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December 1997

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Frescolat® MGA

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**Frescolat® MGA****1. APPLICANT**

Haarman & Reimer (Australia) Pty Ltd of 9 Garling Road KINGS PARK NSW 2148 has submitted a limited notification statement in support of their application for an assessment certificate for Frescolat® MGA.

2. IDENTITY OF THE CHEMICAL

Frescolat® MGA, is considered to be hazardous (type 2) based on the nature of the chemical and the data provided. However, the chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data and details of the chemical composition have been exempted from publication in the Full Public Report and the Summary Report.

Generic Name: Menthone glycerine Acetal (INSI)

Trade Name: Frescolat® MGA

3. PHYSICO-CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa: clear colourless viscous liquid with a minty odour

Boiling Point: > 250°C at 101.2 kPa

Density: 1 030 kg.m⁻³ at 20.0 - 20.5 °C

Vapour Pressure: 2.0 x 10⁻⁴ kPa at 25°C (static technique)

Water Solubility: 1.2 g.L⁻¹ at 20°C (flask method)

Partition Co-efficient (n-octanol/water): log P_{ow} > 2.9 (estimation method)

Hydrolysis as a Function of pH:T_{1/2} at pH 4.0 < 2.4 hours at 50°CT_{1/2} at pH 7.0 > 1 year at 50°CT_{1/2} at pH 9.0 > 1 year at 50°C**Adsorption/Desorption:**

not determined (see comments below)

Surface Tension38.7 mN.m⁻¹ at 20°C**Dissociation Constant:**

not determined (see comments below)

Flash Point:

143°C (closed cup)

Flammability Limits:

not flammable

Autoignition Temperature:

340°C

Explosive Properties:

non-explosive

Reactivity/Stability:

stable at room temperature and does not evolve any flammable gases in contact with water or humid air

Comments on Physico-Chemical Properties

All tests have been performed according to EEC Test Guidelines (1)

It has not been possible to determine a freezing point or a range as the viscosity of the notified substance increased with decreasing temperature, until the substance completely solidified at 21°C.

The surface tension data are taken from a notification dossier prepared according to the EC Guidelines and submitted to the German authority in 1992. By definition, a chemical has surface activity when the surface tension is less than 60 mN.m⁻¹ (2). The notified chemical is therefore expected to be surface active.

The water solubility of the chemical as measured by the Flask Method seems high. The detailed test report is not available. It is possible that the surface activity of the chemical influenced the solubility measurement to some degree.

The Log P_{ow} cannot be measured accurately for surface active substances. It has been calculated using the separate solubilities of the chemical in n-octanol/water. Details of the estimation method have not been provided. Given the high water solubility, the estimated Log P_{ow} appears somewhat higher than expected.

Adsorption/desorption has not been determined due to the surface active nature of the chemical. From the water solubility and the Log P_{ow} data the chemical's ability to adsorb to soil and sediment can be expected to be low. However, this may be balanced by its propensity to attach to surfaces.

The chemical does not contain any dissociable functionalities.

4. PURITY OF THE CHEMICAL

Degree of Purity: approximately 100%

Toxic or Hazardous Impurities: none

Non-hazardous Impurities (> 1% by weight): < 2%

Additives/Adjuvants: none

5. USE, VOLUME AND FORMULATION

The notified chemical will not be manufactured in Australia. Five hundred kilos of the notified chemical will be imported into Australia per annum for the first five years.

The notified chemical is intended to be used as an ingredient in flavour and fragrance compounds. It has a highly effective cooling effect when used in cosmetics. The compounded fragrances containing the notified chemical, are in turn incorporated into a variety of scented consumer products (eg. dentifrices, soaps, shampoos, shaving foams, shower gels and "after-sun" creams). The end product sold to consumers contains approximately 0.0001% to 2% (0.04% average) of the notified chemical.

6. OCCUPATIONAL EXPOSURE

The notified chemical will be imported in pure form, packed in drums with a net weight of 25 kg. The chemical is normally stored in its original packaging in a cool location. Under storage conditions, the chemical remains stable for at least one year.

