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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Tinosan HP100

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Director
Chemicals Notification and Assessment

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Tinosan HP 100

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Ciba Specialty Chemicals Pty Ltd (ABN: 97 005 061 469)
235 Settlement Road Thomastown VIC 3074

NOTIFICATION CATEGORY
Limited-small volume: Chemical other than polymer, (1 tonne or less per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication: Chemical name(s), CAS number, molecular and structural formulae, molecular weight, spectral data, purity, identity and weight of impurities and additives/adjuvants, import volume.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
No variation to the schedule of data requirements is claimed.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
EU

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
Tinosan HP 100

METHODS OF DETECTION AND DETERMINATION

ANALYTICAL METHOD	The notified chemical can be identified by UV-Vis, IR, ^{1}NMR and HPLC.
Remarks	The notifier has provided copies of the spectra.

3. COMPOSITION

All information on the composition of the notified chemical is exempt from information.

4. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notified chemical is imported as a > 25% component of the commercial product Tinosan HP 100.

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	<1	<1	<1	<1	<1

USE
The notified chemical will be used as an anti-microbial additive in laundry detergents and fabric

softeners.

5. PROCESS AND RELEASE INFORMATION

5.1. Distribution, Transport and Storage

PORT OF ENTRY
Not stated

TRANSPORTATION AND PACKAGING
The notified chemical will be imported in solution in propylene glycol (> 25% notified chemical) in 60 L plastic drums.

5.2. Operation Description

The notified chemical is reformulated in Australia to manufacture laundry products containing a maximum 0.18% notified chemical.

At the manufacturers, the drum containing the notified chemical will be placed on a drum tilter, uncapped or connected to delivery pump and the required quantity (<10 kg) poured into a dipper or bucket. The contents of the dipper would then be poured into the blending vessel containing the other ingredients of the detergent or softener. When blended, the batch will be sampled for QC and on approval packed off with retail and commercial packaging.

5.3. Occupational exposure

Number and Category of Workers

Category of Worker	*Number*	*Exposure Duration*	*Exposure Frequency*
Process workers	30	4 hours	<30 days/year
Laboratory technicians	30	1 hour	<30 days/year
Warehouse	30	1 hour	<30 days/year

Exposure Details

Transport and warehousing

Workers are not expected to be exposed to the imported notified chemical, as they will be handling closed containers. Exposure is possible in the event of an accident where the packaging is breached.

The imported drum will remained closed for most of the handling process but may be opened for QC sampling. It would be expected that workers undertaking QC sampling and testing activities would wear eye protection, gloves and overalls.

Detergent and softener manufacture

The product containing the notified chemical is dispensed using a delivery pump or decanting on drum tilter into a dispensing bucket or dipper and charged to the blending vessel where it blended with other ingredients of the laundry products. Once blending is completed, QC samples are taken. There is potential for dermal and ocular exposure to drips and spills to occur during dispensing and charging process. Areas where the raw materials are charged to blending vessels, are normally equipped with local exhaust ventilation. Workers involved in the process will wear eye protection, gloves, and overalls.

Maintenance work

Maintenance work on the equipment in which the notified chemical has been present is expected to occur infrequently. The equipment will be purged using process water before maintenance work commences. Maintenance workers will wear eye protection, gloves, and overalls.

Users of commercial laundry products

Workers using the finished commercial laundry product may have significant dermal exposure to the notified chemical. The concentration of the notified chemical will not be greater than 0.18% in commercial laundry products.

Transport, warehousing, and retail of finished laundry product
Exposure to the notified chemical finished laundry product may occur during transport, warehousing, and retail, in the event of an accident if the packaging is breached.

5.4. Release

RELEASE OF CHEMICAL AT SITE
The notified chemical will be blended into laundry products (detergents and softeners) at up to 10 facilities in Australia. Release at blending sites is expected to be limited to incidental spills. Blending facilities do not normally discard wash water from equipment cleaning, but retain it for blending into compatible products.
Due to the use of drum washwater, residues in import containers are expected to be in the order of 0.17 kg notified chemical per annum. Residues are likely to be blended with compatible products, or otherwise may be discarded in landfill.

RELEASE OF CHEMICAL FROM USE
Practically all of the notified chemical (< 1 tonne per annum) contained in laundry products (at up to 0.18%) will be released into the sewer in commercial or domestic laundry effluent when the wash-water is released. Use of the products may include specialist uses such as laundering hotel linen, washing nappies in domestic situations, or general commercial and domestic laundering. Therefore, release is expected to be widespread and include both metropolitan and country areas. Release into closed septic tanks in country areas is a possibility. Note that the notifier has indicated only "small" manufacturers will use this chemical, implying it will not be present in major brands.

Small amounts may remain in empty product containers, and be disposed of through domestic garbage, into landfill.

5.5. Disposal
The notifier has recommended that the notified chemical be disposed of in a secure landfill. Where possible rinsed empty import containers should be returned to the notifier for re-use or recycling. Otherwise, drums should be rinsed and the contents recycled into process materials. It is noted that disposal recommendations in the MSDS supplied indicate that the notified chemical is not suitable to landfill (including a secure one), but is suitable for incineration and high temperature incineration. It also indicates contaminated empty containers should be disposed of as chemical waste. This will need amendment.

5.6. Public exposure
The public may have significant dermal exposure to the notified chemical during use of the laundry products. The concentration of the notified chemical in the finished product will be less than 0.18%. Exposure to the notified chemical from washed clothing and linen is not expected to occur as the chemical is expected to be rinsed from the washed articles prior to drying.

The public are unlikely to be exposed to the notified chemical during transport, storage, manufacture and commercial use, except in the accident of an accidental spillage.

6. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20ºC and 101.3 kPa	The notified chemical is an off white to beige powder with almost no odour.
Melting Point	73.6ºC
METHOD	OECD TG 102 Melting Point/Melting Range. EC Directive 92/69/EEC A.1 Melting/Freezing Temperature.
TEST FACILITY	RCC (1999a)
Boiling Point	359.3ºC at 101.3 kPa

METHOD OECD TG 103 Boiling Point.
EC Directive 92/69/EEC A.2 Boiling Temperature.
TEST FACILITY RCC (1999b)

Density 1470 kg/m^3 at 20°C

METHOD OECD TG 109 Density of Liquids and Solids.
EC Directive 92/69/EEC A.3 Relative Density.
TEST FACILITY RCC (1999c)

Vapour Pressure $1.2x10^{-9}$ kPa at 25°C.

METHOD OECD TG 104 Vapour Pressure.
EC Directive 92/69/EEC A.4 Vapour Pressure.
TEST FACILITY RCC (1998a)

Water Solubility 19.5 mg/L at 20°C

METHOD OECD TG 105 Water Solubility.
EC Directive 92/69/EEC A.6 Water Solubility.
Remarks Water solubility was determined by the column elution method with 11 samples in two runs at sampling intervals of 1 hour using standard solutions of between 2.132 and 42.64 µg/L notified chemical. Quantification was determined by HPLC. The notified chemical is moderately soluble in water (Mensink *et al*. 1995).
TEST FACILITY RCC (1999d)

Hydrolysis as a Function of pH

METHOD OECD TG 111 Hydrolysis as a Function of pH.
EC Directive 92/69/EEC C.7 Degradation: Abiotic Degradation: Hydrolysis as a Function of pH.

PH	*T (°C)*	*$t_{½}$ <hours or days>*
4	25	>1 year
7	25	>1 year
9	25	>1 year

Remarks Aliquots each containing approximately 10 mg notified chemical were dissolved in 100 mL buffer, containing 2% dimethylsulfoxide (pH 4, 7) or 2% acetonitrile (pH 9), as a solubilizer, and incubated for 5 days at temperatures of 50°C. No significant degradation of the notified chemical was observed by HPLC analysis. Thus, under environmental conditions of temperatures and pH, the half-life is expected to be more than 1 year.
TEST FACILITY RCC (1999e)

Partition Coefficient (n-octanol/water) log Pow at 20°C = 3.7

METHOD OECD TG 117 Partition Coefficient (n-octanol/water), HPLC Method.
EC Directive 92/69/EEC A.8 Partition Coefficient.
Remarks The partition coefficient was determined by the column elution method, where the test item was injected 3 times, and its retention times were compared against 6 reference items. The chemical concentrations were quantified by HPLC. The partition coefficient was determined using a regression curve. The notified chemical has an affinity to lipids.
TEST FACILITY RCC (1999f)

Adsorption/Desorption Log K_{oc} between 3.1 and 3.2

METHOD OECD TG 106 Adsorption - Desorption Using a Batch Equilibrium Method.

Remarks Adsorption was estimated by the QSAR method to be between 1250 and 1550 L/kg by the equations logKoc = 0.81*logKow + 1 (predominantly hydrophobics), and logKoc = 0.57*logKow + 1.08 (phenols, benzonitriles). However, as the notified chemical is weakly ionic, the results are considered as indicative only. Based on the estimates, the notified chemical is expected to adsorb to soils and to have a low mobility in soils (McCall *et al*. 1980).

TEST FACILITY Ciba (2000a)

Dissociation Constant pKa = 8.2

METHOD Albert & Serjeant (1971) Determination of Ionization Constants, Chapman and Hall Ltd. London.

Remarks The dissociation constant was calculated from differences in absorbances at 296 nm in samples (14 in all) diluted with different ratios of buffer solution (ie. HCL, NaOH) to give pH values between 1 and 13. The dissociation constant indicates the notified chemical is weakly ionic. The degree of dissociation is expected to increase in alkaline environments.

TEST FACILITY Ciba (2000b)

Particle Size

METHOD OECD TG 110 Particle Size Distribution/Fibre Length and Diameter Distributions.

