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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

CS-8593

This Assessment has been compiled in accordance with the provisions of *the Industrial Chemicals (Notification and Assessment) Act 1989* (the Act), and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by Worksafe Australia which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment, Sport, and Territories and the assessment of public health is conducted by the Department of Health and Family Services

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

CS-8593

1. APPLICANT

Hanimex Pty Limited of 108 Old Pittwater Road BROOKVALE NSW 2100 has submitted a limited notification statement in support of their application for an assessment certificate for CS-8593.

2. IDENTITY OF THE CHEMICAL

CS-8593 is not considered to be hazardous based on the nature of the chemical and the data provided. Therefore the chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data and details of import quantities have been exempted from publication in the Full Public Report and the Summary Report.

Trade Name:	CS-8593
Method of Detection and Determination:	the chemical is detected by ultraviolet/visible, infrared, nuclear magnetic resonance spectroscopy and ion chromatography

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	clear, colourless liquid
Odour:	unknown
Freezing Point:	-19°C
Boiling Point:	107°C at 101.3 kPa
Density:	1092 kg/m^3 at 22°C
Vapour Pressure:	not applicable
Water Solubility:	miscible in all proportions of water
Hydrolysis as a Function of pH:	after 120 hours at pH 4,7 and 9 at 50°C, <10% hydrolysis was observed

Partition Coefficient (n-octanol/water)	log P_{ow} < -2 at 20°C
Adsorption/Desorption:	adsorption coefficients - sandy loam > 225, sandysilt loam > 5.5, clay loam > 225
Dissociation Constant pK_a:	not determined
Flammability Limits:	not flammable
Autoignition Temperature:	not auto-flammable
Explosive Properties:	not explosive
Reactivity/Stability:	a liquid at room temperature, therefore oxidising properties not investigated.

Comments on Physico-Chemical Properties

The test material is an aqueous solution, so vapour pressure was not determined.

Water solubility was not recorded.

High performance liquid chromatography was performed to determine the concentration of the notified chemical in respective soils, in order to ascertain the adsorption coefficients. The coefficients for this chemical indicate it would be immobile in sandy loam and clay loam soils, and have a low mobility in the sandy silt loam soil.

No dissociation constant was determined when the test was conducted by a titrimetric method over the pH range 2 to 11.

4. PURITY OF THE CHEMICAL

Degree of Purity:	typical 33% (range 25-50%) ammonium methanesulfinate is supplied in a mixture with water since it is unstable and cannot be isolated

Hazardous Impurities:

Chemical name:	ammonium chloride
CAS No.:	12125-02-9

Weight percentage:	0-5%
Toxic properties:	LD_{50} (oral-rat)= 1650 mg/kg severe eye irritant (1)
Chemical name:	ammonium methane sulfonate
Weight percentage:	0.1-5%
Toxic properties:	severe eye irritant (2)

Other Impurity:

Chemical name:	isopropanol
CAS No.:	67-63-0
Weight percentage:	0 -1%

Additives/Adjuvants: none

5. INDUSTRIAL USE, VOLUME AND FORMULATION

CS-8593, a stabilising agent, will be imported into Australia as a component of a photographic processing reagent, to be used in photographic film processing laboratories. The estimated quantities imported during 1996-99 being < 1 tonne.

6. OCCUPATIONAL EXPOSURE

The notified chemical will be imported in aqueous solution (N3R), at a concentration of 2.1% in sealed 2 litre plastic bottles secured with a screw type plastic top. Bottles are packed into inner cartons which are repacked into outer cartons. The cartons are palletised and wrapped in a plastic film. From the wharf palletised cartons are transported by road to a warehouse. The product containing the notified chemical is sold in carton quantities and transported by road to mainland customers and by sea to non mainland customers.

The notified chemical will be initially used in about 25 Fuji automated photographic film processing laboratories in Australia. This number is expected to increase as more machines are imported. N3R is used without dilution in the fixer tank of the film processing machine. At each site, exposure to the notified chemical will be limited to:

- one worker for 0.2 hours/day, approximately 125 days/year, while charging the machine; and

- 2.5 workers for 8 hours/day, approximately 250 days/year, during machine operation.

The film processing takes place in a closed system. There is possible exposure during charging and emptying the fixer tank, local exhaust ventilation will be used at these stages.

Expected exposure to the notified chemical is approximately 0.042 kg per batch.

7. PUBLIC EXPOSURE

Following completion of film processing, the amount of chemical remaining on the film surface is 8-12 mg/m^2. The residual surface chemical can be removed by contact. The general public will handle the processed film, and therefore be exposed (via dermal contact) to small quantities of the notified chemical. Ocular contact may also result from accidental transfer of chemical from hands to eyes. Minor public exposure may result from accidental spillage of the notified chemical during transport or storage, but such an event is expected to be rare.

