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December 2009

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

DEIPA

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (Cwlth) (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 the Department of Health and Ageing, and conducts the risk assessment for public health and occupational health and safety. The assessment of environmental risk is conducted by the Department of the Environment, Water, Heritage and the Arts.

For the purposes of subsection 78(1) of the Act, this Full Public Report may be inspected at our NICNAS office by appointment only at 334-336 Illawarra Road, Marrickville NSW 2204.

This Full Public Report is also available for viewing and downloading from the NICNAS website or available on request, free of charge, by contacting NICNAS. For requests and enquiries please contact the NICNAS Administration Coordinator at:

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Director
NICNAS

TABLE OF CONTENTS

FULL PUBLIC REPORT

DEIPA

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Grace Australia Pty Ltd (ABN 41 080 660 117)
40 Scanlon Drive
Epping VIC 3076

NOTIFICATION CATEGORY
Standard: Chemical other than polymer (more than 1 tonne per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication: Chemical Name, Other Names, CAS Number, Molecular Formula, Structural Formula, Molecular Weight, Spectral Data, Impurities, Purity, Import volume, Use details, Identity of manufacturer/recipient.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
Variation to the schedule of data requirements is claimed as follows: Melting point, Density, Vapour pressure, Water solubility, Partition coefficient, Absorption/desorption, Dissociation constant, Hydrolysis as a function of pH, Particle size, Flash point, Flammability, Autoignition temperature.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
USA, Canada, EU

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
DEIPA
ESE 323 (admixture containing 5-10% notified chemical)

MOLECULAR WEIGHT
100 - 500 Da

ANALYTICAL DATA
Reference NMR, IR spectra were provided.

3. COMPOSITION

DEGREE OF PURITY > 90%

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20°C AND 101.3 kPa: Clear, colourless liquid

Property	Value	Data Source/Justification
Melting Point	81.76°C	Estimated (EPIWEB). However, expected to be a liquid at room temperature and thus melting point < 25 °C.
Boiling Point	330°C at 101.3 kPa	MSDS
Density	1079 kg/m^3	MSDS
Vapour Pressure	7 x 10^{-7} kPa at 25 °C	Estimated (EPIWEB)
Water Solubility	1× 10^6 mg/L	Estimated (WSKOW v1.41). The notified chemical is considered completely water soluble based on the modelling result, which is consistent with the hydrophilicity of the chemical.
Hydrolysis as a Function of pH	Not determined	The notified chemical does not contain any hydrolysable functional groups.
Partition Coefficient (n-octanol/water)	log P_{OW} = - 2.06	Estimated (KOWWIN v1.67). The notified chemical is not expected to partition from water into n-octanol.
Adsorption/Desorption	log K_{oc} = 1.0	Estimated (PCKOCWIN v 1.66). The notified chemical is not expected to adsorb to organic matter in soil strongly. The notified chemical is expected to sorb to mineral surfaces.
Dissociation Constant	pKa = 8.43	Estimated (ACD/I-Lab). The notified chemical will be ionised in the environmental pH range of 4-9.
Particle Size	Not determined	Liquid at room temperature.
Flash Point	171°C	MSDS
Flammability Limits	Not determined	Not expected to be flammable due to low vapour pressure
Autoignition Temperature	> 171°C	Based on its flash point
Explosive Properties	Not expected to be explosive	Does not contain any structural groups indicative of explosive properties

DISCUSSION OF PROPERTIES

Reactivity

The notified chemical is hygroscopic. The MSDS for the notified chemical states that, when wet or in the presence of aluminium at temperatures > 60°C, it is corrosive to metals and may generate flammable hydrogen gas. Contact with metals such as copper and copper alloys, oxidising materials, nitrites, strong acids and absorbent materials such as sawdust and cellulose should be avoided. The product may potentially react with halogenated organic solvents leading to temperature and/or pressure increases. The product could decompose if exposed to elevated temperatures. The MSDS states that the notified chemical is stable when stored in a dry place without moisture.

Based on the submitted physical-chemical data in the above table the notified chemical is not classified according to the Australian Dangerous Goods Code (NTC, 2007). However the data above does not address all Dangerous Goods endpoints. Therefore consideration of all endpoints should be undertaken before a final decision on the Dangerous Goods classification is made by the introducer of the chemical.

5. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

The notified chemical will not be manufactured in Australia. It will be imported neat and reformulated locally.

MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	30-80	30-80	30-80	30-80	30-80

PORT OF ENTRY
Sydney, Brisbane or Melbourne

IDENTITY OF RECIPIENT
Grace Australia

TRANSPORTATION AND PACKAGING
The notified chemical will be imported in 205 L plastic drums or 1000 L IBCs and transported by road from the wharf to the notifier's site. The reformulated admixture product containing the notified chemical at 5-10% will be transported by road to cement producers in 1000 L bulk tanks or 205 L plastic drums. Finished cement containing the notified chemical at < 0.07% will be transported by road, rail or sea to concrete production facilities, industrial customers or to construction sites.

USE
The notified chemical is a component of concrete admixtures that will be added to cement for the production of ready-mix concrete for the construction industry. A small amount will be sold to formulators for mixing into ready-mix dry concrete products (containing < 0.07% notified chemical) which are sold to commercial contractors for small scale industrial use or to consumers for home use such as domestic repair, maintenance and building purposes.

OPERATION DESCRIPTION
Cement admixture production
The imported notified chemical will be moved from the warehouse to the mixing area, where it will be placed on scales and the appropriate amount weighed and pumped to a closed mixing vessel and blended with water and other ingredients to produce a cement admixture containing 5-10% notified chemical. At the end of the blending process, a sample of the admixture will be taken for quality control testing.

The admixture will then be transferred via pipeline into bulk storage tanks and subsequently into tanker trucks or totes. The mixing vessel and fill lines will be cleaned by flushing the system with water and the residues collected for re-use in later production.

Cement production
At the production plants, the admixture containing 5-10% notified chemical will be mixed with other cement components and ground to produce finished powdered cement containing < 0.07% notified chemical. The cement will be packaged and transported to concrete production facilities.

A small proportion (~10%) of the cement containing < 0.07% notified chemical will be delivered to industrial customers who will prepare pre-mixed products for sale to small scale industrial users and the public.

Concrete production and use
The cement (< 0.07% notified chemical) will be mixed with other materials to produce concrete containing < 0.007% notified chemical and subsequently tested by quality control staff. The concrete will be transferred to the mixing drum of concrete trucks and delivered to construction sites. Workers will shovel and rake fresh concrete and finish the surface with vibrators and trowels.

