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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

PROCION NAVY H-EXL

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

PROCION NAVY H-EXL

1. APPLICANT

ICI Australia (Operations) Pty Ltd, 1 Nicholson Street, Melbourne, Victoria 3000.

2. IDENTITY OF THE CHEMICAL

Other name: Substance H 112323

Trade name: Procion Navy H-EXL

Methods of detection and determination:

Infrares spectroscopy data were submitted for assessment.

Details relating to the chemical name, Chemical Abstract Service Registry Number (CAS No:), molecular and structural formulae, molecular weight and spectral data, have been exempted from publication in the Full Public Report and the Summary Report.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa: dark blue granular powder.

Odour: odourless.

Melting Point: >300°C.

Specific Gravity: 1.67 at 20°C.

Vapour Pressure: <10-6 kPa at 20°C (estimated value).

Water Solubility: **>**25 g/100 g at 25°C (gel formed at high concentration).

Fat Solubility:	**<**0.009 mg/100 g solvent at 37°C (not detected in fat; value based on limit of detection obtained from analysing aqueous or methanol solutions).
Partition Co-efficient (n-octanol/water) log Po/w:	< -5.0 at 25°C.
Hydrolysis as a function of pH:	at 50°C, pH 7.0 and 9.0, <10 % hydrolysed; at 50°C and pH 4.0, 30% hydrolysed, t1/2 = 8.43 days; at 25°C and pH 4.0, t1/2 = 187.3 days (hydrolytic half-life is estimated). The percentage degradation cited occured over 4 days.
Adsorption/Desorption:	while high water solubility and low partition coefficient suggest low affinity for soil and sediment, the literature indicates (6) that similar dyes sorb to sediment.
Dissociation Constant pKa:	determined, but ready dissociation in aqueous solution is indicated by the high water solubility and presence of sulphonate groups.
Flash Point:	not applicable for solids.
Flammability Limits:	not highly flammable; could form flammable dust clouds in the air.
Combustion Products:	oxides of carbon, nitrogen and sulphur together with some soot and hydrogen chloride.

Autoignition Temperature:	does not self-ignite below 400°C.
Explosive Properties:	not explosive when exposed to heat, mechanical shock or friction; capable of a dust explosion.
Reactivity/Stability:	stable under ambient conditions; not oxidising.
Particle size distribution:	range - 0.5µm - 100µm mean - 25µm.

4. PURITY OF THE CHEMICAL

Degree of purity: 30-60% w/w

Impurities (%w/w): 30-60% in total Component

1	<10%
Component 3	<10%
Component 4	<10%
Component 5	<10%
Component 6	<10%
Component 7	<10%
Component 12	<10%
Component 13	<10%
Component 14	<10%
Component 15	<10%
Component 17	<10%
Four other coloured components	<10%
One UV absorbing component	<10%
Sodium chloride	<10%
Sodium sulphate	<10%
Water	10-30%

Additive(s)/Adjuvant(s): none

5. INDUSTRIAL USE

Procion Navy H-EXL is a reactive dye which will be imported into Australia as a granular powder for use in the dyeing of cellulose or cellulose blend yarn or fabric to improve shade and fastness. The estimated yearly import is one tonne in the first year, then one to 10 tonnes per year in subsequent years.

6. OCCUPATIONAL EXPOSURE

Procion Navy H-EXL will be generally stored and transported in its original 25 kg sealed steel drums. Where repacking is necessary for sampling and development purposes, it will be repacked into heavy polyethylene containers with locking press-seal caps which have to be cut before they can be re-opened. Therefore, significant risk of worker exposure during transport and storage is unlikely unless in the event of an accident.

The two main groups of workers who may be exposed to the notified chemical are laboratory personnel involved with development and shade matching work at ICI, and those workers at the dye factories who are involved with the dyeing of the yarn or fabric.

The major routes of exposure to the notified chemical are through skin contact or the inhalation of dust.

Exposure of development, and shade matching and sampling laboratory personnel is expected to be very low as minor quantities of 1 kg/year will be used and exposure is estimated at 1/2 hour/day.

