

Inorganic mercury/ elemental mercury

Incident management

Key Points

Fire

- Non flammable and non combustible under normal conditions
- Reacts with nitric acid and hot concentrated sulphuric acid. May react explosively with ammonia and violently with metals
- Mercury is a liquid and when heated emits toxic fumes that are heavier than air
- In the event of a fire involving mercury, use fine water spray and liquid-tight protective clothing with breathing apparatus
- In the event of a fire involving liquid mercury, use gas tight protective suit with breathing apparatus

Health



- Mercury poisoning can occur from ingestion, inhalation or dermal absorption
- Very toxic
- Inhalation of mercury vapour causes cough, breathlessness, chest tightness and pulmonary tightness within a few hours of exposure
- Inhalation of elemental mercury globules may cause pneumonitis, haemoptysis and respiratory distress
- Gastrointestinal upset may occur within a few hours of exposure
- Mercury vapour exposure to the eyes can cause conjunctivitis and eyelid tremor

Environment

- Dangerous for the environment
- Inform Environment Agency of substantial release incidents

Hazard Identification

Standard (UK) Dangerous Goods Emergency Action Codes^(a)

UN		2809	Mercury, n.o.s.	
EAC		2X	Use fine water spray. Wear liquid-tight chemical protective clothing in combination with breathing apparatus. Spillages and decontamination run-off should be prevented from entering drains and watercourses.	
APP		-		
Hazards	Class	8	Corrosive substance	
	Sub risks	-		
HIN		80	Corrosive or slightly corrosive substance	
UN		2024	Mercury compound, liquid, n.o.s. packing group I	
EAC		2X	Use fine water spray. Wear liquid-tight chemical protective clothing in combination with breathing apparatus*. Spillages and decontamination run-off should be prevented from entering drains and watercourses.	
APP		B	Gas-tight chemical protective suit in combination with breathing apparatus**.	
Hazards	Class	6.1	Toxic substance	
	Sub risks	-		
HIN		66	Highly toxic substance	


UN – United Nations number; EAC – Emergency Action Code; APP – Additional Personal Protection; HIN - Hazard Identification Number


* Liquid-tight chemical protective clothing (BS 8428) in combination with self-contained open circuit positive pressure compressed air breathing apparatus (BS EN 137).

** Gas-tight chemical protective clothing (BS EN 943 part 2) in combination with self-contained open circuit positive pressure compressed air breathing apparatus (BS EN 137).

^a Dangerous Goods Emergency Action Code List, HM Fire Service Inspectorate, Publications Section, The Stationery Office, 2009.

Standard (UK) Dangerous Goods Emergency Action Codes^(a)

N		2024	Mercury compound, liquid, n.o.s. packing groups II & III	
EAC		2X	Use fine water spray. Wear liquid-tight chemical protective clothing in combination with breathing apparatus*. Spillages and decontamination run-off should be prevented from entering drains and watercourses.	
APP		-		
Hazards	Class	6.1	Toxic substance	
	Sub risks	-		
HIN		60	Toxic or slightly toxic substance	

UN		2025	Mercury compound, solid, n.o.s.	
EAC		2X	Use fine water spray. Wear liquid-tight chemical protective clothing in combination with breathing apparatus*. Spillages and decontamination run-off should be prevented from entering drains and watercourses.	
APP		-		
Hazards	Class	6.1	Toxic substance	
	Sub risks	-		
HIN		66/60	Highly toxic substance / toxic or slightly toxic substance	





UN – United Nations number; EAC – Emergency Action Code; APP – Additional Personal Protection; HIN - Hazard Identification Number

* Liquid-tight chemical protective clothing (BS 8428) in combination with self-contained open circuit positive pressure compressed air breathing apparatus (BS EN 137).

^a Dangerous Goods Emergency Action Code List, HM Fire Service Inspectorate, Publications Section, The Stationery Office, 2009.

Chemical Hazard Information and Packaging for Supply Classification^(a)



Mercury

Classification	Repr. Cat 2	Category 2 Reproductive Toxin	
	T+	Very toxic	
	T	Toxic	
	N	Dangerous for the environment	
Risk phrases	R61	May cause harm to the unborn child	
	R26	Very toxic by inhalation	
	R48/23	Toxic: danger of serious damage to health by prolonged exposure through inhalation	
	R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment	
Safety phrases	S45	In case of accident or if you feel unwell seek medical advice immediately (show the label where possible)	
	S53	Avoid exposure - obtain special instructions before use	
	S60	This material and its container must be disposed of as hazardous waste	
	S61	Avoid release to the environment. Refer to special instructions/safety data sheet	

^a Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures- Table 3.2.

