File No: NA/854

February 2001

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

K-Corr 100

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Director
Chemicals Notification and Assessment

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K-Corr 100

1. APPLICANT

Kemspex Pty Ltd of 97 Falrey Road SOUTH WINDSOR NSW 2756 (ACN No 003 708 987) has submitted a standard notification statement in support of their application for an assessment certificate for K-Corr 100.

2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the composition and details of exact import volume have been exempted from publication in the Full Public Report and the Summary Report.

Marketing Name: K-Corr 100;
K-Corr 161 (containing 55-65% K-Corr 100);
K-Corr 100A (containing 60-75% K-Corr 100); and
K-Corr 100A2 (containing 65-80% K-Corr 100).

3. PHYSICAL AND CHEMICAL PROPERTIES

The physical and chemical properties were determined from K-Corr 100.

Appearance at 20°C & 101.3 kPa: Amber coloured viscous liquid.

Melting/Freezing Point: <-20°C.

Boiling Point: Boiled with decomposition from approximately 191°C at 1 006.7 kPa.

Density: 1 023.1 kg/m^3.

Vapour Pressure: < 9.8×10^{-8} kPa at 25°C.

Water Solubility: 5.26 mg/L at 20°C and pH 5.7.

Partition Co-efficient (n-octanol/water): Log P_{ow} > 4.33

Hydrolysis as a Function of pH: $T_{1/2}$ at pH 4.0 > 1 year;
$T_{1/2}$ at pH 7.0 > 1 year;
$T_{1/2}$ at pH 9.0 < 24 hours.

Adsorption/Desorption:	Log K_{OC} in the range <1.77 to 4.20.
Particle Size:	Not applicable to a liquid.
Dissociation Constant:	Not determined.
Flash Point:	161°C (closed cup method).
Flammability Limits:	Not determined.
Autoignition Temperature:	378°C
Explosive Properties:	Not explosive.
Surface Tension:	47.3 mN/M at 18°C (11.1 mg/L).
Reactivity/Stability:	Stable.

3.1 Comments on Physico-Chemical Properties

Tests were performed according to EEC/OECD test guidelines at facilities complying with OECD Principles of Good Laboratory Practice (Study Director, 1996d). The tests were carried out according to EU test guidelines which are essentially identical to those of the OECD.

The melting point was determined using the crystallising point method in a dry ice/acetone mixture with duplicate samples.

The boiling point of the notified chemical was found to be approximately 191ºC (with decomposition) by the distillation method. The substance failed to distil at reduced pressures of 6.3 to 14.5 kPa using a standard technique.

The relative density was determined using the pycnometer method (equivalent to OECD TG 109).

The vapour pressure of the notified chemical was determined by the balance method (based on OECD TG 104) (Study Director, 1996h).

The water solubility of the notified chemical was determined using the flask shaking method (based on OECD TG 105). A preliminary test was performed with samples being shaken for 66 h then filtered and analysed by HPLC. A definitive test was then performed on triplicate samples containing approximately 0.02 g of notified chemical in 200 mL of water. These were also shaken for 66 h at 30ºC, allowed to stand for 24 h, then filtered, centrifuged and filtered again before the concentrations were determined using HPLC. The solubility was calculated using the sum of the peak areas of the two components (Components B and C) in the notified substance.

The hydrolytic stability of the new substance was assessed on the three major components. Components B and C of the test are the actual components. Component A is a reaction intermediate present at low concentration. Some hydrolysis was observed at neutral pH from Component A. The substance underwent <10% hydrolysis after 5 days at 50ºC at pH4, therefore the half-life at pH 4 is estimated to be > 1 year. At pH 7 Components B and C also underwent <10% hydrolysis. At pH 9 there was >50% hydrolysis after 2.4 h at 50ºC, equivalent to a half-life of <1 d at 25ºC.

The partition coefficient for the notified substance was measured using the shake flask method (based on OECD TG 107) with HPLC analysis. A preliminary test was followed by the definitive test where six partitions of varying concentrations were performed. The Pow was found to be 2.16×10^4 at 21.5ºC and was calculated using the sum of the peak areas of the major components in the notified substance.

Log K_{OC} for the notified chemical was determined using a HPLC screening method. Solutions of the test substance and reference standards including simazine, monolinuron, phenamiphos, baytan and monceren were prepared in acetonitrile for analysis by HPLC. The sample showed five peaks which were all below the reference standard cyfluthrin. The K_{oc} calculated from the peak areas was <58.9 to 1.6×10^4.

No dissociation constant data was provided for the notified chemical. It has a small amount of carboxylic acid functionality, which will have typical acidity and a pKa of about 4.5.

Surface tension of the notified chemical was measured by the surface tensiometer, ISO ring method (based on OECD TG 115). The result indicates that the substance will likely have surfactant qualities.

4. PURITY OF THE CHEMICAL

Degree of Purity: High

5. USE, VOLUME AND FORMULATION

The notified chemical is designed to function as a corrosion inhibitor in formulated lubricant and hydraulic liquids used in closed hydraulic systems for industrial equipment and heavy machinery at a concentration of 0.1 to 1%. The notified chemical is not used in automotive motor oil.

K-Corr 100 will not be manufactured in Australia but will be imported in pure form and in 3 products namely K-Corr 161, K-Corr 100A and K-Corr 100A2 which contain approximately 60%, 70% and 72% K-Corr 100, respectively. K-Corr 100, 161, 100A and 100A2 are imported in 191 kg closed head drums.

The volume of importation over the 5 years will be less than 10 tonnes per year. K-Corr 100A2 will constitute 50% of the total import volume, K-Corr 100 will constitute 25% of the import volume and K-Corr 161 and K-Corr 100A will make up the remaining 25%.

6. OCCUPATIONAL EXPOSURE

Transport and storage
Transport and storage workers are not likely to be exposed to the notified chemical except in the case of an accident involving damage to the packaging.

