HEXAMINE

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

HEXAMINE

OTHER NAMES

C6-H12-N4, HMTA, hexamethyleneamine, "1, 3, 5, 7-tetraazatricyclo[3.3.1.1]-decane", "1, 3, 5, 7-tetraaza-adamantane", Resotropin, Urotropin, "Methenamine GR", Aminoform, Ammoform, Cystamin, Cystogen, Formin, Formamine, Ammonioformaldehyde, Metramine, Hexaform, Uritone, Hexilmethyleneamine, Urotropine,

PROPER SHIPPING NAME

HEXAMETHYLENE-TETRAMINE
HEXAMETHYLENETETRAMINE

PRODUCT USE

Used in the manufacture of explosive compounds, sealing compounds, hide preservatives, phenol-formaldehyde resin cross-linking agents, corrosion inhibitors, and lubrication and insulation oils.
It is also used in the manufacture of adhesives, dye fixatives, shrink-proof textiles, and protein modifiers. Other uses include antiseptics, pharmaceuticals, fuel tablets for camping stoves and organic synthesis. Decomposes on heating to form highly irritating and flammable formaldehyde and ammonia gases.

SUPPLIER

Company: S D FINE- CHEM LIMITED
Address:
315- 317, T.V. INDUSTRIAL ESTATE,
248, WORLI,
MUMBAI- 400030.INDIA.
technical@sdfine.com
Telephone: 91- 22- 24959898
Telephone: 91- 22- 24959899
Fax: 91- 22- 24937232

HAZARD RATINGS

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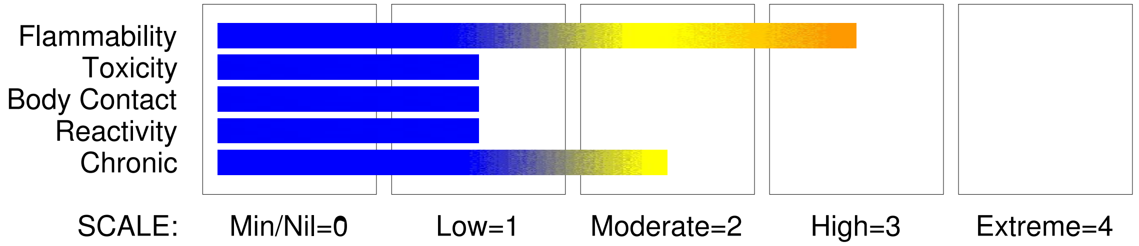

Section 2 - HAZARDS IDENTIFICATION

GHS Classification

Acute Toxicity (Oral) Category 4
Flammable Solid Category 2
Respiratory Sensitizer Category 1
Skin Sensitizer Category 1

EMERGENCY OVERVIEW

HAZARD

DANGER
Determined by using GHS criteria:
H228 H302 H334 H317
Flammable solid
Harmful if swallowed
May cause allergic or asthmatic symptoms or breathing difficulties if inhaled
May cause allergic skin reaction

PRECAUTIONARY STATEMENTS

Prevention

Wash hands thoroughly after handling.
Do not eat, drink or smoke when using this product.
Contaminated clothing should not be allowed out of the workplace.
Avoid breathing dust/fume/gas/mist/vapours/spray.
In case of inadequate ventilation wear respiratory protection.
Keep away from heat/sparks/open flame - No smoking.
Wear protective gloves and eye/face protection.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting/equipment

Response

If experiencing respiratory symptoms call a POISON CENTER or doctor/physician.

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IF INHALED: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing.
Wash contaminated clothing before reuse.
If skin irritation or rash occurs, seek medical advice/attention.
Specific treatment: refer to Label or MSDS.
IF ON SKIN: Gently wash with plenty of soap and water.

Storage

Store locked up.

