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September 1999

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

# DOWFAX Dry Hydrotrope Powder

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Director
Chemicals Notification and Assessment

# FULL PUBLIC REPORT

## DOWFAX Dry Hydrotrope Powder

## 1. APPLICANT

Dow Chemical (Australia) Limited of 541-583 Kororoit Creek Road, Altona, Victoria has submitted a standard notification statement in support of their application for an assessment certificate for DOWFAX Dry Hydrotrope Powder.

## 2. IDENTITY OF THE CHEMICAL

The CAS number, generic molecular and structural formula, estimated molecular weight, spectral data, details of import volume and detailed calculations of environmental releases, along with the identity of the scientists who performed the reported studies, have been exempted from publication in the Full Public Report and Summary Report.

| | |
|---|---|
| **Generic Name:** | Ethers; Sulfonic acids (CAS Registry file) |
| **Other Names:** | DOWFAX XD 008292.00<br>DOWFAX C6L Solution Surfactant<br>DOWFAX C6 Surfactant |
| **Marketing Name:** | DOWFAX Dry Hydrotrope Powder<br>DOWFAX Hydrotrope Surfactant |
| **Method of Detection and Determination:** | infrared (IR) and ultraviolet/visible (UV/Vis) spectra were provided for the notified chemical |

## 3. PHYSICAL AND CHEMICAL PROPERTIES

Data has been provided for both the dry powder ("powder") and 40 – 50 % (w/v) aqueous solutions ("solution").

| | |
|---|---|
| **Appearance at 20°C and 101.3 kPa:** | Light tan powder (powder)<br>Yellow to light brown liquid (solution) |
| **Boiling Point:** | 100°C (solution) |
| **Melting Point:** | 215ºC - 232ºC (powder)<br>Reaction or decomposition observed at > 330ºC. |

| | | |
|---|---|---|
| **Specific Gravity:** | 1.36 at 20ºC (powder) | |
| **Vapour Pressure:** | $2.2\times10^{-3}$ kPa at 20ºC (powder) | |
| **Water Solubility:** | Soluble in all proportions | |
| **Particle Size Distribution:** | < 2 μm | 0.1% |
| | 2 – 5 μm | 0.5 % |
| | 5 – 10 μm | 0.8 % |
| | 10 – 20 μm | 2.6 % |
| | 20 – 50 μm | 10.6 % |
| | 50 – 63 μm | 3.6 % |
| | 63 – 250 μm | 78.3 % |
| | > 250 μm | 3.6 % |
| | 1.4 % less than 10 μm diameter | |
| **Partition Co-efficient (n-octanol/water):** | $\log P_{ow} \leq -3.5$ | |
| **Hydrolysis as a Function of pH:** | $T_{1/2}$ at pH 4.0 > 1 year<br>$T_{1/2}$ at pH 7.0 > 1 year<br>$T_{1/2}$ at pH 9.0 > 1 year | |
| **Adsorption/Desorption:** | Koc = 12.3 $cm^3/g$ (silt loam)<br>= 5.3 $cm^3/g$ (loamy sand)<br>= 0 $cm^3/g$ (clay loam) | |
| **Surface Tension:** | 34.2mN/m at 20ºC (for 1.019 gm/L solution) | |
| **Dissociation Constant:** | not determined (see comments below) | |
| **Flash Point:** | none – notified chemical not volatile | |
| **Flammability Limits:** | not flammable; not readily combustible | |
| **Autoignition Temperature:** | > 400°C (powder) | |
| **Explosive Properties:** | not expected to be explosive | |
| **Reactivity/Stability:** | stable at normal handling temperature and pressure | |

**Comments on Physico-Chemical Properties**

The melting point of the notified chemical was determined using a differential scanning calorimeter. The powder was observed to change from a glassy state to an under-cooled liquid over the temperature range of 215-232°C. Decomposition was observed above 330°C with minor effects seen at 265-280°C.

The vapour pressure of the notified chemical as a 45-50 % solution in water was determined to be 2.2 Pa at 20°C using the Static Technique, OECD TG 104.

The notified chemical was determined by the flask shaking method OECD TG 105 to be miscible with water in at least a 1:1 (w/v) ratio at 19.5°C.

The notifier based the determination of hydrolysis as a function of pH on the EEC Directive 92/69 Part C. Quantification was based on the major component in the notified chemical, which was determined to be hydrolytically stable with a half-life > 1 year at 25°C at pH 4, 7 and 9.

The partition coefficient log $P_{OW}$ of the notified chemical between n-octanol and water was determined to be ≤ -3.5 at 20°C by the flask shaking method OECD TG 107.

Adsorption of the notified chemical was measured by the batch equilibrium method OECD TG 106 with three standard soils using 0.01 M $CaCl_2$. The notified chemical is potentially highly mobile, depending upon the soil type. Desorption of the notified chemical was not determined because the quantities adsorbed were very low and not capable of being accurately determined.

No dissociation constant data was provided for the notified chemical. The notifier indicates that the notified chemical is a mixture of sodium salts of sulphonated and alkylated molecules as well as containing sodium sulphate and sodium chloride as significant impurities. The notifier has indicated that the notified chemical is soluble in water and is expected to dissociate. The notified chemical contains very acidic $ArSO_3^-$ substituents which would be primarily dissociated or exist as sodium salts.

The surface tension of an aqueous solution of the notified chemical at a concentration of 1.019 g/L was determined to be 34.2 mN/m based on OECD TG 115. According to the criteria outlined in the guideline, the notified chemical should be regarded as a surface-active material.

## 4. PURITY OF THE CHEMICAL

**Degree of Purity:** > 92% (in powder form)

**Hazardous Impurities:** none

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

*Chemical name:* water
*Weight percentage:* < 6.0 %
*CAS No.:* 7732-18-5

*Chemical name:* sodium sulphate

| | |
|---|---|
| *Weight percentage:* | < 3.0 % |
| *CAS No.:* | 7757-82-6 |
| | |
| *Chemical name:* | sodium chloride |
| *Weight percentage:* | < 1.5 % |
| *CAS No.:* | 7647-14-5 |

The concentrations (weight %) of sodium chloride and sodium sulphate in the notified chemical were determined by ion chromatography. The concentration (weight %) of water in the chemical mixture was determined by the Karl Fischer Titration method.

**Additives/Adjuvants:** none added, when in powder form

## 5. USE, VOLUME AND FORMULATION

The notified chemical will not be manufactured in Australia. It will be imported in the form of a 40 – 50 % (w/v) aqueous solution for use as a hydrotrope in formulations for hard surface cleaners, carpet cleaners, industrial and institutional cleaning and rinsing formulations. A hydrotrope is a chemical which has the property of increasing the aqueous solubility of otherwise slightly soluble organic chemicals.

The products containing the notified chemical will be formulated in Australia. A typical cleaning formulation will contain approximately 1 % (w/v) notified chemical. The notifier indicates that 85 % of the imported volume will be used in commercial cleaning formulations for hard surface cleaning and carpet cleaning, while the remaining 15 % will be used in industrial cleaning and rinsing products for "cleaning in place", mainly in the dairy industry.

Import volume is expected to be in the range 1 – 10 tonnes per year in the first year of importation, and in the range 10 – 100 tonnes per year for each of the next four years.

## 6. OCCUPATIONAL EXPOSURE

*Transport and storage*
The notified chemical in aqueous solution will be imported by sea in 200 L High Density Polyethylene (HDPE) drums. Containers will be transported by road to a warehouse where the drums will be unloaded and stored in an approved warehouse until required by customers. Up to 4 shipments per year will be received, with 1 transport driver and 1 storage worker being involved per shipment, for 2 – 3 hours per time.

Delivery of individual drums or pallets could take place up to 150 times per year. Storage workers would be expected to handle the drums or pallets for 10 minutes per delivery.