8. ENVIRONMENTAL EXPOSURE

Release

There is currently only one model of film processor in Australia which can use this chemistry, and some 25 photolabs have this model.[4] No environmental exposure during transport of the chemical is expected.

In the event of accidental spillages, environmental exposure would be minimal due to the small container size. Also there are adequate instructions on the Material Safety Data Sheet (MSDS) to deal with spillage situations.

All labs have two processing machines, one being for paper processing, and the other for film processing. Within the film processing machines, there are generally five chemical tanks which are replenished from holding tanks . Any resulting overflow is collected for disposal along with the waste from other machines within the lab.

It is standard practice to rinse freshly emptied chemical containers with water and add the resulting rinsate to the chemical mix in the processor. The plastic containers are recyclable, or will be landfilled.

The concentration of the chemical in the processing chemical mixture is approximately 2.1%. Of the photographic film and paper process chemical waste, overflow of this solution accounts for about 5%. This waste is then further diluted with water and allowed to enter the sewerage drainage system at an estimated concentration of 318 ppm.

Fate

All photographic chemical wastes are to be disposed in accordance with P.U.R.E. guidelines (Photographic Uniform Regulations for the Environment guidelines) (3). This involves disposal to sewer as the preferred option, however, where a discharger is unable to meet the requirements, or chooses not to install the necessary pre-treatment facilities, waste photographic chemicals are to be carted off site by a licensed transporter to an approved liquid waste disposal depot. Disposal to sewer usually involves dilution with other photo chemicals and water, balancing with other photo chemicals and then desilvering.

A modified Sturm Test on CS-8593 (EC Directive 92/69/EEC) to determine ready biodegradation showed it could be considered to be readily biodegradable, with 79% CO_2 production over 28 days.

[4] Hanimex supplies to 600 photolabs in Australia, so this number is expected to increase.

Bioaccumulation is not expected due to its low Log P_{OW} and high water solubility (4), and through its ready biodegradability.

9. EVALUATION OF TOXICOLOGICAL DATA

9.1 Acute Toxicity

Summary of the acute toxicity of Ammonium Methanesulfinate

Test	*Species*	*Outcome*	*Reference*
acute oral toxicity	rat	LD_{50} > 2,000 mg/kg	(5)
acute dermal toxicity	rat	LD_{50} > 2,000 mg/kg	(6)
eye irritation	rabbit	slight irritant	(7)
skin sensitisation	guinea pig	negative	(8)

9.1.1 Oral Toxicity (5)

Groups of CD strain rats (5 per sex; approximately 5 weeks old) were administered a single gavage dose of 500 (LD) or 2,000 (HD) mg of the notified chemical (ammonium methanesulfinate)/kg. The animals were maintained for 14 days. Mortality and clinical signs of toxicity were assessed several times on the day of test compound administration, and daily thereafter. Body weight was determined pre-treatment and on days 1, 2, 3, 4, 8, and at study termination. An autopsy was performed on all animals at the completion of the study, and abnormal tissue retained in formaldehyde.

One of 5 HD males and females died within 12 hours of dosing. Within 3 hours of dosing, the surviving animals showed inactivity (4 of 4 per sex), staggering gait (4 of 4 per sex) and hunched posture (3 of 4 males). The majority of animals appeared normal by day 2. The animals receiving the LD showed evidence of piloerection 3 to 5 hours after dosing.

The acute oral LD_{50} of the notified chemical was greater than 2,000 mg/kg in male and female rats.

9.1.2 Dermal Toxicity (6)

A dose of 2,000 mg of the notified chemical (ammonium methanesulfinate)/kg was applied to shaved, intact skin of CD strain rats (5 per sex, approximately 7-11 weeks old). The area was occluded for 24 hours, after which, the residual chemical was removed using a water moistened tissue. The study was terminated after 14 days. Mortality and clinical signs of toxicity were assessed several times on the day of test compound application, and twice daily (for mortalities) and daily (for clinical signs of toxicity) thereafter. Body weight was

determined pretreatment and on days 1, 8 and 15. An autopsy was performed on all animals at the completion of the study.

No deaths or abnormalities were noted over the duration of the study.

The acute dermal LD_{50} of the notified chemical was greater than 2,000 mg/kg in male and female rats.

9.1.3 Eye Irritation (7)

A dose of approximately 0.1 mL of the notified chemical (ammonium methanesulfinate) was instilled into the right conjunctival sac of 3 female New Zealand White rabbits. The eyes were not flushed. The study was terminated after 72 hours. The eyes were examined 1, 24, 48 and 72 hours after chemical instillation, and the degree of corneal, iridial and conjunctival irritation assessed.