Range (μm)	*Mass (%)*
< 10	0.34
< 53	50.0

Remarks The notified chemical will only be imported in solution form and the particle size as manufactured is not relevant to Australian exposure

TEST FACILITY RCC (1999g)

Surface Tension 65 mN/m at 19.7°C

METHOD OECD TG 115 Surface Tension of Aqueous Solutions.
EC Directive 92/69/EEC A.5 Surface Tension.

Remarks Concentration: 90% of saturation concentration. The notified chemical is not surface active.

TEST FACILITY RCC (1999k)

Flash Point Not determined

Remarks The notified chemical is a solid

Flammability Limits Not highly flammable.

METHOD EC Directive 92/69/EEC A.10 Flammability (Solids).

Remarks The notified chemical could not be ignited with a flame during pretest (contact time 2 minutes). In contact with the ignition source, the notified chemical melted and a white smoke was observed, but the notified chemical did not burn without contact with the ignition source. No main test was conducted.

TEST FACILITY RCC (1999h)

Autoignition Temperature Not auto flammable.

METHOD 92/69/EEC A.15 Auto-Ignition Temperature (Liquids and Gases).
92/69/EEC A.16 Relative Self-Ignition Temperature for Solids.

Remarks No self heating or decomposition to 400°C

TEST FACILITY RCC (1999i)

Explosive Properties Not considered an explosive.

METHOD EC Directive 92/69/EEC A.14 Explosive Properties.
Remarks The substance is not considered an explosive, as concluded from test results on thermal sensitivity (effects of a flame) and mechanical sensitivity (shock and friction).
TEST FACILITY ISS (1999)

Oxidizing Properties Not oxidising

METHOD EC Directive 92/69/EEC A.17 Oxidizing Properties (Solids).
Remarks The notified chemical is incapable of causing fire or enhancing the risk of fire when in contact with combustible material.
TEST FACILITY RCC (1999j)

Reactivity

Remarks Stable under normal environment conditions.

7. TOXICOLOGICAL INVESTIGATIONS

Endpoint and Result	*Assessment Conclusion*
Rat, acute oral	LD50 >2000 mg/kg bw low toxicity
Rat, acute dermal	LD50 >2000 mg/kg bw low toxicity
Rabbit, skin irritation	non-irritating
Rabbit, eye irritation	severely irritating
Guinea pig, skin sensitisation - adjuvant test/non-adjuvant test.	no evidence of sensitisation.
Rat, oral repeat dose toxicity - 28 days.	NOAEL 150 mg/kg bw/day
Genotoxicity - bacterial reverse mutation	non mutagenic
Genotoxicity – in vitro Mammmalian Chromosomal Aberration Test	clastogenic
Genotoxicity – in vivo Mammalian Erythrocyte Micronucleus Test	not clastogenic

7.1. Acute toxicity – oral

TEST SUBSTANCE Notified chemical

METHOD OECD TG 423 Acute Oral Toxicity – Acute Toxic Class Method.
EC Directive 96/54/EEC B.1tris Acute Oral Toxicity – Acute Toxic Class Method.
Species/Strain Rat/HanIbm: WIST (SPF)
Vehicle Polyethylene glycol
Remarks - Method A single dose was administered by oral gavage after 16.5 hours fasting with free access to water. Food was provided three hours after dosing.

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Mortality*
1	3 males	2000	0
2	3 males	2000	0

LD50 >2000 mg/kg bw
Signs of Toxicity No clinical signs were observed during the study period in all females, and in two males. One male showed diarrhoea five hours after treatment only.
Effects in Organs No macroscopic changes were observed at necropsy.
Remarks - Results Body weight gains were within normal range for the strain and age of rat

used.

CONCLUSION	The notified chemical is of low toxicity via the oral route.
TEST FACILITY	RCC (1991)

7.2. Acute toxicity – dermal

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 402 Acute Dermal Toxicity. EC Directive 92/69/EEC B.3 Acute Toxicity (Dermal).
Species/Strain	Rat/HanIbm: WIST (SPF)
Vehicle	Polyethylene glycol
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 females	2000	0
2	5 males	2000	0

LD50	>2000 mg/kg bw
Signs of Toxicity - Local	Slight scaling of the treated skin was observed in all animals. All males and four females showed focal erythema. In three males and two females, serous rhinorrhoea was noted. The treated skin was crusted in one animal only.
Signs of Toxicity – Systemic	None
Effects in Organs	No macroscopic findings were observed at necropsy.
Remarks - Results	All signs were reversible after 15 days
CONCLUSION	The notified chemical is of low toxicity via the dermal route.
TEST FACILITY	RCC (1999m)

7.4. Irritation – skin

TEST SUBSTANCE	Notified chemical
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	Three
Vehicle	The notified chemical was moistened with bi-distilled water before application.
Observation Period	72 hours
Type of Dressing	Semi-occlusive.
Remarks - Method	No significant protocol deviations.
RESULTS	No signs of irritation or corrosion were observed.
Remarks - Results	No clinical signs of systemic toxicity were observed and no deaths occurred.
CONCLUSION	The notified chemical is non-irritating to skin.
TEST FACILITY	RCC (1998b)

7.5. Irritation – eye

TEST SUBSTANCE	Notified chemical
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	Three
Observation Period	21 days
Remarks - Method	The notified chemical was applied as solid to the eye of the rabbits. The observation period was extended to 21 days to examine the persistence of the observed effects.

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	2	1	2	2	21 days	1
Conjunctiva: chemosis	2	1	2	3	7 days	0
Corneal opacity	0	0.66	0.66	1	21 days	1
Iridial inflammation	0	0	0	0	0	0

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

Remarks - Results	In all animals, reddening (including hyperemia of the scleral blood vessels) and swelling of the conjunctivae, swelling of the nictating membrane and watery discharge were observed. In two animals, slight opacity and mucous discharge was evident. Hyperemia of the scleral blood vessels persisted in all animals until the end of the observation period. In two animals, conjunctival reddening and in one animal, corneal opacity was noted until 21 days after treatment. No corrosion of the treated eye was observed. No systemic toxicity or mortality was observed.
CONCLUSION	The notified chemical is severely irritating to the eye.
TEST FACILITY	RCC (1999n)

7.6. Skin sensitisation

TEST SUBSTANCE	Notified Chemical
METHOD	OECD TG 406 Skin Sensitisation – maximisation test. EC Directive 96/54/EC B.6 Skin Sensitization – maximisation test.
Species/Strain	Guinea pig/albino
PRELIMINARY STUDY	Maximum Non-irritating Concentration: intradermal: 5% topical: 50%
MAIN STUDY	
Number of Animals	Test Group: 10 Control Group: 5
INDUCTION PHASE	Induction Concentration: intradermal injection 5% topical application 50%
Signs of Irritation	Irritation was only observed following treatment with 10 % SLS prior to topical induction.

CHALLENGE PHASE

1st challenge	topical application: 50%
Remarks - Method	No significant effects were seen in the preliminary test and the maximum concentrations used in the preliminary test were therefore used for induction.

RESULTS

Animal	*Challenge Concentration*	*Number of Animals Showing Skin Reactions after: 1st challenge*	
		24 h	*48 h*
Test Group	50%	1/10	1/10
Control Group	50%	0/5	0/5

Remarks - Results	There were no deaths during the course of the treatment, and no symptoms of systemic toxicity. Well defined erythema grading to very slight erythema was seen in one test animal.
CONCLUSION	There was limited evidence of reactions indicative of skin sensitisation to the notified chemical under the conditions of the test.
TEST FACILITY	RCC (1999o)

7.7. Repeat dose toxicity

TEST SUBSTANCE	Notified Chemical
METHOD	EC Directive 96/54/EC B.7 Repeated Dose (28 Days) Toxicity (Oral).
Species/Strain	Rat – SPF Wistar
Route of Administration	Oral – gavage
Exposure Information	Total exposure days: 28 days; Dose regimen: 7 days per week; Post-exposure observation period: 14 days
Vehicle	Polyethylene glycol 300
Remarks - Method	A post exposure recovery group was used to examine the reversibility of the observed changes

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw/day*	*Mortality*
I (control)	5 per sex	0	0
II (low dose)	5 per sex	50	1
III (mid dose)	5 per sex	150	0
IV (high dose)	5 per sex	750	1
V (control recovery)	5 per sex	0	0
VI (high dose recovery)	5 per sex	750	0

Mortality and Time to Death

Two animals (one low dose male on day 12 and one high dose female on day 9) died during the treatment period. The male showed soft faeces for three days before being found dead. In the female clinical signs of toxicity were observed on day 7 and 8. On day 7, piloerection and hypothermia were observed. On day 8, piloerection, haunched posture sedation, dyspnea, and hypothermia were observed.

Clinical Observations

Slight salivation was noted in two animals treated with 150 mg/kg bw/day and in several animals treated with

750 mg/kg bw/day. Reduction in locomotor activity was seen in all high dose animals. Other findings, including piloerection, hunched posture, sedation, hypothermia, dyspnea, breathing noise, vocalisation, kinked tail and hardened abdomen were observed infrequently in individual animals. From treatment day 9 onwards, soft faeces (slight in degree) were noted in all animals.

Body Weights:
At 750 mg/kg bw/day the mean body weight of the males on treatment day 8 was significantly less ($p<0.01$) than that of the control males. The body weight gain from day 1-8 was 15.5% for this group compared to 20.9% for the controls. This correlated with the lower food consumption noted during the first treatment week. The mean body weight of the females in the 750 mg/kg bw/day group were lower than those of the control females throughout the treatment period, although the body weight gain was similar.