At the dye factories, workers may be exposed to the notified chemical during processes such as the weighing and dissolving of the dyestuff, the delivery and addition of the dissolved dyestuff to the dyeing machines, the rinsing of the containers, during the sampling of the dyeing liquor, and during equipment maintenance.

The weighing of the dyestuff will take one to two minutes, and dissolution with a high speed stirrer, five to ten minutes. The notifier has indicated that a worker would need to be present only during the initial stages of dissolution and at the end of the process to remove and rinse the high speed stirrer. Before dissolution of the notified chemical, exposure through inhalation

of dust can be high if local exhaust ventilation or a dust mask is not implemented. Skin and eye contact with the dissolved dyestuff can be high if good work practices to avoid splashings and spillages are not implemented, and personal protection devices such as splash-proof goggles, impervious gloves and overalls, and safety shoes, are not worn.

Trolleys will be used to transfer the dissolved dyestuff to the dyeing machine. The notifier has indicated that the time taken will depend on the distance to the machine but will generally take one minute. During transfer, splashings and/or spillages may occur. The notifier has indicated that the addition of the dyestuff to the dyeing machine, including the rinsing of the containers into the machine would take one to two minutes. It is not clearly indicated how the dissolved dyestuff will be tipped into the dyeing machine but, if this was to be done by hand, depending on the amount handled, splashings and/or spillages may occur. If good work practices to avoid spillages and splashings, and personal protection devices, are not implemented, worker exposure through skin and eye contact can be high

Procion Navy H-EXL will be used in combination with other dyestuffs. In preparation for dyeing, the yarn or fabric will be loaded into the dyeing machine and, if necessary, scoured prior to dyeing. The pH will be set to pH 6-7 with acetic acid, and surfactants and common or Glaubers salt will be added in prescribed amounts depending on the fabric, machinery and the amount of dyestuff used. After even distribution of these agents by circulation, the dissolved dyestuff is added. Even distribution of the dyestuff will be established before the temperature is raised to 80°C, the temperature at which the system will be held to allow exhaustion of the dyestuff from the liquor onto the yarn or fabric. It is estimated that 65-70% of the notified chemical will be transferred to the yarn or fabric at this stage. Alkali, usually soda ash, will then be added to establish a pH of 10.8-11.2 to initiate the fixation of the dyestuff. This process is allowed to continue for 45-60 minutes depending on the depth of the shade. During this time, exhaustion onto the yarn or fabric is estimated to increase to 90% of the notified dyestuff, with 82 % of the total dyestuff present covalently bonded to the fibre. Of the 18% dyestuff not covalently fixed to the fibre, the notifier states that 10% will be in solution in a hydrolysed form, with the other 8% attached to the fibre in a hydrolysed form by hydrogen bonds. This will later be removed in hot rinsing and "soap-off" stages to ensure

that maximum fastness is obtained onto the finished goods. After completion of the fixation stage, the fibre will be given two rinses at 70°C, followed by a treatment at the boil for 10-15 minutes. This will be followed by a further hot rinse and cold rinses before subsequent processing is done. The notifier has indicated that discharge of the spent liquors and washing-offs will be done directly to the sewers or to specialised trade waste treatment plants.

During dyeing, worker exposure to the notified chemical decreases as it is exhausted onto the fibre. After treatment of the yarn or fabric, worker exposure to the notified chemical is likely to be very low as 90% of the notified chemical is estimated to be fixed to the fibre, with the remainder washed off directly into the sewers.
Therefore, the exposure of workers to the notified chemical during equipment maintenance is expected to be very low.

As the notified chemical will be fixed to the fibre, the exposure of handlers of the dyed yarn or fabric will be negligible.

7. PUBLIC EXPOSURE

Based on the proposed use, public exposure to the notified chemical during manufacture is expected to be very low. Levels of the notified chemical in dyeing effluent will typical range between 24 and 87 ppm, and opportunities for exposure to waste stream will be limited. Although use of the treated yarn or fabric by the public will be widespread, public exposure to the notified chemical will be negligible as it will be fixed to the finished goods.

8. ENVIRONMENTAL EXPOSURE

. Release

Three customers, located in Stawell and Tullamarine, Victoria, have been involved during the commercial evaluation of the

notified chemical. The notifier expects to attract a further 25 customers around Australia.

