ARSENIC TRIOXIDE

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
ARSENIC TRIOXIDE

OTHER NAMES

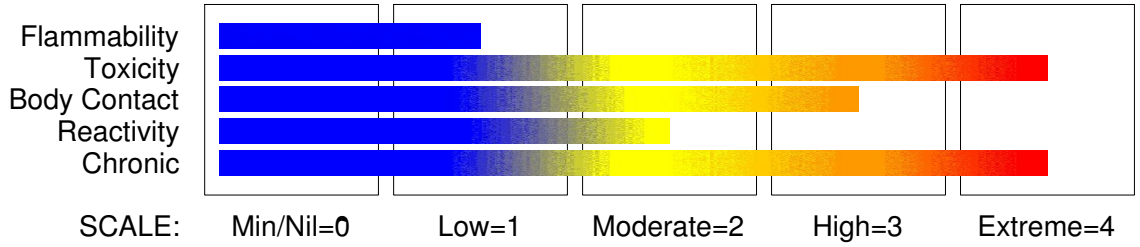
As2-O3, "arsenic oxide", "arsenic sesquioxide", "arsenicum album arsen. alb", "arsenious acid", "arsenious oxide", "arsenious trioxide", arsenite, "arsenous acid", "arsenous acid anhydride", "arsenous anhydride", "arsenous oxide", "arsenous oxide anhydride", arsentrioxide

PROPER SHIPPING NAME
ARSENIC TRIOXIDE

PRODUCT USE
Primary material for all arsenic compounds. In manufacture of special glass, Paris green, weed killers, timber preservatives, metallic arsenic.
Also used for killing rodents and insects.
Used in sheep dips and as a textile mordant.
Dangerous POISON. Available ONLY for industrial and manufacturing purposes. To be used by or in accordance with directions of accredited pest control officers. Operators to be trained in procedures for safe use of material.

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 (Inhalation) Category 3
Acute Toxicity (Oral) Category 2
Carcinogen Category 1A
Chronic Aquatic Hazard Category 1
Skin Corrosion/Irritation Category 1C
Skin Sensitizer Category 1

EMERGENCY OVERVIEW

HAZARD

DANGER
Determined by using GHS criteria:
H300 H331 H317 H350 H314 H410
Fatal if swallowed
Toxic if inhaled
May cause allergic skin reaction
May cause CANCER
Causes severe skin burns and eye damage
Very toxic to aquatic life with long lasting effects

PRECAUTIONARY STATEMENTS

Prevention

Use only outdoors or in a well ventilated area.
Wear protective gloves/clothing and eye/face protection.
Contaminated clothing should not be allowed out of the workplace.
Do not breathe dust or mist.
Wash thoroughly after handling.
Do not breathe dust/fume/gas/mist/vapours/spray.
Avoid breathing dust/fume/gas/mist/vapours/spray.
Do not handle until all safety precautions have been read and understood.
Use personal protective equipment as required.
Wash hands thoroughly after handling.
Do not eat, drink or smoke when using this product.
Obtain special instructions before use.

Response

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
If skin irritation or rash occurs, seek medical advice/attention.
If exposed or concerned: Get medical attention advice.

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Wash contaminated clothing before reuse.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Call a POISON CENTER or doctor/physician if you feel unwell.
IF ON SKIN: Gently wash with plenty of soap and water.
If on skin or hair: remove/take off immediately all contaminated clothing. Rinse with water/shower.
Specific treatment: refer to Label or MSDS.
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
Keep container tightly closed.
Immediately call a POISON CENTER or doctor/physician.

Storage

Store locked up.

Disposal

Dispose of contents and container in accordance with relevant legislation.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
arsenic trioxide	1327-53-3	>99

Section 4 - FIRST AID MEASURES

SWALLOWED

DO NOT delay. Immediately transport to hospital or doctor.
For advice, contact a Poisons Information Centre or a doctor.
· IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
· For advice, contact a Poisons Information Centre or a doctor.
Where Medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:
· Induce vomiting with fingers down the back of the of the throat, ONLY IF CONSCIOUS.
· Lean patient forward or place on left side (head-down position if possible) to maintain open airway and prevent aspiration.
NOTE: Wear a protective glove when inducing vomiting by mechanical means.
· In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
· If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.
· If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.