6. HUMAN HEALTH IMPLICATIONS

6.1 Exposure assessment

6.1.1 Occupational exposure

NUMBER AND CATEGORY OF WORKERS

	Category of Worker	*Number*	*Exposure Duration (hours/day)*	*Exposure Frequency (days/year)*
Cement admixture production	Plant operator	10	2	20
	Truck driver	10	2	20
	Quality control	5	1	20
	Supervisor	5	1	20
	Salesman	1	4	20
Cement production	Process engineers	20	2	30
	Lab technician	20	1	30
	Maintenance fitter	10	1	30
	Mill workers	140	8	30
Concrete production	Quality control	25	4	30
	Labourer	100	4	240
	Truck driver	400	4	240
	Placing & finishing crew	1000	8	240
	Technician – concrete testing	100	6	100

EXPOSURE DETAILS

Cement admixture production

During cement admixture formulation, exposure to the neat notified chemical will be predominantly via the dermal route with the possibility of ocular exposure when connecting and disconnecting transfer pumps, collecting samples for QC analysis and during cleaning of mixing vessels and fill lines. The level of exposure is expected to be reduced by the use of automated pumping and mixing systems and workers wearing personal protective equipment (gloves, safety glasses, enclosed shoes). Local ventilation at the mixing site is expected to minimise potential inhalation exposure to vapours or aerosols.

Workers may come into dermal contact with the notified chemical at concentrations of 5-10% during transfer into storage tanks or totes. However, limited exposure is anticipated due to the use of a closed delivery system and routine compressed air flushing of hoses used on trucks to reduce spills and to limit worker exposure to any material remaining in the hoses.

Cement production

The cement admixture (5-10% notified chemical) will be added to the cement mill via an automated additive dispensing unit with workers wearing personal protective equipment; hence the possibility of dermal and ocular exposure to 5-10% notified chemical is likely to be low. Inhalation exposure to powdered finished cement containing < 0.07% notified chemical could occur during bagging of cement. The level of exposure will be reduced by the use of bag filters or electrostatic precipitators to collect dust during transfer.

Concrete production and use

The predominant route of exposure for workers involved in preparing fresh concrete containing < 0.07% is dermal, but inhalation of cement dust could also occur during transfer of the powder. Widespread dermal exposure to wet concrete containing < 0.007% notified chemical is likely during use of the concrete in construction and other industries. After the concrete has set, the notified chemical will be contained within a hardened matrix and will not be available for exposure.

6.1.2. Public exposure

Public exposure may occur from contact with finished concrete structures containing < 0.007% notified chemical, however the notified chemical will be trapped inside a solid matrix and will not be available for exposure.

Members of the public may be exposed to cement dust containing < 0.07% notified chemical in ready-mix preparations during domestic repair, maintenance or building work. No exposure will occur once the concrete has set and the notified chemical is trapped inside the solid matrix.

6.2. Human health effects assessment

The results from toxicological investigations conducted on the notified chemical are summarised in the table below. Details of these studies can be found in Appendix A.

Endpoint	*Result and Assessment Conclusion*
Rat, acute oral	low toxicity, LD50 >2000 mg/kg bw
Rat, acute dermal	low toxicity, LD50 >2000 mg/kg bw
Rat, acute inhalation	low toxicity, LC50 >16.4 mg/L/7 hour
Rabbit, skin irritation	non-irritating
Rabbit, eye irritation	slightly irritating
Guinea pig, skin sensitisation – maximisation adjuvant test.	no evidence of sensitisation
Rat, oral repeat dose toxicity - 28 days	NOAEL 100 mg/kg bw/day
Genotoxicity - bacterial reverse mutation	non mutagenic
Genotoxicity – *in vitro* chromosome aberration	non genotoxic
Developmental effects – screening (probe) study	NOEL for maternal toxicity and embryo/foetal lethality = 1000 mg/kg/day
Developmental effects – rat teratogenicity	NOAEL for foetotoxicity =100 mg/kg/day NOEL for maternal toxicity = 300 mg/kg/day

Toxicokinetics

The notified chemical is expected to be absorbed dermally and orally due to its relatively low molecular weight and liquid physical state, though absorption may be limited by its poor lipophilicity. A structural analogue of the notified chemical has been found to be extensively absorbed following dermal administration to animals and not to be extensively transformed (Snyder 1990; Exemption Information Report, Ref. 4). The same analogue was also found to be rapidly orally absorbed and then excreted unchanged in animal studies (Snyder 1990). Inhalation of vapours of the notified chemical is not expected due to its low vapour pressure.

Acute toxicity

The notified chemical was found to be of low toxicity via the oral, dermal and inhalation routes, based on studies conducted in rats.

Irritation and Sensitisation

Based on studies conducted in rabbits, the notified chemical was found to be non-irritating to the skin and slightly irritating to the eye. In a guinea pig maximisation test there was no evidence of reactions indicative of skin sensitisation.

Repeated Dose Toxicity

In a 28-day oral gavage study conducted in rats effects were observed in the stomach, kidney and liver. The most significant effect was inflammation, hyperplasia and hyperkeratosis of the stomach mucosa in high-dose animals, which was completely resolved following the 2-week recovery period. The No Observed Adverse Effect Level (NOAEL) was established as 100 mg/kg bw/day.

Mutagenicity

The notified chemical was found to be non-mutagenic in a bacterial reverse mutation assay, and non-clastogenic in a chromosomal aberration test. Therefore the notified chemical is not expected to be a mutagen or clastogen *in vivo*.

Toxicity for reproduction

A preliminary developmental toxicity study on rats found no evidence of treatment-related maternal toxicity or

lethality to embryos/foetuses when females were administered up to and including 1000 mg/kg/day of notified chemical during gestation. The NOEL for maternal toxicity and embryo/foetal lethality was determined to be 1000 mg/kg/day in this study. In a subsequent prenatal developmental toxicity test, there were no treatment-related effects or changes to reproductive parameters, although females in the highest treatment dose group (1000 mg/kg/day) showed an increase in absolute and relative kidney weights compared to controls. No effects were seen in females dosed at 100 or 300 mg/kg/day. The NOEL for maternal toxicity was 300 mg/kg/day. Foetal examinations showed no malformations or developmental changes except for statistically significant delayed ossification of several skull bones at the 300 and 1000 mg/kg/day dose levels with some effects at 100 mg/kg/day (not statistically significant but above the historical control range). The NOAEL for foetotoxicity was 100 mg/kg/day. The incidences of interparietal and parietal delayed ossification at both 300 and 1000 mg/kg/day are statistically significant and well above historical control ranges, therefore classification of the notified chemical as a Category 3 developmental toxicant (R63: possible risk of harm to the unborn child) is warranted.