Occupational exposure is unlikely during transport, unloading the container, warehousing and delivery to the manufacturers as the drums remain sealed until required for use in the manufacturing process. Exposure may occur only in the event of a transportation incident or a

leak in packaging.

*Formulation of cleaning products*
There is potential for limited worker exposure during manufacture of the cleaning formulation. As the notified chemical is used as a water based solution, the most likely route of exposure is skin contact and to a lesser extent by eye contact.

The formulation operator will open the drum containing the notified chemical, insert a drum pump, and connect the transfer hose to a mixing vessel or feed tank. After transfer of the notified chemical, the transfer hose will be disconnected and drained, and the drum pump rinsed in a drum containing water. Samples will also be taken for quality control measurements. Dermal exposure to the a 40 – 50 % solution of the notified chemical is possible during all of these operations.

The notifier estimates that there will be potentially 14 formulation sites using the notified chemical, and approximately 40 batches per year will be produced. One operator will be involved in preparing each batch, with an exposure time in total of 2 hours per batch, of which 30 minutes will comprise handling the solution of the notified chemical. Total exposure is therefore likely to be up to 20 hours per year for approximately 14 formulation operators.

The operators are stated to wear chemical goggles, waterproof gloves, overalls and protective footwear while handling the solution of the notified chemical.

The formulation process is a controlled batch process which takes place in a closed vessel with controlled addition of components. The finished product is transferred to a storage tank, prior to packaging into HDPE containers of different capacities. The product following formulation will typically contain less than 1 % notified chemical. If the mixing tank is not enclosed, aerosols may be generated during the mixing process, leading to possible inhalation exposure. Packaging of the formulated product into 1, 5, 20 or 200 L containers or drums is stated to be fully automatic or semi-automatic, and little potential for exposure of the packaging workers is expected. Dermal exposure may occur in the event of overfilling of containers and resultant clean-up. The notifier states that the packaging operators would be expected to wear overalls, footwear and safety spectacles.

Dermal exposure may also occur for laboratory personnel testing the product. Some exposure to the notified chemical may occur during cleaning and maintenance of equipment.

*End use*
Institutional, commercial and industrial cleaning workers may be exposed to the notified chemical as a component at < 10 % (generally < 2 %) of the end use cleaning formulation. The formulations may be further diluted by a factor of up to 40 prior to application.

The main route of exposure is potentially dermal. Incidental eye contact may also occur. If the cleaning solution is used in spray form, inhalation exposure may occur. Exposure to the notified chemical as a component of a cleaning formulation may be several hours per week when used by cleaning workers.

## 7. PUBLIC EXPOSURE

The end use products containing the notified chemical are not available to the public, but are used in institutional, commercial and industrial cleaning. Such cleaning generally occurs out of normal working hours, so exposure to the public from the use of cleaners containing the notified chemical should be minimal. The exposure of the public to surfaces cleaned with the products is expected to result in only minimal exposure. Use of the cleaning products containing the notified chemical as carpet cleaning solutions in domestic situations may result in exposure to the public. These solutions are generally rinsed from the carpet by the operator so exposure is expected to be minimal.

## 8. ENVIRONMENTAL EXPOSURE

### Release

After importation, the notified chemical will be transported via road in 200 L HDPE drums contained within the full container load. Once received by the distributor, the drums are stored separately from the workplace until required. Distribution of either individual drums or pallet loads per customer will be via road with no repackaging; potential release would only be through accidental spills. The Material Safety Data Sheet (MSDS) details procedures to protect the environment in these cases.

The notifier indicates that some release of the notified chemical will occur during formulation via the draining and washing of mixing vessels, filling lines and empty drums. From estimates provided by the notifier, it can be calculated that approximately 66 kg of the notified chemical will be lost per year in total in this manner.

The majority of the notified chemical will be contained within the hard surface and carpet cleaning formulations as well as industrial cleaning and rinsing products. These products will be sold nationally and the quantity used by each State and Territory is assumed by the notifier to be proportional to the population of each capital city. It can also be assumed that the cleaning products will be used in a diffuse manner and that the majority of this material will be released to the environment. The notifier estimates that 5 % of the carpet-cleaning product will be retained on the surface and that there would be no significant amount retained on hard surfaces. Hard surface cleaning products may also be used in commercial and industrial applications such as car washes. In these cases the notifier indicates that there is potential for recycling rinse water and concentration of solid waste which would be disposed in approved landfill.

### Fate

The notifier indicates that the drained solution and washings from the formulation site will be discharged to either the on site trade waste water system or waste water treatment plant, then to the community sewerage system.

The notifier estimates that 85 % of the new chemical will be formulated into cleaning products for hard surface and carpet cleaning, of which 3 % will be used outside metropolitan areas. The entire notified chemical is expected to make its way into water treatment plants via the sewer. The other 15 % of the new chemical is to be formulated into industrial cleaning

and rinsing products for "cleaning-in-place" operations, mainly in the dairy industry. The notifier assumes that the rinse water from the cleaning of milk processing equipment would be treated and possibly disposed to sewer, although typically dairy shed effluent is collected on site in storage pits and treatment lagoons for recycling and reuse. It is unlikely that any notified chemical used in the dairy industry will end up in water treatment plants via the sewer or directly into the environment via natural waterways.

The ready biodegradability of the notified chemical powder was examined by exposure of activated sewage sludge microorganisms to a nominal concentration of 20 mg/L at 21°C for 28 days in the Modified Sturm Test OECD TG 301B (Dow Chemical Company, 1998a). Degradation of the notified chemical was assessed by the determination of carbon dioxide produced. A degradation of < 20 % was attained after 28 days and the notified chemical cannot be considered to be readily biodegradable.

The ready biodegradability of the notified chemical 40-50 % solution was examined by exposure of activated sewage sludge microorganisms at a nominal concentration of 20 mg/L at 21°C under the test conditions specified by the Soap and Detergent Association Subcommittee on Biodegradation Test Method (Dow Chemical Company, 1987a). A degradation of 79.2 % was attained after 15 days and the notified chemical cannot be considered to be readily biodegradable. The criterion for biodegradability in this test is a 90 % reduction in methylene blue active substance. This measures primary degradation only, namely removal of the aromatic chromophore.

The ready biodegradability of the notified chemical 40-50 % solution was also examined by exposure to activated sewage sludge microorganisms under EEC Directive 82/243/EEC which is possibly specified by the OECD Screening Test 301 E (Hervouet, 1986). A degradation of 63.3 % was attained after 19 days and the notified chemical cannot be considered to be readily biodegradable. The criterion for biodegradability in the OECD screening test is a degradation > 70 % occurring within 10 days after a 10 % degradation has been reached.

The notifier does not expect the new chemical to bioaccumulate considering the appreciable water solubility and low partition coefficient.

## 9. EVALUATION OF TOXICOLOGICAL DATA

### 9.1 Acute Toxicity

The notifier has provided toxicological data for three grades of the notified chemical.

These are for (a) powder, 92 % minimum active ingredient
(b) aqueous solution 40 – 50 % (w/w) of the notified chemical (DOWFAX C6L)
(c) aqueous solution, 5 % (w/w) of the notified chemical.