EYE

If this product comes in contact with the eyes:
· Immediately hold eyelids apart and flush the eye continuously with 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.
· Continue flushing until advised to stop by the Poisons Information Centre or a doctor,

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or for at least 15 minutes.
· Transport to hospital or doctor without delay.
· Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

If skin or hair contact occurs:
· Immediately flush body and clothes with large amounts of water, using safety shower if available.
· Quickly remove all contaminated clothing, including footwear.
· Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre.
· Transport to hospital, or doctor.

INHALED

· If fumes or combustion products are inhaled remove from contaminated area.
· Lay patient down. Keep warm and rested.
· Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
· Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
· Transport to hospital, or doctor.

NOTES TO PHYSICIAN

For acute or short term repeated exposures to arsenic, soluble compounds: Treat as per arsenic poisoning.
· Acute skin lesions such as contact dermatitis usually do not require other treatment than removal from exposure.
· If more severe symptoms of the respiratory system, the skin or the gastro-intestinal tract occur, British Anti-Lewisite (BAL, dimercaprol) may be given. Prompt administration in such cases is vital; to obtain maximum benefit such treatment should be administered within 4 hours of poisoning.
· In addition, general treatment such as prevention of further absorption from the gastro -intestinal tract are mandatory.
· General supportive therapy such as maintenance of respiration and circulation, maintenance of water and electrolyte balance and control of nervous system effects, as well as elimination of absorbed poison through dialysis and exchange transfusion, may be used if feasible.
· Dimercaprol is given by deep intramuscular injection as a 5% solution in peanut oil (or a 10% solution with benzyl-benzoate in vegetable oil). It is usually given in a dose of 3 mg/kg, 4-hourly, for the first two days, or twice daily for up to seven days. [ILO Encyclopedia]
· BAL Therapy is effective for haematological manifestations of chronic arsenic poisoning but not for neurological symptoms. Watch for side effects (e.g. urticaria, burning sensation in the lips, mouth and throat, fever, conjunctivitis etc).
· Some relief results from administration of diphenhydramine (Benadryl) (1.5 mg/kg intramuscularly or by mouth every 6 hour). [Ellenhorn and Barceloux: Medical Toxicology]
BIOLOGICAL EXPOSURE INDEX - BEI (Notice of Intent to Establish)
BEIs represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the
Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Inorganic arsenic	35 ug/gm creatinine	End of workweek	B

continued...

metabolites in urine

B: Background levels occur in specimens collected from subjects NOT exposed Consult specific documentation.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
Water spray or fog, from a safe distance only.
Foam.
Dry chemical powder.

FIRE FIGHTING
Alert Fire Brigade and tell them location and nature of hazard.
· Wear breathing apparatus plus protective gloves.
· Prevent, by any means available, spillage from entering drains or water courses.
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
· Solid which exhibits difficult combustion or is difficult to ignite.
· Avoid generating dust, particularly clouds of dust in a confined or unventilated space 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
Breathing apparatus.
Gas tight chemical resistant suit.
Limit exposure duration to 1 BA set 30 mins.

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

MINOR SPILLS
Clean up all spills immediately.
Wear protective clothing, gloves, safety glasses and dust respirator.
Increase ventilation.
Use dry clean up procedures and avoid generating dust.
Place in suitable containers for disposal.
Wash area down with large quantity of water and prevent runoff into drains.

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MAJOR SPILLS
POLLUTANT -contain spillage . Clear area of personnel and move upwind.
Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water courses.

Restrict access to area. DO NOT touch the spill material.
Stop leak if safe to do so.
Use dry clean up procedures and avoid generating dust.
Collect recoverable product into labelled containers for recycling.
Collect residues and seal in labelled drums for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.

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:
arsenic trioxide 5 mg/m³

irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:
arsenic trioxide 5 mg/m³

other than mild, transient adverse effects without perceiving a clearly defined odour is:
arsenic trioxide 0.03 mg/m³

The threshold concentration below which most people will experience no appreciable risk of health effects:
arsenic trioxide 0.01 mg/m³

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

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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.