<http://esis.jrc.ec.europa.eu/index.php?PGM=cla> (accessed 11/2011)

Inorganic Compounds of Mercury^(a)

Classification	T+	Very toxic	
	N	Dangerous for the environment	
Risk phrases	R26/27/28	Very toxic by inhalation, in contact with skin and if swallowed	
	R33	Danger of cumulative effects	
	R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment	
Safety phrases	S1/2	Keep locked up and out of reach of children	
	S13	Keep away from food, drink and animal feedstuffs	
	S28	After contact with skin, wash with plenty water	
	S45	In case of accident or if you feel unwell seek medical advice immediately (show the label where possible)	
	S60	This material and its container must be disposed of as hazardous waste	
	S61	Avoid release to the environment. Refer to special instructions/safety data sheet	






Specific concentration limits

Concentration	Classification
C ≥ 2 %	T+; R26/27/28
0.5 % ≤ C < 2 %	T; R23/24/25
0.1 % ≤ C < 0.5 %	Xn; R20/21/22
C ≥ 0.1 %	R33

^a Inorganic compounds of mercury with the exception of dimercy dichloride, dimercy dicyanide oxide, phenylmercury nitrate, phenylmercury hydroxide, 2-methoxyethylemercury chloride, mercury dichloride and phenylmercury acetate

Globally Harmonised System of Classification and Labelling of Chemicals (GHS)^(a)






Mercury

Hazard Class and Category	Repr. 1B	Toxic to reproduction, category 1B	
	Acute Tox. 2	Acute toxicity (inhalation), category 2	
	STOT RE 1	Specific target organ toxicity following repeated exposure, category 1	
	Aquatic Acute 1	Acute hazards to the aquatic environment, category 1	
	Aquatic Chronic 1	Chronic hazards to the aquatic environment, category 1	
Hazard Statement	H360D	May damage the unborn child	
	H330	Fatal if inhaled	
	H372	Causes damage to organs through prolonged or repeated exposure	
	H400	Very toxic to aquatic life	
	H410	Very toxic to aquatic life with long lasting effects	
Signal Words	DANGER		

* Implemented in the EU on 20 January 2009.

^a Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures- Table 3.1.
<http://esis.jrc.ec.europa.eu/index.php?PGM=cla> (accessed 11/2011)

Inorganic Compounds of Mercury

Hazard Class and Category	Acute Tox. 2	Acute toxicity (two routes), category 2	
	Acute Tox. 1	Acute toxicity (one route), category 1	
	STOT RE 2	Specific target organ toxicity following repeated exposure, category 2	
	Aquatic Acute 1	Acute hazards to the aquatic environment, category 1	
	Aquatic Chronic 1	Chronic hazards to the aquatic environment, category 1	
Hazard Statement	H330	Fatal if inhaled	
	H310	Fatal in contact with skin	
	H300	Fatal if swallowed	
	H373	May cause damage to organs through prolonged or repeated exposure	
	H400	Very toxic to aquatic life	
	H410	Very toxic to aquatic life with long lasting effects	
Signal Words	DANGER		

Specific concentration limits

Concentration	Hazard Class and Category	Hazard Statement	
C ≥ 0.1%	STOT RE 2	H373	May cause damage to organs through prolonged or repeated exposure

Physicochemical Properties

CAS number	7439-97-6
Atomic weight	201
Chemical symbol	Hg
Common synonyms	Quicksilver; Liquid silver; Hydragyrum
State at room temperature	Liquid
Volatility	Vapour pressure = 0.002 mm at 25 °C
Specific gravity	13.5 at 25 °C (water = 1)
Flammability	Non combustible and non flammable
Lower explosive limit	Not applicable
Upper explosive limit	Not applicable
Water solubility	Slightly soluble in water. Insoluble in alcohol and ether
Reactivity	Reacts with nitric acid and hot concentrated sulphuric acid. May react explosively with ammonia, and violently with metals, chlorine, nitromethane, dry bromine and ethylene
Reaction or degradation products	Emits toxic fumes when heated to decomposition
Odour	Odourless

References^(a,b,c)

^a Mercury (HAZARDTEXT® Hazard Management). In: Klasco RK (Ed): TOMES® System. Thomson Micromedex, Greenwood Village, Colorado (accessed 02/2007).