**Summary of the acute toxicity of DOWFAX Dry Hydrotrope Powder**

| *Test* | *Species* | *Outcome* | *Reference* |
|---|---|---|---|
| acute oral toxicity | rat | $LD_{50}$ > 2000 mg/kg | (Dow Chemical Company, 1998b) |
| acute dermal toxicity | rat | $LD_{50}$ > 2000 mg/kg | (Dow Chemical Company, 1998c) |
| skin irritation | rabbit | non-irritant | (Dow Chemical Company, 1998d) |
| eye irritation | rabbit | moderate irritant | (Dow Chemical Company, 1998e) |
| skin sensitisation | guinea pig | non-sensitiser | (Dow Chemical Company, 1998g) |

**Summary of the acute toxicity of a 40 – 50 % aqueous solution of notified chemical**

| *Test* | *Species* | *Outcome* | *Reference* |
|---|---|---|---|
| acute oral toxicity | rat | $LD_{50}$ > 2000 mg/kg | (Dow Chemical Company, 1995) |
| skin irritation | rabbit | slight irritant | (Dow Chemical Company, 1995) |
| eye irritation | rabbit | moderate irritant | (Dow Chemical Company, 1995) |
| acute oral toxicity | rat | $LD_{50}$ > 5000 mg/kg | (Dow Chemical Company, 1985a) |
| acute dermal toxicity | rabbit | $LD_{50}$ > 2000 mg/kg | (Dow Chemical Company, 1985a) |
| skin irritation | rat | non-irritant | (Dow Chemical Company, 1985a) |
| eye irritation | rabbit | moderate irritant | (Dow Chemical Company, 1985a) |

**Summary of the acute toxicity of a 5 % aqueous solution of notified chemical**

| *Test* | *Species* | *Outcome* | *Reference* |
|---|---|---|---|
| eye irritation | Rabbit | slight irritant | (Dow Chemical Company, 1998f) |

### 9.1.1 Oral Toxicity

(a) powder, 92 % minimum active ingredient (Dow Chemical Company, 1998b)

*Species /Strain:* rat/Wistar Crl: (WI) BR

| | |
|---|---|
| *Number /sex of animals:* | 3/sex |
| *Observation period:* | 14 days |
| *Method of administration:* | gavage; dose level 2000 mg/kg body weight; 45 % (w/v) aqueous solution |
| *Test method:* | OECD TG 401 |
| *Mortality:* | no deaths occurred during the study |
| *Clinical Observations:* | diarrhoea in all males on day 1, salivation and noisy breathing in one female on day 1 and 2, respectively |
| *Morphological findings:* | no gross abnormalities were observed on day 14 |
| *$LD_{50}$:* | > 2000 mg/kg |
| *Result:* | the notified chemical was of very low oral toxicity in rats |

(b) aqueous solution, 40 – 50 % (w/w) of the notified chemical (Dow Chemical Company, 1995)

| | |
|---|---|
| *Species / Strain:* | rat/Fischer 344 |
| *Number/sex of animals* | 3 male |
| *Observation period:* | 14 days |
| *Method of Administration:* | gavage; dose level 2000 mg/kg body weight |
| *Test Method:* | Dow Environmental Sciences Research Laboratories Standard Operating Procedures |
| *Clinical observations:* | faecal soiling in all animals on days 1 and 2 |
| *Mortality :* | there were no deaths during the study |
| *Morphological findings:* | none reported |
| *LD50:* | > 2000 mg/kg |
| *Result* | 40 -50% solution of notified chemical was of very low oral toxicity to male rat |

(c) aqueous solution, 40 – 50 % (w/w) of the notified chemical (Dow Chemical Company, 1985a)

| | |
|---|---|
| *Species/Strain:* | rat/Fischer 344 |
| *Number/sex of animals:* | not reported/male |
| *Observation period:* | 14 days |
| *Method of administration:* | gavage; single dose of 1300, 2500 and 5000 mg/kg of the undiluted test material |
| *Test Method:* | Dow Environmental Sciences Research Laboratories Standard Operating Procedures |
| *Clinical Observations:* | transient diarrhoea, lethargy and palpebral (eyelid) closure in all animals following dosing |
| *Mortality:* | there were no deaths during the study |
| *Morphological findings:* | none reported |
| *LD50:* | >5000 mg/kg in the male rat |
| *Result:* | 40 -50% solution of notified chemical was of very low oral toxicity to male rat |

### 9.1.2 Dermal Toxicity

(a) powder, 92 % minimum active ingredient (Dow Chemical Company, 1998c)

| | |
|---|---|
| *Species / Strain:* | rat/Wistar Crl: (WI) BR |
| *Number/sex of animals:* | 5/sex |
| *Observation period:* | 14 days |
| *Method of administration:* | single dermal application of 2000 mg/kg test substance as a 20 % (w/w) aqueous solution; site covered by occlusive dressing for 24 hours; residual test substance removed using tap water |
| *Test method:* | OECD TG 402 |
| *Mortality:* | there were no deaths during the study |
| *Clinical Observation:* | signs of necrosis developing into scabs were observed in all females and one male; erythema and scabs were observed in all animals; these effects were resolved by day 9 |
| *Morphological findings:* | no gross abnormalities were observed on day 14 |

| | |
|---|---|
| *$LD_{50}$:* | > 2000 mg/kg |
| *Result* | the notified chemical was of low acute dermal toxicity in rats |

(b) aqueous solution, 40 – 50 % (w/w) of the notified chemical (Dow Chemical Company, 1985a)

| | |
|---|---|
| *Species/Strain:* | rabbit/New Zealand |
| *Number/sex of animals:* | 2/male |
| *Observation period:* | 14 days |
| *Method of administration:* | not stated; dose 2000 mg/kg of undiluted test material |
| *Test Method:* | Dow Environmental Sciences Research Laboratories Standard Operating Procedures. |
| *Clinical Observation:* | slight redness and swelling at the application sites 24 hours after application; transient lethargy following treatment; both animals gained weight during observation period |
| *Mortality* | there were no deaths during the study |
| *Morphological findings:* | none reported |
| *LD50* | > 2000 mg/kg |
| *Result:* | 40 -50% solution of notified chemical was of low acute dermal toxicity in rabbits |

### 9.1.3 Inhalation Toxicity

No inhalation toxicity data was provided by the notifier. This variation of Schedule data requirements was accepted for the following reasons. Inhalation is not likely to be an important route of exposure due to the low (less than 1.5 %) proportion of the powder in the respirable size range (less than 10 micron diameter). The notified chemical will be used in spray cleaner formulations, where inhalation exposure is possible, but is likely to be at a concentration of less than 2 %.

### 9.1.4 Skin Irritation

(a) powder, 92 % minimum active ingredient (Dow Chemical Company, 1998d)

| | |
|---|---|
| **Species / Strain** | rabbit/New Zealand white |
| *Number/sex of animals:* | 3 male |
| *Observation period:* | 72 hours |
| *Method of administration:* | 0.5 g of notified chemical was applied to a 6 $cm^2$ of intact dorsal skin, moistened with water and the skin was covered by a semi-occlusive patch secured around the abdomen for 4 hours; remaining test substance was removed with water after dressing removed<br><br>observations were made at 1 hour, 24, 48 and 72 hours after dressing removed |
| *Test method:* | OECD TG 404 |

*Draize scores (Draize, 1959):*

| ***Time after treatment (days)*** | ***Animal #*** | | |
|---|---|---|---|
| | ***1*** | ***2*** | ***3*** |
| ***Erythema*** | | | |
| 1 | 1[a] | 1 | 1 |
| 2 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 |
| ***Oedema*** | | | |
| 1 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 |

[a] see Attachment 1 for Draize scales

| | |
|---|---|
| *Comment:* | all animals developed slight to moderate erythema at 1 hour observation; this cleared by 48 hrs; one animal also showed slight oedema at the 1 hour observation time |
| *Result:* | the notified chemical was slightly irritating to the skin of rabbits |