Exposure of workers to the notified chemical during transport and storage is not expected, and will occur only in the rare event of an accident.

The notifier states exposure to workers during fragrance compounding is expected to be low. The notified chemical after removal from storage is transferred into vessels for compounding by process workers. The notifier has provided no details regarding the transfer process, and there is a likelihood that it might be carried out manually, where potential for dermal, inhalational and accidental ocular exposure may occur. The chemical is subsequently metered with electronic programmable logic controls and introduced into the plant's production process.

The production of consumer goods with fragrance compounds containing the notified chemical is carried out in a fully automated closed system. Therefore worker exposure is considered negligible. However, the notifier has provided no details of the transfer of the end products for packaging.

7. PUBLIC EXPOSURE

Since the notified chemical will be used in consumer products such as dentifrices, soaps, shower gels, shampoos, shaving foams and "after-sun" cream, widespread public exposure will occur via the dermal and/or oral routes. There will be negligible public exposure from transport, storage, reformulation and disposal. The notifier indicated that the majority (about 98.5%) of the notified chemical will be released through the consumer products to the sewer. A small amount of waste (<2%) from reformulation into fragrance compounds and consumer products is to be disposed of by incineration. Accidental spills will be taken up with absorbent materials and then disposed of by incineration as shown in the Material Safety Data Sheet (MSDS).

8. ENVIRONMENTAL EXPOSURE

Release

Major release of the chemical to the environment would be through the end-use products. The notifier estimates 98.5% of the import volume to be released in this way. Incorporation of the fragrance compounds containing the chemical into consumer goods is done using fully automated closed systems. Therefore, waste from the production processes is not expected to exceed 1% of the import volume (5 kg per annum). This waste is likely to be disposed of largely by incineration. About 0.5% of the import volume (2.5 kg per annum) is expected to be lost as residues in empty containers that may go mostly to landfill.

Fate

The bulk of the chemical will finally find its way to the sewer. Due to the considerable water solubility and low partition coefficient of the chemical, its adsorption to the sludge will be poor. However, some amount will be removed in the sewer due to the tendency of the chemical to bind to surfaces. Small amounts of the chemical may be carried with the water discharged from the sewer in a highly diluted manner. It will be further diluted after discharge.

Ready biodegradability tested according to Modified Sturm Test (OECD Guideline No 301 B) found only 3% biodegradation after 28 days. Hence the chemical is not readily biodegradable. Faster biodegradation may be indicated in inherent biodegradability tests.

Low biodegradability suggests a potential for bioaccumulation. However, considerable water solubility tends to reduce the bioaccumulation potential (3,4).

In landfill, the chemical will tend to show some mobility, but again its tendency to bind to surfaces would minimise mobility. It will eventually undergo hydrolysis and slow degradation. Incineration will destroy the chemical by conversion to water vapour and oxides of carbon.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicity data are required for chemicals which will be imported at volumes of less than one tonne per annum, according to the Act. However, the data summarised below were provided by the notifier.

9.1 Acute Toxicity

Summary of the acute toxicity of Frescolat® MGA

Test	Species	Outcome	Reference
acute oral toxicity	rat	LD ₅₀ = 5 716 mg.kg ⁻¹	(5)
acute dermal toxicity	rat	LD ₅₀ > 2 000 mg.kg ⁻¹	(6)
skin irritation	rabbit	moderate irritant	(7)
eye irritation	rabbit	severe irritant	(8)
skin sensitisation	guinea pig	non-sensitising	(9)

9.1.1 Oral Toxicity (5)

<i>Species/strain:</i>	rat/Wistar
<i>Number/sex of animals:</i>	15/sex(5/sex/test group)
<i>Doses:</i>	2 800, 3 750 and 5 000 mg.kg ⁻¹
<i>Observation period:</i>	14 days
<i>Method of administration:</i>	gavage