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Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

Avoid generating and breathing dust.
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 are maintained.
Avoid all personal contact, including inhalation.
Wear personal protective equipment when handling.
Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards, otherwise PPE is required.
Avoid contact with incompatible materials.
Avoid sources of heat.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use.
Avoid physical damage to containers.
Wash hands with soap and water after handling.
Work clothes should be laundered separately: NOT at home.

SUITABLE CONTAINER

Packaging as recommended by manufacturer.
· Check that containers are clearly labelled.
Plastic drum or Polylined drum.

STORAGE INCOMPATIBILITY

Segregate from acids, alkalies, oxidising agents, halogens and halogen compounds including chlorine trifluoride, fluorine, hydrogen fluoride, oxygen difluoride and sodium chlorate.
Contact with nascent hydrogen may produce arsine gas (arsenic hydride).
Contact with acids produces toxic fumes.

STORAGE REQUIREMENTS

Observe manufacturer's storing and handling recommendations.
Keep dry . Store in original containers.
Keep containers securely sealed.
Store away from sources of heat or ignition / naked lights.
Store in a cool, dry and well-ventilated area.
Avoid storage at temperatures higher than 60 deg. C.
Store away from incompatible materials.
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

• arsenic trioxide: CAS:1327- 53- 3 CAS:1303- 24- 8 CAS:13473- 03- 5 CAS:28380- 38- 3

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EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
arsenic trioxide	5	

MATERIAL DATA

Use control measures / protective gear to avoid any personal contact. The ES-TWA is based solely on the prevention of systemic effects due to inhalation and is not protective against the substantial risk of cancer produced by exposure to inorganic arsenic. Some jurisdictions require health surveillance be performed on occupationally exposed workers. Such surveillance should emphasise

· demography, occupational and medical history and health advice
· physical examination with emphasis on the peripheral nervous system and skin
· urinary total arsenic
· records of personal exposure.

Inorganic arsenic compounds appear to produce an increased incidence of skin and lung cancers following their use in medicine, after drinking arsenic-contaminated water, or after occupational exposure. Cancers at other sites have been described but a clear association has yet to be determined.

TRK: 0.1 mg/m3
(measured as inhalable fraction of the aerosol).

Currently available analytical methods for monitoring workplace concentrations in most cases yield total levels of the elements arsenic, nickel or cobalt in the substances analysed. The differentiation of the type of chemical compound, which is necessary from a toxicological standpoint, is frequently not possible without special analytical measures. Because of such difficulties in the identification of individual compounds of these elements, it is recommended that the threshold values be applied in general for the relevant element and its compounds as a basis for meeting safety precautions, even if it has not been analytically proved that carcinogenic compounds of these elements are present in the work area.

It is recommended that this TRK value also be used as a basis for protective measures for arsenic and all its compounds which are not mentioned here (with the exception of arsine).

The threshold value is based on analysis of metal content.

The technical exposure limit, TRK (Technische Richtkonzentrationen), defines the airborne concentration of named carcinogenic materials which is the minimum possible given the state of current technologies. TRK values are assigned only for materials for which there is no current MAK (German exposure standard). Observance of the TRK value is intended to reduce the risk of adverse effects on health but does NOT completely eliminate it. Since no threshold doses can be determined for carcinogens, health considerations require that the exposure limits be kept as far as possible below the TRK and that the TRK value be gradually reduced. The limitation of exposure peaks is regulated as follows;

Short-term exposure limit: 5 x TRK
Short-term exposure duration: 15 min/average
Frequency per work shift: 5 times
Interval: 1 hour

Report No. 35 1999, Deutsche Forschungsgemeinschaft.

NOTE: Detector tubes for arsenic trioxide, measuring in excess of 0.2 mg/m3 (calculated as As), are commercially available.

PERSONAL PROTECTION

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EYE
· Full face shield.
DO NOT wear contact lenses.
· 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
DO NOT handle directly. Wear gloves and use scoop / tongs / tools.
Impervious, gauntlet length gloves or Rubber Gloves or PVC gloves.
Rubber boots.