Disposal

Dispose of contents and container in accordance with relevant legislation.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
hexamine	100-97-0	> 98
NOTE: Slowly decomposes in water to produce		
formaldehyde	50-00-0	
ammonia	1336-21-6	

Section 4 - FIRST AID MEASURES

SWALLOWED

For advice, contact a Poisons Information Centre or a doctor.
- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

EYE

If this product comes in contact with the eyes:
- Wash out immediately with fresh running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- If pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

If skin or hair contact occurs:
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED

- If dust is inhaled, remove from contaminated area.

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- Encourage patient to blow nose to ensure clear passage of breathing.
- If irritation or discomfort persists seek medical attention.

NOTES TO PHYSICIAN

For acute or short-term repeated exposures to formaldehyde:
INGESTION:
- Patients present early with severe corrosion of the gastro-intestinal tract and systemic effects.
- Inflammation and ulceration may progress to strictures.
- Severe acidosis results from rapid conversion of formaldehyde to formic acid. Coma, hypotension, renal failure and apnoea complicate ingestion.
- Decontaminate by dilution with milk or water containing ammonium acetate; vomiting should be induced. Follow with gastric lavage using a weak ammonia solution (converts formaldehyde to relatively inert pentamethylenetetramine)
- Gastric lavage is warranted only in first 15 minutes following ingestion.

SKIN:
- Formaldehyde can combine with epidermal protein to produce a hapten-protein couple capable of sensitising T-lymphocytes. Subsequent exposures cause a type IV hypersensitivity reaction (i.e allergic contact dermatitis). [Ellenhorn & Barceloux: Medical Toxicology].

May decompose in acid environment of stomach.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

FIRE FIGHTING

- If safe, switch off electrical equipment until vapour fire hazard removed.
- Use water delivered as a fine spray to control fire and cool adjacent area.
- Avoid spraying water onto liquid pools.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.

FIRE/EXPLOSION HAZARD

Flammable solid. Moderate fire and explosion hazard, in the form of dust, when exposed to heat or flame.

Decomposes on heating and produces acrid and toxic fumes of: highly discomforting formaldehyde and ammonia.

Combustion products include: nitrogen oxides (NOx).

FIRE INCOMPATIBILITY

Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Flammable solid. or · Solid which exhibits difficult combustion or is difficult to ignite.

- Avoid generating dust, particularly clouds of dust in a confined or unventilated space

continued...

as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion. Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust may burn rapidly and fiercely if ignited.
- Dry dust can also be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.
- Build-up of electrostatic charge may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.
- All movable parts coming in contact with this material should have a speed of less than 1-metre/sec.

Personal Protective Equipment

Gas tight chemical resistant suit.
Limit exposure duration to 1 BA set 30 mins.

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

MINOR SPILLS

- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Control personal contact by using protective equipment.
- Use dry clean up procedures and avoid generating dust.
- Place in a suitable labelled container for waste disposal.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Neutralise/decontaminate residue.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

EMERGENCY RESPONSE PLANNING GUIDELINES (ERPG)

The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour WITHOUT experiencing or developing

life-threatening health effects is:
hexamine 500 mg/m³

irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:

continued...

hexamine 50 mg/m^3

other than mild, transient adverse effects without perceiving a clearly defined odour is:
hexamine 30 mg/m^3

The threshold concentration below which most people will experience no appreciable risk of health effects:
hexamine 10 mg/m^3

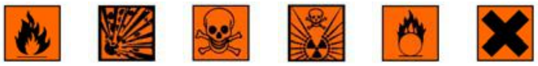
American Industrial Hygiene Association (AIHA)

Ingredients considered according to the following cutoffs

Very Toxic (T+)	>= 0.1%	Toxic (T)	>= 3.0%
R50	>= 0.25%	Corrosive (C)	>= 5.0%
R51	>= 2.5%		
else	>= 10%		

where percentage is percentage of ingredient found in the mixture

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



+ X X X X +

+: May be stored together
O: May be stored together with specific preventions
X: Must not be stored together

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- Avoid smoking, naked lights or ignition sources.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

SUITABLE CONTAINER

Glass container.