The notifier has indicated that levels of the notified chemical in effluent after a dyeing operation will typically range between 24 and 87 ppm. Waste dye that may arise from spills, cleaning of ventilation filters or container residues will be consigned to landfill.

. Fate

The bulk of the notified chemical will become chemically bound to fibre and in this state is not expected to impact on the environment.

Unfixed residues from dyeing operations will enter the aquatic environment following discharge from textile mills and subsequent treatment, during which they may be removed through degradation (chemical or biological) or sorption to sludge. In view of its hydrolytic stability, it is likely that significant quantities will be discharged. Furthermore, reactive dyes in general have been found not to adsorb to sludge in model systems (1).

Ready biodegradation was not observed when the notified chemical was tested using activated sludge from a domestic sewage plant (2) according to OECD Guidelines *for Testing of Chemicals No: 301C (3). Under a*naerobic conditions, 93% colour removal was observed during 15 days. The slow rate at which this and other highly sulphonated dyes undergo aerobic biodegradation probably reflects the low absorption of these soluble compounds by microbial cells (4).

Residues that survive treatment will enter freshwater or marine environments in solution. Azo dyes are generally stable under aerobic conditions, but are susceptible to reductive degradation under anaerobic conditions characteristic of sediment (5). Although hydrophilic, Procion Navy H-EXL and its sulphonated metabolites can be expected to partition to sediment as other highly sulphonated bis(azo) dyes have been shown to sorb to sediment (6). Degradation of such dyes in sediment water systems proceeded with a half-life of 2-16 days. Accordingly, no significant increase in dissolved concentrations over time is predicted, while residues bound to sediment are expected to undergo reductive degradation.

The bioaccumulation potential of Procion Navy H-EXL was not investigated because of the low partition coefficient. Hydrophilic dyes with logPo/w <3 have been shown not to bioaccumulate (7, 8).

9. EVALUATION OF TOXICOLOGICAL DATA

9.1 Acute Toxicity

Table 1 Summary of the acute toxicity of Procion Navy H-EXL

Test	Species	Outcome	Reference
Oral	rats	LD50: >2000 mg/kg	9
Dermal	rats	LD50: >2000 mg/kg	10
Skin irritation	rabbit	mild irritant	11
Eye irritation	rabbit	mild irritant	12
Skin sensitisation	guinea pig	non-sensitising	13

9.1.1 Oral Toxicity (9)

This study was carried out according to OECD Guidelines *for Testing of Chemicals No: 401 (14).*

*A si*ngle dose of 2000 mg/kg of Procion Navy H-EXL in corn oil was administered by gavage to 10 (SPF) Wistar albino rats (five males and five females). The animals were observed for 15 days. No deaths were noted during the study. All animals showed an initial loss in bodyweight on Day 1, but by Day 3, all have exceeded their initial bodyweight. Four females showed a slight weight loss on Day 4. During the remainder of the study, all

animals gained weight. Necropsy revealed pelvic dilatation in two males and a distended uterus in one female.

The results of this study indicate an oral LD50 of >2000 mg/kg for Procion Navy H-EXL in male and female rats.

9.1.2Dermal Toxicity (10)

This study was carried out in accordance with OECD Guidelin*es for Testing of Chemicals No: 402 (15).*

*A si*ngle dose of 2000 mg/kg of Procion Navy H-EXL moistened with water was administered by occlusive application to the shaved backs of 10 (SPF) Wistar albino rats (five males and five females) for 24 hours. The animals were observed for 15 days. No deaths were noted during the study. One male and two females had slight initial bodyweight loss but by Day 8 all animals had exceeded their Day 1 bodyweights and gain in bodyweight was observed during the remainder of the study. Slight to extreme erythema and slight to moderate oedema were noted in all animals on Day 2; and small scabs were seen in eight animals on Day 4. Blue staining of the skin was seen in all animals from Day 2 which could have obscured erythema on Day 3 and 4. All signs of staining and irritation had disappeared by Day 5. Single cases of chromodacryorrhea and blue staining of the nose; and four cases of slight urinary incontinence were also noted. Necropsy revealed pelvic dilatation in three males and in one female accentuated lobular pattern in the liver.