OTHER
· Overalls.
· PVC Apron.
· PVC protective suit may be required if exposure severe.
· Eyewash unit.
· Ensure there is ready access to a safety shower.
* Pre-employment medical examinations should be carried out. It is not recommended to employ persons with pre-existing diabetes, cardiovascular diseases, allergic or other skin diseases, neurologic, hepatic or renal lesions in arsenic work.
Periodic medical examinations of all arsenic-exposed employees (male or female) should be performed with special attention to possible arsenic related symptoms. [ILO Encyclopaedia]

RESPIRATOR

Protection Factor	Half- Face Respirator	Full- Face Respirator	Powered Air Respirator
10 x ES	P1 Air- line*	- -	PAPR- P1 -
50 x ES	Air- line**	P2	PAPR- P2
100 x ES	-	P3	-
		Air- line*	-
100+ x ES	-	Air- line**	PAPR- P3

* - Negative pressure demand ** - Continuous flow.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

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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. Use ventilated helmet or air-line hood to provide clean air at the breathing zone. If risk of overexposure exists, wear approved respirator.- Correct fit is essential to obtain adequate protection. Air contaminants generated in the 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.

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Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

White amorphous lumps or powder. Slightly soluble in cold water but soluble in hot water. Soluble in dilute hydrochloric acid, alkalis and carbonate solutions. Toxic arsine gas is formed when acid or alkaline solutions are in contact with metals (zinc, aluminium, iron). Arsenic trioxide vapourises without melting (sublimes) on mild heating giving toxic arsenic oxide vapour.
Also occurs as two crystal modifications:
monoclinic claudetite mp: 313 deg.C d: 4.15 [CAS RN: 13473-03-5]
cubic arsenolite mp: 275 deg.C d: 3.9 [CAS RN: 1303-24-8]

PHYSICAL PROPERTIES

Solid.
Does not mix with water.
Sinks in water.
Contact with acids liberates toxic gas.

Molecular Weight: 197.84	Boiling Range (°C): 465
Melting Range (°C): 190.0- 275	Specific Gravity (water=1): 3.74
Solubility in water (g/L): Partly miscible	pH (as supplied): Not applicable
pH (1% solution): Not available.	Vapour Pressure (kPa): 0.13 @ 212 C
Volatile Component (%vol): Not available.	Evaporation Rate: Not available
Relative Vapour Density (air=1): Not available.	Flash Point (°C): Non flammable
Lower Explosive Limit (%): Not applicable	Upper Explosive Limit (%): Not applicable
Autoignition Temp (°C): Not available	Decomposition Temp (°C): Not available
State: Divided solid	

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

Contact with acids liberates toxic gases.
Presence of incompatible materials.
Presence of heat source.
Product is considered stable under normal handling conditions.
Hazardous polymerisation will not occur.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

Severely toxic effects may result from the accidental ingestion of the material; animal experiments indicate that ingestion of less than 5 gram may be fatal or may produce serious damage to the health of the individual.

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The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.
Ingestion may produce nausea, vomiting and diarrhoea, bloody stools, shock, rapid pulse and coma. Severe gastritis or gastroenteritis may occur as a result of lesions produced by vascular damage from absorbed arsenic (and not local corrosion); symptoms may be delayed for several hours. Eventually a violent haemorrhagic gastroenteritis leads to profound loss of fluid and electrolyte resulting in shock and death. Occasionally alimentary symptoms are mild or absent in which case symptoms are usually referable to the central nervous system, headache, vertigo, muscle spasm or convulsion, delirium and, sometimes, mania. In advanced poisonings by arsenic and its inorganic salts, nervous symptoms are prominent; disorders of the brain (encephalopathies) and peripheral neuritis (more commonly) have been described. A prickling sensation (paresthesia), decreased sensitivity to sensation and pain (hypoesthesia), eventually paralysis and muscular atrophy appear, usually in the legs. "Glove and stocking' distribution of sensory loss may be prominent. The toxic moiety is presumed to be trivalent arsenic in the form of inorganic arsenious acid (arsenite) or an organic arsenoxide. Arsenites are active enzyme inhibitors. Arsenic and its compounds may damage the stem cell which acts as the precursor to components of the blood. Loss of the stem cell may result in pancytopenia (a reduction in the number of red and white blood cells and platelets) with a latency period corresponding to the lifetime of the individual blood cells. Granulocytopenia (a reduction in granular leukocytes) develops within days and thrombocytopenia (a disorder involving platelets), within 1-2 weeks, whilst loss of erythrocytes (red blood cells) need months to become clinically manifest. Aplastic anaemia develops due to complete destruction of the stem cells.