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Multi-ply paper bag with sealed plastic liner or heavy gauge plastic bag.
NOTE: Bags should be stacked, blocked, interlocked, and limited in height so that they are stable and secure against sliding or collapse. Check that all containers are clearly labelled and free from leaks. Packing as recommended by manufacturer.

STORAGE INCOMPATIBILITY

- Avoid oxidising agents, acids, acid chlorides, acid anhydrides.

STORAGE REQUIREMENTS

Observe manufacturer's storing and handling recommendations.
Store away from sources of heat or ignition / naked lights.
Store in a cool, dry place.
Keep containers securely sealed.
Store away from incompatible materials.
No smoking, naked lights, heat or ignition sources.
Protect containers against physical damage.
Check regularly for spills and leaks.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records

• hexamine:	CAS:100- 97- 0 CAS:56549- 34- 9 CAS:15978- 33- 3 CAS:11103- 67- 6 CAS:74734- 16- 0 CAS:91773- 48- 7
• ammonia:	CAS:1336- 21- 6 CAS:178115- 93- 0 CAS:125888- 87- 1 CAS:16393- 49- 0 CAS:132103- 60- 7 CAS:7664- 41- 7

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
formaldehyde		20
ammonia		300

ODOUR SAFETY FACTOR (OSF)

OSF=0.36 (FORMALDEHYDE)
Exposed individuals are NOT reasonably expected to be warned, by smell, that the Exposure Standard is being exceeded.
Odour Safety Factor (OSF) is determined to fall into either Class C, D or E.
The Odour Safety Factor (OSF) is defined as:
OSF= Exposure Standard (TWA) ppm/ Odour Threshold Value (OTV) ppm
Classification into classes follows:

Class	OSF	Description
A	550	Over 90% of exposed individuals are aware by smell that the Exposure Standard (TLV- TWA for example) is being reached, even when distracted by working activities
B	26- 550	As " A" for 50- 90% of persons

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		being distracted
C	1- 26	As " A" for less than 50% of persons being distracted
D	0.18- 1	10- 50% of persons aware of being tested perceive by smell that the Exposure Standard is being reached
E	<0.18	As " D" for less than 10% of persons aware of being tested

.

MATERIAL DATA

CEL TWA: 3 mg/m3 (compare OEL TWA (Sweden))

INGREDIENT DATA

FORMALDEHYDE:

Odour Threshold Value: 0.98 ppm (recognition)
NOTE: Detector tubes for formaldehyde, measuring in excess of 0.2 ppm are available commercially.
Formaldehyde vapour exposure:
Primary irritation is dependent on duration of exposure and individual susceptibility.
The following are typical symptoms encountered at various exposure levels.
0.1 ppm - Lower level of mucous eye, nose and throat irritation
0.8 ppm - Typical threshold of perception
1-2 ppm - Typical threshold of irritation
2-3 ppm - Irritation of eyes, nose and throat
4-5 ppm - Increased irritation, tearing, headache, pungent odour
10-20 ppm - Profuse tearing, severe burning, coughing
50 ppm - Serious bronchial and alveolar damage
100 ppm - Formaldehyde induced chemical pneumonia and death
Despite the intent of the TLV Ceiling recommendation it is believed that 0.3 ppm will not protect that portion of the workforce (up to 20%) reported to be responsive to low ambient concentrations. Because of the dose-related carcinogenic activity for rat and mouse inhalation of formaldehyde, the report of macromolecular adducts in the upper and lower respiratory tracts of nonhuman primates following inhalation of formaldehyde, the human case reports of upper respiratory tract malignant melanoma associated with formaldehyde inhalation and the suggestive epidemiologic data on human cancer risk, the TLV Committee recommends that workplace formaldehyde air concentrations be reduced to the lowest possible levels that can be achieved using engineering controls.