The results of this study indicate a dermal LD50 of >2000 mg/kg for Procion Navy H-EXL in male and female rats.

9.1.3 Skin Irritation (11)

This study was carried out according to the OECD Guidelin*es for Testing Chemicals No: 404 (16).*

*A si*ngle dose of 0.5 g of Procion Navy H-EXL moistened with water was administered by occlusive application to the clipped flank of three male New Zealand White albino rabbits for four hours. The site of application was examined 30-60 minutes and 1, 2 and 3 days after removal of the dressing. Skin reactions were assessed according to Draize (17). There were no signs of erythema in any

of the animals. Very slight oedema was observed in two animals 30-60 minutes after removal of the dressings. Blue staining of the application sites which was apparent from 30-60 minutes to one day after the removal of the dressings, could have obscured erythema but the effect would have to be slight for it to be masked.

The results of this study indicate that Procion Navy H-EXL is a mild skin irritant.

9.1.4 Eye Irritation (12)

This study was carried out according to the OECD Guidelin*es for Testing of Chemicals No: 405 (18).*

*Thre*e male New Zealand White albino rabbits were used in the study.

Initially, a single dose of 0.1 g of Procion Navy H-EXL was instilled into the conjunctival sac of the left eye of one rabbit. The other eye which remained untreated, served as the control. Immediately after the instillation of the test substance, the initial pain reaction of the rabbit was assessed using a six-point scale (12). Ocular reactions were assessed according to Draize (19) 1.8 hours and 1, 2, 3, 4, and 7 days post-exposure. Moderate initial pain reaction, and discharge 1.8 hours after dosing, were noted.

Therefore, the remaining two rabbits were pretreated with a local anaesthetic before application of the test substance. Ocular reactions of these two rabbits were assessed 1-2 hours and 1, 2, 3, 4 and 6 or 7 days post-exposure. Fluorescein staining was used to assess corneal damage.

Blue staining of the conjunctiva of all three eyes by the test substance could have obscured any underlying redness which might be present but the effect would have to be slight for it to be masked. Conjunctival discharge was noted in two animals. There were no corneal or iridial effects in any of the three treated eyes. No initial pain reaction was noted in the latter two animals tested.

The results of this study indicate that Procion Navy H-EXL is a mild eye irritant in rabbits at the concentration tested.

9.1.5 Skin Sensitisation (13)

This study was carried out according to the OECD Guidelin*es for Testing of Chemicals No: 406 (20).*

*The m*aximisation test (21) was used. Skin reactions were assessed according to a four-point scale (13). The sensitivity of the strain of guinea pig used in this study was periodically tested with a known skin sensitiser, formaldehyde. Positive sensitisation responses were observed in the animals tested.

Preliminary study

To determine the dose level for intradermal injection in the main study, four dose levels of Procion Navy H-EXL (0.3%, 1%, 3%, and 10% w/v) in water were administered to a group of two Alpk:Dunkin Hartley guinea pigs. Skin reactions were assessed at 24 and 48 hours post-exposure. The dose level selected was 10% w/v as this level was well tolerated both locally and systemically.

To determine the dose level for topical induction in the main study, Procion Navy H-EXL in corn oil (60% w/v) was administered to a group of two animals which have been injected with Freund's Complete Adjuvant for at least 14 days previously. Skin reactions were assessed 24 and 48 hours post-exposure. As there was no evidence of skin irritation, the dose level selected for topical induction was 60% w/v. The highest concentration of the test substance used was 60% w/v as it was not possible to formulate a more concentrated test sample.

To determine the dose level for topical challenge in the main study, four dose levels of Procion Navy H-EXL in corn oil (3%, 10%, 30% and 60% w/v) were administered to a group of four animals which have been injected with Freund's Complete Adjuvant for at least 14 days previously . Skin reactions were assessed 24 and 48 hours post-exposure. As there were no skin irritations at these dose levels, they were selected for use at challenge in the main study.