EYE
The material can produce chemical burns to the eye following direct contact. Vapours or mists may be extremely irritating.
When applied to the eye(s) of animals, the material produces severe ocular lesions which are present twenty-four hours or more after instillation.

SKIN
Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.
The material can produce chemical burns following direct contact with the skin.
Toxic effects may result from skin absorption.
Arsenic and its compounds may irritate the skin. Certain individuals may develop sensitisation dermatitis characterised by eczema with scaling and hyperpigmentation of the skin and hyperkeratosis of the palms of the hands and soles of the feet.
Skin contact may cause erythema, with burning, itching, swelling and skin eruptions.

INHALED
Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system in a substantial number of individuals following inhalation.

CHRONIC HEALTH EFFECTS
There exists limited evidence that shows that skin contact with the material is capable either of inducing a sensitisation reaction in a significant number of individuals, and/or of producing positive response in experimental animals.
On the basis of epidemiological data, the material is regarded as carcinogenic to humans.
There is sufficient data to establish a causal association between human exposure to the material and the development of cancer.
Principal routes of exposure are by accidental skin and eye contact and inhalation of generated dusts.
Subacute and chronic exposure to arsenic and its organic salts may produce anorexia, mild

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gastrointestinal disturbances (nausea and vomiting), low grade fever, persistent headache , pallor, weakness and catarrhal inflammation. Stomatitis (oral lesions) and salivation are common. Skin afflictions are many and varied; erythema, eczema, pigmentation (arsenic melanosis), diffuse alopecia, keratosis (especially of the palms and soles), scaling and desquamation, brittle nails, white lines or bands on the nails (Mees lines), loss of hair and nails and localised subcutaneous oedema (especially of the eye-lids). Signs of renal damage may also develop. Liver enlargement (hepatomegaly) with jaundice (and sometimes pruritus) may develop into cirrhosis with accumulation of body fluids in the abdominal cavity (ascites). Nervous system effects involving the extremities (numbness, tingling, burning pain, weakness, incoordination) may also occur.
Arsenic exposure is linked with increase in diseases including ischaemia, cerebrovascular disease and carotid atherosclerosis. Several cytokines and growth factors involved in inflammation, have been identified in humans after prolonged exposure; these may heighten the risk of atherosclerosis (1). Individual variability in arsenic metabolism may determine susceptibility to arsenic disease. Genetic polymorphism (variability) for enzymes instrumental in arsenic metabolism (purine nucleoside phosphorylase and glutathione S-transferase omega 1-1) has been identified amongst individuals of European and Mexican Hispanic (indigenous) ancestry (2).
Prolonged inhalation of arsenical dusts are implicated in lung cancer. Taiwanese exposed to naturally occurring arsenic in well-water have experienced skin cancer. Inorganic and organic arsenics are established carcinogens in man. Chronic human exposure to non -overtly toxic doses of arsenic is associated with carcinogenicity, although the mechanism is not fully understood. Arsenic does not directly cause DNA damage or mutations. Data indicates that nontoxic doses of arsenite can interact with glucocorticoid receptor (GR) complexes and selectively inhibit GR-mediated transcription which is associated with altered nuclear function (3).

(1) Wu et al; Environmental Health Perspectives, 111, 1429-1438, 2003
(2) Yu et al; Environmental Health Perspectives, 111, 1421-1427, 2003
(3) Kaltreider et al; Environmental Health Perspectives, 109, pp 245-251, 2001.