Formulation
Typically, the notified chemical at 60–100% (based on current product information) is pumped directly from the drum into a 10 000 gallon (approximately 37 850 L) closed system blend tank, and mixed with base oil and other additives. The formulated products as lubricant and hydraulic liquids containing 0.1 to 1% notified chemical. The finished formula will be packed in 55 gallon (approximately 200 L) steel drums or 5 gallon (approximately 20 L) steel pails. When cleaning the tank, base oil is used to flush the tank or drum and the flushings are added to the blend.

The blend operation lasts approximately 1 hour, supervised by 2 workers. Duration of each blending operation is estimated to be 2 hours per procedure, performed once per annum. The notifier provided information of the closed system blending process at industrial sites. The blend operation is an automated process using dedicated tanks and transfer lines where feasible. Therefore, exposure will most likely be limited to residues in lines and on couplings and occasionally from leaks and spills. Dermal contamination would be the main route of occupational exposure. The notifier indicated that workers wear aprons, gloves and safety glasses.

One quality control worker will take sample for quality control analysis at the formulation site. Time to conduct the analysis is estimated to be 1 hour for each batch. The sample will be recycled into batch. The quality control worker will wear safety glasses.

One packaging worker will run the packaging process to fill the formulated product into drums and pails. The packaging worker could be contaminated with the diluted notified chemical. Similar to the blending operators, the duration will be 2 hours per batch for the packaging worker. Dermal contact would be the main route of occupational exposure and the packaging worker will wear aprons, gloves and safety glasses.

End use
The concentration of the notified chemical in the final products is low. Lubricant and hydraulic fluids may be used in large and small facilities to top up reservoirs or, less frequently, as a complete lubricant change in engines, transmissions and differentials. Dermal exposure of the hands may be significant as it is uncommon for gloves to be worn during addition of these products to machinery.

7. PUBLIC EXPOSURE

Since the final products containing up to 1% of the notified chemical will be formulated as lubricant and hydraulic liquids contained in closed hydraulic systems in industrial equipment, it is anticipated that public exposure will be low, except in the event of a spill. The Material Safety Data Sheets (MSDS) state that oil absorbent should be added to small spills, collected and placed in closed containers for disposal. Large spills should be contained with a dike and pumped into drums for use or disposal.

8. ENVIRONMENTAL EXPOSURE

8.1 Release

The notified chemical will be sold and transported in the original 191 kg drums to the customer sites for reformulation into the finished hydraulic fluid and oil products. The typical reformulation process involves pumping the base oil, K-Corr product, antioxidant and other additives into a blending tank, mixing for 1 h before drumming off the finished product into 55 gallon steel drums or 5 gallon steel pails.

The notifier has supplied the following volume estimates for the maximum release/annum for the reformulation process at each customer.

Customer number	*Maximum container residue waste*	*Maximum equipment cleaning*	*Spills*	*Reject batches*	*Maximum total waste volume*
1	1.75 kg	0.56 kg	1.25 kg	0	3.56 kg
2	0.25 kg	0.08 kg	0.18 kg	0	0.51 kg
3	0.25 kg	0.08 kg	0.18 kg	0	0.51 kg
4	0.125 kg	0.04 kg	0.09 kg	0	0.25 kg
5	0.125 kg	0.032 kg	0.07 kg	0	0.23 kg
6	<0.01 kg	<0.01 kg	0.018 kg	0	0.04 kg

All the waste from the reformulation process (total of up to 5.10 kg/annum) will be disposed of by incineration. The notifier claims that there will be no waste produced by reject batches as all batches will be adjusted until the formulations and ratios are correct.

The notifier claims that there will be no environmental release during oil fill ups, but as small spills occur frequently it is assumed that they will be contained and collected with absorbent material for disposal to landfill, rather than being washed down drains and released to waterways. It is estimated that < 1% of the imported volume may be lost as small volume spills during fill ups. If 10 tonnes of the notified chemical are imported per year, up to 100 kg/annum of waste notified chemical would be produced.

The notifier has not indicated the volume of hydraulic oil used in the fill ups of industrial and heavy equipment. A report by the Australian and New Zealand Environment Council found that hydraulic systems lose very little volume of oil over the service life of the oil (ANZEC, 1991). The notifier has not estimated the total amount of hydraulic oil lost to the environment due to leaks during use but it is expected to be < 1% of the total volume imported. That is, up to 100 kg/annum would be lost per year during use in a dispersed fashion.

The time between oil changes is based upon service life and is recommended by the notifier to be 6000 to 7000 hours of operation. The ANZEC report estimated that up to 65% of automotive oil is collected and disposed of in an approved manner. The notifier indicates that the hydraulic oil will not be sold to the public but to industrial customers only. As a result the notifier estimates that 99% of the recovered oil from oil changes will be disposed of in an approved manner since the majority of such changes would be expected to be carried out by professional organisations with trained staff. These centres would have controlled handling

techniques for the removal and disposal of waste hydraulic oil containing the notified chemical *via* approved reclaimers and waste processors. If 10 tonnes of the notified chemical are imported per year, approximately 100 kg (1%) of the notified chemical may not be disposed of properly but this may be an overestimate. Improper release of the chemical to drains may occur if manufacturer disposal recommendations are not followed.

Some waste residue will remain in the 'empty' drums after use. The volume has not been estimated by the notifier but it may be expected that <0.1% of the drum contents will remain as residue after 'emptying' or up to 10 kg/annum of the notified chemical. Emptied drums of the hydraulic oil product containing the notified polymer are expected to be washed and recycled by drum reconditioners.

Release of the hydraulic oil to the environment would be significant in cases of spills. The MSDS and material handling instructions provide directions for the proper containment, collection and disposal of wastes in accordance with local regulations and would be by either incineration or landfill.

8.2 Fate

As the notified chemical will be a component of hydraulic oil, environmental exposure is likely to be limited during use. If there is leakage, the amount of notified chemical exposed to the terrestrial environment would be dispersed and difficult to collect. The chemical is only slightly water soluble and the high partition coefficient and high soil adsorption coefficient indicate that it will tend either to adsorb to or rapidly associate with the organic component of soils and sediments.