AMMONIA:

Odour Threshold Value: Variously reported as 0.019 ppm and 55 ppm;
AIHA Value 16.7 ppm (detection)
NOTE: Detector tubes for ammonia, measuring in excess of 1 ppm, are commercially available.
The TLV-TWA is thought to be protective against irritation of the eyes and respiratory tract and minimise discomfort among workers that are not inured to its effects and systemic damage. Acclimatised persons are able to tolerate prolonged exposures of up to 100 ppm without symptoms. Marked irritation has been seen in persons exposed to ammonia concentrations between 50 and 100 ppm only when the exposures involved sudden

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concentration peaks which do not permit short-term acclimatisation. The detoxification capacity of the liver is significant since the amount of ammonia formed endogenously in the intestines markedly exceeds that from external sources.

Human exposure effects, at vapour concentrations of about:

ppm	Possible Effects
5	minimal irritation
9-50	nasal dryness, olfactory fatigue and moderate irritation
125-137	definite nose, throat and chest irritation
140	slight eye irritation
150	laryngeal spasm
500	30 minute exposures may produce cyclic hypernea, increased blood pressure and pulse rate, and upper respiratory tract irritation which may persist for 24 hours
700	immediate eye irritation
1500-10000	dyspnea, convulsive coughing, chest pain, respiratory spasm, pink frothy sputum, rapid asphyxia and delayed pulmonary oedema which may be fatal. Other effects include runny nose, swelling of the lips, restlessness, headache, salivation, nausea, vomiting, glottal oedema, pharyngitis, tracheitis, and speech difficulties. Bronchopneumonia, asphyxiation due to spasms, inflammation, and oedema of the larynx, may be fatal. Residual effects include hoarseness, productive cough, and decreased respiratory function
>2500	severe eye irritation, with swelling of the eyelids, lachrymation, blepharospasm, palpebral oedema, increased intraocular pressure, oval semi-dilated, fixed pupils, corneal ulceration (often severe) and temporary blindness. Depending on duration of exposure, there may be destruction of the epithelium, corneal and lenticular opacification, and iritis accompanied by hypopyon or haemorrhage and possible loss of pigment from the posterior layer of the iris. Less severe damage is often resolved. In the case of severe damage, symptoms may be delayed; late complications including persistent oedema, vascularisation and corneal scarring, permanent opacity, acute angle glaucoma, staphyloma, cataract, and atrophy of the retina, iris, and symblepharon.

Long-term exposure to sub-acute concentrations or single exposures to high concentrations may produce chronic airway dysfunction, alveolar disease, bronchiolitis, bronchiectasis, emphysema and anxiety neuroses

PERSONAL PROTECTION

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EYE

- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59].

HANDS/FEET

Rubber gloves.
PVC gloves.
Safety footwear.

OTHER

Overalls.
- Barrier cream.
- Skin cleansing cream.
- Eyewash unit.

Ensure there is ready access to a safety shower.

RESPIRATOR

Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Breathing Zone Level ppm (volume)	Maximum Protection Factor	Half- face Respirator	Full- Face Respirator
1000	10	BKAX- AUS P	-
1000	50	-	BKAX- AUS P
5000	50	Airline *	-
5000	100	-	BKAX- 2 P
10000	100	-	BKAX- 3 P
	100+		Airline**

* - Continuous Flow ** - Continuous-flow or positive pressure demand.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.
For further information consult your
Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

Use in a well-ventilated area.
General exhaust is adequate under normal operating conditions. Local exhaust ventilation may be required in specific circumstances. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Provide adequate ventilation in warehouse or closed storage areas. Air contaminants generated in the

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workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapours, degreasing etc., evaporating from tank (in still air).	0.25- 0.5 m/s (50- 100 f/min)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5- 1 m/s (100- 200 f/min.)
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1- 2.5 m/s (200- 500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5- 10 m/s (500- 2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood- local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

White powder or colourless crystals. Mild ammonia odour.
Soluble in water, alcohol, acetone and chloroform.
Aqueous solutions slowly dissociate releasing formaldehyde and ammonia.