Carcinogenicity
No data are available on the carcinogenic potential of the notified chemical, however if the notified chemical is used in formulations containing nitrosating agents such as nitrites (e.g. sodium nitrite), it is possible for carcinogenic nitrosamines to form as an impurity (DEIPA MSDS). The notified chemical itself is not expected to be a precursor of nitrosamines. This is supported by testing performed on a structural analogue under physiological conditions (Exemption Information Report, Ref. 1).

Several carcinogenicity studies have been performed on a structural analogue of the notified chemical. Whilst a number of these gave negative results, there were also at least 2 studies with equivocal results following 2-year dermal administration (Exemption Information Report, Ref. 2 & 3). In addition, there was also a 2-year dermal study in mice with a positive result (Exemption Information Report, Ref. 3). The International Agency for Research on Cancer (IARC) classifies the analogue chemical as a Group 3 Carcinogen (not classifiable as to its carcinogenicity in humans).

Health hazard classification
Based on the available data the notified chemical is classified as hazardous according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004) with the following risk phrase:

Xn; R63 Possible risk of harm to the unborn child

6.3. Human health risk characterisation

6.3.1. Occupational health and safety
During end use of the concrete products, exposure may occur though it will be limited by the low concentration of the notified chemical present in these products (<0.007%). The risk of adverse effects arising from exposure to the notified chemical is not expected to be significant due to its relatively low concentration in most of the products. It is anticipated that the use of engineering controls and PPE during cement and admixture production and concrete production will limit the level of potential exposure to the notified chemical (up to neat concentrations). In summary, under the conditions of the occupational settings described, the notified chemical is not considered to pose an unacceptable risk to the health of workers.

6.3.2. Public health
The risk to public health through contact with finished and hardened concrete structures is negligible as the notified chemical will not be available for exposure in this form.

The health risk to members of the public involved in do-it-yourself (DIY) applications is not expected to be unacceptable based on the low concentration of the notified chemical (< 0.007%) in these products.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1 Environmental Exposure

RELEASE OF CHEMICAL AT SITE

The notified chemical will be imported into Australia for further formulation into cement admixtures. Environmental release of the notified chemical is expected to be limited to accidental spills arising during the production of cement admixtures, cleaning of equipment and transfer of the additive, and during transport to customers. Storage containers and mixing vessels will be rinsed with water (50 L/batch) and the rinsate will be either used in the formulation of the next batch of additive or processed by licensed waste disposal contractors. Any spills will be collected using adsorbent material and sent to landfill by licensed waste contractors.

The cement admixtures are supplied in bulk where minor releases may occur during the transfer of the product from the tanker truck to the customer's storage tanks. Once the additive is incorporated into the powdered cement products, potential release is expected to be low as the notified chemical bonds strongly with the clay in the cement. The total release of the notified chemical during formulation, transport and use in cement manufacture is expected to be less than 1% of the import volume.

RELEASE OF CHEMICAL FROM USE

Release is expected to be minimal at concrete contractor sites and during use by the public, where workers will shovel and rake, consolidate and trowel finish the wet concrete containing low level of the notified chemical. Any unused concrete will be disposed in landfill, as too will product packaging and old concrete in builder's rubble. Once the treated cement is incorporated into the concrete, the potential for release of notified chemical into the environment is expected to be negligible. Release of the notified chemical to the environment during use of the ready-mix concrete by the general public would be limited to the discharge of nominal quantities of water used to clean residual amounts of concrete from equipment. The release into waterways is not expected to be significant.

RELEASE OF CHEMICAL FROM DISPOSAL

The notified chemical is used during the formulation of a number of cement admixtures. Depending on the nature and potential hazards of other ingredients in the admixture, recommended modes of disposal include:

- Recovery and recycling of commercially viable material.
- Adsorption of liquids using non-combustible absorbents.
- Sweep up and collection of cement dusts using various dust-suppressants, where necessary to minimise dispersant effects.
- Disposal of either the liquid, absorbed liquid or collected dust that is applicable to landfill.

Standard procedures have been established to ensure that the tanks and trucks are washed regularly, and that the wash water will be recycled or properly disposed.

7.1.2 Environmental fate

The notified chemical is readily biodegradable according to the provided study report. For the details of the environmental fate studies refer to Appendix C.

Based on the reported use pattern, most of the notified chemical will be bound into the matrix of powdered cement products and/or encapsulated into concrete. It is expected that there will be minimal migration of the chemical from the hardened concrete, and thus no significant release to the environment from this source. At the end of its useful life, the notified chemical may be sent to landfill with the concrete matrix. In landfill, the notified chemical will be degraded via both abiotic and biotic pathways, forming water and oxides of carbon and nitrogen.

7.1.3 Predicted Environmental Concentration (PEC)

It is not necessary to calculate the PEC given the very limited release of the notified chemical to the environment from the proposed use in cement.

7.2. Environmental effects assessment

The results from ecotoxicological investigations conducted on the notified chemical are summarised in the table below. Details of these studies can be found in Appendix C.

Endpoint	*Result*	*Assessment Conclusion*
Fish Toxicity	96 h LC50 > 100 mg/L	Not harmful to fish
Daphnia Toxicity	48 h EC50 > 100 mg/L	Not harmful to daphnia
Algal Toxicity	72 h E_rC50 > 100 mg/L	Not harmful to algae
Inhibition of Bacterial Respiration	3 h IC50 > 4280 mg/L	Not harmful to sludge microorganisms

The notified chemical is not acutely harmful to aquatic organisms.

7.2.1 Predicted No-Effect Concentration

The PNEC has been calculated using the endpoint of LC50 > 100 mg/L (for fish, daphnia and algae) and an assessment factor of 100 given three studies are available.

LC50	> 100	mg/L
Assessment Factor	100	
PNEC:	> 1,000	µg/L

7.3. Environmental risk assessment

The Risk Quotient (Q = PEC/PNEC) has not been calculated since no significant release of the notified chemical to the environment is expected from the proposed use in Australia. The notified chemical is not expected to pose an unacceptable risk to the aquatic environment based on both the reported low release use pattern and the reported low toxicities to the aquatic organisms.

8. CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard classification
Based on the available data the notified chemical is classified as hazardous according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004) with the following risk phrase:

Xn; R63 Possible risk of harm to the unborn child

Product/mixtures containing the notified chemical ≥ 5% should contain the above risk phrase

Human health risk assessment
Under the conditions of the occupational settings described, the notified chemical is not considered to pose an unacceptable risk to the health of workers.