The notifier expects that most used and waste hydraulic oil containing the notified chemical will be either disposed of by incineration (for example in cement kilns) or recycled. All of the waste produced during the reformulation process is expected to be incinerated. Combustion of the notified polymer will produce water and oxides of carbon and nitrogen.

The majority of notified chemical released to the environment would be result from loss of the hydraulic oil product at the filling stage, accidental spills and improper disposal by 'backyard' repairers and mechanics. Spills from the filling stage and accidental spills are expected to be handled by operators according to the instructions provided in the MSDS. Containment, collection and disposal of wastes by incineration or landfill, should be in accordance with local regulations. Up to 1% of the hydraulic oil may be disposed of in an inappropriate manner. If this were released into the environment *via* water drains, the notified chemical would not be expected to enter the aquatic compartment but to settle out and either adsorb to or associate with soils.

Drum residues are expected to be handled by licensed oil waste and registered waste drum disposal companies where the waste chemical will be either recycled or incinerated. If the empty drums are not rinsed and recycled as expected, the hydraulic oil residue will end up in landfill and the notified chemical will tend either to adsorb to or associate with soils and be immobile.

The ready biodegradation of the notified chemical was determined by exposure to micro-organisms from a domestic sewage treatment plant according to OECD TG 301B (CO_2 Evolution Test) (Study Director, 1996e). After 28 days exposure to micro-organisms, the rate

of biodegradation expressed as a percentage of actual against theoretical quantities of CO_2 evolved was 51%. After 28 days exposure to micro-organisms the control test substance, sodium benzoate, was degraded by 99%. Under the conditions of the test the notified chemical was found to be not readily biodegradable.

The notified chemical is not expected to cross biological membranes due to its high molecular weight and large size, and it should not bioaccumulate (Connell, 1989).

9. EVALUATION OF TOXICOLOGICAL DATA

Toxicological tests were performed according to OECD test guidelines at facilities complying with OECD Principles of Good Laboratory Practice.

9.1 Acute Toxicity

Summary of the acute toxicity of K-Corr 100

Test	*Species*	*Outcome*	*Reference*
acute oral toxicity	rat	LD_{50}=7 700 mg/kg	SafePharm Laboratories
acute dermal toxicity	rat	LD_{50}>2 000 mg/kg	Study Director, 1996a
skin irritation	rabbit	Slight irritating	Study Director, 1993a
eye irritation	rabbit	Slight to moderate irritating	Study Director, 1993b
skin sensitisation (1) (Buehler test)	guinea pig	Not sensitising	Study Director, 1993c
skin sensitisation (2) (Magnusson & Kligman test)	guinea pig	Sensitising	Study Director, 1996b
skin sensitisation (3) (Magnusson & Kligman test)	guinea pig	Not sensitising	Study Director, 1997

9.1.1 Oral Toxicity (SafePharm Laboratories)

Species/strain: Rat/Sprague-Dawley.

Number/sex of animals: 5/sex/group.

Observation period: 14 days.

Dose, Method of administration: By oral route at 5 000, 7 000 and 9 000 mg/kg bodyweight.

Test method: OECD TG 401

Mortality:

Dose (mg/kg)	**Deaths in males**	**Deaths in females**
5 000	0	1

7 000	2	3
9 000	3	3

Clinical observations: Before death, the animals exhibited hunched posture, lethargy, facial staining, irregular respiration, ano-genital staining, diarrhoea and decreased faecal volume.

Most surviving animals had similar symptoms but recovered by day 6.

Morphological findings: Deceased animals: at the dose levels of 5 000 and 7 000 mg/kg, discolouration of lungs and intestines, and distension of stomachs were found. Discolouration of the liver and dark fluid in urinary bladders were also seen at 7 000 mg/kg.

Surviving animals: in the group at 9 000 mg/kg, necropsy examination found a small white mass on the surface of kidney in one male, and red discolouration of the adrenal glands in one female.

Comment: A full test report was not provided.

LD_{50}: 7 700 mg/kg

Result: The notified chemical was of very low acute oral toxicity in rats

9.1.2 Dermal Toxicity (Study Director, 1996a)

Species/strain: Rat/Sprague-Dawley.

Number/sex of animals: 5/sex

Observation period: 14 days.

Method of administration: A single dermal application to intact skin at 2 000 mg/kg under a semi-occlusive dressing for 24 hours.

Test method: OECD TG 402

Mortality: None

Clinical observations: None.

Morphological findings: None.

Comment: None.

LD_{50}: > 2 000 mg/kg

Result: The notified chemical was of low dermal toxicity in rats.

9.1.3 Inhalation Toxicity

An inhalation toxicity study was not provided for assessment.

9.1.4 Skin Irritation (Study Director, 1993a)

Species/strain: Rabbit/New Zealand White

Number/sex of animals: 3/sex

Observation period: 72 hours

Method of administration: A single dermal application (0.5 mL) under a semi-occlusive dressing for 4 hours.

Test method: OECD TG 404

Draize scores:

Animal #	***Time after treatment (hour)***			
	1	***24***	***48***	***72***
Erythema				
1	*1	1	1	0
2	1	1	1	0
3	1	0	0	0
4	1	1	1	0
5	1	1	1	0
6	1	0	0	0
Oedema				
1	0	1	0	0
2	0	0	0	0
3	0	0	0	0
4	0	1	0	0
5	0	1	0	0
6	0	0	0	0

[a] see Attachment 1 for Draize scales

Comment: None.

Result: The notified chemical was slight irritating to the skin of rabbits.

9.1.5 Eye Irritation (Study Director, 1993b)

Species/strain: Rabbit/New Zealand White

Number/sex of animals: 4 males and 5 females were divided into 2 groups:
6 (unwashed group);
3 (washed group).