Installation of the test material resulted in a moderate initial pain response in all animals. The vasculature of the conjunctivae were injected, and very slight to slight discharge was observed in all rabbits after 1 hour. Slight chemosis and iritis were seen 1 hour after installation in 1 of 3 rabbits which persisted for 24 hours. One of 3 eyes appeared normal 24 hours after chemical installation, and 2 of 3 eyes appeared normal within 48 hours.

The notified chemical was a slight ocular irritant in rabbits.

9.1.4 Skin Sensitisation (8)

Groups of Dunkin-Hartley strain guinea pigs (6-8 weeks old) were divided into a treatment group (10 per sex) and a control group (5 per sex). An induction dose of 0.1 mL of Freunds Complete Adjuvant (FCA), 30% v/v ammonium methanesulfinate in water or 30% v/v ammonium methanesulfinate in FCA were injected intradermally. On day 8, 0.6 mL of ammonium methanesulfinate was applied to a dermal site over the scapulae, and the area occluded for 48 hours. The control group was similarly treated, except the test material was deleted. On day 22, the animals were challenged by applying purified water to the left flank, 30% v/v ammonium methanesulfinate and 5% v/v ammonium methanesulfinate to the right flank. The occlusive dressings were removed after 24 and 48 hours and the sites assessed for the degree of erythema. In addition, body weights were determined at the beginning and at the completion of the study.

At the second induction phase, topically applied ammonium methanesulfinate induced barely perceptible erythema (6 of 10 males; 4 of 10 females), slight erythema (3 of 10 males; 6 of 10 females), superficial eschar formation (7 of 7 males and females) and exfoliation (10 of 10 males; 7 of 10 females). Twenty four hours after the 30% test compound challenge application, 8 of 10 females and 1 of 10 males showed barely perceptible to slight erythema, and 2 of 10 females and 1 of 10 males showed exfoliation and 2 of 10 females showed eschar formation. This compared to 2 of 5 females showing barely perceptible erythema, and 3 of 5 animals showing exfoliation, in the control group. No adverse reactions were reported in the 5% challenge group.

In summary, 3 of 20 30% ammonium methanesulfinate test animals showed slight erythema or a more marked response (grade 1 or above).

The notified chemical did not cause dermal sensitisation in the guinea pig.

9.2 Repeated Dose Toxicity (9)

Groups of 10 (5 per sex) CD strain rats (approximately 5 weeks old) were administered 0, 30 mg (LD), 150 mg (MD) or 1,000 mg (HD) of the notified chemical (ammonium methanesulfinate)/kg/day, by gavage, for 28 days. Mortality or morbidity were assessed daily, clinical signs of toxicity were assessed twice daily, a detailed examination was carried out, and food consumption was calculated at weekly intervals. Body weight was recorded twice weekly. Blood to determine haematological and clinical biochemical parameters was collected at the completion of the study. Autopsies, which included selected organ histopathology, and organ weight determinations, were carried out at study termination.

Excess salivation was noted in the latter half of the study in MD and HD animals. Haemoglobin, red blood cell number and PCV were reduced in HD males and females. Serum ALT was marginally elevated in HD males and females. Absolute kidney and liver weights were slightly elevated in HD females.

9.3 Genotoxicity

Summary of genotoxicity studies using ammonium methanesulfinate.

STUDY TYPE	*TEST OBJECT*	*CONCENTRATION*	*RESULT*	*REF.*
Reverse mutation	*S. typhimurium* strain TA98, TA100, TA 1535 and TA1537	50-5,000 mg/plate (with and without metabolic activation)	-ve	10
Clastoge-nicity	Human peripheral lymphocytes	625-5,000 mg/mL (with and without metabolic activation)	+ve	11*

* In the absence of metabolic activation, treatment with 2500 mg of ammonium methanesulfinate/mL for 20 hours produced a marked increase in the frequency of metaphases with aberrant chromosomes. Toxic changes were noted at this chemical concentration. The appropriate positive controls, cyclophosphamide and chlorambucil were used.

9.4 Overall Assessment of Toxicological Data

The studies demonstrated that the notified chemical (ammonium methanesulfinate) has low acute oral and dermal toxicity, is a slight ocular irritant, and does not cause dermal sensitisation. A 28-day oral repeat dose study in rats indicated that the main target organ is the liver, and mild anaemia is induced at doses of 1,000 mg of ammonium methanesulfinate/kg/day. The compound, when assessed in an Ames test, was not mutagenic, although showed clastogenicity in human lymphocytes at high doses.

On the basis of submitted data, the notified chemical would not be classified as hazardous in accordance with Worksafe Australia's *Approved Criteria for Classifying Hazardous Substances* in relation to irritant effects (eye), acute lethal effects (oral and dermal), sensitising effects (skin), severe effects after repeated or prolonged exposure (oral route) or mutagenic effects.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

Results of ecotoxicity tests are summarised in Table 1. While the chemical can be classified as non-toxic to fish and algae, it has slight toxicity with respect to the reproduction ability of water fleas, with a 21 day EC_{50} of about 60 mg/L. Also, the chemical does not appear to inhibit the ability of bacteria in aerobic sludge.