PHYSICAL PROPERTIES

Solid.
Mixes with water.

Molecular Weight: 140.19
Melting Range (℃): 285- 295 (Decomp)
Boiling Range (℃): 263 (Sublimes.)
Specific Gravity (water=1): 1.33 @ 20 C

continued...

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Solubility in water (g/L): Miscible
pH (1% solution): 8.4 (0.2M aq)
Volatile Component (%vol): Not applicable.
Relative Vapour Density (air=1): 4.9
Lower Explosive Limit (%): Not available.
Autoignition Temp (°C): Not available.
State: Divided solid

pH (as supplied): Not applicable
Vapour Pressure (kPa): Not applicable.
Evaporation Rate: Not applicable
Flash Point (°C): 250 C
Upper Explosive Limit (%): Not available.
Decomposition Temp (°C): Not available
Viscosity: Not available

log Kow: -2.13- -2.34
log Kow (Prager 1995): 0.35
log Kow (Sangster 1997): 0.35
log Kow: 0-0.35

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

Although ingestion is not thought to produce harmful effects (as classified under EC Directives), the material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.

EYE

Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may produce transient discomfort characterised by tearing or conjunctival redness (as with windburn).
The dust may produce eye discomfort causing transient smarting, blinking.

SKIN

The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.
Sensitisation may result in allergic dermatitis responses including rash, itching, hives or swelling of extremities.
Sensitisation reactions may appear suddenly after repeated

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symptom free exposures.
Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitising substance which is widely distributed can be a more important allergen than one with stronger sensitising potential with which few individuals come into contact. From a clinical point of view, substances are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested.

INHALED
The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.
Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.
Respiratory sensitisation may result in allergic/asthma like responses; from coughing and minor breathing difficulties to bronchitis with wheezing, gasping.

CHRONIC HEALTH EFFECTS
Practical evidence shows that inhalation of the material is capable of inducing a sensitisation reaction in a substantial number of individuals at a greater frequency than would be expected from the response of a normal population.
Pulmonary sensitisation, resulting in hyperactive airway dysfunction and pulmonary allergy may be accompanied by fatigue, malaise and aching. Significant symptoms of exposure may persist for extended periods, even after exposure ceases. Symptoms can be activated by a variety of nonspecific environmental stimuli such as automobile exhaust, perfumes and passive smoking.
Practical experience shows that skin contact with the material is capable either of inducing a sensitisation reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals.
Principal routes of exposure are by accidental skin and eye contact and inhalation of generated dusts.
HMTA is a known skin sensitiser and some individuals develop skin irritation from contact with the solid, vapour or solution.

TOXICITY AND IRRITATION

TOXICITY	IRRITATION
Intravenous (rat) LD50: 9200 mg/kg	Nil Reported
Subcutaneous (mouse) LD50: 215 mg/kg	
Inhalation (rat) TCLo: 350 mg/m^3/2h/3W- I	

FORMALDEHYDE:

TOXICITY	IRRITATION
Oral (woman) LDLo: 108 mg/kg	Skin (human): 0.15 mg/3d- I Mild
Oral (man) TDLo: 643 mg/kg	Skin (rabbit): 2 mg/24H SEVERE
Oral (rat) LD50: 100 mg/kg	Eye (human): 4 ppm/5m
Inhalation (man) TCLo: 0.3 mg/m^3	Eye (rabbit): 0.75 mg/24H SEVERE
Inhalation (rat) LC50: 203 mg/m^3	
Dermal (rabbit) LD50: 270 mg/kg	

WARNING: This substance has been classified by the IARC as Group 1: CARCINOGENIC TO

continued...

HUMANS.
Tenth Annual Report on Carcinogens: Substance anticipated to be Carcinogen
[National Toxicology Program: U.S. Dep. of Health & Human Services 2002].