When used in the proposed manner, the notified chemical is not considered to pose an unacceptable risk to public health.

Environmental risk assessment
On the basis of the reported use pattern, the notified chemical is not expected to pose a risk to the environment.

REGULATORY CONTROLS
Hazard Classification and Labelling

Material Safety Data Sheet

- The MSDS for products containing ≥ 5% notified chemical must:
  - disclose the full chemical name (Type I ingredient according to NOHSC (2003))
  - contain the hazard classification, ‘hazardous substance’
  - contain the risk phrase, Xn; R63 Possible risk of harm to the unborn child

CONTROL MEASURES
Occupational Health and Safety

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified chemical:
  - Avoid dust in eyes during bagging and dispensing
  - Avoid inhalation of dust during bagging and dispensing of cement
  - Do not use if pregnant or likely to become pregnant
  - Use closed/automated systems when preparing admixture or using neat concentration

- Employers should ensure that the following personal protective equipment is used by workers when preparing cement to minimise occupational exposure to the notified chemical:
  - Gloves
  - Eye protection
  - Enclosed shoes

  Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

- Preventive measures should be taken to avoid formation of carcinogenic nitrosamine. The following measures should be taken regarding handling of the notified chemical:
  - Do not use sodium nitrite or other nitrosating agents in formulations containing the notified chemical.

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

- If products and mixtures containing the notified chemical are classified as hazardous to health in accordance with the *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(2004)] workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Disposal

- The notified chemical should be disposed of to landfill.

Storage

- The following precautions should be taken regarding storage of the notified chemical:
  - Do not store in copper, copper alloys, aluminium or aluminium alloys

Emergency procedures

- Spills or accidental release of the notified chemical should be handled by physical containment, collection and subsequent safe disposal.

Transport and Packaging
- Avoid contact with oxidising materials
- Avoid moisture
- Avoid contact with absorbent materials such as sawdust and cellulose
- Avoid extreme heat

Regulatory Obligations

Secondary Notification

This risk assessment is based on the information available at the time of notification. The Director may call for the reassessment of the chemical under secondary notification provisions based on changes in certain circumstances. Under Section 64 of the *Industrial Chemicals (Notification and Assessment) Act (1989)* the notifier, as well as any other importer or manufacturer of the notified chemical, have post-assessment regulatory

obligations to notify NICNAS when any of these circumstances change. These obligations apply even when the notified chemical is listed on the Australian Inventory of Chemical Substances (AICS).

Therefore, the Director of NICNAS must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under Section 64(2) of the Act; if
- the function or use of the chemical has changed from a component of cement, or is likely to change significantly;
- the notified chemical is added to finished powdered cement at concentrations greater than 0.07%;
- the amount of chemical being introduced has increased from 80 tonnes, or is likely to increase, significantly;
- the chemical has begun to be manufactured in Australia;
- additional information has become available to the person as to an adverse effect of the chemical on occupational health and safety, public health, or the environment.

The Director will then decide whether a reassessment (i.e. a secondary notification and assessment) is required.

Material Safety Data Sheet
The MSDS of the notified chemical provided by the notifier was reviewed by NICNAS. The accuracy of the information on the MSDS remains the responsibility of the applicant.

APPENDIX A: TOXICOLOGICAL INVESTIGATIONS

A.1 Acute toxicity – oral

TEST SUBSTANCE	Notified chemical (92.9% purity)
METHOD	OECD TG 401 Acute Oral Toxicity – Limit Test. EC Directive 92/69/EEC B.1 Acute Toxicity (Oral) – Limit Test.
Species/Strain	Rat/Fischer 344
Vehicle	Nil
Remarks - Method	No significant protocol deviations. 15 days observation period.

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Mortality*
1	5 male	2000	0/5
2	5 female	2000	0/5

LD50	>2000 mg/kg bw
Signs of Toxicity	Treatment-related clinical signs noted on test day 1 consisted of faecal soiling in 2 male and 3 female animals, watery or soft faeces in 1 male and 2 females, and diarrhoea in 1 female. These clinical signs resolved for all animals on test days 2 or 3. There were no other treatment-related clinical signs for the remainder of the study. All rats gained body weight over the duration of the study.
Effects in Organs	No gross pathological observations.
CONCLUSION	The notified chemical is of low toxicity via the oral route.
TEST FACILITY	Dow Chemical Company (1999a)

A.2 Acute toxicity – dermal

TEST SUBSTANCE	Notified chemical (92.9% purity)
METHOD	OECD TG 402 Acute Dermal Toxicity – Limit Test. EC Directive 92/69/EEC B.3 Acute Toxicity (Dermal) – Limit Test.
Species/Strain	Rabbit/New Zealand White
Vehicle	Nil
Type of dressing	Semi-occlusive.
Remarks – Method	No significant protocol deviations.

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Mortality*
1	5 male	2000	0/5
2	5 female	2000	0/5

LD50	>2000 mg/kg bw
Signs of Toxicity	All male and female rabbits had reddened and/or thickened skin at the dermal test site on test day 2. Dermal irritation resolved by test day 3 in all rabbits, with the exception of one male that had reddened skin at the dermal test site on test days 3 and 4, and flaking/scaling skin at the dermal test site on test day 4. The skin of this rabbit was normal by test day 7. There were no clinical signs of systemic toxicity. One female had faecal soiling of the perineum on test day 2. All animals lost body weight on test

	day 1 and/or 2 of the study, and then gained or maintained body weight for the remainder of the study.
Effects in Organs	There were no treatment-related gross pathologic observations.
CONCLUSION	The notified chemical is of low toxicity via the dermal route.
TEST FACILITY	Dow Chemical Company (1999b)

A.3 Acute toxicity – inhalation

TEST SUBSTANCE	Notified chemical
METHOD	In-house method
Species/Strain	Rat – strain unknown
Vehicle	None
Method of Exposure	Assumed to be whole-body exposure
Exposure Period	7 hours
Physical Form	Vapour
Remarks - Method	Only a summary was available for this study and so only limited details regarding the method are provided. It is assumed to be a non-GLP study.

RESULTS

Group	*Number and Sex of Animals*	*Concentration mg/L*		*Mortality*
		Nominal	*Actual*	
1	6 male	16.4	Unknown	0/6

LC50	>16.4 mg/L/7hours
Signs of Toxicity	None reported
Effects in Organs	None reported, but it is unclear whether necropsy was carried out.
Remarks - Results	All animals exhibited eye and nasal irritation which subsided 24 hours post exposure.
CONCLUSION	The notified chemical is of low toxicity via inhalation.
TEST FACILITY	Dow Chemical Company (1975)

A.4 Irritation – skin

TEST SUBSTANCE	Notified chemical (92.9% purity)
METHOD	OECD TG 404 Acute Dermal Irritation/Corrosion. EC Directive 92/69/EEC B.4 Acute Toxicity (Skin Irritation).
Species/Strain	Rabbit/New Zealand White
Number of Animals	3
Vehicle	Nil
Observation Period	4 days
Type of Dressing	Semi-occlusive
Remarks – Method	No significant deviations to protocol.