<i>Clinical observations:</i>	all animals showed signs of piloerection, lethargy and ataxia after treatment with the test material and a number of animals developed no reaction to external stimuli; all animals treated with 5 000 mg/kg developed bradypnoea
<i>Mortality:</i>	two males and two females died in the highest dose group
<i>Morphological findings:</i>	no findings were noted for surviving animals treated with 2 800 mg/kg; all animals treated with 3 750 and 5 000 mg.kg ⁻¹ showed irregularities in the forestomach one male and two females which died after being dosed with 5 000 mg/kg had yellow fluid in the stomach and one male had a grey-green colouration in the forestomach
<i>Test method:</i>	similar to OECD guidelines (1)
<i>LD₅₀:</i>	5 716 mg.kg ⁻¹
<i>Result:</i>	the notified chemical was of low oral toxicity to rats

9.1.2 Dermal Toxicity (6)

<i>Species/strain:</i>	rat/Wistar
<i>Number/sex of animals:</i>	5/sex
<i>Observation period:</i>	14 days
<i>Method of administration:</i>	single semi-occlusive dermal application
<i>Clinical observations:</i>	nil
<i>Mortality:</i>	nil
<i>Morphological findings:</i>	nil
<i>Test method:</i>	similar to OECD guidelines (1)
<i>LD₅₀:</i>	> 2 000 mg.kg ⁻¹

Result: the notified chemical was of low dermal toxicity to rats

9.1.3 Inhalation Toxicity

No inhalation toxicity data were provided by the notifier.

9.1.4 Skin Irritation (7)

Species/strain: rabbit/New Zealand White

Number/sex of animals: not provided

Observation period: 72 hours

Method of administration: 4 hour semi-occlusive dressing application using 0.5 g of notified chemical

Draize scores (10):

<i>Animal number</i>	<i>mean scores after 24, 48 and 72 hours</i>
<i>Erythema</i>	
1	2.0
2	1.7
3	2.0
<i>Oedema</i>	
1	2.0
2	2.7
3	2.7

^a see Attachment 1 for Draize scales

Test method: similar to OECD guidelines (1)

Result: the notified chemical is a moderate skin irritant in rabbits

9.1.5 Eye Irritation (8)

Species/strain: rabbit/New Zealand White

Number/sex of animals: not provided

Observation period: 14 days

Method of administration: not provided

<i>Draize scores (9) of unirrigated eyes:</i>	redness of the conjunctivae persisted for a period of 72 hours with a mean score of 3.0
<i>Test method</i>	similar to OECD guidelines (1)
<i>Result:</i>	the notified chemical is a severe eye irritant in rabbits

Time after instillation

<i>Animal number</i>	<i>1</i>	<i>2</i>	<i>3</i>
	<i>Mean of 24, 48 and 72 hours</i>		
<i>Cornea</i>	1.0	1.7	1.7
<i>Iris</i>	0.3	0.3	0.3
<i>Conjunctivae (redness)</i>	3.0	3.0	3.0
<i>Conjunctivae (chemosis)</i>	1.7	1.7	1.7

9.1.6 Skin Sensitisation (9)

<i>Species/strain:</i>	guinea pig/albino
<i>Number of animals:</i>	20 test; 10 control
<i>Induction procedure:</i>	2% w/w of notified chemical in polyethylene glycol injected and undiluted for topical application (time not recorded)
<i>Challenge procedure:</i>	occluded application of 25%, 10% and 5% of the notified chemical in polyethylene glycol
<i>Challenge outcome:</i>	No evidence of contact hypersensitivity (details not provided)
<i>Test method:</i>	similar to OECD guidelines (1)
<i>Result:</i>	the notified chemical was not a skin sensitiser in albino guinea pigs

9.2 Repeated Dose Toxicity (11)

<i>Species/strain:</i>	rat/Wistar
<i>Number/sex of animals:</i>	20/sex (5/sex/dose group)
<i>Method of administration:</i>	gavage; vehicle distilled water