(b) aqueous solution, 40 – 50 % (w/w) of the notified chemical (Dow Chemical Company, 1995)

| | |
|---|---|
| *Species/Strain* | rabbit/New Zealand white |
| *Number/sex of animals:* | 1 male |

| | |
|---|---|
| *Observation period:* | Not reported |
| *Method of administration:* | topical application of solution to inner surface of left ear (0.1 mL) and to intact and abraded skin on the abdomen (0.5 mL each)<br><br>five consecutive applications to ear and intact skin, three consecutive applications to abraded skin |
| *Observations:* | no clinical signs of toxicity observed; very slight erythema at ear site; very slight to slight erythema at abdominal test sites but this may be due to mechanical damage occurring when removing test substance; very slight oedema at intact skin site after 5 applications |
| *Test Method:* | Dow Environmental Sciences Research Laboratories Standard Operating Procedures |
| *Result:* | the notified chemical was a very slight skin irritant to this rabbit. |

(c) aqueous solution, 40 – 50 % (w/w) of the notified chemical (Dow Chemical Company, 1985a)

| | |
|---|---|
| **Species/Strain** | rabbit/New Zealand white |
| *Number/sex of animals:* | not stated/male |
| *Observation period:* | 14 days |
| *Method of administration:* | prolonged or repeated contact on intact and abraded skin |
| *Observations* | no irritation observed |
| *Test Method* | Dow Environmental Sciences Research Laboratories Standard Operating Procedures |
| *Result* | the notified chemical was a non-irritant to rabbit skin |

### 9.1.5 Eye Irritation

(a) powder, 92 % minimum active ingredient (Dow Chemical Company, 1998e)

| | |
|---|---|
| **Species / Strain** | rabbit/New Zealand white |

*Number/Sex of animals:* 3 male

*Observation period* 21 days

*Method of administration* 33 mg of the test substance was placed in the conjunctival sac of one animal, the other eye served as the control; the same amount was instilled in the second animal 1 week later and in the third animal one week after the second animal

installation caused obvious signs of pain in the first two animals and anaesthetic was used for the final animal

*Test method:* OECD TG 405

*Draize scores (Draize, 1959) of unirrigated eyes:*

| | ***Time after instillation*** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Animal*** | ***1 hour*** | | | ***1 day*** | | | ***2 days*** | | | ***3 days*** | | | ***7 days*** | | |
| ***Cornea*** | ***o*** | | ***a*** | ***o*** | | ***a*** | ***o*** | | ***a*** | ***o*** | | ***a*** | ***o*** | | ***a*** |
| 1 | 1[1] | | 3 | 1 | | 3 | 1 | | 3 | 0 | | 1 | 0 | | 0 |
| 2 | 2 | | 1 | 2 | | 2 | 2 | | 2 | 2 | | 2 | 2 | | 1 |
| 3 | 1 | | 2 | 1 | | 2 | 1 | | 1 | 1 | | 1 | 0 | | 0 |
| ***Iris*** | | | | | | | | | | | | | | | |
| 1 | | 1 | | | 1 | | | 0 | | | 0 | | | 0 | |
| 2 | | 1 | | | 1 | | | 0 | | | 0 | | | 0 | |
| 3 | | 1 | | | 1 | | | 0 | | | 0 | | | 0 | |
| ***Conjunctiva*** | ***r*** | ***c*** | ***d*** | ***r*** | ***c*** | ***d*** | ***r*** | ***c*** | ***d*** | ***r*** | ***c*** | ***d*** | ***r*** | ***c*** | ***d*** |
| 1 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 1 | 1 | 2 | 0 | 0 | 2 | 0 | 0 |
| 2 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 1 | 2 | 1 | 1 |
| 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 1 | 1 | 2 | 0 | 0 | 1 | 0 | 0 |

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

*Comment:* all conjunctival effects cleared by Day 14

*Fluorescein applications* application of fluorescein immediately after the 24 hour observation indicated the following:

animal 1 – approximately 55 % of corneal epithelium affected by treatment
animal 2 – 100 % of corneal epithelium affected by treatment
animal 3 – approximately 35 % of corneal epithelium affected by treatment

after 5 days 3 observation corneal epithelium was still affected as follows:

| | |
|---|---|
| animal 1 | 25 % |
| animal 2 | 55 % |
| animal 3 | 10 % |

after Day 6 and Day 7 there was no fluorescein retention in animals 1 and 3, respectively; for animal 2 after day 7 10% of corneal epithelium was affected; by Day 21 there was no fluorescein retention in animal 2.

*Result* the notified chemical was a moderate irritant to rabbit eyes

(b) aqueous solution, 40 – 50 % (w/w) of the notified chemical (Dow Chemical Company, 1995)

*Species/Strain:* rabbit/New Zealand white

*Number/sex of animals* 1 male

*Observation period:* 7 days

*Method of administration:* 0.1 ml of the solution was instilled into each conjunctival sac of the test animal; one eye was washed with water 30 seconds after exposure while the other eye was washed with water 1 hour after exposure

*Rating of effect* moderate discomfort immediately after instillation in first eye dosed; moderate to severe conjunctival redness and swelling from dosing through to 72-hour observation

both eyes had very slight to moderate irritation of the iris from 1 hour to 48 hour observations; both eyes very slight to moderate corneal opacity through to 72 hour observation

ocular irritation was resolved by Day 7

*Method* Dow Environmental Sciences Research Laboratories Standard Operating Procedures

*Result* the solution of the notified chemical was moderately irritating to the eye of the rabbit

(c) aqueous solution, 40 – 50 % (w/w) of the notified chemical (Dow Chemical Company, 1985a)

*Species/Strain:* rabbit/New Zealand white

| | |
|---|---|
| *Number/Sex of animal:* | 1/female |
| *Observation period:* | 21 days |
| *Method of administration:* | undiluted test material instilled into eyes of rabbit; one eye treated was washed |
| *Rating of Effect:* | moderate discomfort, marked conjunctival redness and swelling, moderate reddening of the iris and moderate corneal haziness; all signs of irritation essentially resolved in unwashed eye within 7 days; in washed eye signs of irritation were exhibited 21 days post exposure |
| *Method:* | Dow Environmental Sciences Research Laboratories Standard Operating Procedures |
| *Result:* | the test material was moderately irritating to the eyes of the rabbit |

(d) aqueous solution, 5 % (w/w) of the notified chemical (Dow Chemical Company, 1998f)

| | |
|---|---|
| **Species/Strain:** | rabbit/New Zealand white |
| *Number/sex of animals:* | 3/sex |
| *Method of administration:* | 0.1 mL of the above solution was instilled in the conjunctival sac of the right eye; the untreated left eye served as a control; the eyes of all rabbits were washed 24 hours after treatment<br><br>obvious discomfort was observed in the first animal, and anaesthetic was used thereafter<br><br>both eyes were examined 1 hour, 1 day, 2 days and 3 days post-instillation for conjunctival redness, chemosis discharge, corneal opacity and reddening of iris |
| *Test method:* | OECD TG 405 |

*Draize scores (Draize, 1959) of unirrigated eyes:*

| | ***Time after instillation*** | | | |
|---|---|---|---|---|
| ***Animal*** | ***1 hour*** | ***1 day*** | ***2 days*** | ***3 days*** |
| ***Corneal Opacity*** | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 0[1] | | | 0 | | | 0 | | | 0 | |
| 2 | | 0 | | | 0 | | | 0 | | | 0 | |
| 3 | | 0 | | | 1 | | | 1 | | | 0 | |
| 4 | | 0 | | | 1 | | | 1 | | | 0 | |
| 5 | | 0 | | | 1 | | | 1 | | | 0 | |
| 6 | | 0 | | | 0 | | | 0 | | | 0 | |
| ***Iris*** | | | | | | | | | | | | |
| 1 | | 0 | | | 0 | | | 0 | | | 0 | |
| 2 | | 0 | | | 0 | | | 0 | | | 0 | |
| 3 | | 0 | | | 0 | | | 0 | | | 0 | |
| 4 | | 0 | | | 0 | | | 0 | | | 0 | |
| 5 | | 1 | | | 0 | | | 0 | | | 0 | |
| 6 | | 1 | | | 1 | | | 0 | | | 0 | |
| ***Conjunctiva*** | ***r*** | ***c*** | ***d*** | ***r*** | ***c*** | ***d*** | ***r*** | ***c*** | ***d*** | ***r*** | ***c*** | ***d*** |
| 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 3 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 4 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 5 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |

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

*Result:* a 5% aqueous solution of the notified chemical was a slight irritant to rabbit eyes

### 9.1.6 Skin Sensitisation (Dow Chemical Company, 1998f)

*Species/strain:* guinea pig /Dunkin Hartley

*Number of animals:* 15 female

*Induction procedure:*

test group: day 1 — to a clipped area of the scapular dorsal skin, each animal received 3 pairs of 0.1 mL injections as follows –

- 1:1 (w/w) mixture of Freund's Complete Adjuvant and corn oil
- the test material diluted to 1 % (w/w) in water
- the test material diluted to 1 % (w/w) with a 1:1 (w/w) mixture of Freund's Complete Adjuvant and water

day 8 — the scapular area between the injection sites was clipped and rubbed with 10 % sodium dodecyl sulphate in petroleum jelly to produce an irritation response

day 9 — a patch with 0.5 mL of a 50 % aqueous solution of test material was placed over the injection area and covered with impervious adhesive tape; this was left in place for 2 days; excess test material was removed from the skin after the dressing was removed

control group: — the induction procedure was identical to that for the test group, except that water only was used in place of the aqueous solution of test substance in both induction phases

*Challenge procedure:*

day 21 — a 24 hour occluded application of 0.5ml of the 50% solution of the notified substance was applied to the shaved flank of both test and control animals; excess test material was removed from the skin after the dressing was removed

*Test method:* OECD TG 406

*Challenge outcome:*

| | ***Test animals*** | | ***Control animals*** | |
|---|---|---|---|---|
| ***Challenge concentration*** | ***24 hours**** | ***48 hours**** | ***24 hours*** | ***48 hours*** |
| 50% | 0/10** | 0/10 | 0/5 | 0/5 |
| water | 0/10 | 0/10 | 0/5 | 0/5 |

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

*Comment:* positive results were obtained in reliability testing using α-hexylcinnamaldehyde

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

## 9.2 Repeated Dose Toxicity (Dow Chemical Company, 1987b)

*Species/strain:* rat/CD

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

*Method of administration:* oral (gavage); approximately 45 % solution in water

*Dose/Study duration:* 0, 50, 250, 1000 mg/kg/day; administered daily for 28

consecutive days

*Test method:* OECD TG 407

*Mortality:*

One female of the 1000 mg/kg/day group was sacrificed *in extremis* on day 27. Post-mortem examination indicated that the poor condition of this animal was due to pneumonia, which was not considered to be treatment related by the study authors.

*Clinical observations:*

Salivation was observed throughout the study with the 1000 mg/kg/day animals immediately after dosing and was resolved 2 hours after dosing. Similar signs were observed on days 26 & 27 with two males and one female at 250 mg/kg/day dose level. Loose faeces observed during first and last two weeks of treatment of high dose group of animals. Body weight and food consumption were unaffected by the treatment with the solution of the notified substance.

*Clinical chemistry/Haematology*

Prothrombin time of female rats receiving 250 or 1000 mg/kg/day was longer than that of female controls, although all values were within the historical control range. Higher plasma alanine amino-tranferase and aspartate amino-transferase activities and lower plasma glucose and albumin concentrations were recorded for rats treated at 1000 mg/kg/day compared to the controls.

Higher plasma aspartate amino-transferase activity was also apparent for rats treated at 250 mg/kg/day. Aspartate amino-transferase activity was also marginally higher for the 50 mg/kg/day animals than for the controls, although the difference was not statistically significant.

Lower volume and higher specific gravity for urine of male rats treated at 1000 mg/kg/day when compared to the control animals. Similar less marked differences were recorded for female rats at this dosage but were not statistically significant. Blood pigments, erythrocytes and, to a lesser extent, nitrite were observed in the urine of some males and most females treated at 1000 mg/kg/day.

*Gross Pathology:*

There were no differences in organ weights of rats treated by the solution of the notified substance or the vehicle alone that could be unequivocally ascribed to an affect of the notified chemical.

There were no macroscopic pathological changes which could be attributed to the effect of treatment with the notified chemical.

*Histopathology:*

Acute inflammation of the glandular gastric mucosa was seen in all animals treated at 1000

mg/kg/day and all females treated at 250 mg/kg/day. While this inflammation was seen in all groups, including the controls, and was attributed to an effect of mechanical damage from the administration procedure, there appeared to be an increase in the incidence and severity of this symptom, at least in the highest dose group, which could be attributed to treatment with the notified chemical.

| | |
|---|---|
| *Comment:* | the treatment of the rats at 1000 mg/kg/day demonstrated evidence of irritation to the gastric mucosa and mild non-specific systemic toxicity: a dosage of 250 mg/kg/day appeared to be close to the threshold for these effects |
| *Result:* | a no observed effect level (NOEL) of 50 mg/kg/day was established in this study |

## 9.3 Genotoxicity

### 9.3.1 *Salmonella typhimurium* and *Escherichia coli* Reverse Mutation Assay

(a) powder, 92 % minimum active ingredient (Dow Chemical Company, 1998h)

| | |
|---|---|
| *Strains:* | *S typhimurium*, TA1535, TA1537, TA98 and TA100 and *E coli*, WP2 uvrA bacteria |
| *Concentration range:* | 6, 20, 68, 200, 680, 2000, 6800 and 10000 µg/plate |
| *Metabolic Activation System:* | rat liver S9 fraction from animals pretreated with Arochlor 1254 |
| *Test method:* | OECD TG 471 and TG 472 (plate incorporation method) |
| *Comment:* | no precipitation of test material was observed; no signs of toxicity were evident in the background lawn; cytotoxicity was observed for TA1537, TA98 and TA100 at 6800 µg/plate and above in the presence and absence of S9 mix<br><br>no substantial increase in the number of revertant colonies or indication of clear dose response was observed<br><br>the positive and vehicle controls responded as expected, indicating that the test system responded appropriately |
| *Result:* | the notified chemical was not considered mutagenic in the bacterial strains tested in the absence or presence of metabolic activation provided by rat liver S9 fraction |

(b) aqueous solution, 40 – 50 % (w/w) of the notified chemical (Dow Chemical Company, 1996a)

| | |
|---|---|
| *Strains:* | *S typhimurium*, TA1535, TA1537, TA98 and TA100 and *E coli*, WP2 uvrA bacteria |
| *Concentration range:* | 100, 250, 500, 1000, 2500 and 5000 µg/plate |
| *Metabolic Activation System:* | rat liver S9 fraction from animals pretreated with Arochlor 1254 |
| *Test method:* | OECD TG 471 and TG 472 (preincubation method) |
| *Comment:* | no precipitation of test material was observed; no signs of toxicity were evident in the background lawn; cytotoxicity was observed for TA100 at 5000 µg/plate in the absence of S9 mix in the rangefinding study<br><br>a small increase in revertant colonies (less than double) was seen for 1000 and 2500 µg/plate with TA98 in the absence of S9; the number of revertant colonies for 5000 µg/plate was close to the vehicle control values, possibly indicating toxicity<br><br>no substantial increase in the number of revertant colonies or indication of clear dose response was observed for TA98 in the presence of S9 mix or for other strains either in the absence or presence of S9 mix<br><br>the positive and vehicle controls responded as expected, indicating that the test system responded appropriately |
| *Result:* | the notified chemical was not considered mutagenic in the bacterial strains tested in the absence or presence of metabolic activation provided by rat liver S9 fraction |