AMMONIA:

TOXICITY	IRRITATION
Oral (rat) LD50: 350 mg/kg	Eye (rabbit): 0.25 mg SEVERE
Oral (human) LDLo: 43 mg/kg	Eye (rabbit): 1 mg/30s SEVERE
Inhalation (human) LCLo: 5000 ppm/5m	
Inhalation (human) TCLo: 20 ppm	
Inhalation (rat) LC50: 2000 ppm/4h	
Unreported (man) LDLo: 132 mg/kg	
Oral (Human) LD: 43 mg/kg	
Inhalation (Human) LC: 5000 ppm/4h	
Inhalation (Human) TCLo: 408 ppm/4h	
Subcutaneous (Mouse) LD: 160 mg/kg	
Intravenous (Mouse) LD50: 91 mg/kg	
Oral (Cat) LD: 750 mg/kg	
Subcutaneous (Rabbit) LD: 200 mg/kg	
Intravenous (Rabbit) LD: 10 mg/kg	

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

Section 12 - ECOLOGICAL INFORMATION

log Pow (Verschueren 1983):	0.91025641
BOD5:	1.31

log Kow: -2.13- -2.34
BOD 5 if unstated: 0.015-0.026
Refer to data for ingredients, which follows:

FORMALDEHYDE:

Hazardous Air Pollutant:	Yes
Fish LC50 (96hr.) (mg/l):	96- 7200
Daphnia magna EC50 (48hr.) (mg/l):	2
Algae IC50 (72hr.) (mg/l):	0.39- 14
log Kow (Prager 1995):	0.35
log Kow (Sangster 1997):	0.35

continued...

log Pow (Verschueren 1983):	0
BOD5:	60%
BOD20:	1.228
COD:	100%
ThOD:	1.068
Half- life Soil - High (hours):	168
Half- life Soil - Low (hours):	24
Half- life Air - High (hours):	6
Half- life Air - Low (hours):	1.25
Half- life Surface water - High (hours):	168
Half- life Surface water - Low (hours):	24
Half- life Ground water - High (hours):	336
Half- life Ground water - Low (hours):	48
Aqueous biodegradation - Aerobic - High (hours):	168
Aqueous biodegradation - Aerobic - Low (hours):	24
Aqueous biodegradation - Anaerobic - High (hours):	672
Aqueous biodegradation - Anaerobic - Low (hours):	96
Aqueous biodegradation - Removal secondary treatment - High (hours):	99%
Aqueous biodegradation - Removal secondary treatment - Low (hours):	57%
Aqueous photolysis half- life - High (hours):	6
Aqueous photolysis half- life - Low (hours):	1.25
Photooxidation half- life water - High (hours):	1.90E+05
Photooxidation half- life water - Low (hours):	4813
Photooxidation half- life air - High (hours):	71.3
Photooxidation half- life air - Low (hours):	7.13

The material is classified as an ecotoxin* because the Fish LC50 (96 hours) is less than or equal to 0.1 mg/l

* Classification of Substances as Ecotoxic (Dangerous to the Environment)
Appendix 8, Table 1
Compiler's Guide for the Preparation of International Chemical Safety Cards: 1993
Commission of the European Communities.
log Kow: 0-0.35
Half-life (hr) air: 19-50
Henry's atm m^3 /mol: 3.27E-07
BOD 5 if unstated: 0-1.1,60%
COD: 1.06,100%
ThOD: 1.068
Formaldehyde is ubiquitous in the environment as a contaminant of smoke and as photochemical smog.

In the atmosphere, formaldehyde both photolyses and reacts with reactive free radicals (primarily hydroxyl radicals); half-lives in the sunlit tropospheres are 1.25 to 6 hours for photolysis, and 7.13-71.3 hours for reaction with hydroxyl radicals).