^b The Merck Index (14th Edition). Entry 5898: Mercury, 2006.

^c The Dictionary of Substances and their Effects. Ed. S Gangolli. Second Edition, Volume 5, 1999.

Threshold Toxicity Values

EXPOSURE VIA INHALATION		
ppm	mg m ⁻³	SIGNS AND SYMPTOMS
0.006	0.05	Non-specific symptoms
0.012 – 0.024	0.1 – 0.2	Tremor
0.12 – 4.83	1 – 40	Chest pains, haemoptysis, dyspnoea, cough, impairment of lung function, metallic taste and excessive salivation

References^(a,b)

^a Agency for Toxic Substances and Disease Registry. Toxicological Profile for Mercury, 1999.

^b International Programme on Chemical Safety, Environmental Health Criteria 1, Mercury, 1976.

Published Emergency Response Guidelines

Emergency Response Planning Guideline (ERPG) Values^(a)

	Listed value (ppm)	Calculated value (mg m ⁻³)
ERPG-1*	N/A	N/A
ERPG-2**	0.25	2.0
ERPG-3***	0.5	4.1

* Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odour.

** Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

*** Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing life-threatening health effects.

N/A - Not appropriate

Proposed Acute Exposure Guideline Levels (AEGs)^(b)

	mg m ⁻³				
	10 min	30 min	60 min	4 hr	8 hr
AEGL-1[†]	NR	NR	NR	NR	NR
AEGL-2^{††}	3.1	2.1	1.7	0.67	0.33
AEGL-3^{†††}	16	11	8.9	2.2	2.2

[†] The level of the chemical in air at or above which the general population could experience notable discomfort.

^{††} The level of the chemical in air at or above which there may be irreversible or other serious long-lasting effects or impaired ability to escape.

^{†††} The level of the chemical in air at or above which the general population could experience life-threatening health effects or death.

NR – Not recommended due to insufficient data

^a American Industrial Hygiene Association (AIHA). 2010 Emergency Response Planning Guideline Values and Workplace Environmental Exposure Level Guides Handbook, Fairfax, VA (accessed 01/2011).

^b U.S. Environmental Protection Agency. Acute Exposure Guideline Levels, <http://www.epa.gov/oppt/aegl/pubs/chemlist.htm> (accessed 01/2011)

Exposure Standards, Guidelines or Regulations

Occupational standards

WEL	LTEL(8 hour reference period): No guideline value specified
	STEL(15 min reference period): No guideline value specified

Public health guidelines

DRINKING WATER QUALITY GUIDELINE^(a)	1 µg L ⁻¹
AIR QUALITY GUIDELINE^(b)	1 µg m ⁻³ annual average
SOIL GUIDELINE VALUE AND HEALTH CRITERIA VALUES^(c,d)	Residential Elemental Mercury - 1 mg kg ⁻¹ dry weight soil Inorganic Mercury - 170 mg kg ⁻¹ dry weight soil
	Allotments Elemental Mercury - 26 mg kg ⁻¹ dry weight soil Inorganic Mercury - 80 mg kg ⁻¹ dry weight soil
	Commercial Elemental Mercury - 26 mg kg ⁻¹ dry weight soil Inorganic Mercury - 3600 mg kg ⁻¹ dry weight soil
	Tolerable Daily Intake^{oral} Elemental Mercury – Not derived Inorganic Mercury - 2 µg kg ⁻¹ bw day ⁻¹
	Mean Daily Intake^{oral} Elemental Mercury - Negligible Inorganic Mercury - 1 µg day ⁻¹
	Tolerable Daily Intake^{inhalation} Elemental Mercury - 0.06 µg kg ⁻¹ bw day ⁻¹ Inorganic Mercury - 0.06 µg kg ⁻¹ bw day ⁻¹
	Mean Daily Intake^{inhalation} Elemental Mercury – 0.05 µg day ⁻¹

^a The Water Supply (Water Quality) Regulations 2000 (England) and the Water Supply (Water Quality) Regulations 2001 (Wales) (accessed 01/2011).