Food consumption:
At 750 mg/kg bw/day, a test related reduction of mean daily food consumption was noted in males during the first treatment week and in the females throughout the study. During the recovery period, the mean daily food consumption of all groups was similar.

Laboratory Findings – Clinical Chemistry, Haematology, Urinalysis
Clinical Chemistry:
Treatment-related differences in the clinical biochemistry parameters included increased plasma uric acid concentration in males and females ($p<0.01$) at 750 mg/kg bw/day; reduced concentration of total plasma bilirubin in males ($p<0.1$) and females (not significant) treated with 750 mg/kg bw/day and males ($p<0.1$) treated with 150 mg/kg bw/day; increased triglycerides in animals ($p<0.1$) treated with 750 mg/kg bw/day; increased phospholipids in females ($p<0.1$) treated with 750 mg/kg bw/day; increased alkaline phosphatase activity in males ($p<0.1$) treated at 750 mg/kg bw/day; reduced plasma chloride level in males (not significant) and females ($p<0.1$) treated at 750 mg/kg bw/day. After the two week recovery period, the levels of phospholipids remained higher in males ($p<0.5$) and females (not significant) treated with 750 mg/kg bw/day, whereas total bilirubin remained lower in males ($p<0.5$) and females (not significant).

Haematology:
In males treated with 750 mg/kg bw/day, there was a statistically significant increase in activated partial thromboplastin time. After the two-week recovery period, the levels were comparable to the control group. The activated partial thromboplastin times of the males in the mid and low dose treatment groups were also longer than those of control males.

Urinalysis:
Increased urine volume (18-hour), and decreased specific gravity and osmolality were noted in males ($p<0.05$) and females ($p<0.01$) treated with 750 mg/kg bw/day.

Effects in Organs
Organ weights:
Increased absolute and relative liver weight occurred in the males and females in the 750 mg/kg bw/day treatment group. After the recovery period, absolute liver weights remained higher for the high dose animals and there was a statistically significant reduction in absolute and relative adrenal weight in the treated males.

Macroscopic Observations
All macroscopic findings were scattered observations, or occurred at similar frequency in both test and control animals.

Microscopic Observations:
Minimal or slight degrees of hepatocellular (midzonal/centrilobular) hypertrophy were recorded in four males and three females in the 750 mg/kg bw/day treatment group. Hyperplasia/hyperkeratosis of the squamous epithelium of the forestomach was seen at mild to moderate degrees in all animals in the high dose treatment group. These findings were absent in the recovery group.

Remarks – Results
Neither of the two deaths observed was considered to be related to the systemic toxicity of the test article. At necropsy, the lungs of the male were incompletely collapsed. The death of the male was hence considered due to a dosing error. For the female, none of the macroscopic findings (distension of the intestine and reduced spleen size) at necropsy indicated a possible cause of death. The death of female was hence considered

incidental.

The soft faeces from treatment day 9 onward, noted in all animals, was considered a common effect caused by PEG300. The activated partial thromboplastin times observed in mid and low dose males, though longer than those of the control males, were comparable to historical controls and were considered incidental. All the clinical signs of toxicity, other than the slight salivation, were common findings that were considered unrelated to treatment with the notified chemical.

Test article related findings were noted in animals treated at 150 and 750 mg/kg bw/day. At 150 mg/kg bw/day salivation was observed in one male and one female and reduction of total plasma bilirubin was seen in all males only. No other treated related changes were observed.

At 750 mg/kg bw/day the test article caused salivation in several animals, reduced food consumption and body weight development, reduced locomotor activity as well as changes in haematology, clinical biochemistry, and urinalysis parameters after 28 days. The absolute and relative liver weights were increased. Morphologic changes were restricted to hepatocellular hypertrophy in liver and squamous epithelium hyperplasia/hyperkeratosis of the forestomach in several rats. After the recovery period, increased phosopholipids and reduced total plasma bilirubin and slightly elevated absolute liver weights (males only) persisted. The morphological changes were reversible after the 14-day recovery period.

CONCLUSION

The No Observed (Adverse) Effect Level (NO(A)EL) was established as 150 mg/kg bw/day, based on changes in locomotor activity, clinical chemistry, haematology, liver weight and macroscopic effects in the liver and stomach at 750 mg/kg bw/day.

TEST FACILITY	RCC (1999p)

7.8. Genotoxicity - bacteria

TEST SUBSTANCE	Notified Chemical
METHOD	OECD TG 471 Bacterial Reverse Mutation Test. EC Directive 2000/32/EC B.13/14 Mutagenicity – Reverse Mutation Test using Bacteria. Plate incorporation procedure (experiment I) and Pre incubation procedure (experiment II)
Species/Strain	*S. typhimurium*: TA 1535, TA 1537, TA 98, TA 100 *E. coli*: WP2 uvrA
Metabolic Activation System	S9 fraction from the livers of male rats induced with phenobarbital and β-naphthoflavone
Concentration Range in Main Test	a) With metabolic activation: 0.1 - 33.3 µg/plate. b) Without metabolic activation: 0.03 - 10.0 µg/plate.
Vehicle	DSMO
Remarks - Method	To evaluate the toxicity of the test article a pre-experiment was performed. Toxicity of the test article results in a reduction in the spontaneous revertants or a clearing of the bacterial background lawn. Based upon the results of this pre-experiment the concentrations applied in the main experiment were chosen.

RESULTS

Remarks - Results	The background growth was reduced at and above 0.1 to 1.0 µg/plate depending on strain without S9 mix. In the presence of S9 mix, toxic effects were generally only seen at the maximum concentration tested. In experiment II, an isolated increase in revertant colony numbers in strain TA 1535, with metabolic activation was observed. The number of revertant colonies reached a threshold of 3 times the control. This was not reproduced in experiment I. The study authors have suggested that,

most likely, this increase was caused by the toxic effects of test article resulting in lower number of surviving bacteria on the corresponding plates. A low number of bacteria competing for traces of histidine introduced with the top agar leads to bacterial colony growth until the histidine is depleted. These colonies, though smaller, may be mistaken for mutant colonies. No reproducible increase in the number of revertant colonies occurred in any of the strains up to the maximal concentration tested, with or without metabolic activation.

Appropriate reference mutagens were used as positive controls, and showed a distinct increase in induced revertant colonies.

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

TEST FACILITY — RCC (1999q)

7.9. Genotoxicity – in vitro

TEST SUBSTANCE — Notified chemical

METHOD — OECD TG 473 In vitro Mammalian Chromosomal Aberration Test.

Cell Type/Cell Line	Chinese Hamster V79 lung cells.
Metabolic Activation System	S9 fraction from the livers of male rats induced with phenobarbital and β-naphthoflavone
Vehicle	DMSO
Remarks - Method	Toxic effects indicated by reduced cell numbers below 50% of control were observed after 4 hr treatment with 40.63 µg/mL in the absence of S9 mix and with 20.31 µg/mL in the presence of S9. Precipitation occurred at 20.31 µg/mL.

Metabolic Activation	*Test Substance Concentration (µg/mL)*	*Exposure Period*	*Harvest Time*
Absent			
Test I	2.5, 5, 10*, 20*, 30*, 40	4	18
Test IIa	5, 10*, 20*, 30*, 35	4	18
Test IIb	10, 20, 25, 30*, 35*	4	28
Test III	1.2, 2.5*, 5*, 10*, 20, 30	18	18
Present			
Test I	1.25*, 2.5*, 5*, 10, 20, 30	4	18
Test III	0.625, 1.25, 2.5*, 5*, 10*, 15*	4	28

* Cultured selected for analysis

RESULTS

Metabolic Activation	*Test Substance Concentration (µg/mL) Resulting in:*			
	Cytotoxicity in PreliminaryTest	*Cytotoxicity in Main Test*	*Precipitation*	*Genotoxic Effect*
Absent				
Test I	40.63	30	-	20.0
Test IIa	40.63	30	-	-
Test IIb	40.63	35	30, 35	-
Test III	40.63	10.0	-	-
Present				
Test I	20.31	-	-	-
Test III	20.31	5.0, 10, 15	-	5.0

Remarks - Results — In the absence of S9, statistically significant increases in the number of structural aberrations were observed after an exposure period of 4 hours and preparation intervals of 18 and 28 hours. However, taking into

account historical control data, only in Test 1 (20 µg/mL=6.5%; 30 µg/mL=5.5%) can the statistical significance be regarded as being biologically significant.

In the presence of S9 mix in Test II, a concentration-dependent increase in the aberration rates (2.5%, 7.5%, 19.5%) was observed with 2.5, 5.0, 15.0 µg/mL of the notified chemical. In addition, a distinct increase in cells carrying exchanges (3.0% and 13.0%) was found at 5.0 and 15.0 µg/mL compared with the corresponding controls.

Cytotoxicity was indicated by a reduction in mitotic index.

Appropriate mutagens were use as positive controls. They induced a statistically significant increase ($p<0.05$) in cells with structural chromosome aberrations.

CONCLUSION — The notified chemical was clastogenic to V79 Chinese Hamster cells treated in vitro under the conditions of the test.

TEST FACILITY — RCC (1999r)

7.10. Genotoxicity – in vivo

TEST SUBSTANCE — Notified Chemical

METHOD — OECD TG 474 Mammalian Erythrocyte Micronucleus Test.
- Species/Strain: Mouse/NMRI
- Route of Administration: Oral – gavage
- Vehicle: Polyethylene glycol 400
- Remarks - Method: No significant protocol deviations

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Sacrifice Time hours*
1	5 per sex	0	24
2	5 per sex	200	24
3	5 per sex	670	24
4	5 per sex	2000	24
5	5 per sex	2000	48
6	5 per sex	CP	24

CP=cyclophosphamide.