<i>Dose/Study duration::</i>	the test substance was administered daily for a period of 28 days: control: 0 mg/kg/day low dose: 50 mg/kg/day mid dose: 200 mg/kg/day high dose: 800 mg/kg/day all animals were sacrificed at the end of the treatment period
<i>Clinical observations:</i>	increased kidney weights in males at 200 and 800 mg/kg/day and hepatocellular hypertrophy and increased liver weights in both sexes at 800 mg/kg/day
<i>Clinical chemistry/Haematology</i>	200 mg/kg/day: decreased serum glucose in males; 800 mg/kg/day: decreased red blood cell count, haemoglobin and haematocrit in females (anaemia)
<i>Histopathology:</i>	males in the 200 mg/kg/day dose group were found to have hepatocellular hypertrophy with fine hepatocellular vacuolation; all animals in the high dose group were found to have periportal hepatocellular hypertrophy accompanied by fine hepatocellular vacuolation in males
<i>Test method:</i>	similar to OECD guidelines (1)
<i>Result:</i>	oral administration of the notified chemical at a dose level of 200 mg/kg/day for 28 days induced changes in blood serum, liver and kidney in males; and at 800 mg/kg/day for 28 days induced changes in the blood of females and in the liver of both sexes

9.3 Genotoxicity

9.3.1 *Salmonella typhimurium* Reverse Mutation Assay (12)

<i>Strains:</i>	<i>Salmonella typhimurium</i> TA 1535, TA 1537 TA 1538, TA 98 and TA 100
<i>Concentration range:</i>	1.0 - 5 000 µg.plate ⁻¹ (with or without S9 mix)
<i>Test method:</i>	similar to OECD guidelines (1)

Result: the notified chemical was not mutagenic in the bacterial strains tested in the presence or absence of metabolic activation provided by rat liver S9 fraction

9.3.2 Micronucleus Assay in the Bone Marrow Cells of the Mouse (13)

Species/strain: mouse/NMRI

Number and sex of animals: 35/sex (5/sex/test group)

Doses: group 1: 2 500 mg/kg
group 2: negative control (dose rate not provided)
group 3: positive control (identity and dose rate not provided)

Sacrifice times: 24, 48 and 72 hours

Method of administration: oral administration; vehicle was polyethylene glycol

Test method: similar to OECD guidelines (1)

Result: the notified chemical did not induce micronuclei in bone marrow polychromatic erythrocytes of the mouse; positive controls showed appropriate increases in induced micronucleus frequency

9.3.3 Human Repeat Insult Patch Test for Skin Sensitisation (14)

Species/strain: humans

Number/sex of animals: 92

Observation period: 72 hours

Induction procedure: 0.3 mL of a 3% solution of the notified chemical and the vehicle applied on lateral surface of the upper arm three times a week for 24 hours for three weeks

Challenge procedure: after two weeks occluded application of a 3% solution of the notified chemical on the original and alternate arm

Challenge outcome: irritant potential of the notified chemical was very low; possible sensitisation observed in 2/92 subjects; one of the subjects could not be confirmed by rechallenge while the second remained doubtful(details not provided);

Result: 1/92 subjects had an equivocal reaction following challenge exposure; very slight skin irritation; no conclusive evidence for skin sensitisation

9.4 Overall Assessment of Toxicological Data

The notified chemical was of low oral and dermal toxicity in rats (oral LD₅₀ = 5 716 mg/kg; dermal LD₅₀ > 2 000 mg/kg). No inhalation toxicity data were provided by the notifier. The notified chemical was a moderate skin and severe eye irritant in rabbits. The notified chemical was not a skin sensitiser when tested in guinea pigs. Human Repeat Insult Patch Test showed there was no potential for skin sensitisation but may have very slight skin irritation potential in humans. Oral administration of high doses (800 mg/kg/day) to rats for 28 days induced local changes in the liver of both sexes and blood of females. At moderate doses (200 mg/kg/day) changes in blood serum, liver and kidney in males were observed.

The notified chemical was not found to be mutagenic in bacteria and did not induce micronuclei in an *in vivo* mouse micronucleus assay.