Induction and Challenge Study

Thirty female Alpk:Dunkin Hartley guinea pigs (20 test and 10 control animals) were used.

A row of three injections of: Freund's Complete Adjuvant and deionised water 1:1; a 10% w/v preparation of the test substance in deionised water; and a 10% w/v preparation of the test substance in a 1:1 preparation of Freund's Complete Adjuvant and deionised water, was made on each side of the mid-line of the test animals. The injection sites were checked for adverse effects for up to 24 hours. One week later, a single dose of 60% w/v of the test substance in corn oil was administered by occlusive application to the clipped scapular area of each test animal for 48 hours. Twenty-four hours after the removal of the dressings, the application sites were examined for skin reactions. Control animals were similarly induced but without the use of the test substance.

Two weeks after the inductions, both the test and control animals were challenged with a single dose of 3%, 10%, 30% and 60% w/v of the test substance in corn oil by occlusive application for 24 hours at different sites on the shaved backs of the animals.

One test animal was killed due to irritation prior to challenge, and was excluded from the study. The challenge sites of all animals were stained blue which obscured the assessment of skin response. Therefore, skin samples from the 30% and 60% w/v sites together with samples of untreated skin from both test and control animals were taken for histopathological examination. Histopathological examination showed a mild inflammatory reaction consisting of mainly minimal to slight acanthosis and inflammatory cell infiltration at the challenge sites of both test and control animals. The number of animals exhibiting such responses was slightly higher in the test group. Minimal changes were also observed in some sections of untreated skin indicating contamination in these animals. Based on these observations, it is considered unlikely that the 3% and 10% w/v challenge sites would reveal a sensitisation response so, histopathological examination of these sites was not conducted. Gain in bodyweight was unaffected in all animals.

The results of this study indicate that Procion Navy H-EXL is not a skin sensitiser in guinea pigs at the concentrations tested. However, it did cause skin irritation.

9.2 Repeated Dose Toxicity (22)

This study was carried out according to OECD Guidelines *for Testing of Chemicals No: 407 (23).*

*Procio*n Navy H-EXL in water was administered by gavage once daily to groups of five male and five female Sprague Dawley albino rats at dose levels of 0, 50, 200 and 1000 mg/kg, seven days a week for 28 doses over 28 days. An additional two groups of five males and five females consisting of a control group and a group dosed with 1000 mg/kg of the test substance were subjected to a two week recovery period without further treatment.

The bodyweight of males of the high dose non-recovery group was significantly lower than that of the control group throughout most of the study period. This effect was not observed in high dose males of the recovery group. Slightly lower bodyweight than that of the control group which was not dose-related was observed in mid and low dose males. Also observed was slightly lower bodyweight in high dose females of the recovery group when compared to the corresponding control, throughout the study period. No dose-related effects were apparent in females from the other groups.

Food consumption was significantly lower than that of the control group in high dose males of the non-recovery group. There were no effects on the food consumption of high dose males of the recovery group or in any female groups. Food consumption of mid and low dose males was slightly lower than that of the control but a dose-related response was not observed.

One male was killed because of mis-dosing. The remaining animals survived the entire study period. Black faeces were noted in all treated animals throughout most of the dosing phase of the study but was not evident from Day 30 onwards in recovery animals. Blue staining of skin was observed in most of the high dose animals from Day 11 or 12 onwards until the end of the dosing period and, in two animals this persisted to Day 43. Also observed were five cases of dark brown faeces in low dose males. Scabs were seen in three animals but were not treatment related.

Blood clinical chemistry and haematology results were unremarkable.

A dose-related increase in urine pH which was statistically different from the control was noted in both sexes of the mid and high dose recovery groups. Significant increases were also observed in both sexes of the high dose non-recovery group. Renal epithelial cells were seen in high dose males and females of the non-recovery and recovery group. Urine of high-dose animals was discoloured.

Changes in mean organ weights were slight in all animals.