RESULTS
- Doses Producing Toxicity: None
- Genotoxic Effects: None
- Remarks - Results: The mean number of normochromatic erythrocytes was not substantially increased after treatment with the notified chemical compared with the mean value of the controls. There was no enhancement in the frequency of the detected micronuclei at any dose level and preparation interval of the notified chemical.

CONCLUSION — The notified chemical was not clastogenic in this in vivo bone marrow cells of the mouse under the conditions of the test.

TEST FACILITY — RCC (1999s)

8. ENVIRONMENT

8.1. Environmental fate

8.1.1. Ready biodegradability

TEST SUBSTANCE	Notified Chemical
METHOD	OECD TG 301 F Ready Biodegradability: Manometric Respirometry Test.
Inoculum	Sludge from domestic wastewater treatment plant
Exposure Period	28 days
Auxiliary Solvent	None
Analytical Monitoring	Electro-chemical analysis of consumed oxygen, pH.
Remarks - Method	Two replicates, containing 100 mg/L of test item, plus two inoculum controls, 1 procedural control, 1 abiotic control (poisoned with mercury dichloride), and 1 toxicity control (test item plus sodium benzoate), were incubated with 30 mg/L suspended solids (the maximum concentration allowed in the guidelines) for 28 days. Oxygen consumption was recorded daily. The percent degradation of the test item was based on BOD/ThOD. ThOD was determined from the structural formula.

RESULTS

Test substance		*Sodium benzoate*	
Day	*% degradation*	*Day*	*% degradation*
7	0	7	88
28	0	28	98

Remarks - Results	No biodegradation or abiotic degradation of the test item occurred during the test. Degradation in the procedure controls reached 94% by day 14. The degradation rate of the test item in the toxicity control reached 42% by day 7 and 46% by day 28, indicating no inhibitory effects on the activated sludge according to the guidelines, which specify >25% degradation within 14 days.
CONCLUSION	The notified chemical is not readily biodegradable at 100 mg/L.
TEST FACILITY	RCC (1999t)

8.1.2 Ready biodegradability

TEST SUBSTANCE	Notified Chemical
METHOD	OECD TG 301 F Ready Biodegradability: Manometric Respirometry Test.
Inoculum	Mixture of polyvalent bacteria (activated sludge obtained from communal wastewater treatment plant)
Exposure Period	28 days
Auxiliary Solvent	None
Analytical Monitoring	Electro-chemical analysis of consumed oxygen and GC analysis
Remarks - Method	The notifier indicates that as the above ready biodegradation test is in the toxic range of the notified chemical, no biodegradation occurred during the 28 day period. The testing was repeated according to OECD 301B "Dye away test" for biodegradation at 100 µg/L. Unfortunately, the oxygen content dropped into an anaerobic range and no biodegradation could be shown. To ensure aerobic conditions at all times, another assay was conducted using the OECD 301F test method (Ciba Speciality Chemicals 2003). The notified chemical tested in duplicate at 100 µg/L, plus five inoculum controls, 1 procedural control, 1 abiotic control (poisoned with mercury dichloride), and 1 toxicity control (test item plus

sodium benzoate), were incubated with 30 mg/L suspended solids (the maximum concentration allowed in the guidelines) for 28 days. The degradation was followed by GC analysis for the test substance and BOD analysis for the reference item at frequent intervals over the incubation period. The concentration is too low for BOD to be used for the test substance. Oxygen consumption was recorded daily. The percent degradation of the reference substance was based on BOD/ThOD. ThOD was determined from the structural formula.

RESULTS

Test substance		*Sodium benzoate**	
Day	*% degradation*	*Day*	*% degradation*
14	67	8	78
24	88	14	90
28	100	28	100

*representative degradation % were presented

Remarks - Results

The pass levels for ready biodegradability are 70% removal of DOC and 60% of ThOD or $ThCO_2$ production for respirometric methods in accordance with the TG 301. These pass values have to be reached in 10-d window within 28-d period of the test. The 10-d window begins when the degree of biodegradation has reached 10% DOC, ThOD or $ThCO_2$ and must end before day 28 of the test (OECD 1992). The test substance attained >60% by day 12 based on the 10 day window and 100% by day 28 of incubation. However, this is primary biodegradation only as it was based on the GC determination of the test substance at different timepoints where it is not fully degraded. Furthermore the test concentration of 100 µg/L tested is significantly lower than the test concentration of 100 mg/L under conditions of manometric respirometry. Degradation in the reference item also reached 100% by day 28, thus satisfying the requirement that the reference substance had to attain >60% degradation, confirming the validity of the study. The degradation rate of the test item in the toxicity control reached 80% by day 14 and 88% by day 28, indicating no inhibitory effects on the activated sludge at this level according to the guidelines, which specify >25% degradation within 14 days.

The notifier has indicated that due to the low concentration of the test substance, the degradation cannot be calculated by oxygen consumption or reduction of DOC. Therefore, the substance does not fulfil the proper criteria for ready biodegradable, although the resulting primary metabolites are expected to be slowly but completely biodegradable.

CONCLUSION

The notified chemical does not fulfil the proper criteria for ready biodegradability at 100 µg/L, and therefore has not been shown to be readily biodegradable.

TEST FACILITY

Solvias AG (2002a)

8.1.3. Inherent biodegradability

TEST SUBSTANCE

Notified Chemical

METHOD

Inherent Biodegradability: OECD 302 B: Zahn-Wellens/EMPA Test.

Inoculum: Sludge from communal wastewater treatment plant

Exposure Period: 14 days

Auxiliary Solvent: None

Analytical Monitoring: DOC and GC/MS

Remarks - Method: A mixture containing 100 µg/L of test item, a mineral medium and 0.5

g/L dry weight activated sludge (guidelines specify between 0.2 and 1.0 g/L sludge) was agitated and aerated for 14 days at 20-25ºC. Reference controls containing diethylene glycol and blank controls were run in parallel. The concentration of dissolved oxygen was determined at the start of the test and at intervals of 3 hours, 1, 4, 7 and 14 days. The pH was maintained at between 7.0 and 8.0.

RESULTS

Test substance		*Diethylene glycol*	
Day	*% degradation*	*Day*	*% degradation*
1	67.3	1	1
4	95.7	4	4
7	98.4	7	62
14	99.7	14	86

CONCLUSION The notified chemical is inherently biodegradable at 100 µg/L.

TEST FACILITY Novartis (1999)

8.1.4. Inherent biodegradability

TEST SUBSTANCE Notified Chemical

METHOD Internal Method (SOP N-A.211.113.01) which fulfils the requirements and specifications of Inherent Biodegradability: OECD 302 B and 87/302/EEC, Part C

Inoculum: Mixture of polyvalent bacteria (activated sludge from a domestic sewage treatment plant)

Exposure Period: 28 days

Auxiliary Solvent: None

Analytical Monitoring: DOC and GC

Remarks - Method: A mixture containing 100 µg/L of test item, a mineral medium and 0.49 g/L dry weight activated sludge (guidelines specify between 0.2 and 1.0 g/L sludge) was agitated and aerated for 28 days in the dark at 20-25ºC. Reference controls containing diethylene glycol and blank controls were run in parallel. The biodegradation process was monitored by the GC determination of test substance from 3 h to day 28. During the test the DOC concentration in the reference vessel was determined at certain time intervals. The pH, temperature and dissolved oxygen levels were all within acceptable limits.

RESULTS

Test substance		*Diethylene glycol*l*	
Day	*% elimination*	*Day*	*% degradation*
3 h	39.5	1	3
24 h	71.3	5	37
28	>99	7	100

*representative degradation % were presented

REMARKS The notified chemical was tested on inherent biodegradability and has a primary degradation of >90% within 5 days (Ciba Speciality Chemicals 2003). The notifier indicates that after 7 days there is a peak concentration of the microbiologically formed methyl-derivative in water and sludge that is completely degraded in water after 18 days. Other

metabolites could not be traced due to their volatility. Therefore, the test was repeated with a mix of possible metabolites at 100 µg/L each (TAOH, 2000). Samples from the aqueous and sludge phase were collected and analysed on the metabolites using GC/MS. All chlorophenols and chloroanisols had evaporated from the aqueous phase as well as from sludge due to their high volatility. The methoxy derivative was the only metabolite found which was completely adsorbed on sludge within 2 to 4 days and is released with formation of some diclosan during the 28 days of trial. Methyl-diclosan could not be traced anymore in the aqueous phase after 24 h.

CONCLUSION — The notified chemical is inherently biodegradable at 100 µg/L since the OECD indicates a figure of >20% biodegradation may be regarded as evidence for inherent primary degradation.

TEST FACILITY — Solvias AG (2001)

8.1.5 Activated sludge simulation test

TEST SUBSTANCE — Notified Chemical

METHOD — OECD 303A

Inoculum	Activated sludge of a communal sewage treatment plant
Exposure Period	26 days main test, 14 days running in period
Auxiliary Solvent	None
Analytical Monitoring	GC/MSD and DOC

Remarks - Method

This test is conducted to estimate the biodegradability of the notified chemical by aerobic micro-organisms in a continuously operated test system simulating the activated sludge process. An easily biodegradable organic medium and the organic test substance were the sources of organic carbon for the micro-organisms. The test system for the test compound consisted of two test units and two control units running in parallel under identical conditions. Each activated sludge plant consisted of an aeration tank and a settling tank. The test system was inoculated with activated sludge from a biological waste water treatment plant (suspended solids about 2.5 g/L). A dosing pump was used to recycle the activated sludge from the settling tank to the aeration tank intermittently

The running period was 14 days to ensure that the DOC removal is >80%. The elimination of the test item and the biodegradation of the synthetic and domestic sewage was followed in two control units and determined by DOC analysis. Synthetic sewage at a concentration of 50-70 mg/L was dosed into the aeration tank of the test and control plants at intervals of 6 times per hour. Each plant was reinoculated on day 17, 24, 28 31 and 38 with activated sludge. The domestic sewage was dosed continuously during the main test period. The notified chemical was tested at approximately 40 µg/L. As the low concentration of the test substance could not be followed by DOC analysis, the test compound was determined with GC/MSD. The water temperature and pH were maintained throughout the exposure period.