Observation period: 14 days

Method of administration: A single dose (0.1 mL) was placed into the conjunctival sac of the right eye and the left eye was served as a control.

Eyes of 6 rabbits were not irrigated (unwashed group) and the eyes of the remaining 3 rabbits were irrigated with 30 mL saline approximately 20-30 seconds after instillation (washed group).

Test method: OECD TG 405

Draize scores for unwashed eyes:

	Time after instillation															
Animal	*1 hr*		*1 day*		*2 days*		*3 days*		*5 days*		*7 days*		*10 days*		*14 days*	
Cornea	***o***	***a***	***o***	***a***	***o***	***a***	***o***	***a***	***o***	***a***	***o***	***a***	***o***	***a***	***o***	***a***
1	[1]1	1	1	1	0	4	0	4	0	4	0	4	0	4	0	4
2	1	1	1	1	0	4	0	4	0	4	0	4	0	4	0	4
3	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4
4	1	1	1	1	0	4	0	4	0	4	0	4	0	4	0	4
5	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4
6	1	1	1	1	1	1	0	4	0	4	0	4	0	4	0	4
Iris																
1	0		0		0		0		0		0		0		0	
2	0		0		0		0		0		0		0		0	
3	1		1		0		0		0		0		0		0	
4	1		1		0		0		0		0		0		0	

5	0			0			0			0			0			0			0			
6	0			0			0			0			0			0			0			
Conjunctiva	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	
1	2	2	2	3	3	1	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
2	1	3	2	3	4	2	2	2	0	1	2	0	1	1	0	1	1	0	1	1	0	0
3	2	2	2	3	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	2	2	2	3	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	2	2	2	3	4	2	3	3	0	2	3	0	2	2	0	1	1	0	1	1	0	0
6	2	3	2	2	4	3	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0

[1] see Attachment 1 for Draize scales
o = opacity a = area r = redness c = chemosis d = discharge

Draize scores for washed eyes:

Time after instillation

Animal	*1 hr*		*1 day*		*2 days*		*3 days*		*5 days*		*7 days*		*10 days*		*14 days*	
Cornea	***o***	***a***	***o***	***a***	***o***	***a***	***o***	***a***	***o***	***a***	***o***	***a***	***o***	***a***	***o***	***a***
1	[1]1	1	0	4	0	4	0	4	0	4	0	4	0	4	0	4
2	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4
3	0	4	1	1	0	4	0	4	0	4	0	4	0	4	0	4
Iris																
1	0		0		0		0		0		0		0		0	
2	0		1		0		0		0		0		0		0	
3	1		1		0		0		0		0		0		0	

Conjunctiva	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	
1	2	2	3	3	2	2	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
2	2	2	3	3	3	2	2	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0
3	3	2	3	2	2	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0

[1] see Attachment 1 for Draize scales
o = opacity a = area r = redness c = chemosis d = discharge

Comment:

The mean Draize score of oedema of the conjunctivae (chemosis) was equal to 2.

Apart from the eye irritation noted, there were no signs of gross toxicity, adverse pharmacological effects or abnormal behaviour.

Result:

The notified chemical was a slight to moderate irritant to the eyes of rabbits.

9.1.6 Skin Sensitisation

9.1.6.1 Sensitisation test No. 1 (Buehler method) (Study Director, 1993c)

Species/strain: Female Guinea pigs/Hartley

Number of animals: Test group: 10;
Positive control: 10;
Naive control group: 5; and
Positive naive group: 5.

Induction procedure:

test group: day 1 — Topical Induction:
A dermal application of the notified chemical (0.4 mL) was applied using an occlusive chamber for 6 hours.

day 8 & 15 — Topical Induction:
Topical inductions were repeated as day 1.

control group: Treated similarly to the test animals using dinitrochlorobenzene (DNCB) instead of the notified chemical in topical applications.

Challenge procedure:

day 29 — Test and Positive control animals:
A 24 hour occluded application of 100% notified chemical to each animal.

The naïve control and positive naïve groups which without induction treatment received a challenge dose of the notified chemical and DNCB, respectively.

Test method: OECD TG 406

Challenge outcome:

	Test animals		***Positive control animals***	
Challenge concentration	***24 hours****	***48 hours****	***24 hours***	***48 hours***
100%	**0/10	0/10	8/10	8/10

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

Comment: In the test group animals, very faint to severe erythema was observed at most of the test sites during induction phase. The number of incidence and its severity of irritation increased with each successive treatment.

Very faint erythema was noted in naïve control group (2 of 5 animals) and positive naïve control group (3 of 5 animals).

Result: The notified chemical was not sensitising to the skin of guinea pigs.

9.1.6.2 Sensitisation test No. 2 (Magnusson & Kligman maximisation test) (Study Director, 1996b)

Species/strain: Guinea pigs/Hartley

Number of animals: Test group: 10 males;
Control group: 5 males.

Induction procedure:

test group:
day 0 — Intradermal Induction:
Three pairs of intradermal injections (0.1 mL) into the shoulder region:
Freund's complete adjuvant (FCA) 1:1 in distilled water;
25% notified chemical in arachis oil B.P.;
25% notified chemical in an 1:1 mixture of FCA and distilled water.

day 7 — Topical Induction:
A 48-hour occluded dermal application of 100% notified chemical to the treated area.

control group: Treated similarly to the test animals without the notified chemical in the intradermal injections and topical application.

Challenge procedure:

day 21 — Test and Control animals:
Occluded dermal application of 75% notified chemical in arachis oil B.P. and 100% notified chemical to each animal for 24 hours.

Test method: OECD TG 406

Challenge outcome:

	Test animals		***Control animals***	
Challenge concentration	***24 hours****	***48 hours****	***24 hours***	***48 hours***

75%	**5/10	3/10	0/5	0/5
100%	7/10	3/10	0/5	0/5

* time after patch removal
** number of animals exhibiting positive response (Draize score ≥1).

Comment: See section 9.4.

Result: The notified chemical was sensitising to the skin of guinea pigs under the experimental conditions.