Necropsy showed blue discolouration of various organs in high dose animals of both the non-recovery and recovery group. Mid dose animals which showed discolouration were fewer and this was confined mainly to the stomach. Discolouration was not observed in low dose animals. Dark kidneys or lungs were also noted in some mid and high dose animals. These effects were still seen on Day 43, the last day of the two weeks recovery period. Microscopic findings showed minimal increased granularity of the cytoplasm of proximal convoluted tubules in four high dose females and moderate chronic pneumonitis in two females, on Day 29. Five high dose females in the recovery group also showed minimal increased granularity cytoplasm of proximal convoluted tubules on Day 43. Other incidental findings were not treatment related.

9.3 Genotoxicity

9.3.1 Salmonella typhimurium Reverse Mutation Assay (24)

This study was carried out according to the OECD Guidelines *for Testing Chemicals No: 471 and No: 472 (25, 26).*

*P*rocion Navy H-EXL at dose levels of 8710.8, 5000, 2500, 1000, 500 and 200 µg/plate was tested in two independent experiments for gene mutation using Salmonella typ*himurium strains TA98,* TA100, TA1535 and TA1537, and E. coli strains *WP2P* and WP2P uvrA, both in the presence and absence of an auxiliary metabolising system (S9-mix). The first experiment was conducted according to the standard direct plate incorporation method (27). In the second experiment, the +S9 phase was conducted according to the Pre-incubation method (28). Positive controls used were acridine mutagen, 2-aminoanthracene, daunomycin HC1 and N-methyl-N'-nitro-N-nitrosoguanidine. Dimethylsulphoxide was used as the solvent

for these chemicals. Sterile deionised water was used as the diluent for the test substance and as the negative control.

In the two separate experiments, the test substance did not induce statistically significant dose-related or twice the solvent control value increases in the observed number of revertant colonies in Salmonella typ*himurium strains TA98,* TA100 and TA1537 in the absence of S9-mix, nor in strains TA98, TA100, TA1535 and TA1537 in the presence of S9-mix. Statistically significant increases observed with E. coli strain*s WP2P* and WP2P uvrA (both with and without S9-mix), did not exceed 1.8 times solvent control values and there was limited dose related reponse. Statistically significant reproducible increases in revertant colony numbers were observed with Salmonella typ*himurium strain TA1535* without S9-mix which exceeded twice the solvent control value in both experiments, and there was also evidence of a dose-related response. The positive controls induced marked increases.

The results of this study suggest that Procion Navy H-EXL was mutagenic under the test conditions reported.

9.3.2 Cytogenetic Assay in Human Lymphocytes (29)

This study was carried out according to OECD Guideline*s for Testing Chemicals No: 473 (30).*

*Proc*ion Navy H-EXL was tested in an in-vitro cyto*genetic as*say in human lymphocytes obtained from two donors (one male and one female) to determine if the the test substance had any clastogenic potential.

A range-finding cytotoxicity test was carried out using six test substance dose levels from 2.8 to 8720 µg/ml. No significant reductions in mitotic activity were observed with any of the six dose levels tested.

Two independent cytogenetic tests in the presence and absence of auxiliary metabolic activation system (S9-mix), were conducted using a range of three dose levels of Procion Navy H-EXL (872, 4360 and 8720 µg/ml) for both donors for harvesting at the 72 hour sampling time and, for the female only, a range of five test dose levels (872, 2180, 3050, 4360 and 8720 µg/ml) for harvesting at the 96 hour sampling time. The highest dose selected (8720

µg/ml) was approximately equal to 5000 µg of the test substance which was the limit dose of the assay. Three dose levels (872, 4360 and 8720 µg/ml) were selected for chromosomal aberration analysis at the 72 hour sampling time for both donors, and for the female donor only, one dose level (4360 µg/ml) was selected for analysis at the 96 hour sampling time. Cultures from the female donor treated with dose level 4360 µg/ml was selected for analysis at the 96 hour sampling time because precipitation of test substance at the highest dose level of 8720 µg/ml made it unsuitable for analysis. Blank medium control was used as solvent control, and mitomycin C and cyclophosphamide as positive controls were included in both cytogenetic tests.