### 9.3.2 *In Vitro* Cytogenetic Assay

(a) powder, 92 % minimum active ingredient (Dow Chemical Company, 1998i)

| | |
|---|---|
| *Cells:* | rat lymphocytes/Sprague-Dawley |
| *Doses:* | 12.1, 36.3, 72.6, 145.2, 217.8, 290.4, 387.2 and 484 µg/ml without metabolic activation<br><br>36.3, 72.6, 145.2, 290.4, 435.6, 580.8, 677.6 and 774.4 µg/ml with metabolic activation |
| *Metabolic Activation System:* | rat liver S9 fraction from animals pretreated with Arochlor 1254 |
| *Treatment Regime:* | test material or positive controls were added to cell cultures |

| | |
|---|---|
| | for 24 hour incubation without S9 mix; colcemid was added 3 hours before harvest to arrest cells in metaphase<br><br>test material or positive controls were added to cell cultures for 4 hour incubation with S9 mix; the cells were then washed and incubated in fresh complete medium for the remainder of the 24 hour incubation time; colcemid was added 3 hours before harvest to arrest cells in metaphase |
| *Test method:* | OECD TG 473 |
| *Positive controls* | mitomycin C 0.05 and 0.075 μg/mL (for cells treated without metabolic activation)<br>cyclophosphamide 4 and 6 μg/mL (for cells treated with metabolic activation) |
| *Comment:* | the toxicity, by mitotic inhibition, was approximately 53 % at the second highest dose (387.2 μg/mL) without S9 and approximately 53 % at the top dose (774.4 μg/mL) with S9<br><br>no statistically significant increase in the percentage of cells with structural aberrations was observed at these concentrations both with and without metabolic activation<br><br>clear positive results were obtained with the positive controls in both assays indicating that the test system responded appropriately |
| *Result:* | the notified chemical did not induce chromosomal aberrations in rat lymphocytes *in vitro* either in the presence or absence of metabolic activation |

(b) aqueous solution, 40 – 50 % (w/w) of the notified chemical (DOWFAX XD 8292) (Dow Chemical Company, 1987c)

| | |
|---|---|
| *Cells:* | human lymphocytes from one male donor |
| *Doses:* | 1, 3.3, 10, 33.3, 100, 222, 1000, 3330 and 5000 μg/ml with or without metabolic activation, vehicle dimethylsulphoxide |
| *Metabolic Activation System:* | rat liver S9 fraction from animals pretreated with Arochlor 1254 |
| *Treatment Regime:* | test material or positive controls were added to cell cultures for 24 hour incubation without S9 mix; colchicine was added 3 hours before harvest to arrest cells in metaphase<br><br>test material or positive controls were added to cell cultures for 2 hour incubation with S9 mix; the cells were then |

| | |
|---|---|
| | washed and incubated in fresh complete medium for the remainder of the 24 hour incubation time; colchicine was added 3 hours before harvest to arrest cells in metaphase |
| *Test method:* | OECD TG 473 |
| *Positive controls* | mitomycin C 0.1 μg/mL (for cells treated without metabolic activation)<br>cyclophosphamide 20 μg/mL (for cells treated with metabolic activation) |
| *Comment:* | the toxicity, by mitotic inhibition, was 50 – 60 % at 3300 and 5000 μg/mL without S9; a slight reduction in mitotic index was observed at 1000 and 3300 μg/mL, but not at 5000 μg/mL with S9; 1000, 3300 and 5000 μg/mL were chosen for scoring with and without S9 based on these findings<br><br>the test substance induced a statistically significant and dose related increase in the percentage of cells with structural aberrations without metabolic activation; a slight non dose related increase was also seen with S9<br><br>the authors stated that the test substance included 205 ppm peroxide (not specified), with the structural chromosomal aberrations attributed to the peroxide content<br><br>clear positive results were obtained with the positive controls in both assays indicating that the test system responded appropriately |
| *Result:* | under the conditions of the test, a 40 – 50 % (w/w) aqueous solution of the notified chemical induced chromosomal aberrations in human lymphocytes *in vitro* in the presence and absence of metabolic activation |

(c) aqueous solution, 40 – 50 % (w/w) of the notified chemical (DOWFAX C6L) (Dow Chemical Company, 1996b)

| | |
|---|---|
| *Cells:* | rat lymphocytes/Sprague-Dawley |
| *Doses:* | 16.7, 50, 166.7, 500, 1666.7 and 5000 μg/ml with or without metabolic activation |
| *Metabolic Activation System:* | rat liver S9 fraction from animals pretreated with Arochlor 1254 |
| *Treatment Regime:* | test material or positive controls were added to cell cultures for 24 hour incubation without S9 mix; colcemid was added |

| | |
|---|---|
| | 3 hours before harvest to arrest cells in metaphase<br><br>test material or positive controls were added to cell cultures for 4 hour incubation with S9 mix; the cells were then washed and incubated in fresh complete medium for the remainder of the 24 hour incubation time; colcemid was added 3 hours before harvest to arrest cells in metaphase |
| *Test method:* | OECD TG 473 |
| *Positive controls* | mitomycin C 0.05 and 0.075 μg/mL (for cells treated without metabolic activation)<br>cyclophosphamide 4 and 6 μg/mL (for cells treated with metabolic activation) |
| *Comment:* | the toxicity, by mitotic inhibition, was approximately 33 % at 500 μg/mL but greater than 99 % at 1667 μg/mL without S9; the toxicity, by mitotic inhibition, was approximately 69 % at 1667 μg/mL but greater than 99 % at 1667 μg/mL with S9; based on these results, cultures treated with 50, 167 and 500 μg/mL in the absence of S9 were selected for analysis; the corresponding doses in the presence of S9 were 167, 500 and 1667 μg/mL<br><br>no statistically significant increase in the percentage of cells with structural aberrations was observed at up to 500 μg/mL with metabolic activation and 1667 μg/mL without metabolic activation<br><br>clear positive results were obtained with the positive controls in both assays indicating that the test system responded appropriately |
| *Result:* | a 40 – 50 % (w/w) aqueous solution of the notified chemical did not induce chromosomal aberrations in rat lymphocytes *in vitro* either in the presence or absence of metabolic activation |

### 9.4 Developmental toxicity (Chernoff test) (Dow Chemical Company, 1985b)

| | |
|---|---|
| *Species/Strain:* | rat/Fischer 344 |
| *Number/sex of animals* | 109/female and pregnant |
| *Method of administration:* | gavage, vehicle deionised water |

| | |
|---|---|
| *Dose:* | test material administered on days 6 through 15 of gestation at dose levels of:<br><br>300 mg/kg/day - 29 animals<br>1000 mg/kg/day - 37 animals<br><br>control group (43 animals) was administered deionised water |
| *Clinical Observations* | 23 animal dosed with 300 mg/kg/day produced litters and 25 animals at 1000 mg/kg/day produced litters or were pregnant at necropsy. |
| *Maternal:* | the majority of animals in 1000 mg/kg/day dose group exhibited perineal staining and/or loose watery stools during initial 3-4 days of dosing; signs were also occasionally evident during latter half of study; two deaths occurred in this dose group<br><br>no statistically identified differences in overall body weights in any dose group when compared with control group; maternal body weight gains during gestation revealed significant treatment related decreases in weight gain in both dose groups compared with control group |
| *Neonatal:* | the mean litter size among rats dosed at 1000 mg/kg/day was slightly lower than control group; no totally resorbed litters were found<br><br>no malformations were noted in any pups in either treatment group and no foetuses were born dead in the highest dose group, but a higher proportion of small pups was seen in the litter from the highest dose group; neonatal survival was not affected by treatment |
| *Test Method:* | Chernoff test (Chernoff, 1980) |
| *Comment:* | oral administration of the notified substance as an aqueous solution on days 6 through 15 of gestation at dose level of 300 and 1000 mg/kg/day produced significant depression in maternal body weight gain during the treatment period but no significant adverse affects on selected reproductive parameters in either group<br><br>the incidence of perineal staining and loose watery stools in dams was consistent with bolus administration of high doses of surfactants |
| *Result:* | the notified chemical does not appear to be a selective developmental toxicant at dose levels producing significant |

maternal toxicity; a NOEL for developmental toxicity of 1000 mg/kg/day was established in this study; no NOEL for maternal toxicity was established

### 9.5 Overall Assessment of Toxicological Data

The acute oral toxicity of the notified chemical in rats is very low ($LD_{50}$ > 2000 mg/kg) and the acute dermal toxicity in rats is low ($LD_{50}$ > 2000 mg/kg). It was found to be a slight skin irritant in rabbits. It was not a skin sensitiser in guinea pigs. Similar results for acute toxicity and skin irritation were found for the aqueous solution containing 40 – 50 % (w/w) of the notified chemical which is to be imported.