9.1.6.3 Sensitisation test No. 3 (Magnusson & Kligman maximisation test) (Study Director, 1997)

Species/strain: Guinea pigs/Hartley

Number of animals: Test group: 10 females;
Control group: 10 females.

Induction procedure:

test group:
day 0 — Intradermal Induction:
Three pairs of intradermal injections (0.1 mL) into the shoulder region in the vicinity of the shoulders:
- Freund's complete adjuvant (FCA) 1:1 in distilled water;
- 0.1% notified chemical in arachis oil B.P.;
- 0.1% notified chemical in a 1:1 mixture of FCA and distilled water.

day 7 — Topical Induction:
A 48-hour occluded application of 100% notified chemical to the treated area.

control group: Treated similarly to the test animals without the notified chemical in the intradermal injections and topical application.

Challenge procedure:

day 21 — Test and Control animals:
Dermal occluded application of 5%, 10% and 25% and 100% notified chemical (vehicle: arachis oil B.P.) to each animal for 24 hours.

Test method: OECD TG 406

Challenge outcome:

Challenge concentration	Test animals		Control animals	
	*24 hours**	*48 hours**	*24 hours*	*48 hours*
5%	**0/10	0/10	0/9	0/9
10%	0/10	0/10	0/9	0/9
25%	0/10	0/10	0/9	0/9
100%	0/10	0/10	0/9	0/9

* time after patch removal
** number of animals exhibiting positive response (Draize score ≥1).

Comment: See section 9.4.

One animal from control group died on day 11. The absence of this animal did not affect interpretation of results.

Result: The notified chemical was not sensitising to the skin of guinea pigs under the experimental conditions.

9.2 Repeated Dose Toxicity (Study Director, 1996k)

Species/strain: Rat/Sprague-Dawley

Number/sex of animals: 5/sex/group.

Method of administration: Oral (gavage) administration daily for 28 days.

Dose/Study duration: Control group: 0 mg/kg/day;
Low dose group: 15 mg/kg/day;
Mid dose group: 150 mg/kg/day; and
High dose group: 1 000 mg/kg/day
(vehicle: Arachis oil B.P.).

Control and high dose groups had additional 5/sex as recovery groups which were terminated after 14 days.

Test method: OECD TG 407

Clinical observations:
Mortality: One female at mid dose was killed on day 20 due to a physical injury. No treatment related death occurred during the study.

Clinical Observations: Both males and females at high dose level showed short-lived increased salivation before or immediately after dosing from day 2 associated with fur wetting, noisy respiration and red/brown staining. Most of these animals had sporadic incidents of more prolonged increased salivation from the end of week 1. Transient red/brown staining around the eyes was occasionally observed during the study. There were no clinical abnormalities observed amongst high dose recovery group animals that could be

considered attributable to toxicity.

Animals at mid dose level showed short-lived increased salivation immediately after dosing from day 7. Animals from the low dose group showed no clinically observable signs of toxicity during the study.

Bodyweight: High dose males had a 21% reduction in bodyweight gain than the controls in week 3 and 4, and the effect of lower bodyweight gain persisted amongst high dose recovery group males during week 5.

Food and water consumption: There was no adverse effect on food consumption during the study.

From day 22 onwards, water consumption increased 21% and 44% amongst males and females, respectively in high dose group when compared with controls. The water consumption remained slightly elevated amongst females in high dose recovery group for several days following cessation of treatment. However, the water consumption regressed immediately upon cessation of treatment amongst males in the high dose recovery group.

Clinical chemistry/Haematology
There were no toxicologically significant differences between test and control animals in haematological or blood chemical examinations.

High dose females had a mild diuresis, producing a slightly greater volume of urine with lower specific gravity than the controls. Both males and females in high dose group had an increased incidence of haemoglobin in the urine (haemoglobinuria). There was no evidence of an haemoglobinuria amongst the high dose recovery group of either sex.

Pathology:
No toxicologically significant macroscopic or microscopic abnormalities were observed in necropsy.

High dose males had a 24% increase in absolute adrenal weight and a 30% increase in relative adrenal weight compared with controls. This effect was reversible in the males of the high dose recovery group. The organ weight changes amongst animals at low and mid dose levels were comparable with the controls.

Comment:
None.

Result:
The No Observed Adverse Effect Level (NOAEL) from this repeat dose study is established to be 150 mg/kg/day based on the clinical observations at the higher doses.

9.3 Genotoxicity

9.3.1 *Salmonella typhimurium* and *Escherichia coli* Reverse Mutation Assay (Study Director, 1996g)

Strains:	*S. typhimurium* TA1535, TA1537, TA98 and TA100; *E. coli* WP2uvrA.
Metabolic activation:	Liver fraction (S9 mix) from rats pretreated with Aroclor 1254.
Concentration range:	0, 15, 50, 150, 500, 1 500 and 5 000 μg/plate (vehicle: DMSO). Each concentration was tested in triplicate, either with or without metabolic activation. Positive controls (without metabolic activation): 9-aminoacridine for TA1537; 4-nitroquinoline-1-oxide for TA98; and N-ethyl-N'-nitro-N-nitrosoguanidine (ENNG) for WP2uvrA, TA100 and TA1535. Positive control (with metabolic activation): 2-aminoanthracene for all strains.
Test method:	OECD TG 471
Comment:	Toxicity and precipitation were observed at 5 000 μg/plate. There were no significant increases in revertant colony numbers at any concentration, in the presence or absence of metabolic activation. Concurrent positive controls used in the tests induced marked increases in the frequency of revertant colonies and the activity of the S9 fraction was found to be satisfactory.
Result:	The notified chemical was non mutagenic under the conditions of the test.

9.3.2 Chromosomal Aberration Assay in Chinese Hamster Lung Cells (Study Director, 1996c)

Cells:	Chinese hamster lung cells.
Metabolic activation system:	Liver fraction (S9 mix) from rats pretreated with Aroclor 1254.
Dosing schedule:	Vehicle: DMSO.