Remarks - Results

The elimination of the test substance from the two test plants from days 14-39 was always between 99.4-99.7%. The concentration of the activated sludge measured as suspended solids was in the range of approximately 2.1-3.3 g/L. In the control units, the synthetic and domestic sewage measured as DOC were both degraded to a mean of 89% over the 26 days exposure period. In the test units, the synthetic and

domestic sewage measured as DOC were both degraded to a mean of 90% over the 26 days exposure period. During the trial period, the balance of diclosan and methyl-diclosan in the treated effluent and activated sludge was determined. It was found that diclosan and methyl-diclosan in the treated effluent were 0.3 and <0.3%, respectively, and in the activated sludge, <0.3 and <0.14%, respectively (Ciba Speciality Chemicals 2003).

CONCLUSION

Therefore, no inhibition effect of the test substance to the activated sludge could be observed at 40 µg/L. The mass balance results appear to indicate that diclosan and its methyl derivative were virtually completely degraded during the 26 days exposure in a pilot plant simulating the activated sludge process.

TEST FACILITY

Solvias AG (2002b)

8.1.6. Bioaccumulation

TEST SUBSTANCE

Notified Chemical

METHOD

OECD TG 305E: Bioconcentration: Flow-through Fish Test.

Species	Carp (*Cyprinus carpio*)
Exposure Period	Exposure: 28 days Depuration: 7 days
Auxiliary Solvent	None
Concentration Range	
Nominal	0 (control) Level 1: 0.02 mg/L Level 2: 0.002 mg/L
Actual	Level 1: 0.0178-0.0209 mg/L Level 2: 0.00183-0.00211 mg/L
Analytical Monitoring	HPLC
Remarks - Method	Following a preliminary 96 h acute toxicity test with Zebra fish (*Brachydanio rerio)* to determine appropriate test concentrations (LC50 = 0.86 mg/L), 38 fish per concentration were exposed in a flow through system to two levels of the test substance for 28 days, along with 10 control fish. At the end of the exposure period, test fish were returned to clean water for 7 days. Test item concentrations in water were determined on days 0, 7, 14, 21, 26, and 28, and remained within 99.8% of nominal. Test item concentrations in fish were determined on days 7, 14, 21, 26, and 28, and 3 and 7 days after the start of depuration. Two fish per concentration and two fish from the controls were analysed in duplicate for test item concentrations in tissue.

RESULTS

Bioconcentration Factor	Level 1: 67.4 ± 8.9 Level 2: 76.7 ± 6.6
Remarks - Results	Bioconcentration factors in fish were from 51 to 84 times and from 69 to 89 times in fish exposed to 0.02 and 0.002 mg/L of the test substance, respectively. More than 95% of the test substance was eliminated from fish within 7 days.

CONCLUSION

The test substance has a low bioaccumulation in Carp under the test conditions.

TEST FACILITY

Institute of Ecotoxicity (2000)

8.2. Ecotoxicological investigations

8.2.1. Acute toxicity to fish

TEST SUBSTANCE	Notified Chemical
METHOD	OECD TG 203 Fish, Acute Toxicity Test –static test.
Species	Zebra fish *(Brachydanio rerio)*
Exposure Period	96 hours
Auxiliary Solvent	None
Water Hardness	250 mg $CaCO_3$/L
Analytical Monitoring	HPLC
Remarks – Method	Seven fish per concentration were exposed to the test substance. Fish were observed at 2, 24, 48, 72, and 96 hours. Dead fish were removed daily. Test concentrations were determined at the start of the test, on day 2, and at the end of the test. Test concentrations were in the range of 74-112% of nominal. All results are reported as mean measured concentrations. It was suggested that the wide variation in concentrations may have been the result of adsorption to organic and food particles in the test vessel and subsequent uptake of the test item by fish. The pH, temperature and oxygen concentrations remained within acceptable limits during the test.

RESULTS

Concentration mg/L		*Number of Fish*	*Mortality (%)*			
Nominal	*Actual*		*24 h*	*48 h*	*72 h*	*96 h*
0	0	7	0	0	0	0
0.46	0.34	7	0	0	0	0
1.0	0.74	7	14*	43*	57*	57*
2.2	2.2	7	100	100	100	100
4.6	5.1	7	100	100	100	100
10	Not determined	7	100	100	100	100

LC50	0.70 mg/L at 96 hours (CI = 0.54-0.92 mg/L)
NOEC (or LOEC)	0.34 mg/L at 96 hours.
Remarks – Results	Fish exposed to concentrations equal to, or above, 1 mg/L nominal exhibited effects. The * indicates the remaining live fish exhibited abnormal behaviour and symptoms of intoxication including apathy, tumbling during swimming, remaining at the bottom of the tank or at the surface, lying on side or back on the bottom of the tank. The EC50 values could not be determined by Probit Analysis or Moving Average Interpolation due to the steep concentration-effect relationship. LC50 values were determined from the geometric mean value of the two consecutive test concentrations with 1% and 100% mortality.
CONCLUSION	The notified chemical is very toxic to fish.
TEST FACILITY	RCC (1999u)

8.2.2. Acute toxicity to aquatic invertebrates

TEST SUBSTANCE	Notified Chemical
METHOD	OECD TG 202 Daphnia sp. Reproduction Test – 48-h static test.
Species	*Daphnia magna*
Exposure Period	48 hours
Auxiliary Solvent	None
Water Hardness	250 mg $CaCO_3$/L

Analytical Monitoring	HPLC and UV/VIS of test concentrations, pH, temperature, dissolved oxygen
Remarks - Method	Two replicates of 10 daphnids per concentration were exposed to the test item. The test concentrations in the test media were analysed at the start and end of the test. Concentrations varied in the range from 81 to 87% of the nominal values. The test solution media remained clear throughout the test period. The pH, temperature and oxygen concentrations remained within acceptable limits during the test.

RESULTS

Concentration mg/L		*Number of D. magna*	*Number Immobilised*	
Nominal	*Actual*		*24 h*	*48 h*
0	nd	20	0	0
0.1	nd	20	0	0
0.22	0.18	20	0	0
0.46	0.40	20	0	20
1.0	nd	20	20	20
2.2	nd	20	20	20

LC50	0.68 mg/L at 24 hours 0.32 mg/L at 48 hours (95% CI = 0.22-0.46 mg/L)
NOEC	0.22 mg/L at 48 hours
Remarks - Results	The EC50 values could not be determined by Probit Analysis or Moving Average Interpolation due to the steep concentration-effect relationship. The EC50 values were determined as the geometric mean values of the two consecutive test concentrations with 0% and 100% immobility. The NOEC was determined directly from the raw data. All results are reported as nominal concentrations.

CONCLUSION — The test item is very toxic to *Daphnia magna* (GHS category Acute 1)

TEST FACILITY — RCC (1999v)

8.2.3. Chronic toxicity to aquatic invertebrates

TEST SUBSTANCE — Notified Chemical

METHOD — OECD TG 211 Daphnia sp. Acute Immobilisation Test and Reproduction Test - semi-static conditions.

Species	*Daphnia magna*
Exposure Period	21 days
Auxiliary Solvent	None
Water Hardness	250 mg $CaCO_3$/L
Analytical Monitoring	HPLC and UV/VIS of test concentrations, pH, temperature, dissolved oxygen
Remarks - Method	Ten daphnids per test concentration were exposed to the test item. The test media was renewed on days 2, 5, 7, 9, 12, 14, 16 and 19. Test concentrations were determined on Day 0, 12 and 16. In the freshly prepared and spent media, test concentrations remained stable (i.e. within 73-103% of nominal values). In the spent test media with food particles, concentrations decreased to 41-63% of nominal values, indicating that the test item adsorbed to the food particles. This was not considered to invalidate the test because the daphnids may take up the test item from ingested food. The mortality of adults and the number of young were recorded at least 3 times per week. The pH, temperature and oxygen concentrations remained within acceptable limits during the test.

RESULTS

Concentration mg/L	*Number of D. magna*	*At 21 days*	
Nominal		*Survival rate %*	*Number Live Young*
0	10	100	883
0.022	10	100	847
0.046	10	100	908
0.10	10	100	919
0.22	10	100	968
0.46	10	0	0

LC50	0.30 mg/L at 21 days (reproduction)
NOEC	0.22 mg/L at 21 days (survival and reproduction)
Remarks - Results	The reproduction rate was calculated as the total number of living offspring produced per parent female alive at the end of the test. The NOEC for survival and reproduction and EC50 for reproduction were calculated by statistical analyses. Daphnids exposed to the highest test concentration successively died from day 2 of exposure, with no animals surviving at the end of the test. Thus, the reproduction rate of daphnids exposed to 0.46 mg/L could not be calculated. No significant toxic effects on the reproduction rate were evident in test concentrations below and including 0.22 mg/L.

CONCLUSION — The test item is slightly toxic to Daphnia in chronic studies (Mensink *et al*. 1995).

TEST FACILITY — RCC (1999w).

8.2.3. Algal growth inhibition test

TEST SUBSTANCE — Notified Chemical

METHOD — OECD TG 201 Alga, Growth Inhibition Test.