On the basis of the toxicity studies summarised above, the notified chemical would be classified as hazardous according to the *Approved Criteria for Classifying Hazardous Substances* (15) in relation to irritant effects (skin and eye).

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

While not required by the Act for substances imported in quantities less than one tonne per annum, the following ecotoxicity studies have been supplied by the notifier. The tests were carried out according to OECD Test Guidelines, complying with Good Laboratory Practice.

Test	Species	Results
Acute Toxicity - Static	Fish (<i>Cyprinus carpio</i>)	24 h LC ₅₀ = 24 mg.L ⁻¹ NOEC = 5.6 mg.L ⁻¹
Acute Immobilisation - Static	Water Flea (<i>Daphnia magna</i>)	48 h EC ₅₀ = 63.7 mg.L ⁻¹ 1 NOEC = 32 mg.L ⁻¹

Both of the above tests used Tween 20 at 0.1 mL.L^{-1} as an auxiliary solvent. Tests reported a 5% loss of the test chemical over the test periods. Other details of the test procedures have not been provided as summary reports only are available.

The ecotoxicity data for the notified chemical indicate it to be slightly toxic to fish and aquatic invertebrates.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The notifier has provided information indicating that, according to 1996 figures, the total daily volume of effluent discharged to the sewer system in Sydney (consisting of 33 sites) to be approximately 1117 ML. The notifier also estimates 98.5% of the total annual import, (equivalent to 492.5 kg) to enter the sewer through end use. If we assume 25% of the total national sales of any cosmetic product to be made in Sydney, the maximum amount of the chemical going into the sewer per day in Sydney can be estimated to be about 0.34 kg. When diluted in the sewer this will yield a concentration of 0.3 ppb. At least a part of this can be expected to be adsorbed to the sludge. Even if nothing is adsorbed, the concentration of the chemical in the water discharged from the sewer would be at least four orders of magnitude below the toxicity limits of aquatic organisms. Hence significant aquatic hazard is unlikely.

The notifier has recommended incineration as a method of disposal of waste. Most of the production waste (up to 5 kg per annum) can be expected to be disposed this way. Such incineration will destroy the chemical.

Some of the sludge removed from the sewerage treatment plants containing traces of the chemical and empty containers of cosmetic products containing residues can be landfilled. The chemical has the tendency to be mobile in soil but this will be mitigated by its tendency to bind to surfaces and low exposure. In landfill it will undergo slow hydrolysis and degradation.

The chemical can therefore be expected to pose minimal hazard to the environment when used as proposed.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Based on the toxicological data, the notified chemical is not expected to exhibit acute or chronic toxicity, is not likely to be a skin sensitiser and is not likely to be genotoxic. However, it is likely to be a skin and eye irritant. Human Repeat Insult Patch Test showed there was no conclusive evidence of skin sensitisation due to the notified chemical. The notified chemical is classified as hazardous according to the National Occupational Health and Safety Commission's *Approved Criteria for Classifying Hazardous Substances* (15).

Exposure of transport and storehouse workers to the notified chemical is likely to occur in the rare event of an accident.

Exposure of workers involved in the manufacture of fragrance containing the notified chemical is expected to be low. Fragrance manufacture will involve mainly automated equipment so that exposure is only likely during introduction of the notified chemical to the manufacturing plant. The notifier has provided no details regarding the transfer process. If it is assumed that it will be carried out manually, there will be potential for dermal, inhalational and accidental ocular exposure. However, inhalational exposure is considered negligible due to very low vapour pressure.

The production of consumer goods with fragrance compounds containing the notified chemical is also carried out in fully automated closed systems. However, no details with regard to transfer of the end-consumer products for packaging has been provided by the notifier.

The main occupational health risk to workers involved in fragrance manufacture during transfer of the pure notified chemical is likely to be skin irritation. This can be minimised by the use of protective gloves and clothing as outlined below. Eye irritation is a potential health risk but ocular exposure is likely to be rare. The health risk to other workers handling fragrance compounds and consumer products containing the notified chemical is likely to be minimal, since, the approximate concentration of the notified chemical in these products are in the range of 0.001% to 2% with an average concentration of 0.04%.