RESULTS

Remarks – Results	Application of test material resulted in no skin irritation in any of the rabbits. The study was terminated on test day 4. No systemic toxicity was observed. Body weight gain was unaffected by treatment.
CONCLUSION	The notified chemical is non-irritating to the skin.

TEST FACILITY Dow Chemical Company (1999c)

A.5 Irritation – eye

TEST SUBSTANCE Notified chemical (92.9% purity)

METHOD OECD TG 405 Acute Eye Irritation/Corrosion.
EC Directive 92/69/EEC B.5 Acute Toxicity (Eye Irritation).

Species/Strain Rabbit/New Zealand White
Number of Animals 3
Observation Period 7 days
Remarks – Method No significant protocol deviations. An ocular anaesthetic was used for 2 rabbits after discomfort was observed in the second rabbit dosed.

RESULTS

Lesion	*Mean Score* Animal No.*			*Maximum Value*	*Maximum Duration of Any Effect*	*Maximum Value at End of Observation Period*
	1	2	3			
Conjunctiva: redness	1.3	1.0	1.0	2	< 7 days	0
Conjunctiva: chemosis	0.33	0.33	0.33	2	< 48 hr	0
Conjunctiva: discharge	0.66	0	0	2	< 48 hr	0
Corneal opacity	0.33	0	0	1	< 48 hr	0
Iridial inflammation	0.33	0	0	1	< 48 hr	0

*Calculated on the basis of the scores at 24, 48, and 72 hours for EACH animal.

Remarks – Results The eyes of all animals were normal on test day 7 when the test was terminated. Instillation of test material in the eye had no effect on body weight gain.

CONCLUSION The notified chemical is slightly irritating to the eye.

TEST FACILITY Dow Chemical Company (1999d)

A.6 Skin sensitisation

TEST SUBSTANCE Notified chemical (92.9% purity)

METHOD OECD TG 406 Skin Sensitisation – Maximisation test.
EC Directive 96/54/EC B.6 Skin Sensitisation – Maximisation test.

Species/Strain Guinea pig/ albino Crl:(HA)BR strain
PRELIMINARY STUDY Maximum Non-irritating Concentration:
topical: 100%
Maximum concentration resulting in mild to moderate irritation:
intradermal: 1% (in water)

MAIN STUDY
Number of Animals Test Group: 20
Induction phase Induction Concentration:
intradermal injection 1%
topical application 100%
Signs of Irritation Mild to moderate erythema with scab formation was observed at the intradermal induction sites in the control and test group animals.

CHALLENGE PHASE
1st challenge topical application: 100%

Remarks – Method Sodium lauryl sulfate pre-treatment of the topical induction sites was

used due to the non-irritating nature of the test substance. A positive control study on α-hexylcinnamaldehyde using the same methodology and conducted within 6 months confirmed the validity of this study.

RESULTS

Animal	*Challenge Concentration*	*Number of Animals Showing Skin Reactions after:*			
		1st challenge		*2nd challenge*	
		24 h	*48 h*	*24 h*	*48 h*
Test Group	100%	0/20	0/20	-	-
Vehicle Control Group	100%	0/10	0/10	-	-

Remarks - Results: None of the animals in the test or vehicle control groups exhibited a dermal reaction to the challenge applications.

CONCLUSION: There was no evidence of reactions indicative of skin sensitisation to the notified chemical under the conditions of the test.

TEST FACILITY: Covance (1999a)

A.7 Repeat dose toxicity

TEST SUBSTANCE: Notified chemical

METHOD: OECD TG 407 Repeated Dose 28-day Oral Toxicity Study in Rodents.
EC Directive 96/54/EC B.7 Repeated Dose (28 Days) Toxicity (Oral)

Species/Strain: Rat/Fischer-344
Route of Administration: Oral – gavage
Exposure Information: Total exposure days: 28 days;
Dose regimen: 7 days per week;
Post-exposure observation period: 2 weeks
Vehicle: Water
Remarks - Method: No significant protocol deviations.

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw/day*	*Mortality*
control	5 male + 5 female	0	0/10
low dose	5 male + 5 female	30	0/10
mid dose	5 male + 5 female	100	0/10
high dose	5 male + 5 female	1000	0/10
control recovery	5 male + 5 female	0	0/10
high dose recovery	5 male + 5 female	1000	0/10

Mortality and Time to Death
There were no mortalities during the study or recovery period.
Clinical Observations
There were no treatment-related clinical observations at any dose level.

Laboratory Findings – Clinical Chemistry, Haematology, Urinalysis
Males and females administered 1000 mg/kg/day had the following treatment-related statistically significant alterations: decreases in hemoglobin concentration; increases in urea nitrogen, aspartate aminotransferase, total protein, albumin, triglycerides, and calcium. All parameters were either resolved or were only slightly statistically different from controls following recovery. Both sexes from the high dose group had reduced urine specific gravity. This was also seen in female animals at 100 mg/kg/day. The mean urine specific gravity of

high dose females resolved after the recovery period, though not the males.

Effects in Organs

Males and females administered 1000 mg/kg/day had treatment-related statistically significant increases in mean absolute and relative liver and kidney weights. There was partial recovery after the 2-week recovery period.

All animals administered 1000 mg/kg/day had treatment-related alterations in the non-glandular mucosa of the stomach which consisted of slight to moderate inflammation, hyperplasia and/or hyperkeratosis of the non-glandular mucosa at the limiting ridge. One female at this dose also had a focal erosion of the hyperplastic non-glandular mucosa. These alterations had completely resolved after the 2-week recovery period.

Remarks – Results

The most significant effect was inflammation, hyperplasia and hyperkeratosis of the stomach mucosa in high-dose animals, which was completely resolved following the 2-week recovery period. There were no histopathological correlates to the kidney and liver weight alterations. There were no toxicological alterations associated with the decreased urine specific gravity.

CONCLUSION

The No Observed Adverse Effect Level (NOAEL) is 100 mg/kg bw/day based on reduced urine specific gravity seen in females at this dose level.

The No Observed Effect Level (NOEL) was established as 100 mg/kg bw/day for both sexes based on effects on clinical chemistry, haematology, stomach, kidney and liver at the next higher dose (1000 mg/kg bw/day).