Metabolic Activation	Experiment/ Study Number	Test concentration (μg/mL)	Controls

-S9	1 (12 hour harvest) 2 (24 hour harvest) 2 (48 hour harvest) 2 (24 hour harvest) 2 (12 hour harvest)	treatment time = 12 hours 0, 5, 10, 20, 40, 60 and 80 µg/mL treatment time = 24 hours 0, 5, 10, 20, 40, 60 and 80 µg/mL treatment time = 48 hours 0, 2.5, 5, 10, 20, 30 and 40 µg/mL treatment time = 6 hours 0, 5, 10, 20, 40, 60 and 80 µg/mL treatment time = 12 hours 0, 2.5, 5, 10, 20, 40 and 60 µg/mL	Positive: MMC or CP Negative: solvent
+S9	1 (12 hour harvest) 2 (24 hour harvest) 2 (12 hour harvest)	treatment time = 4 hours 0, 20, 40, 80, 160, 320 and 480 µg/mL treatment time = 6 hours. 0, 20, 40, 80, 160, 240 and 320 µg/mL treatment time = 4 hours 0, 20, 40, 80, 160, 240 and 320 µg/mL	Positive: CP Negative: solvent

MMC - Mitomycin
CP - cyclophosphamide
DMSO – dimethylsulphoxide

Test method: OECD TG

Comment: In the preliminary test, precipitation occurred at 312.5 µg/mL and above. Dose related cytotoxicity was observed in all tests. The maximum dose range with metaphase present was 19.5-39.0 µg/mL and 156.25-312.5 µg/mL in the absence and presence of S9-mix, respectively.

In the two main tests, the notified chemical induced similar levels of toxicity to that seen in the preliminary test. In the second main experiment, the mitotic indexes were elevated above the vehicle control values in several occasions. This was probably due to the toxicity of the notified chemical causing cell-cycle delay and synchronisation of the cultures.

Positive controls used in the test caused marked increases in the incidence of aberrant cells and the activity of the S9 fraction was found to be satisfactory.

Result: The notified chemical was non-clastogenic under the conditions of the test.

9.3.3 Micronucleus Assay in the Bone Marrow Cells of the Mouse

A micronucleus assay was not provided for assessment.

9.4 Overall Assessment of Toxicological Data

The notified chemical was of very low acute oral toxicity (LD_{50}=7 700 mg/kg) and low acute dermal toxicity (LD_{50}>2 000 mg/kg) in rats. It was a slight skin irritant and a slight to moderate eye irritant in rabbits.

The notifier provided 3 skin sensitisation study reports. The notified chemical was found to be non-sensitising in female guinea pigs in a study using the Buehler method (sensitisation test 1) and a study using the Magnusson and Kligman maximisation method with a low concentration (0.1%) of induction (sensitisation test 3), but found sensitising in a study using the Magnusson and Kligman maximisation method with a higher concentration (25%) of induction in male guinea pigs (sensitisation test 2). In sensitisation test 2 after intradermal induction, test animals had severe erythema and dermal necrosis at 24 hours, and severe erythema and eschar at 48 hours. The control group that had very slight to well-defined erythema after intradermal induction with the vehicle. Following topical induction with 100% notified chemical, less irritant responses were observed. Test animals had very slight to well-defined erythema and very slight oedema at 24 hours after induction. On challenge, 70% of test animals were positive, and no positive response was found in the control animals. In the sensitisation test 3, a much lower concentration (0.1%) was selected for intradermal induction. Test animals had very slight to well-defined erythema at 24 hours, and well-defined or moderate to severe erythema at 48 hours. Control animals had very slight erythema after intradermal injections. The same concentration (100%) as the test 2 was used in topical induction. Bleeding from the injection site and dried blood were observed, and test animals had very slight to well-defined erythema after induction. On balance of the 2 Magnusson and Kligman maximisation tests, the positive results in the test animals at challenge phase in test 2 may reflect irritation, as was observed in the skin irritation study rather than skin sensitisation. The Buehler method is known to have more weight than the Magnusson and Kligman maximisation method as the Buehler method is more relevant to the pattern of exposure. Considering the two test methods and all three sets of results, the notified chemical was unlikely to be a skin sensitiser.

In a 28 day oral repeat dose study in rats, males at 1 000 mg/kg/day had a lower bodyweight gain than the controls in week 3 and 4, an effect that persisted amongst recovery group males during week 5. In addition, both males and females at 1 000 mg/kg/day had an increased incidence of haemoglobin in the urine (haemoglobinuria). In pathological examination, the males at 1 000 mg/kg/day had an increase in absolute adrenal weight and relative adrenal weight compared with controls. No other adrenal effects were observed. This effect was found reversible in the recovery group. The NOAEL is 150 mg/kg/day based on the clinical observations at the higher doses.

The notified chemical was found non-mutagenic in bacteria strains tested and non-clastogenic in Chinese hamster lung cell cultures.

According to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999), the notified chemical is classified as a hazardous substance with R36 (irritating to eyes) based on its eye irritation effects.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The notifier has supplied ecotoxicity studies on the notified chemical. They are summarised in the following table.

Test	*Species*	*Result s(mg/L)*
Acute Toxicity -(Static Test) (OECD TG 203)	Rainbow trout (*Oncorhynchus mykiss*)	96 h LC_{50} = 1.3 (see comments below).
Acute Toxicity -Immobilisation (Static Test) (OECD TG 202)	Water Flea (*Daphnia magna*)	48 h EC_{50} > 2 (see comments below).
Growth Inhibition - Growth (μ) & Biomass (b) (Static Test) (OECD TG 201)	Green Algae (*Scenedesmus subspicatus*)	72 h $E\mu C_{50}$ > 0.72 72 h E_bC_{50} > 0.72 72 h $NOEC\mu$ = 0.72 72 h $NOEC_b$ = 0.72 (see comments below).