Species	*Scenedesmus subspicatus*
Exposure Period	72 hours
Concentration Range	
Nominal	0 (control), 2.2, 4.6, 10, 22, 46 µg/L
Actual	Test concentrations in the analysed media ranged between 77 and 124% of nominal. The total mean measured concentrations were between 95 and 119% of nominal.
Auxiliary Solvent	None
Water Hardness	24 mg $CaCO_3$/L
Analytical Monitoring	Cell concentrations (Coulter counter), pH, temperature, test concentrations (HPLC).
Remarks - Method	Three replicates per each test concentration and 6 replicates for the control were inoculated with 10,000 algal cells per mL of test medium and incubated for 3 days in a temperature controlled water bath. The test concentrations in the test media were analysed at the start of the test and after 72 hours. A slight decrease in concentrations was observed at the end of the test (77-114% nominal). The pH, temperature and oxygen concentrations remained within acceptable limits during the test.

RESULTS

Biomass		*Growth*	
EC50	*NOEC*	*EC50*	*NOEC*
µg/L at 72 h	*µg/L*	*µg/L at 72 h*	*µg/L*
22	10	38	10

Remarks - Results	The test item had a significant inhibitory effect on the growth of algae when exposed to concentrations above 10 µg/L. Microscopic examination of the shape of algal cells revealed no difference between cells in the control and those exposed to 10 µg/L. No observations were made of algal cells exposed to higher concentrations.
CONCLUSION	The test substance is very toxic to algae.
TEST FACILITY	RCC (1999x)

8.2.4. Inhibition of microbial activity

TEST SUBSTANCE	Notified Chemical
METHOD	OECD TG 209 Activated Sludge, Respiration Inhibition Test.
Inoculum	Activated sludge from a domestic wastewater treatment plant.
Exposure Period	3 hours
Concentration Range	
Nominal	0, 0.32, 1.0, 3.2, 10 and 32 mg/L
Remarks – Method	The oxygen consumption of sewage micro-organisms exposed to the test substance was measured after 3 hours incubation time with 2.4 g/L dry weight sludge (final concentration of 0.96 g/L suspended solids). Consumption rates were compared to that of micro-organisms in a blank control, and 3 concentrations (10, 32 and 100 mg/L) of a reference substance (3,5-dichlorophenol), incubated under the same conditions.
RESULTS	
3 h EC50	8 mg/L (95% CI = 3.5-28 mg/L).
Remarks – Results	Test results indicate increasing rates of inhibition of oxygen consumption by micro-organisms in sewage sludge when exposed to increasing concentrations of the test item. Inhibition rates were as follows: 0.32 mg/L = 9.1%, 1.0 mg/L = 22.1%, 3.2 mg/L = 24.7%, 10 mg/L = 48.9%, and 32 mg/L = 81% inhibition, respectively. The variation in consumption between the two blank controls was less than 6%, while the EC_{50} of the reference substance was determined to be 18 mg/L, which is in the range 5-30 mg/L. Therefore the test was deemed valid.
CONCLUSION	The test item is moderately toxic to micro-organisms (Mensink *et al*. 1995).
TEST FACILITY	RCC (1999y)

8.2.5 **Aquatic toxicity data on metabolites**

The notifier has provided the aquatic toxicity of possible metabolites as shown in the following table (Ciba Speciality Chemicals 2003).

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Table 1: Toxicity of diclosan and its metabolites to the aquatic organisms

Substance	Fish LC50 (mg/L)	Algae EC50 (mg/L)	Daphnia EC50 (mg/L)	Activated sludge IC50 (mg/L)
Diclosan (DCS)	0.7	0.03	0.32	8
Methyl-DCS	>0.27	0.2	>0.3	>100 nominal
p-chlorophenol	3-9	4-40	4-40	70
o-chlorophenol	3-20	100	3-23	100

The data appear to indicate that the metabolites are less toxic than the parent compound but the methyl derivative appears to be of significant toxicity to the aquatic organisms. Therefore, the notifier should provide the reports for the above toxicity studies if the usage volume of the notified chemical exceeds 1 tonne per annum.

9. RISK ASSESSMENT

9.1. Environment

9.1.1. Environment – exposure assessment

Potentially all of the notified chemical contained in laundry products will be released in a diffuse manner into the sewer when spent wash-water is released. The notified chemical is very slightly volatile (1.2 X 10^{-6} Pa at 25°C) and loss to the atmosphere is unlikely to be significant from sewers and the aquatic environment. The notifier indicates that as the ready biodegradation test performed at 100 mg/L is in the toxic range of the notified chemical, no biodegradation occurred during the 28 day period. Degradation by domestic sewage micro-organisms occurred over a 28-day period in a stringent ready biodegradability test when present at a relatively low concentration of 100 µg/L However, due to the low concentration of the test substance, the degradation would not be calculated by oxygen consumption or reduction of DOC and GC was used. Therefore, the substance does not fulfil the proper criteria for ready biodegradable. However, in a less stringent test, 99.7% notified chemical (test concentration = 0.1 mg/L), was degraded within 14 days, classifying it as inherently biodegradable at likely levels found in the sewer. Therefore, this criterion is used in the SIMPLETREAT model for partition modelling in the sewage treatment plants. Furthermore, it is apparent from the activated sludge simulation test that diclosan and its methyl derivative were virtually completely degraded during the 26 days exposure.

A calculated worst-case scenario daily PEC in the sewer effluent is 0.7 µg/L. In calculating the PEC, the following were assumed: (1) usage of the maximum import volume is evenly distributed over a 365 day period; (2) usage is nationwide, with a population of 19.5 million contributing 200 L of water per person per day to the sewer, (3) there is no adsorption or degradation in the sewer prior to release. However, data provided by the notifier indicate some biodegradation may take place in the sewer, and as the notified chemical has some affinity to organic matter (calculated log Koc = 3.1-3.2), some losses may also occur through adsorption to suspended solids in the sewer, thereby decreasing the PEC.

Using the SIMPLETREAT model for modelling partitioning and losses in sewage treatment plants (European Communities, 2003), the percentage removal from solution by STP approximates 0% through volatilisation, 19% adsorption in sludge, and 33% biodegraded. This is based on the Henry's Law Constant Log H of –4.8, log K0/w of 3.7 and inherent biodegradability. Hence, approximately 48% of the inflow concentration of the notified chemical may potentially remain in solution, passing through the STP. The resulting PEC concentrations in treated effluents will be reduced to 0.34-µg/L. The PEC in treated sewage effluent would be further diluted in the receiving water. In a large coastal city, it is assumed that the sewage effluent is diluted by a factor of 10 to 0.034 µg/L after discharge into the ocean, while a dilution factor of 1 is assumed for rural areas.

Partitioning to biosolids in STPs Australia-wide may result in an average biosolids concentration of 1.33 mg/kg (dry wt), assuming 19% attenuation in sludge during the STP process. This is based on the assumption that 0.1 tonne of biosolids is generated for each ML of STP effluent and the consumption of 3900 ML/day for total population per year. Biosolids are applied to agricultural soils, with an assumed average rate of 10 t/ha/year. Assuming a soil bulk density of 1000 kg/m^3 and a soil mixing zone of 0.1 m, the concentration of the notified chemical may approximate0.1mg/kg in the applied soil, assuming accumulation of the notified chemical in soil for 10 years under repeated biosolids application.

The effluent re-use (eg. irrigation purposes) concentration of the notified chemical may potentially approximate 0.34µg/L, assuming 48% remains in solution during the STP process. STP effluent re-use for irrigation in Australia occurs throughout Australia. The agricultural irrigation application rate is assumed to be 1000 L/m2/year (10 ML/ha/year). The notified chemical in this volume is assumed to infiltrate and accumulate in the top 0.1 m of soil (density

1000 kg/m3). Using these assumptions, irrigation with a concentration of 0.34 µg/L may potentially result in a soil concentration of approximately 34µg/kg assuming accumulation of the notified chemical in soil for 10 years under repeated irrigation.
The worst-case PECs values are summarised below:

Sewage effluent/coastal city = 0.034 µg/L
Sewage effluent/rural areas = 0.34 µg/L.
Soil concentrations after 10 years application of biosolids = 0.1 mg/kg
Soil concentrations following 10 years irrigation with effluent = 35 µg/kg.

The notified chemical was found to have a BCF in carp of between 67 and 77. Chemicals with BCF >1000 are considered bioaccumulative (US EPA 1999, POPS). Thus, the notified chemical has a low bioaccumulation potential.

9.1.2. Environment – effects assessment

In summary, the aquatic toxicity data indicate:

Algae: 72 h EC50 = 22.2 µg/L, NOEC 10 µg/L
Daphnia magna: 48 h LC50 = 0.32 mg/L
Daphnia magna: 21-day LC50 for reproduction = 0.30 mg/L
Zebra fish: 96 h LC50 = 0.7 mg/L
Sewage micro-organisms: 3 h EC50 = 8 mg/L.

The Predicted No Effect Concentration (PNEC) is 0.22 µg/L, using a safety factor of 100, and the lowest acute 72 hour EC50 for algae of 22 µg/L.

9.1.3. Environment – risk characterisation

The worst-case PECs and risk Quotients for the aquatic environment are summarised below:

	PEC	Q
Sewage effluent/coastal city:	0.034 µg/L	0.15
Sewage effluent/rural areas:	0.34 µg/L	1.5

The risk quotients indicate an acceptable hazard (Q<1) formarine organisms, but a potential hazard for aquatic organism in inland rivers and waterways without sufficient dilution (at least 1:1 is required).