TEST FACILITY Dow Chemical Company (1999e)

A.8 Genotoxicity – bacteria

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 471 Bacterial Reverse Mutation Test. Pre incubation procedure
Species/Strain	*S. typhimurium*: TA1535, TA1537, TA98, TA100. *E. coli*: WP2 uvrA.
Metabolic Activation System	S9 fraction from Aroclor-induced rat liver.
Concentration Range in Main Test	a) With metabolic activation: 100-5000 µg/plate. b) Without metabolic activation: 100-5000 µg/plate.
Vehicle	Water
Remarks – Method	No significant protocol deviations. Positive controls (+S9): TA98, benzo(a)pyrene; TA100/1535/1537, 2-aminoanthracene; WP2*uvr*A, 2-aminoanthracene. Positive controls (-S9): TA98, 2-nitrofluorene; TA100/TA1535, sodium azide; TA1537, ICR-191; WP2*uvr*A, 4-nitroquinoline-N-oxide. All criteria for a valid study were met.

RESULTS

Metabolic Activation	*Test Substance Concentration (µg/plate) Resulting in:*			
	Cytotoxicity in Preliminary Test	*Cytotoxicity in Main Test*	*Precipitation*	*Genotoxic Effect*
Absent				
Test 1	> 5000	> 5000	> 5000	Negative
Test 2		> 5000	> 5000	Negative
Present				
Test 1	> 5000	> 5000	> 5000	Negative
Test 2		> 5000	> 5000	Negative

Remarks - Results The notified chemical did not cause a positive increase in the mean

number of revertants per plate or a reduction in the background lawn with any of the tester strains either in the presence or absence of metabolic activation.

The positive controls induced the expected increase in number of revertants and therefore confirmed the validity of the study.

CONCLUSION The notified chemical was not mutagenic to bacteria under the conditions of the test.

TEST FACILITY Covance (1999b)

A.9 Genotoxicity – in vitro

TEST SUBSTANCE Notified chemical (92.9% purity)
METHOD OECD TG 473 In vitro Mammalian Chromosomal Aberration Test.
Species/Strain Rat/Sprague-Dawley (Crl: CD BR)
Cell Type/Cell Line Lymphocytes
Metabolic Activation System S-9 liver homogenate from Aroclor 1254 treated male Sprague-Dawley rats
Vehicle Distilled water
Positive Controls Mitomycin C for (-S9) assay (0.5 µg/ml forTest 1 and 0.075 µg/ml for Test 2).
Cyclophosphamide monohydrate for (+S9) assay (4 µg/ml for Test 1) and 6 µg/ml for Test 2).
Remarks – Method No significant protocol deviations. The pH of the treatment medium at the two highest concentrations of test substance in each test was adjusted to physiological levels by additional 1 N hydrochloric acid.

Metabolic Activation	*Test Substance Concentration (µg/mL)*	*Exposure Period*	*Harvest Time*
Absent			
Test 1	0*, 1.63, 5.44, 16.32, 54.4, 163.2*, 544*, 1632*	4 hours	24 hours
Test 2	0*, 5.44, 16.32, 54.4, 163.2*, 544, 816*, 1088, 1360, 1632*	24 hours	24 hours
Present			
Test 1	0*, 1.63, 5.44, 16.32, 54.4, 163.2*, 544*, 1632*	4 hours	24 hours
Test 2	0*, 54.4, 163.2*, 544*, 1632*	4 hours	24 hours

*Cultures selected for metaphase analysis.

RESULTS

Metabolic Activation	*Cytotoxicity in Main Test*	*Precipitation*	*Genotoxic Effect*
Absent			
Test 1	> 1632	> 1632	Negative
Test 2	≥ 1088	> 1632	Negative
Present			
Test 1	> 1632	> 1632	Negative
Test 2	> 1632	> 1632	Negative

Remarks - Results There were no statistically significant increases in the frequency of cells with aberrations in test material treated cultures (with or without S9 activation), except for the highest dose in the presence of S9 in Test 2. However this was not considered to be biologically significant because:

a) there were no background aberrations in the concurrent negative control due to random variability;
b) only one of the duplicate cultures at this dose had a noticeable increase;
c) there was no significant increase in aberrations in Test 1 at this dose;
d) the frequencies of aberrant cells were within the laboratory historical background range.

	There was no significant increase in the incidence of polyploid cells in the test material cultures compared to negative control values either with or without S9 activation. Significant increases in the frequency of cells with aberrations were observed in cultures treated with the positive control chemicals, confirming the validity of this assay.
CONCLUSION	The notified chemical was not clastogenic to rat lymphocytes treated in vitro under the conditions of the test.
TEST FACILITY	Dow Chemical Company (1999f).

A.10 Developmental toxicity – Preliminary study

TEST SUBSTANCE	Notified chemical (92.9% purity)
METHOD	Similar to OECD 414 Prenatal Developmental Toxicity Study
Species/Strain	Female CD rat (Crl:CD(SD)IGS BR)
Route of Administration	Oral – gavage
Exposure Information	Exposure period: 6-20 days of gestation Dose regimen: 7 days per week
Vehicle	Distilled water
Remarks - Method	The objective of this study was to make a preliminary evaluation of maternal toxicity and embryonal/foetal lethality potential of the notified chemical and to determine dose levels for a subsequent developmental toxicity study in rats. A detailed pathological examination was not performed on the foetus in this study. The study complies with GLP standards with the exception that an analytical confirmation of dose concentrations was not performed.

RESULTS

Group	*Number of Animals*	*Dose mg/kg bw/day*	*Mortality*
1	8	0	0/25
2	8	100	0/25
3	8	300	0/25
4	8	600	0/25
5	8	1000	0/25

Mortality and Time to Death

No dam deaths (or foetal lethality) reported during the study.

Effects on Dams

There were no clinical signs of toxicity observed at any dose. There were no statistically significant differences in kidney or liver weights for any of the treated groups when compared to the control groups. No gross pathological changes were observed in treated animals. Mated females did not show any treatment-related effects on pregnancy rates, numbers of corpora lutea, implantations, resorptions or viable foetuses at any dose level tested. All treated groups had increased % of postimplantation loss and litter resorptions compared to the control group. There was a statistically relevant increase in the percentage of litters with resorptions and a corresponding slight increase in % post-implantations loss at 1000 mg/kg bw/day when compared to the control group. The study author states that this was attributed to the very low incidence observed in control animals (14.1%) which was outside the historical control data range for % litters with resorptions (24-62.5%).