The tests were performed in compliance with OECD/EEC Test Methods and according to OECD Principles of Good Laboratory Practices.

Fish
The acute toxicity of the notified chemical to Rainbow trout was determined in a 96 hour flow-through test (Study Director, 1996i). Groups of 10 fish were exposed to the notified chemical at nominal exposure concentrations of 0.50, 0.90. 1.6, 2.8 and 5.0 mg/L and solvent and non-solvent controls. Each solution was prepared by dissolving the appropriate amount of test material in 5% Tween 80/ethanol to give stock solutions of 0.125, 0.225, 0.40, 0.70 and 1.25 g/25 mL. Solutions were prepared each day prior to dosing by the continuous flow apparatus to give the test concentrations. The temperature was maintained at 14ºC with the dissolved oxygen (DO) content ≥ 9.7 mg/L.

The actual concentrations of the test solutions measured using HPLC were 0.362, 0.604, 1.28, 2.12 and 4.16 mg/L, respectively. The mean measured concentrations were between 57-88% of the nominal values and showed a marked decline during the test due to the unstable nature of the chemical in water.

After 96 hours the highest nominal concentration at which no mortality occurred was 0.90 (nominal) mg/L and the lowest nominal concentration resulting in 100% mortality was 2.8 mg/L. Marked reactions to exposure, other than death, included coughing, loss of equilibrium and moribund fish and were observed at concentrations >0.90 mg/L.

Based on mean measured concentrations, the LC_{50} (96 h) was 1.3 mg/L with 95% confidence limits of 1.1-1.6 mg/L. The NOEC was 0.604 mg/L.

Aquatic Invertebrates
The acute toxicity of the notified chemical to *Daphnia magna* was determined in a 48 hour static test (Study Director, 1996j). Four groups of 10 daphnia were exposed to a nominal concentration of 5.0 mg/L notified chemical. Solvent and non-solvent controls were established. The test solution was prepared by dissolving 500 mg of test material in 5%

Tween 80/ethanol to give a stock solution which was then diluted to the nominal concentration. The actual concentration of the test solution measured using HPLC was 4.48-4.68 mg/L at 0 h and 1.94-1.97 mg/L at 48 h. Because of the marked decline in sample concentration it was decided to base the results on the measured concentration. The temperature was maintained at 21ºC for the duration of the test, the pH was 7.7-7.8 and the DO was 7.9-8.4 mg/L.

No immobility and adverse effects were observed during the duration of the test. Both the 48 hour EC_{50} and NOEC of the notified chemical were determined to be > 5 mg/L nominal concentration or >2 mg/L measured concentration.

Algae
The acute toxicity of the notified chemical to Algae was determined in a 72 hour static test (Study Director, 1996f). Six replicate algal cultures with an initial cell count of 1 x 10^4/mL in mineral salts medium specified by OECD TG 201 were exposed to a nominal concentration of the notified chemical of 5.0 mg/L (prepared as above). Two solvent and non-solvent controls were prepared. The actual concentration of the test solution measured using HPLC was 4.63-5.03 mg/L at 0 h and 0.741-0.706 mg/L at 72 h. Because of the marked decline in sample concentration it was decided to base the results on the measured concentration. The temperature was maintained at 24ºC for the duration of the test and the pH was 8.0-10.2 due to the large number of growing cells.

No abnormalities or growth inhibition were observed during the duration of the test. Both the 48 hour EC_{50} and NOEC of the notified chemical were determined to be > 5 mg/L nominal concentration or >0.72 mg/L measured concentration.

Conclusion
The ecotoxicity data for the notified substance suggests that it is moderately toxic to fish but not toxic to aquatic invertebrates and algae up to the limits of its water solubility.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

Low volumes of waste chemical (<5.10 kg/annum) are expected from the reformulation process and will be disposed of by incineration. Waste hydraulic oil product generated during the filling process will be handled by licensed waste oil disposal companies and be disposed of either through oil recycling or incineration.

In the event of accidental spillage of the hydraulic oil into waterways, the notified chemical which is of high molecular weight and low water solubility, is not expected to disperse into the water but settle out onto sediments. Chemical is spilt on land, either during usage or transport, is expected to immobilise in the soil layer. Contaminated soil can then be collected and disposed to landfill.

In a worst case situation 1% of the waste hydraulic oil may be disposed of in an inappropriate manner. If this were released into the environment *via* stormwater drains the notified chemical would not be expected to enter the aquatic compartment but settle out from water and either adsorb to or associate with the organic component soils and sediments. If, for example, the notified chemical waste were to be used for dust suppression or the treatment of wooden fences, it would also be expected to either adsorb to or associate with soils. However,

due to the proposed use in industrial equipment and heavy machinery and the long periods of time between oil changes, the level of inappropriate disposal is likely to be far lower.

Given the above, environmental exposure and the overall environmental hazard is expected to be low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified chemical was of very low acute oral and low acute dermal toxicity. It was a slight skin irritant and a slight to moderate eye irritant, but on balance is not assessed as a skin sensitiser. In a repeat dose study, males at 1 000 mg/kg/day had a lower bodyweight gain in weeks 3-4, and persisted in recovery group during week 5. In addition, both males and females at 1 000 mg/kg/day had an increased incidence of haemoglobin in the urine (haemoglobinuria). In pathological examination, the males at 1 000 mg/kg/day had an increase in absolute adrenal weight and relative adrenal weight compared with controls. This effect was found reversible in the recovery group. The NOAEL was found to be 150 mg/kg/day from a 28 day oral repeat dose study in rats. The notified chemical was non-mutagenic in bacteria and non-clastogenic in cell cultures. The notified chemical is classified as a hazardous substance based on its eye irritation effects according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999). The risk phrase R36 (irritating to eyes) is assigned for the notified chemical.

Occupational health and safety

Workers involved in importation, transport and storage could only be exposed to the notified chemical in the event of accidental spillage.