Due to the activity against sewage micro-organisms, use in country areas could present a problem in septic tanks. Assuming 30 mL of typical detergent (containing 0.18% of notified chemical) and 100 L of water are used per wash, the concentration in a septic tank would be 0.054 mg/L prior to dilution with other household wastes (likely to be at least 1:1). This PEC is below the LC50 of 8 mg/L for sewage micro-organisms, resulting in a Q value of 0.007, indicating a low concern. However, the potential for the notified chemical to inhibit anaerobic sewage micro-organisms is not known, nor is its potential for degradation or build up under anaerobic conditions in a septic tank.

The notified chemical is structurally very similar to triclosan (also an anti-microbial) and hence is expected to behave in similar ways in the environment. Recent research (Latch *et al*. 2003) has shown that triclosan may form a chloro-substituted dibenzodioxin (from 1-12%) in water following exposure to ultraviolet light. While the resulting form of dioxin (2,8-DCDD) is 150,000 times less toxic than the most dangerous forms, it is suggested that repeated exposure to chlorine, perhaps in water treatment facilities, could chlorinate triclosan. After chlorinated triclosan is discharged from the facility, sunlight could convert it into the more toxic forms of dioxins. (
Dioxins are also formed by burning chlorine-based chemical compounds with hydrocarbons. The major source of dioxin in the environment comes from incinerators burning chlorinated wastes. The most likely immediate precursor compounds forming dioxins are compounds with an oxygen atom directly attached to the benzene ring, and with a chlorine in the ortho-substituted position relative to the oxygen atom. Chlorophenols fall into this category and are thus considered to exhibit the greatest potential for dioxin formation (http://www.ea.gov.au/industry/chemicals/dioxins/pubs/dioxins-revised.pdf). Triclosan may therefore form 2,8-DCDD by displacement of the chlorine at the ortho position on the phenol.
However, the small volume of notified chemical likely to be incinerated would not greatly contribute to dioxin formation, considering that any sources of carbon, burned in the presence of halogens, could form dioxins.

The notifier has indicated that diclosan compared to triclosan lacks the one chlorine atom that is needed for the ring closure reaction resulting in a dioxin derivative. Therefore, the postulated mechanisms are impossible for diclosan. The notifier also indicates that given the expected low conversion rate to triclosan in water treatment facilities, the contribution of higher dioxins postulated for triclosan is very low and insignificant versus other dioxin sources. It is accepted that the formation of dioxin from diclosan is unlikely to occur.

9.2. Human health

9.2.1. Occupational health and safety – exposure assessment

Worker exposure to the notified chemical during laundry product manufacture will be greater than for workers handling the notified chemical in the final product. Laundry product manufacture workers will be exposed to the notified chemical as imported dissolved in propylene glycol at concentration of >25%. Those workers handling the finished product will be exposed to the notified chemical at up to 0.18% in the finished laundry product.

Worker exposure may occur during the formulation of the final product. Dermal and ocular

exposure may occur during the QC prior to use, dispensing (decanting from the drum or connecting and disconnecting hoses for pumping) the solution of the notified chemical, charging the blending vessel, and QC sampling. Minimal exposure will occur during the maintenance of the manufacture equipment.

Worker exposure will be minimised by use of the appropriate personal protection equipment. When dispensing, the charging of blending vessel, QC sampling and maintenance the workers will wear eye protection, gloves and overalls. Local exhaust ventilation will be used areas where the raw material are charged to blending vessels.

Worker exposure during the transport, storage, and distribution of the imported notified chemical and finished product is unlikely to occur unless there is an accidental spillage or packaging breach. Exposure for retail workers is not likely to occur, unless the packaging of the final product is breached.

Workers using the commercial laundry products will be exposed to the notified chemical. However, the concentration of the notified chemical in these products will be very low (maximum 0.18%).

9.2.2. Public health – exposure assessment

Public exposure will be restricted to those persons using the final domestic laundry products. These persons will be exposed to the notified on regular basis, with repeated use of the laundry products. The maximum concentration of notified chemical in the final domestic laundry product will be 0.18%. Dermal and accidental ocular may occur when the products are being transferred between containers, if containers are reused and when products are decanted for use.

After rinsing and drying no residual chemical expected to be on the clothing/linen. Thus exposure of the public to the notified chemical is expected to be low.

Direct public exposure during transport and storage is unlikely.

9.2.3. Human health - effects assessment

The notified chemical has low acute toxicity to rats by both oral and dermal routes. The vapour pressure of the notified chemical is very low, and no inhalation toxicity study has been submitted. In a 28-day repeat dose oral toxicity study, a NOAEL of 150 mg/kg bw/day was established based on findings in clinical chemistry, haematology and urinalysis. The notified chemical was not irritating to the skin of the rabbit, and was not a skin sensitiser in a guinea pig study.

The notified chemical (undiluted) when applied to eye of the rabbit caused reddening and swelling of the conjunctivae, swelling of the nictating membrane and water discharge in all animals. The observed conjunctival reddening in two animals, and opacity in one animal persisted for 21 days. The presence of ocular lesion at the end of the observation period is sufficient to classify the notified chemical as a severely irritating. Thus the notified chemical is classified as R41- Risk of serious damage to eyes in accordance with the Approved Criteria for Classifying Hazardous Substance (NOHSC, 1999b)

In an *in vitro* Mammalian Chromosomal Aberration Test, the notified chemical was clastogenic to V79 Chinese Hamster cells. In a Bacterial Reverse Mutation Test and in a Mammalian Erythrocyte Micronucleus Test, the notified chemical was not mutagenic nor clastogenic. There is insufficient evidence to classify the notified chemical as R46 (mutagenic) or R40 (possible risk of adverse effects) in accordance with the Approved Criteria for Classifying Hazardous Substance (NOHSC, 1999b).

Dermal absorption of the notified chemical may occur. The log Pow of the notified chemical is 3.7, which is favourable for dermal absorption. However, the dermal absorption may be limited by molecular weight of the notified chemical and its water solubility.

9.2.4. Occupational health and safety – risk characterisation

Occupational exposure can occur when handling the imported solution. During the formulation process, dermal and accidental ocular exposure to notified chemical may occur when the imported solution is dispensed and poured into the blending vessel and during QC testing. Based on the physico-chemical data provided, dermal absorption of the notified chemical may occur. The notified chemical is severely irritating to the eyes. Workers handling the imported solution containing the notified chemical should wear gloves and overalls to minimise dermal exposure. Operators must wear protective eye wear to prevent ocular exposure. The maximum concentration of the notified chemical in the finished laundry product will be 0.18%. At this concentration, the risk of dermal absorption and ocular effects would be minimal.

Maintenance of the formulation equipment is infrequent. Exposure is minimised as the equipment is purged with water prior to work and the workers use PPE, as specified above.

Once the final laundry product is packed, exposure should be low. Hence, exposure for warehousing and distribution workers and retail workers is unlikely unless the packaging is breached.

Workers using the commercial laundry products will be exposed to the notified chemical at low concentrations (0.18% max). The risk to these workers will be similar to the public using the domestic detergent products. Data from animals indicate that notified chemical is not a sensitiser, and thus repeated dermal exposure is not of concern.

9.2.5. Public health – risk characterisation

The level of the notified chemical in the final domestic product to which the public will be exposed is low (a maximum concentration of 0.18%). At this concentration dermal absorption and the risk of ocular effects would be minimal. Data from animals indicate that notified chemical is not a sensitiser, and thus repeated dermal exposure is not of concern.

After rinsing and drying no residual chemical expected to be on the clothing/linen. Thus exposure of the public to the notified chemical is expected to be low.

10. CONCLUSIONS – ASSESSMENT LEVEL OF CONCERN FOR THE ENVIRONMENT AND HUMANS

10.1. Hazard classification

Based on the available data the notified chemical is classified as hazardous under the NOHSC *Approved Criteria for Classifying Hazardous Substances*. The classification and labelling details are:

Classification
R41 Risk of serious eye damage

Labelling
S24/25 Avoid contact with skin and eyes
S26 In case of contact will eyes, rinse immediately with plenty of water and seek medical advice
S36/37/39 Wear suitable protective clothing, gloves and eye/face protection

As a comparison only, the classification of notified chemical using the Globally Harmonised System for the Classification and Labelling of Chemicals (GHS) (United Nations, 2003) is presented below. This system is not mandated in Australia and carries no legal status but is presented for information purposes.

Acute I
Eye: Category 1

10.2. Environmental risk assessment

On the basis of the PEC/PNEC ratios: The chemical is not considered to pose a risk to the marine environment, but could present a hazard in inland rivers..
Further work or actions such as additional testing in the area of concern, detailed exposure analysis, in-depth risk assessment or further risk management actions should be considered if the import volumes increase above 1 tonne per annum.

10.3. Human health risk assessment

10.3.1. Occupational health and safety

There is Low Concern to occupational health and safety under the conditions of the occupational settings described.

10.3.2. Public health

There is Negligible Concern to public health when used as described in this submission.

11. MATERIAL SAFETY DATA SHEET

11.1. Material Safety Data Sheet

The MSDS of the notified chemical provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994a). It is published here as a matter of public record. The accuracy of the information on the MSDS remains the responsibility of the applicant.

11.2. Label

The label for the notified chemical provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances* (NOHSC, 1994b). The accuracy of the information on the label remains the responsibility of the applicant.