In the presence and absence of S9-mix, reductions in mitotic activity were observed in cultures from both donors harvested at the 72 hour sample time, and were also observed in cultures from the female donor at the 96 hour sample time, indicating cytotoxic effect of the test substance in the culture systems. In the presence of S9-mix, the very slight increases in chromosomal aberration frequencies when compared to the medium control, observed in both donors at the 72 hour sampling time, were unremarkable. No statistically significant increases in chromosomal aberration frequencies when compared to the medium control, were observed in any culture treated with the test substance in the presence or absence of S9-mix at either sampling time. The sensitivity of the test system, and the metabolic activity of the S9-mix employed, were clearly demonstrated by statistically significant increases in chromosomal aberration frequencies induced by the positive control agents, mitomycin C and cyclophosphamide.

The results of this study suggest that under the test conditions reported, Procion Navy H-EXL was non-clastogenic to human lymphocytes following in-vitro treat*ment at* dose levels up to that producing cytotoxicity and the limit dose of the assay, in the presence or absence of S9-mix.

9.3.3 Micronucleus Assay in the Bone Marrow Cells of the Mouse (31)

This study was carried out according to OECD Guidelines *for Testing Chemicals No: 474 (32).*

The maximum tolerated dose was determined by administering Procion Navy H-EXL in a single oral dose of 5600 mg/kg (limit dose for the assay) in corn oil to a group of ten (five males and five females) CD-1 mice. These animals were observed for four days. No deaths were noted during the study. All treated animals excreted blue/black urine and faeces, and staining was observed in the skin, tail, coat and genital area. As no significant effects of treatment were observed, the maximum tolerated dose selected was the limit dose for the assay of 5600 mg/kg.

In the main test, three groups of ten (five males and five females) CD-1 mice were administered either a single oral dose of the solvent control, corn oil; the positive control, cyclohosphamide; or the test substance at a dose level of 5600 mg/kg. An additional four animals (two males and two females) were dosed with the test substance to replace any animal which died or killed before the termination of the study. Bone marrow smears were prepared 24 and 48 hours dosing for the vehicle control and test animals, and at 24 hours after dosing for the positive control animals.

Clinical signs observed included black colouration of the faeces, and blue colouration of the urine, skin, coat, genital area and internal organs which indicate absorption of the test substance through the oral route. Two males and two females died on the day of dosing and a further three males were found dead within 24 hours of dosing. None of these animals showed any adverse reaction to treatment prior to death. When compared to the solvent control, no statistically significant increases in the mean incidence of micronucleated polychromatic erythrocytes per 1000 polychromatic erythrocytes were seen in any of the animals treated at either sampling times. The very slight increases seen in males at 48 hours of dosing, and in females at 24 hours, were unremarkable. The positive control, when compared with the solvent control, induced statistically significant increases in the frequency of micronucleated polychromatic erythrocytes in both male and female mice 24 hours after dosing, demonstrating the sensitivity of the test system. Decreases in the mean

percentage of polychromatic erythrocytes were observed in males at 24 and 48 hours after dosing and in females at 48 hours.

The results of this study suggest that under the test conditions reported Procion Navy H-EXL did not exhibit clastogenic effects in the bone marrow of the mouse for both male and female mice at dose levels up to the limit dose for the assay.

9.4 Overall Assessment of Toxicological Data

Procion Navy H-EXL has low acute oral and dermal toxicity (oral LD50 in rats: >2000 mg/kg; dermal LD50 in rats: >2000 mg/kg). It is a mild eye and skin irritant but not a skin sensitiser. A short-term repeated dose study showed treatment-related effects at dose level 1000 mg/kg. Procion Navy H-EXL was found to be weakly mutagenic in the Salmonella typ*himurim reverse mutati*on assay but not clastogenic in the human lymphocytes cytogenetic assay nor the mouse bone marrow cells micronucleus assay.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

Table 2 Summary of the ecotoxicity of Procion Navy H-EXL

Test	Species	Result	Reference
96 hour acute	Rainbow trout	LC50: >100mg/L	33
48 hour immobilisation	Daphnia magna	*EC50: >100 m*g/L	34

The above results show the notified chemical to be practically non-toxic to fish and daphnids. This is consistent with its water solubility and high molecular weight.

Algal growth inhibition was not investigated, but effects would not be expected as the notified chemical is water soluble and has a high molecular weight.