Remarks - Results

Gavage administration of the notified chemical up to and including 1000 mg/kg/day produced no treatment-related maternal toxicity or embryo/foetal lethality.

CONCLUSION
The NOEL for maternal toxicity and embryo/foetal lethality was 1000 mg/kg/day.

TEST FACILITY Dow Chemical Company (2001a)

A.11 Developmental toxicity

TEST SUBSTANCE Notified chemical (92.9% purity)

METHOD OECD 414 Prenatal Developmental Toxicity Study
EC Directive 87/302/EEC B.31 Teratogenicity Test – Rodent And Non-Rodent

Species/Strain	Female CD rat (Crl:CD(SD)IGS BR)
Route of Administration	Oral – gavage
Exposure Information	Exposure period: 6-20 days of gestation Dose regimen: 7 days per week
Vehicle	Distilled water

RESULTS

Group	*Number of Animals*	*Dose mg/kg bw/day*	*Mortality*
1	25	0	0/25
2	25	100	0/25
3	25	300	0/25
4	25	1000	0/25

Mortality and Time to Death
No dam deaths (or foetal lethality) reported during the study.

Effects on Dams
There were no clinical signs of toxicity; however, treatment at the highest dose (1000 mg/kg/day) resulted in increased absolute and relative kidney weights. Kidney weights were unaffected at doses of 100 or 300 mg/kg/day. Neither liver weights, body weights, body weight gains nor feed consumption were affected by treatment. There were no significant treatment-related changes in reproductive parameters at all dose levels. There were no treatment-related effects on body weights or body weight gains at any dose compared to the controls.

Effects on Foetus
Foetal examinations indicated that the notified chemical induced statistically significant increases in skeletal variations, exhibited as delayed ossification of several skull bones at the 300 and 1000 mg/kg/day dose levels (Table 1). The % incidence of delayed ossification at 100 mg/kg/day were higher than the historical control values in the occipital bone, but the increase was not identified as statistically significant and there was no clear dose-response relationship. There were no statistically significant embryonal/foetal effects at 100 mg/kg/day and no evidence of increased malformations at any dose.

Table 1: Incidence of Delayed Ossification of Selected Skull Bones (%)

Skull bone	*Dose level (mg/kg/day)*					
	Foetuses (F)/ Litters(L)	*0*	*100*	*300*	*1000*	*Maximum historical control values*
Frontal	F	0.8	0	**1.3**	**5.4**	0.8
	L	4.3	0	**8.0**	**12.0**	4.2
Parietals	F	0.8	0.7	**5.9**	**12.8**	4.5
	L	4.3	4.0	**28.0***	**40.0***	20.8
Interparietal	F	2.4	4.7	**16.4**	**26.4**	6.0
	L	8.7	20.0	**44.0***	**60.0***	20.8
Occipital	F	0	**4.1**	**2.6**	**6.1**	0.8
	L	0	**8.0**	**8.0**	**20.0***	4.3
Zygomatic	F	0.8	0.7	0.7	2.0	3.8
	L	4.3	4.0	4.0	12.0	16.7
Thoracic centra	F	0.8	0	0.7	2.0	4.5
	L	4.3	0	4.0	12.0	18.2

* Statistically identified as different from the control mean by Wilcoxon's test, alpha = 0.05

Remarks - Results

Although foetal toxicity was seen below maternally toxic dose, the only effect seen was delayed ossification. Statistically significant incidences of delayed ossification were observed at the two highest dose levels and a statistically non-significant increase was observed at 100 mg/kg/day. All these % incidences (in bold text) were above the maximum historical control values. This may suggest the possibility of a dose-response relationship in the incidence of ossification of certain skull bones. No malformations were seen at any dose. The NOAEL for foetotoxicity was 100 mg/kg/day based on occipital skull bone variations observed at this dose level. The NOEL for maternal toxicity was 300 mg/kg/day based on increased kidney weights at 1000 mg/kg/day.

CONCLUSION

There is some evidence to indicate that human exposure to the notified chemical at doses at and above 100 mg/kg bw/day may result in developmental toxicity. The study authors concluded that affected bones from calvarium ossifies very late in gestation (Aliverti et al 1979) and they are transient effects that are completely reversible postnatally (Collins et al 1987; Marr et al 1992). However, as the incidences of interparietal and parietal delayed ossification at both 300 and 1000 mg/kg are statistically significant and well above historical control ranges, classification as Category 3 developmental toxicant (NOHSC Approved Criteria, 2004) is warranted.

TEST FACILITY Dow Chemical Company (2001b)

APPENDIX B: ENVIRONMENTAL FATE AND ECOTOXICOLOGICAL INVESTIGATIONS

B.1 Environmental Fate

B.1.1 Ready biodegradability

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 301 F Ready Biodegradability: Manometric Respirometry Test. EC Directive 92/69/EEC C.4-D Biodegradation: Determination of the "Ready" Biodegradability: Manometric Respirometry Test.
Inoculum	Activated sludge (mixed liquor)
Exposure Period	28 days
Auxiliary Solvent	None
Analytical Monitoring	Gas phase measurements of O_2 and CO_2 were performed using the Columbus MicroOxymax respirometer system (using a paramagnetic oxygen sensor and a non-dispersed infrared CO_2 detector). In addition, removal of dissolved organic carbon (DOC) was determined at the beginning of the test and after 28 days.
Remarks - Method	Activated Sewage Sludge was exposed to the notified chemical in duplicates at 88.8 mg/L ThOD, 22 ± 1˚C and pH 7.12 – 7.63 for 28 days in darkness for the ready biodegradability test. A blank control with inoculum only, a reference control with benzoate (192 mg/L ThOD), a killed control with the notified chemical and mercuric chloride (250 mg/L), and a toxicity control with the notified chemical and benzoate were conducted for validation purposes. All were conducted in duplicates except for the toxicity control where only a single flask was used.

RESULTS

Test substance		*Benzoate*	
Day	*% Degradation*[*]	*Day*	*% Degradation*
10	87	2	60
28	86	28	95

[*] Based on the O_2 consumption relative to $ThOD_{NH3}$ and corrected for partial mineralization of organic nitrogen to nitrate and nitrite.

Remarks - Results	Degradation of the reference control exceeded 60% at day 2 of the test. Degradation of benzoate based on O_2 consumption, CO_2 production, and DOC removal was 95%, 75% and 96% respectively after 28 days. Duplicate toxicity control vessels containing a mixture of benzoate and test substance showed no evidence of inhibition of sludge microbial activity. The test substance exhibited an average of 86% biodegradation based on O_2 consumption after 28 days. Biodegradation was confirmed by measurement of substantial mineralization (CO_2 production 68%), and DOC removal (91%) after 28 days.
CONCLUSION	The notified chemical is readily biodegradable.
TEST FACILITY	Dow Chemical Company (1999g).