12. RECOMMENDATIONS

REGULATORY CONTROLS
Hazard Classification and Labelling

- The NOHSC Chemicals Standards Sub-committee should consider the following health hazard classification for the notified chemical:
  - R41 Risk of serious eye damage

- The following safety phrases should be used for the notified chemical as introduced:
  - S24/25 Avoid contact with skin and eyes
  - S26 In case of contact will eyes, rinse immediately with plenty of water and seek medical advice
  - S36/37/39 Wear suitable protective clothing, gloves and eye/face protection

CONTROL MEASURES
Occupational Health and Safety

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified chemical as introduced:

- Prevent spills and splashes
- NOHSC Exposure Standards for all components of the final laundry products should not be exceeded in the workplace

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified chemical as introduced
  - Chemical resistant gloves, protective clothing, and safety goggles or safety glasses.

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

- 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 NOHSC *Approved Criteria for Classifying Hazardous Substances*, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Environment

- The following concentration limits should be implemented by State regulators for release of the notified chemical to the environment:

0.22 µg/L (based on PNEC calculations)

- The following control measures should be implemented by manufacturers to minimise environmental exposure during formulation of the notified chemical:
  - Recycle and reuse wash water
  - Prevent discharge to natural waters, and ensure adequate dilution prior to release to sewer

Disposal

- The notifier recommends that the notified chemical be disposed on in a secure landfill. Where possible rinsed empty import containers should be returned to the notifier for re-use or recycling. Otherwise, drums should be rinsed and the contents recycled into process materials. It is noted that disposal recommendations in the draft MSDS supplied indicate that the notified chemical is not suitable to landfill (including a secure one), but is suitable for incineration and high temperature incineration. It also indicates contaminated empty containers should be disposed of as chemical waste. Therefore, the draft MSDS should be amended in accordance with the recommendation made.

Emergency procedures

- Spills/release of the notified chemical should be cleaned up with absorbent material, placed in labelled containers and disposed of as hazardous chemical waste. Prevent runoff into drains or waterways.

Transport and Packaging

- Adherence to the Australian Code for the Transport of Dangerous Goods by Road and Rail.

12.1. Secondary notification

The Director of Chemicals Notification and Assessment must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under Section 64(1) of the Act; if
The following additional secondary notification conditions are stipulated if the import volume exceeds 1 tonne per annum:

1. An anaerobic degradation test to clarify potential degradation under anaerobic conditions in a septic tank

2. Test reports for the aquatic toxicity data for the metabolites should be provided

3.

or

(2) Under Section 64(2) of the Act:

– if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.

13. BIBLIOGRAPHY

Ciba (2000a) Determination of the Adsorption/Desorption of Notified Chemical. Project No: PRi50420. Ciba Specialty Chemicals Inc. (Unpublished report provided by notifier).

Ciba (2000b) Determination of Ionization Constant of Notified Chemical. Ciba Specialty Chemicals Inc. (Unpublished report provided by notifier).

Ciba Speciality Chemicals (2003) Tinosan HP100: Summary of environmental data and risk assessment according to the EC "Technical Guidance Document". Ciba Speciality Chemicals Inc., Home and Personal Care, (Unpublished report provided by notifier).

European Communities (2003) Technical Guidance Document in Support of Commission Directive 93/67/EEC on Risk Assessment for New Notified Substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for Existing Substances and Directive 98/8/EC concerning the placing of biocidal products on the market. Part II, Appendix II, p 278

Institute of Ecotoxicity (2000) Bioconcentration of Test of Notified Chemical in Carp (*Cyprinus carpio*). Report No G4-0014·C112·CR. Institute of Ecotoxicity, Gakushuin University, Japan. (Unpublished report provided by notifier).

ISS (1999) Test Report 98.4099.EXP: Explosive Properties of Notified Chemical. Institute of Safety and Security, Basle, Switzerland (Unpublished report provided by notifier).

Latch DE, Packer JL, Arnold WA and McNeill K (2003) Photochemical conversion of triclosan to 2,8-dichlorodibenzo-*p*-dioxin in aqueous solution. J Photochemistry & Photobiology: Chemistry, In press.

McCall PJ, Swann RL, Laskowski DA, Unger SM, Vrona SA, and Dishburger HJ (1980). Estimation of chemical mobility in soil from liquid chromatographic retention times. *Bull. Environm. Contam. Toxicol.* 24:190-195.

Mensink BJWG, Montforts M, Wijkhuizen-Maslankiewicz L, Tibosch H and Linders JBHJ (1995) Report no. 679101022: Manual for Summarising and Evaluating the Environmental Aspects of Pesticides. National Institute of Public Health and Environmental Protection, Bilthoven, The Netherlands.

NOHSC (1994a) National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]. National Occupational Health and Safety Commission, Canberra, Australian Government Publishing Service.

NOHSC (1994b) National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012(1994)]. National Occupational Health and Safety Commission, Canberra, Australian Government Publishing Service.

NOHSC (1999a) List of Designated Hazardous Substances [NOHSC:10005(1999)]. National Occupational Health and Safety Commission, Canberra, AusInfo.

NOHSC (1999b) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1999)]. National Occupational Health and Safety Commission, Canberra, AusInfo

Novartis (1999) Inherent Biodegradability of Notified Chemical (Zahn-Wellens/EMPA Test) Test Number S 03613 Novartis Service AG Scientific Services Ecotox Centre CH-4002 Basel, Switzerland. (Unpublished report provided by notifier).

OECD Guideline for testing of chemicals, Paris (1992). Guideline 301: Ready Biodegradability (POPS) Stockholm Convention on Persistent Organic Pollutants (POPs), Text and Annexes. UNEP.

RCC (1998a) Calculation of the Vapour Pressure of Notified Chemical. Study Project No: 711990. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1998b) Notified Chemical. Primary Irritation Study in Rabbits. Study Project No: 712102. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999a) Determination of the Melting Point/Melting Range of Notified Chemical. Study Project No: 711966. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999b) Determination of the Boiling Point/Boiling Range of Notified Chemical. Study Project No: 711977. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999c) Determination of the Relative Density of Notified Chemical. Study Project No: 711988. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999d) Determination of the Water Solubility of Notified Chemical. Study Project No: 712012. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999e) Hydrolysis Determination of Notified Chemical at Different pH Values. Study Project No: 712260. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999f) Determination of the Partition Coefficient (n-Octanol/Water) of Notified Chemical. Study Project No: 712023. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999g) Determination of Particle Size Distribution of Notified Chemical. Study Project No: 712078. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999h) Determination of Flammability of Notified Chemical. Study Project No: 712034. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999i) Determination of the Relative Self-ignition Temperature of Notified Chemical. Study Project No: 712056. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999j) Expert Statement on the Oxidising Properties of Notified Chemical. Study Project No: 712067. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999k) Determination of the Surface Tension of an Aqueous Solution of Notified Chemical. Study Project No: 712001. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999l) Notified Chemical Acute Oral Toxicity Study in Rats. Study Project No: 712080. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999m) Notified Chemical. Acute Dermal Toxicity Study in Rats. Study Project No: 712091. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999n) Notified Chemical. Primary Eye Irritation Study in Rabbits. Study Project No: 712113. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999o) Notified Chemical: Contact Sensitivity in Albino Guinea Pigs; Maximisation Test study. Project No: 712124. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999p) Notified Chemical: 28-day oral toxicity (gavage) in the Wistar rat. Project No: 712135 RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999q) *Salmonella typhimurium* and *Escherichia coli* Reverse Mutation Assay with Notified Chemical. Project No: 623601 RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999r) *In vitro* Chromosome Aberration Assay in Chinese Hamster V79 Cells with Notified Chemical Project No: 623602 RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999s) Micronucleus Assay in Bone Marrow Cells of the Mouse with Notified Chemical. Project No: 634900 RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999t) Ready Biodegradability of Notified Chemical in a Manometric Respirometry Test. Study Project No: 712258. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999u) Toxicity of Notified Chemical to Zebra Fish (*Brachydanio rerio*) in a 96-hour Static Test. Study Project No: 712170. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999v) Acute Toxicity of Notified Chemical to *Daphnia magna* in a 48-hour Immobilization Test study Project No: 712203 RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999w) Influence of Notified Chemical on survival and reproduction of *Daphnia magna* in a Semistatic Test Over Three Weeks. Study Project No: 735322. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999x) Acute Toxicity of Notified Chemical to *Scenedesmus subspicatus* in a 72-hour Algal Growth Inhibition Test. Study Project No: 712225. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

RCC (1999y) Toxicity of Notified Chemical to Activated Sludge in a Respiration Inhibition Test. Study Project No: 712247. RCC Ltd, Itingen, Switzerland. (Unpublished report provided by notifier)

Solvias AG (2001) Inherent biodegradability of FAT 80220/A (Zahn-Wellens/EMPA-Test). Report No. G594 13, Solvias AG, GLP Test Facility Solvias, Basel, Switzerland. (Unpublished report provided by notifier)

Solvias AG (2002a) Ready biodegradability of FAT 80220/B. Report No. LO2-002909, Solvias AG, GLP Test Facility Solvias, Basel, Switzerland. (Unpublished report provided by notifier)

Solvias AG (2002b) Activated sludge simulation test for the biodegradability of FAT 80220/B. Report No. LO1-002997, Solvias AG, GLP Test Facility Solvias, Basel, Switzerland. (Unpublished report provided by notifier)

TAOH (2000) Determination of FAT 80220/A (Diclosan) in samples of a biodegradation study. Report No. G594 13, Department of Trace Analysis and Occupational Hygiene (TAOH), Basel, Switzerland. (Unpublished report provided by notifier)

United Nations (2003) Globally Harmonised System of Classification and Labelling of Chemicals (GHS). United Nations Economic Commission for Europe (UN/ECE), New York and Geneva

US EPA (1999) Criteria used by the PBT (for Persistent, Bioaccumulative, and Toxic chemicals) Profiler. http://www.pbtprofiler.net/criteria.asp