Since the notified chemical will be used in consumer products such as dentifrices, soaps, showergels, shampoos, shaving foams and “after sun” cream, widespread public exposure could occur via the dermal and/or oral routes. A lotion containing 3% of the notified chemical caused very slight skin irritation in humans. Consumer products containing 1% to 2% of the notified chemical may cause eye irritation and very slight skin irritation to the user.

Since there is no data on dermal absorption, a worst case of 100% dermal absorption is used in the following exposure estimations. Reference values such as application rates, quantity of products remaining on the skin after rinsing and body weight were adopted (16) with slight modification for some parameters.

The notified chemical in tooth paste may be swallowed and absorbed through the mucous membranes of the oral cavity. The following assumptions would give an oral (systemic) exposure of 0.0008 mg/kg/day.

amount used per event = 1.5 g
 fraction of tooth paste swallowed = 3%
 fraction remaining in the oral cavity after rinsing = 1%
 weight fraction of notified chemical = 0.04% (average)
 frequency of use = twice/day, every day
 body weight = 60 kg

Of the rinse-off products, shampoo may represent a worst case of exposure to

consumers. The following assumptions would provide a systemic exposure of 0.0008 mg/kg/day.

amount used per application = 12 g
 fraction remaining on the skin after rinsing = 1%
 weight fraction of notified chemical = 0.04% (average)
 dermal absorption = 100%
 frequency of use = once/day, every day
 body weight = 60 kg

The use of “after sun” cream would result in an average daily exposure of 0.016 mg/kg/day, based on the following assumptions.

amount used per application = 10 g
 fraction remaining on the skin = 100%
 weight fraction of notified chemical = 0.04% (average)
 dermal absorption = 100%
 frequency of use = once/day, 90 days/year
 body weight = 60 kg

Assuming that a person uses toothpaste, two rinse-off products (shampoo and one other rinse-off product) daily and “after-sun” cream for 90 days per year as the worst case scenario, the total daily dose would be 0.018 mg/kg/day. In comparison with the NOEL of 50 mg/kg/day established in a 28-day oral gavage study in rats, the above estimated worst case exposure would represent a safety margin of about 2800.

13. 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 (17) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (18);
- Industrial clothing should conform to the specifications detailed in AS 2919 (19);
- Impermeable gloves or mittens should conform to AS 2161 (20);
- All occupational footwear should conform to AS/NZS 2210 (21);
- Spillage of the notified chemical should be avoided, spillages 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; and
- The following warning statements be included on the labels of consumer products if the notified chemical is present at a level greater than 1%:
 - Avoid contact with eyes
 - If skin irritation occurs, discontinue use

14. 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* (22).

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.

16. REFERENCES

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13. Volkner, W. 1991, *Micronucleus Assay in Bone Marrow Cells of the Mouse with Frescolat®MGA*, Project no., 1991065, Cytotest Cell Research, Itingen.

14. Cuthbert, J.A., & Neilson, L. 1993, Human Repeat Insult Patch Test *with Frescolat®MGA*, Project no., 1992150, IRI
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17. Standards Australia 1994, *Australian Standard 1336-1994, Eye protection in the Industrial Environment*, Standards Association of Australia Publ., Sydney.
18. Standards Australia/Standards New Zealand 1992, *Australian/New Zealand Standard 1337-1992, Eye Protectors for Industrial Applications*, Standards
19. Standards Australia 1987, *Australian Standard 2919-1987, Industrial Clothing*, Standards Association of Australia, Sydney.
20. Standards Australia 1978, *Australian Standard 2161-1978, Industrial Safety Gloves and Mittens (excluding electrical and medical gloves)*, Standards Association of Australia Publ., Sydney.
21. Standards Australia/Standards New Zealand 1994, *Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear*, Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.
22. National Occupational Health and Safety Commission 1994, *National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]*, Australian Government Publishing Service, Canberra.

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