Formulation of notified chemical at 60-100% occurs in large enclosed systems. The potential for worker exposure is limited to contact with residues in lines and on couplings and during clean up of any spills. The workers will wear aprons, gloves and safety glasses. Except in cases where there is a large spill, exposure would be expected to be low. Following blending, automatic filling of containers of oil or hydraulic fluid should not result in exposure unless overfilling or spillage occurs. At this stage, the concentration of the notified chemical in the final products is a maximum of 1% so exposure would be low.

Exposure can also occur during quality assurance testing and sampling. However, these workers will handle small quantities of samples for short periods of time.

End use of the formulated products, namely addition or changing of engine or gear oils or hydraulic fluids may potentially result in frequent exposure if workers do not use gloves, but the risk of adverse health effects is low given the likely low hazard of the notified chemical coupled with its low level in the products.

The risk of adverse health effects to waterside, transport and storage workers, workers involved in formulation and those using the formulated oils and hydraulic fluids containing the notified chemical is expected to be minimal on the basis of its likely low hazard, low concentration in final products and minimal potential for occupational exposure.

Public health

The notified chemical will be reformulated as lubricant and hydraulic liquids used in closed hydraulic systems for industrial equipment, containing up to 1% of the notified chemical. Therefore, the risk of exposure the general public to the notified chemical is considered to be low.

13. RECOMMENDATIONS

To minimise occupational exposure to K-Corr 100 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 and AS 3765.2 (Standards Australia, 1990); 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, 1994a);

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

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

If products containing the notified chemical are hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999), workplace practices and control procedures consistent with State and Territory hazardous substances regulations must be in operation.

The notified chemical may be referred to the National Occupational Health and Safety Commission for consideration for inclusion in the NOHSC *List of Designated Hazardous Substances.*

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* (NOHSC, 1994).

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 may be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

16. REFERENCES

Australian and New Zealand Environment Council (1991) Used lubricating oil: Generation, recovery and reuse in Australia, prepared by Technisearch Ltd. For the Waste and resources Committee.

Connell DW (1989) "General characteristics of organic compounds which exhibit bioaccumulation". In Connell DW, (Ed) *Bioaccumulation of Xenobiotic Compounds*. CRC Press, Boca Raton, USA.

Lyman WJ, Reehl WF, Rosenblatt DH (1982) Handbook of Chemical Property Estimation Methods. Environmental Behavior of Organic Compounds. McGraw-Hill Inc.

Mensink BJWG, Montforts M, Wijkhuizen-Maslankiewicz L, Uibosch H, Linders JBHJ (19995) Manual for Summarising and Evaluating the Environmental Aspects of Pesticides, July 1995. Report no. 679101022. National Institute of Public Health and the Environment, Netherlands.

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.

National Occupational Health and Safety Commission (1999) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)]. Australian Government Publishing Service, Canberra.

SafePharm Laboratories, study reference not provided.

Standards Australia (1990) Australian Standard 3765.2-1990, Clothing for Protection against Hazardous Chemicals Part 2 Limited protection against specific chemicals. Standards Association of Australia.

Standards Australia (1994) Australian Standard 1336-1994, Eye protection in the Industrial Environment. Standards Association of Australia.

Standards Australia/Standards New Zealand (1992) Australian/New Zealand Standard 1337-1992, Eye Protectors for Industrial Applications. Standards Association of Australia/ Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994a) Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear. Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1998) Australian/New Zealand Standard 2161.2-1998, Occupational protective gloves, Part 2: General requirements. Standards Association of Australia/Standards Association of New Zealand.

Study Director (1993a) EPA dermal irritation test, Product Safety Labs, USA.

Study Director (1993b) EPA primary eye irritation, Product Safety Labs, USA.

Study Director (1993c) EPA guinea pig sensitisation test (Buehler), Product Safety Labs, USA.

Study Director (1996a) K-Corr 100: Acute dermal toxicity (limit test) in the rat, Safepharm Laboratories Limited, UK.

Study Director (1996b) K-Corr 100: Magnusson & Kligman maxisation study in the guinea pig, Safepharm Laboratories Limited, UK.

Study Director (1996c) K-Corr 100: Chromosome aberration test in CHL cells *in vitro*, Safepharm Laboratories Limited, UK.

Study Director (1996d) K-Corr 100: Determionation of General Physico-Chemical Properties, Safepharm Laboratories, Derby UK.

Study Director (1996e) K-Corr 100: Assessment of Ready Biodegradability – CO_2 Evolution Test; Safepharm Laboratories, Derby UK.

Study Director (1996f) K-Corr 100: Algal Inhibition Test, Safepharm Laboratories, Derby UK.

Study Director (1996g) K-Corr 100: Reverse mutation assay "Ames test" using *Salmonella typhimuriun* and *Escherichia coli*, Safepharm Laboratories Limited, UK.

Study Director (1996h) K-Corr 100: Determination of Vapour Pressure, Safepharm Laboratories, Derby UK.

Study Director (1996i) K-Corr 100: Acute Toxicity to Rainbow Trout, Safepharm Laboratories, Derby UK.

Study Director (1996j) K-Corr 100: Acute Toxicity to Daphnia Magna; Safepharm Laboratories, Derby UK.

Study Director (1996k) K-Corr 100: Twenty-eight day sub-acute oral (gavage) toxicity study in the rat, Safepharm Laboratories Limited, UK.

Study Director (1997) K-Corr 100: Magnusson & Kligman maxisation dose response study in the guinea pig, Safepharm Laboratories Limited, UK.

Attachment 1

The Draize Scale (Draize, 1959) 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 (Draize *et al*., 1944) 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

Draize, J. H., Woodward, G., Calvery, H. O. (1944) Methods for the Study of Irritation and Toxicity of Substances Applied Topically to the Skin and Mucous Membranes, J. Pharmacol. Exp. Ther. 82 : 377-390

Draize J. H. (1959) Appraisal of the Safety of Chemicals in Foods, Drugs and Cosmetics. Association of Food and Drug Officials of the US, 49 : 2-56.

MSDS