Reaction with nitrate radicals, insignificant during the day, may be an important removal process at night. Due to its solubility, formaldehyde will efficiently transfer to rain and surface water; one model predicts dry deposition and wet removal half-lives of 19 and 50 hours, respectively.

In water, formaldehyde will biodegrade to low concentrations within days; adsorption to sediment and volatilisation are not expected to be significant routes.

In soil, aqueous solutions of formaldehyde leach through the soil; at high concentrations

continued...

adsorption to clay minerals may occur. Although biodegradable under both aerobic and anaerobic conditions the fate of formaldehyde in soil is unclear.

It does not bioconcentrate in the food chain.
Drinking Water Standards:
hydrocarbon total: 10 ug/l (UK max.)
pesticide: 0.1 ug/l (UK max.)
formaldehyde: 900 ug/l (WHO guideline)
Air Quality Standards:
<0.1 mg/m3 as a 30 min. average, indoor air, non-industrial buildings (WHO guideline).

AMMONIA:

Fish LC50 (96hr.) (mg/l):	0.45- 0.8

In air ammonia is persistent whilst, in water, it biodegrades rapidly to nitrate, producing a high oxygen demand. Ammonia is strongly adsorbed to soil. Ammonia is non -persistent in water (half-life 2 days) and is moderately toxic to fish under normal temperature and pH conditions. Ammonia is harmful to aquatic life at low concentrations but does not concentrate in the food chain.

Drinking Water Standards:
0.5 mg/l (UK max.)
1.5 mg/l (WHO Levels)
Soil Guidelines: none available.
Air Quality Standards: none available.
Prevent, by any means available, spillage from entering drains or water courses.
Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.
Wastes resulting from use of the product must be disposed of on site or at approved waste sites.
DO NOT discharge into sewer or waterways.
Toxicity Fish: LC50(96)0.25-8.2mg/l
Toxicity invertebrate: LC50(96)1.1-1.53mg/l
Bioaccumulation: some
Nitrif. inhib.: some
processes Abiotic: oxid

Section 13 - DISPOSAL CONSIDERATIONS

- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Authority for disposal.
- Bury or incinerate residue at an approved site.
- Recycle containers if possible, or dispose of in an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION

continued...

Labels Required: FLAMMABLE SOLID
HAZCHEM: 1[Z]

UNDG:

Dangerous Goods Class:	4.1	Subrisk:	None
UN Number:	1328	Packing Group:	III

Shipping Name:HEXAMETHYLENE-TETRAMINE
HEXAMETHYLENETETRAMINE

Air Transport IATA:

ICAO/IATA Class:	4.1	ICAO/IATA Subrisk:	None
UN/ID Number:	1328	Packing Group:	III
ERG Code:	3L		

Shipping name:HEXAMETHYLENE-TETRAMINE
HEXAMETHYLENETETRAMINE

Maritime Transport IMDG:

IMDG Class:	4.1	IMDG Subrisk:	None
UN Number:	1328	Packing Group:	III
EMS Number:	F- A, S- G		

Shipping name:HEXAMETHYLENE-TETRAMINE
HEXAMETHYLENETETRAMINE

Section 15 - REGULATORY INFORMATION

REGULATIONS

hexamine (CAS: 100-97-0) is found on the following regulatory lists;
OECD Representative List of High Production Volume (HPV) Chemicals

No data available for hexamine as CAS: 56549-34-9, CAS: 15978-33-3, CAS: 11103-67-6, CAS: 74734-16-0, CAS: 91773-48-7.

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
hexamine	100- 97- 0, 56549- 34- 9, 15978 - 33- 3, 11103-

continued...

	67- 6, 74734- 16- 0, 91773- 48- 7
formaldehyde	8013- 13- 6, 8006- 07- 3, 28349 - 70- 4, 85458- 16- 8, 112068- 71- 0, 8005- 38- 7, 50- 00- 0
ammonia	1336- 21- 6, 178115- 93- 0, 125888- 87- 1, 16393- 49- 0, 132103- 60- 7

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