The influence of Procion Navy H-EXL on the respiration and nitrifying ability of activated sludge was tested under aerobic conditions (35). A concentration of 100 mg/L exerted slight inhibition (<10%) over these processes. Under aerobic conditions with dye levels of up to 4.2% total solids, no significant inhibition of gas production was observed.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The notifier has indicated that concentrations of dyestuff in effluent will typically range between 24 and 87 ppm. Dilution with other waste streams and removal during treatment are likely to reduce levels well below 1 ppm before discharge to the environment. The notified chemical is practically non-toxic to aquatic fauna, and is not expected to accumulate in sediment or to bioaccumulate. The predicted environmental hazard is low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

There is no information on the effects of the notified chemical on human health and the notifier has indicated that experience with this chemical has so far been limited. Based on the results of animal studies, it may be an eye or skin irritant in humans but not a skin sensitiser. However, reactive dyes are known to cause respiratory sensitisation and contact dermatitis in humans (36). The notified chemical has a particle size range of 0.5 µm to 100 µm (mean 25 µm). Therefore, if inhaled, it has the potential to enter the respiratory tract and the very fine dust (<7 µm) may reach the bronchioles and alveola regions of the lungs (37). An inhalation study is not available for assessment but, it is likely that the notified chemical may irritate the respiratory tract. The notified chemical has a high molecular weight (>1000) and negligible solubility in fat. Therefore, it is not likely to be absorbed through biological membranes to bring about physiological effects. However, absorption through the gut after oral dosing, was demonstrated in animal studies, by the discolouration of the skin, coat and various organs. It is possible that there was some break down of the chemical in the gut to facilitate the absorption observed in these animals. Effects on the kidneys and lungs were also observed in animals

subjected to repeated high-dose oral dosing of the notified chemical.

The notified chemical is a combustible solid and is capable of a dust explosion.

Under normal use conditions, when control and precautionary measures are implemented, it is unlikely that the notified chemical will pose any significant acute health or safety hazard to workers.

The fastness of the notified chemical to the fibre, suggests that it will present negligible public health hazard.

13. RECOMMENDATIONS

To minimise occupational, public and environmental exposure to Procion Navy H-EXL, the following guidelines and precautions should be observed:

. the work place should be well ventilated and engineering controls such as local exhaust ventilation should be used to collect all foreseeable escapes of dust;

. personal protection equipment which comply with Australian standard (AS) should be worn such as:

.splash-proof goggles or face shield, as appropriate (AS 1336, AS 1337) (38, 39);

.impervious elbow length gloves (AS 2161) (40);

.impervious protective clothing (AS 3765.1, AS 3765.2) (41, 42) and

.safety shoes;

disposable dust masks should be worn when inhalation of dust is anticipated. When ventilation is insufficient, approved respirators (AS 1715, AS 1716) (43, 44) should be worn;

- good work practices should be implemented to avoid the generation of a dust cloud, splashings or spillages. Containers of the powder dyestuff should only be opened during weighing. The handling of powder dyestuff should be minimised;

- good housekeeping and maintenance should be practised. The accumulation of dust should be avoided. Spills should be promptly cleaned up. Personal protection equipment including approved respirators should be worn when cleaning up large spills. Wet methods or vacuuming should be used for cleaning up the powder and inert absorbents for handling the liquid form. Disposal should be according to State regulations;

- storage of the powder dyestuff should be in robust sealable containers and in well ventilated places away from heat and sources of ignition;

- all sources of ignition, hot surfaces or high temperatures should be eliminated in areas where the powder dyestuff will be handled. Electrical fittings, machinery and equipment should be earthed and dust-proof;

- personal hygiene should be observed; and

- a copy of the Material Safety Data Sheet should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The Material Safety Data Sheet (MSDS) for Procion Navy H-EXL (Attachment 1) was provided in Worksafe Australia format (45). This MSDS was provided by ICI Australia (Operations) Pty Ltd as part of their notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of ICI Australia (Operations) Pty Ltd.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Industrial Che*micals (Notification and Assessment) Act 1989 (the Act), s*econdary notification of Procion Navy H-EXL shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

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