^b Air Quality Guidelines for Europe. World Health Organization Regional Office for Europe, Copenhagen WHO Regional Publications, European Series, No. 91, Second Edition, 2000 (accessed 01/2011)..

^c Environment Agency (EA). Soil Guideline Values for Mercury in soil. Science Report SC050021/Mercury SGV.2009. EA. Bristol, UK (accessed 01/2011)..

^d Environment Agency (EA), Contaminants in soil: updated collation of toxicological data and intake values for humans. Mercury. Science Report SC050021. 2009, EA: Bristol, UK (accessed 01/2011).

WEL – Workplace exposure limit; LTEL - Long-term exposure limit; STEL – Short-term exposure limit

Health Effects

Major route of exposure^(a)

- Toxic by ingestion, inhalation or dermal absorption.

Immediate signs or symptoms of acute exposure^(b-e)

- Inhalation of mercury vapour causes cough, breathlessness, chest tightness and pulmonary irritation within a few hours of exposure. Pneumonitis, pulmonary oedema, necrotising bronchiolitis and ARDS may occur. Patients may also exhibit flu like symptoms with muscle pains, fever and tachycardia. GI upset may occur within a few hours. Late features include renal failure, peripheral neuropathy and hepatic dysfunction.
- Inhalation of elemental mercury globules may cause pneumonitis, haemoptysis and respiratory distress.
- Ingestion of metallic mercury in a single acute dose is virtually non-toxic. Elemental mercury is poorly absorbed by the gut and ingestion is usually harmless unless aspiration occurs.
- Dermal exposure is unlikely to have any effect because metallic mercury is only slowly absorbed through the skin. Topical use may cause grey or blue-black skin pigmentation, contact dermatitis, eczema, urticaria, cutaneous burns or exfoliation.
- Ocular exposure may be irritating to the eyes causing an immediate stinging and burning sensation with lacrimation.

TOXBASE - <http://www.toxbase.org> (accessed 01/2011)

^a TOXBASE: Mercury and compounds, 11/2001.

^b TOXBASE: Mercury - inhalation, 11/2001.

^c TOXBASE: Mercury – ingestion, 11/2001.

^d TOXBASE: Mercury (metallic) – skin contact, 11/2001.

^e TOXBASE: Eye irritants, 05/2002.

Decontamination and First Aid

Important Notes

- Ambulance staff, paramedics and emergency department staff treating chemically-contaminated casualties should be equipped with Department of Health approved, gas-tight (Respirex) decontamination suits based on EN466:1995, EN12941:1998 and prEN943-1:2001, where appropriate.
- Decontamination should be performed using local protocols in designated areas such as a decontamination cubicle with adequate ventilation.

Dermal exposure^(a,b)

- Remove patient from exposure.
- The patient should remove all clothing and personal effects.
- Double-bag soiled clothing and place in a sealed container clearly labelled as a chemical hazard.
- Gently blot away any adherent liquid from the patient.
- Wash hair and all contaminated skin with copious amounts of water (preferably warm) and soap for at least 10-15 minutes. Decontaminate open wounds first and avoid contamination of unexposed skin.
- Pay special attention to skin folds, axillae, ears, fingernails, genital areas and feet.
- Patients with major skin exposure may have inhaled a significant amount of vapour.

Ocular exposure^(c)

- Remove patient from exposure.
- Remove contact lenses if necessary and immediately irrigate the affected eye thoroughly with water or 0.9% saline for at least 10-15 minutes.
- Patients with corneal damage or those whose symptoms do not resolve rapidly should be referred for urgent ophthalmological assessment.

Inhalation^(d)

- Remove patient from source of exposure.
- Ensure a clear airway and adequate ventilation.
- Give oxygen to symptomatic patients.
- Monitor oxygen saturation.
- Apply other supportive measures as indicated by the patient's clinical condition.

Ingestion^(e)

- Usually no treatment is required if metallic or elemental mercury is ingested.

This document will be reviewed not later than 3 years or sooner if substantive evidence becomes available.

TOXBASE - <http://www.toxbase.org> (accessed 01/2011)

^a TOXBASE: Mercury and compounds, 11/2001.

^b TOXBASE: Mercury (metallic) – skin contact, 11/2001.

^c TOXBASE: Eye irritants, 05/2002.

^d TOXBASE: Mercury inhalation, 11/2001.

^e TOXBASE: Mercury - ingestion, 11/2001.