TOXICITY AND IRRITATION

TOXICITY	IRRITATION
Oral (human) LDLo: 1.43 mg/kg	Nil Reported
Oral (man) LDLo: 29 mg/kg	
Oral (rat) LD50: 14.6 mg/kg	

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

Section 12 - ECOLOGICAL INFORMATION

Hazardous Air Pollutant:	Yes
Fish LC50 (96hr.) (mg/l):	9.33 (48hr

Speciation of arsenic is an important consideration in the fate, movement, and action of this substance. Chemical and biochemical transformations of arsenic include oxidation, reduction and methylation which affects its volatilisation, adsorption, dissolution and biological disposition. The transport of arsenic in the environment is largely controlled by absorption/desorption processes in soils and sediments. Sediment movement is responsible for transport of arsenic soil residues to their ultimate sinks in deep ocean sediments. The clay fraction, plus ferrous and aluminium oxides which coat clay particles , adsorb arsenicals which then undergo transformation as discussed earlier. Conversions of arsenic to volatile alkylarsines leads to air transport losses from soil. Inorganic arsenic occurs in water in different oxidation states depending on the pH and Eh of the water. Arsenate is apparently reduced by bacteria to arsenite in marine environments

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because the ratio of total arsenate to total arsenic is much lower than that predicted thermodynamically. Methylation of arsenic occurs in both freshwater and marine systems where arsenate occurs as arsenate, arsenite, methanearsonic acid and dimethylarsinic acid. Arsenate predominates because this is the most stable form.

Bioaccumulation occurs in some aquatic species such as seaweeds, freshwater algae and crustaceans. Some arsenic in water flea (Daphnia Magna) and algae occurs as arseno -analogues of phospholipids leading to the mistaken impression that accumulation and utilisation of arsenic takes place at the expense of phosphate. Crabs, lobsters and other marine organisms accumulate organo-arsenicals in the food chain. Although human activity may alter the local picture of environmental arsenic there is little evidence that this affects the global scale arsenic cycle.

Airborne concentrations of arsenic in urban areas may range from a few nanograms to a few tenths of a microgram per cubic meter; airborne arsenic is generally inorganic. In oxygenated soils inorganic arsenic is present in pentavalent form; under reducing conditions it occurs as the trivalent form.
Drinking Water Standards:
arsenic: 50 ug/1 (UK max.) 0.01mg/L (WHO provisional guideline)
chloride:400 mg/l (UK max.)
250 mg/l (WHO guideline)
Soil Guideline:
Dutch Criteria: 29 mg/kg (target)
55 mg/kg (intervention)
Air Quality Standard:
No safe levels recommended due to carcinogenic properties (WHO guideline).

Section 13 - DISPOSAL CONSIDERATIONS

Recycle wherever possible. Consult manufacturer for recycling options.
Consult State Land Waste Management Authority for disposal.
Treat and neutralise at an effluent treatment plant.
Puncture containers to prevent re-use.
Bury empty containers at an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION

Labels Required: TOXIC
HAZCHEM: 2Z

UNDG:

Dangerous Goods Class:	6.1	Subrisk:	None
UN Number:	1561	Packing Group:	II

Shipping Name:ARSENIC TRIOXIDE

continued...

Section 14 - TRANSPORTATION INFORMATION

Air Transport IATA:

ICAO/IATA Class:	6.1	ICAO/IATA Subrisk:	None
UN/ID Number:	1561	Packing Group:	II
ERG Code:	6L		

Shipping name:ARSENIC TRIOXIDE

Maritime Transport IMDG:

IMDG Class:	6.1	IMDG Subrisk:	None
UN Number:	1561	Packing Group:	II
EMS Number:	F- A, S- A		

Shipping name:ARSENIC TRIOXIDE

Section 15 - REGULATORY INFORMATION

REGULATIONS

arsenic trioxide (CAS: 1327-53-3) is found on the following regulatory lists;
International Agency for Research on Cancer (IARC) Carcinogens
OECD Representative List of High Production Volume (HPV) Chemicals

arsenic trioxide (CAS: 1303-24-8) is found on the following regulatory lists;
International Agency for Research on Cancer (IARC) Carcinogens

No data available for arsenic trioxide as CAS: 13473-03-5, CAS: 28380-38-3.

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
arsenic trioxide	1327- 53- 3, 1303- 24- 8, 13473- 03- 5, 28380- 38- 3

The above information is believed to be accurate and represent the best information currently available to us, but does not represent any warranty expressed or implied of the properties of the product. User should make their own investigation to determine the suitability of the information for their particular purpose.

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