 mm and extending beyond area of exposure)	4

The Draize scale for evaluation of eye reactions is as follows:

CORNEA

Opacity	*Rating*	*Area of Cornea involved*	*Rating*
No opacity	0 none	25% or less (not zero)	1
Diffuse area, details of iris clearly visible	1 slight	25% to 50%	2
Easily visible translucent areas, details of iris slightly obscure	2 mild	50% to 75%	3
Opalescent areas, no details of iris visible, size of pupil barely discernible	3 moderate	Greater than 75%	4
Opaque, iris invisible	4 severe		

CONJUNCTIVAE

Redness	*Rating*	*Chemosis*	*Rating*	*Discharge*	*Rating*
Vessels normal	0 none	No swelling	0 none	No discharge	0 none
Vessels definitely injected above normal	1 slight	Any swelling above normal	1 slight	Any amount different from normal	1 slight
More diffuse, deeper crimson red with individual vessels not easily discernible	2 mod.	Obvious swelling with partial eversion of lids	2 mild	Discharge with moistening of lids and adjacent hairs	2 mod.
Diffuse beefy red	3 severe	Swelling with lids half-closed	3 mod.	Discharge with moistening of lids and hairs and considerable area around eye	3 severe
		Swelling with lids half-closed to completely closed	4 severe		

IRIS

Values	*Rating*
Normal	0 none
Folds above normal, congestion, swelling, circumcorneal injection, iris reacts to light	1 slight
No reaction to light, haemorrhage, gross destruction	2 severe