The notified chemical is a moderate eye irritant in rabbits, with effects on the cornea, iris and conjunctiva, persisting for greater than 7 days. The scores for conjunctival redness were above the levels prescribed in the NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1999) (Approved Criteria), and the notified chemical should therefore be classified as an eye irritant, with the risk phrase R36 'Irritating to Eyes'. The aqueous solution containing 40 – 50 % (w/w) of the notified chemical was also found to be a moderate eye irritant. The data was insufficient to allow health effects classification, so the notified chemical should be taken as hazardous at this concentration. A 5 % (w/w) solution of the notified chemical was found to be a slight eye irritant in rabbits, and would not be classified as a hazardous substance.

No acute inhalation study on the notified chemical was provided by the notifier.

In a 28 day oral repeat dose study in rats, a NOEL of 50 mg/kg/day was established, based on changes in clinical chemistry and urinalysis parameters, and also on the observation of greater incidence and severity of inflammation of the glandular gastric mucosa, in the animals treated with 250 mg/kg/day and 1000 mg/kg/day.

The notified chemical was not mutagenic in bacterial test systems. Tests on the notified chemical and a 40 – 50 % aqueous solution indicated that the notified chemical did not induce chromosomal aberrations in rat lymphocytes *in vitro*. However, an earlier chromosomal aberration study using human lymphocytes was found to be positive under the conditions of the study. The study authors considered that the study outcome was confounded by the presence of a peroxide impurity in the test material.

From the results of a screening test for developmental toxicity in rats, the notified substance does not appear to be a selective developmental toxicant at dose levels producing significant maternal toxicity.

## 10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

| *Test* | *Species* | *Test concentrations (nominal) mg/L* | *Results (nominal) mg/L* |
|---|---|---|---|
| Acute Toxicity (Static Test) Powder. (OECD TG 203) | Carp (*Cyrinus carpio*) | 0.22, 0.46, 1.0, 2.2, 4.6, 10 | 96 h $LC_{50}$ = 6.8<br>96 h NOEC = 4.6 |
| Acute Toxicity (Static Test) 40-50 % Solution. (ASTM Standard E729-80) | Fathead minnow (*Pimephales promelas*) | 5.5, 7.5, 10, 13, 18, 24, 100 | 96 h $LC_{50}$ = 13 |
| Acute Toxicity, Immobilisation (Static Test) Powder. (OECD TG 202) | Water Flea (*Daphnia magna*) | 5.6, 10, 18, 32, 56, 100 | 48 h $EC_{50}$ = 11.8<br>48 h NOEC = 5.6 |
| Acute Toxicity, Immobilisation (Static Test) 40-50 % Solution. (ASTM Standard E729-80) | Water Flea (*Daphnia magna*) | 10, 18, 32, 56, 100 | 48 h $EC_{50}$ = 47 |
| Growth Inhibition Growth (μ) & Biomass (b) (Static Test) (OECD TG 201) | Green Algae (*Selenastrum capricornutum*) | 10, 22, 46, 100, 220 | $E\mu C_{50}$ > 220<br>$E_bC_{50}$ = 55<br>NOEC = 10 |
| Respiration Inhibition (OECD TG 209) | Activated Sludge -Aerobic Waste Water Bacteria | 100 | 3 h $EC_{50}$ > 100 |

* NOEC - no observable effect concentration

*Fish*

Carp were exposed to the notified chemical powder at nominal loading rates of 0.22, 0.46, 1.0, 2.2, 4.6 and 10 mg/L for a period of 96 hours under semi-static test conditions (Dow Chemical Company, 1998j). Based on these nominal loading rates, the 96 hour $LC_{50}$ was determined to be 6.8 mg/L. The no observed effect concentration was found to be 4.6 mg/L. The notifier did not report sub-lethal effects of exposure, such as loss of equilibrium or swimming at either the surface or bottom. Analytically measured concentrations were all found to be > 96 % of the nominal concentrations.

Fathead minnow were exposed to the imported 40-50 % solution of the notified chemical at nominal loading rates of 5.5, 7.5, 10, 13, 18, 24 and 100 mg/L for a period of 96 hours under semi-static test conditions (Dow Chemical Company, 1984). Based on these nominal loading rates of the 40-50 % solution, the 96 hour $LC_{50}$ was determined to be 13 mg/L. This equates to a 96 hour $LC_{50}$ of active notified chemical of ~ 6.5 mg/L.

*Aquatic Invertebrates*

*Daphnia magna* were exposed to the notified chemical at nominal loading rates of 5.6, 10, 18, 32, 56 and 100 mg/L for a period of 48 hours (Dow Chemical Company, 1999a). Based on these nominal loading rates the 48 hour $EC_{50}$ was determined to be 11.8 mg/L with 95 % confidence limits of 10.5 - 13.9 mg/L. The no observed effect concentration was found to be

5.6 mg/L. The notifier did not report any other sub-lethal effects of exposure. Analytically measured concentrations were all found to be 81-102 % of the nominal concentrations.

*Daphnia magna* were also exposed to the imported 40-50 % solution of the notified chemical at nominal loading rates of 10, 18, 32, 56 and 100 mg/L for a period of 48 hours (Dow Chemical Company, 1984). Based on these nominal loading rates of the 40-50 % solution the 48 hour $EC_{50}$ was determined to be 47 mg/L with 95 % confidence limits of 36-64 mg/L. This equates to a 96 hour $LC_{50}$ of active notified chemical of ~ 24 mg/L.

*Algae*
After 96 hours exposure of the notified chemical powder to green algae S*elenastrum capricornutum* (Dow Chemical Company, 1999b), the $E\mu C_{50}$ was determined to be beyond the range tested, that is > 220 mg/L. The EbC50 was determined to be 55 mg/L with 95 % confidence limits of 31.6-95.5 mg/L. The no observed effect concentration at 96 hours for cell growth inhibition was determined to be 10 mg/L. The no observed effect concentration at 96 hours for growth rate reduction was determined to be 10 mg/L.

*Microorganisms*
The effect of the notified chemical on the respiration of activated sewage sludge microorganisms was studied (Dow Chemical Company, 1998k). A 3 hour $EC_{50}$ of greater than > 100 mg/L was determined as the notified chemical was found to be non-toxic to waste water bacteria at that concentration.

Conclusion
The ecotoxicity data for the notified substance suggests that it is moderately toxic to fish and aquatic invertebrates, slightly toxic to algae and practically non-toxic to microorganisms.