B.1.2 Bioaccumulation

CONCLUSION	Test not conducted. The notified chemical is highly soluble in water with a low partition coefficient. It is also readily biodegradable by activated sludge, with no signs of toxicity to sludge microorganisms (IEC50 > 4820

mg/L). The notified chemical is therefore unlikely to bioaccumulate.

B.2 Ecotoxicological Investigations

B.2.1 Acute toxicity to fish

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 203 Fish, Acute Toxicity Test – Static Limit Test.
Species	*Oncorhynchus mykiss* (Rainbow Trout)
Exposure Period	96 hours
Auxiliary Solvent	None
Water Hardness	56 mg $CaCO_3$/L
Analytical Monitoring	Collected samples were derivatised with pentafluorobenzoyl chloride and analysed by gas chromatography with mass selective detection (GC/MSD).
Remarks – Method	Following a range finding test, three groups of fish (10 for each group) were exposed to the notified chemical at a nominal concentration of 100 mg/L at 12.3 -12.8°C, pH range of 6.8 - 8.5 and an oxygen level of 79% of saturation. The test vessels were sampled and analysed on days 0 and 4. The sensitivity of the test system was not validated with a reference substance.

RESULTS

Concentration mg/L		*Number of Fish*	*Mortality*				
Nominal	*Actual*		*4 h*	*24 h*	*48 h*	*72 h*	*96 h*
0	0	30	0	0	0	0	0
100	101	30	0	0	0	0	0

LC50	> 100 mg/L at 96 hours
NOEC	100 mg/L at 96 hours
Remarks – Results	Analytical verification of the concentration levels showed that test substance was stable over the 96-hour study period. No mortalities or sub-lethal effects were observed in the water control or test vessels during the study.
CONCLUSION	The notified chemical is not harmful to fish.
TEST FACILITY	Dow Chemical Company (1999h)

B.2.2 Acute toxicity to aquatic invertebrates

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 202 Daphnia sp. Acute Immobilisation Test and Reproduction Test – Static Limit Test.
Species	*Daphnia magna*
Exposure Period	48 hours
Auxiliary Solvent	None
Water Hardness	174 mg $CaCO_3$/L
Analytical Monitoring	Collected samples were analysed by the same method used in the fish toxicity test.
Remarks - Method	The study was conducted in triplicates by exposing 10 daphnia for each replicate to the notified chemical at a nominal concentration of 100 mg/L for 48 hours at 20.3 ± 0.2°C, pH range of 7.1 - 8.3 and an oxygen level of

above 96% of saturation. Daphnia were observed daily for mortality (no visible heartbeat or response to gentle prodding) and sub-lethal effects.

The test solutions were analyzed to determine test substance concentrations on days 0 (from bulk solutions) and 2 (from spent solutions) of the study.

The sensitivity of the test system was not validated with a reference substance.

RESULTS

Concentration mg/L		*Number of D. magna*	*Number Immobilised*	
Nominal	*Actual*		*24 h*	*48 h*
0	0	30	0	0
100	93.1	30	0	0

LC50	> 100 mg/L at 48 hours
NOEC	100 mg/L at 48 hours
Remarks - Results	No mortalities or sub-lethal effects were observed in the water control or test vessels during the study.

CONCLUSION The notified chemical is not harmful to aquatic invertebrates.

TEST FACILITY Dow Chemical Company (1999c)

B.2.3 Algal growth inhibition test

TEST SUBSTANCE Notified chemical

METHOD OECD TG 201 Alga, Growth Inhibition Test.
EC Directive 92/69/EEC C.3 Algal Inhibition Test.

Species	*Selenastrum capricornutum* (freshwater green algae)
Exposure Period	96 hours
Concentration Range	3.13, 6.25, 12.5, 25, 50, 100 mg/L
Auxiliary Solvent	None
Water Hardness	170 mg $CaCO_3$/L
Analytical Monitoring	Collected samples were analysed by the same method used in the fish toxicity test. Algal cell densities were determined by electronic particle counting using a Coulter Multisizer.
Remarks - Method	Three replicates were used in each treatment group, including the medium control group, each with an average day 0 cell density of 15,103 cells/mL. The study was conducted at 23.8-24.1°C and a pH range of 7.0-7.5 for four days.

RESULTS

Biomass		*Growth*	
72 h E_bC50 mg/L at 72 h	*NOEC mg/L*	*E_rC50 mg/L at 72 h*	*NOEC mg/L*
N/A	N/A	> 100	100

Remarks - Results

Algal cell growth was inhibited by 0.9, 2.6 and 16% at 21, 49 and 100 mg/L test substance after 3 days. Total cell counts were not statistically significantly different from controls ($p<0.05$) using the one tailed Dunnett's t-test.

An 18.5% inhibition of growth at the 100 mg/L level was observed by Day 4 of the test, and a 3.7% inhibition of growth was observed at a concentration of 49 mg/L. The 96 h E_rC50 and NOEC was therefore determined to be > 100 and 49 mg/L, respectively.

CONCLUSION

The notified chemical is not harmful to freshwater green algae.

TEST FACILITY

Dow Chemical Company (1999j)

B.2.4 Inhibition of microbial activity

TEST SUBSTANCE

Notified chemical

METHOD

OECD TG 209 Activated Sludge, Respiration Inhibition Test.
EC Directive 88/302/EEC C.11 Biodegradation: Activated Sludge Respiration Inhibition Test.

Inoculum: Activated sludge
Exposure Period: 3 hours
Concentration Range: 300 - 4820 mg/L

Remarks – Method

The study was conducted by exposing activated sewage sludge from a municipal waste water plant to the notified chemical at a range of concentrations for 3 hours at 20 ± 2˚C.

The reference substance 3,5-dichlorophenol was tested in parallel under identical conditions at nominal concentrations of 3, 10 and 30 mg/L, and functioned as a positive control. Additionally, a control containing only tap water, synthetic wastewater and inoculum was conducted in duplicates.

RESULTS

IC50: >4820 mg/L
NOEC: 4820 mg/L

Remarks – Results

All criteria for test validity were met. Thus, the results of this study are valid according to OECD guidelines.

The notified chemical at the highest test concentration of 4820 mg/L did not inhibit the respiration rate of activated sludge compared to the controls.

CONCLUSION

The notified chemical does not inhibit activated sludge microbial activity.

TEST FACILITY

Dow Chemical Company (1999k)

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