All ecotoxicity tests were performed to test methods following the EC Directive 92/69/EEC.

Table 1. Ecotoxicity test results

Species	Test	Concentrations *a* (mg/L)	Result (mg/L)
Rainbow Trout	96 h acute	108	LC_{50} > 108 NOEC > 108
Water Flea (*Daphnia magna)*	48 h acute	7.22, 13.8, 27.5, 54, 105	EC_{50} > 105 NOEC > 105
Water Flea (*Daphnia magna*)	21 d	5.81, 12.2, 24.6, 51.1, 106	EC_{50} > 106 EC_{50} (reproduction) = 59.5 & 60.7
Algae (*Selenastrum capricornutum*)	96 h growth	81.9	NOEC > 81.9
Aerobic Sludge	5 d	10	NOEC > 10
Earthworm	15 d	64, 127, 261, 518, 1088	LC_{50} = 682 $mg.kg^{-1}$

a All concentrations are mean measured test concentrations except for aerobic sludge which was not measured.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The chemical will be imported as a component in a photo finishing chemical. No repacking or reformulating will take place in Australia. Import volumes will range from an estimated 40 kg in the first year to 250 kg during 1999. The chemical will be distributed to 25 different processing laboratories throughout the country.

The greatest potential for environmental exposure from CS-8593 will result from disposal of the overflow to sewer.

The notified chemical is present in a concentration of approximately 2.1% in the finishing solution. Overflow of this solution accounts for about 5% of the total photographic film and paper process chemical waste, which at the highest importation rate, will be approximately 12.5 kg per year or 34.2 g per day. In a worst case, if all overflow entered the sewage system in one large country town, in one day (around 5 megalitres per day), the chemical would be present at a concentration of 7 ppb. Several orders of magnitude therefore exists between the worst case estimated environmental concentration (7 ppb) and the most sensitive effects concentration (21 day EC_{50} = 59.5 ppm for water fleas), and the environmental hazard of the chemical can be rated as negligible.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

CS-8593 is non-flammable, non-explosive and is expected to exhibit low volatility. Based on the submitted data, there are no major toxicological concerns associated with the notified chemical except being a slight eye irritant.

The most likely worker exposure will be inhalation (due to aerosol formation) or dermal exposure during charging and emptying the solution containing the notified chemical. During these operations the use of local exhaust ventilation would minimise exposure due to aerosol spray. However, should ventilation methods be inadequate exposure may be further controlled with personal protective equipment. Once the notified chemical is incorporated into the photographic film, no additional worker exposure is anticipated.

Given the low intrinsic health hazard of the notified chemical in the formulation together with expected low exposure, the occupational health risk arising from transport, storage and use is expected to be minimal.

The chemical will be present on the surface of processed films in very small amounts (8-12 mg/m^2 of film) which are capable of being removed by handling. The general public will therefore be exposed to the notified chemical via dermal contact, and, to a very minor degree, via ocular contact from accidental transfer of chemical from hands to eyes. The notified chemical has low acute dermal toxicity, does not cause dermal sensitisation, and is a slight ocular irritant, and therefore its use is not expected to result in significant adverse health effects.

13. RECOMMENDATIONS

To minimise occupational exposure to CS-8593 the following guidelines and precautions should be observed during usage of the formulation:

- safe practices, as should be followed when handling any chemical formulation, should be adhered to - these include:

  - minimising spills and splashes;

  - practising good personal hygiene; and

  - practising good housekeeping and maintenance including bunding of large spills which should be cleaned up promptly with absorbents and put into containers for disposal.

In addition personal protective equipment such as eye protection, impervious gloves and protective clothing should be worn.

- if the concentration of the notified chemical, CS-8593 is to be imported in a formulation at a concentration that exceeds 5%, then the Director should be advised in writing.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in accordance with the *Code of Practice for the Preparation of Material Safety Data Sheets* (12).

This MSDS was provided by the applicant as part of the notification statement. The accuracy of this information remains the responsibility of the applicant.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, secondary notification of CS-8593 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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3. P.U.R.E. *Photographic Uniform Regulations for the Environment*. *Photographic Industry Code of Practice*, March 1993.

4. Connell DW 1989. *General characteristics of organic compounds which exhibit bioaccumulation. In Bioaccumulation of Xenobiotic Compounds*, DW Connell (ed). CRC Press, Boca Raton, USA. Chapter 3.

5. M-3217B: *Acute oral toxicity study in the rat. PB Rees, Pharmaco LSR Ltd, England. Report no.: 94/FIT388/0452*, December 1994. QA; GLP.

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