## 11. ASSESSMENT OF ENVIRONMENTAL HAZARD

*Release From Formulation Process*
The notifier assumes that the waste water from the 6 formulation sites in Victoria, for example, is discharged to one main trunk sewer that flows to a metropolitan treatment farm. This has an average daily sewage flow rate of 470 ML per day. If formulation and washing of equipment occur on the same day at the 6 locations then 0.6 kg of notified chemical will be released. The maximum average daily concentration of the notified chemical in sewage would be 0.0013 mg/L. At an average of 12 drums per site, release of the notified chemical will occur on 48 days of the year. If formulation and washing of equipment occur on different days at the 6 locations, the maximum average daily concentration of the notified chemical in sewage would be < 0.0013 mg/L. The notifier indicates that two batches may also be formulated at one site in one day but not on successive days due to finished product storage limitations and packing capacity. It is assumed that washing of equipment will then still only occur once. This has the potential to halve the number of days of release, from 48 to 24 days of the year. If formulation and washing of equipment occur on different but not coincident days, that is on 144 different days, at the 6 locations then the maximum average daily concentration of the notified chemical derived from the formulation process in sewage would be 0.0002 mg/L.

*Release From Metropolitan Use*
The notifier estimates that proportionally NSW, for example, uses 4.78 tonnes of the notified

chemical for hard surface and carpet cleaning formulations per year. This is equivalent to approximately 24 kg per day assuming that cleaning formulations are used on 200 days per year. If 50 % of this is discharged to sewers in one catchment area of Sydney, for example, which has an average sewage flow of 455 ML per day, the average concentration of the notified chemical in the sewage per day is 0.026 mg/L.

*Release From Country Use*
The notifier estimates that 123 kg per year of the notified chemical is used in the provincial cities of Victoria. Assuming that the bulk of this material can be divided between three major cities, approximately 40 kg per city is used per year. The notifier assumes that all of this will be discharged to sewer with an average sewage flow of 1 ML per day. The notifier also assumes that the cleaning formulations will be used on 150 days of the year, so the average concentration of the notified chemical in the sewage per day will be 0.267 mg/L.

For the most sensitive aquatic organism, Carp, with an $LC_{50}$ = 6.8 mg/L, safety margins for release at formulation sites, metropolitan use and country use are 5200, 260 and 25, respectively.

The potential environmental concentrations calculated above, for loss of notified chemical from formulation and product use in metropolitan and country areas, are conservative estimates. No biodegradation and adsorption to solids has been assumed. It may be assumed that biodegradation is possible, however, adsorption is unlikely. Also, no allowance has been made for dilution into receiving waters. Furthermore, release of the notified chemical for metropolitan and country use has been based on 200 and 150 days of use per year, respectively, and not on a possible 365 days per year which is more likely. If these factors are taken into account, safety margins are expected to be satisfactory.

*Release From Dairy Use*
Information has not been supplied by the notifier concerning the fate and environmental hazard of the use of the notified chemical in the dairy industry. The typical annual dairy shed effluent in NE Victoria is ~8500 L per cow per year (Agriculture and Resource Management Council of Australia and New Zealand, 1995). For a 120 cow dairy with a 300 day milking year gives a total of ~3400 L of effluent per day.

Assuming a 120 cow dairy shed uses 1 L of a cleaning product per milking day containing 1 % of the notified chemical, the average concentration of the notified chemical in the effluent per day is ~2.5 mg/L. This is a safety factor of approximately 2 for Carp with a $LC_{50}$ of 6.8 mg/L. However, as already noted, dairy shed effluent is collected on site in storage pits and treatment lagoons for recycling and reuse and is unlikely to make its way directly into the environment via natural waterways. An exception to this may be during a period of localised flooding where high dilution would also be expected.

The intended use pattern of DOWFAX Dry Hydrotrope Powder is not expected to result in a significant impact on the environment as release to the environment will be widespread and diffuse. In the event of spills and minor releases during transportation and formulation process operations, the MSDS of the chemical contains information on procedures to enable clean up operations to reduce release to the environment.

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 is of low acute oral and dermal toxicity. It is a slight skin irritant in rabbits, and is non-sensitising to guinea pigs. The notified chemical is a moderate eye irritant in rabbits and should be classified as an eye irritant, with the risk phrase R36 'Irritating to Eyes'. The aqueous solution containing 40 – 50 % (w/w) of the notified chemical was also found to be a moderate eye irritant and taken to be a hazardous substance, while a 5 % (w/w) solution of the notified chemical was found to be a slight eye irritant in rabbits, and would not be classified as a hazardous substance according to the Approved Criteria.

In a 28 day repeat dose oral rat study, the notified chemical caused changes in clinical chemistry and urinalysis parameters, and also greater incidence and severity of inflammation of the glandular gastric mucosa at the mid and high dose. A NOEL of 50 mg/kg/day was established. The notified chemical did not show developmental toxicity in a rat screening study which produced significant maternal toxicity.

Neither the notified chemical nor the imported 40 - 50% by wt aqueous solution is classified as a dangerous good.

*Occupational Health and Safety*

The occupational health risk to workers involved in reformulating the notified chemical solution into cleaning products is predicted to be low as the process is largely enclosed and automated. Dermal contact is expected to be the main route of exposure, for example, during the clean-up of spills and incidental contact during transfer of the notified chemical to the mixing vessel. Slight skin irritation may occur if skin contact occurs. As the notified chemical is an anionic surfactant, prolonged or frequently repeated skin contact may also lead to defatting of the skin. The use of appropriate protective clothing and equipment is expected to limit dermal exposure to the notified chemical solution during formulating operations.

If accidental eye contact occurs during reformulation, moderate eye irritation may result but permanent damage is not likely. As the vapour pressure of the notified chemical is very low and reformulating is performed at room temperature, inhalation exposure is unlikely unless mixing tanks are open and aerosols are generated.

Workers may be exposed to the notified chemical as a component of a several cleaning formulations. The maximum concentration of the notified chemical is expected to be less than 5 % and exposures are predicted to be mainly dermal. As a hard surface cleaner may be used in spray form, there is a potential for ocular and inhalation exposure to occur. However as the concentration of the notified chemical is approximately 1 % in products of this type, eye and respiratory irritation due to the new chemical is expected to be low.

Since the concentration of the notified chemical in end products is unlikely to exceed 5 % and the toxicity tests indicate overall a low hazard for the chemical, the occupational health risk for cleaning workers is considered to be low. However, some commercial cleaning solutions contain hazardous substances, eg 2-butoxyethanol, and protective measures are required for their use, particularly in spray form.

*Public Health*
Public exposure to the notified chemical is expected to be negligible, since it will be incorporated into industrial and commercial cleaning products which are not for sale to the general public. Limited exposure may occur when cleaning products containing the notified chemical are used to clean carpet in domestic premises. The concentrations in the final products will be less than 5 %, which is not expected to produce any significant health effects. It is therefore considered that the notified chemical will not pose a significant hazard to public health.

## 13. RECOMMENDATIONS

To minimise occupational exposure to DOWFAX Dry Hydrotrope Powder, the following guidelines and precautions should be observed:

- Mixing tanks for formulation of cleaning products containing the notified chemical should be covered;

- Personal protective equipment during reformulation should include safety goggles which are 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 conforming to the specifications detailed in AS 2919 (Standards Australia, 1987) and AS 3765.2 (Standards Australia, 1990); impermeable gloves conforming to AS/NZS 2161.2 (Standards Australia/Standards New Zealand, 1998); and occupational footwear conforming to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994);

- Personal protective equipment during packaging should include safety glasses which are 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 conforming to the specifications detailed in AS 2919 (Standards Australia, 1987); impermeable gloves conforming to AS/NZS 2161.2 (Standards Australia/Standards New Zealand, 1998); and occupational footwear conforming to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994); protective equipment should take into account the nature and concentration of all the components of the product;

- Personal protective equipment during end use should take into account all of the ingredients in the cleaning solution;

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

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

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

If the conditions of use are varied from the notified use in cleaning products for institution, commercial and industrial cleaning, greater exposure of the public may occur. In such circumstances, secondary notification may be required to assess the hazards to public health.

## 14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 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 shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise.

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## Attachment 1

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

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

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

***CORNEA***

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

***CONJUNCTIVAE***

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