

Inorganic mercury/ elemental mercury

General information

Key Points

Fire

- Does not easily burn under normal conditions
- Reacts with nitric acid and hot concentrated sulphuric acid. May react explosively with ammonia and violently with metals
- Emits toxic fumes when heated to decomposition
- Use fine water spray and liquid-tight protective clothing with breathing apparatus
- Use gas tight protective suit with breathing apparatus with liquid mercury

Health

- Mercury poisoning can occur from ingestion, inhalation or dermal absorption
- Very toxic
- Short-term inhalation of mercury vapour causes cough, breathlessness and chest tightness within a few hours of exposure
- Short-term inhalation of elemental mercury globules may cause inflammation of the lungs, coughing blood and difficulty in breathing
- Stomach upset may occur within a few hours of ingestion of inorganic mercury
- Short-term exposure of the eyes to elemental mercury vapour eyes can cause inflammation and eyelid tremor
- Long-term inhalation of elemental mercury vapour may cause damage to the central nervous system, kidney damage and stomach upsets
- Ingestion of inorganic mercury compounds may cause stomach upsets, kidney failure and damage to the central nervous system
- There is no convincing evidence that mercury or mercury compounds can cause cancer in humans

Environment

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

Background

Mercury widely occurs in the environment, owing to natural and anthropogenic processes. It is present in three forms, namely elemental (metallic) mercury, inorganic or organic mercury. This review will focus on metallic and inorganic mercury only. Elemental mercury is a shiny, silver-white liquid metal at room temperature. It evaporates to form mercury vapour, which is the predominant form of mercury in the atmosphere. Inorganic mercury compounds contain mercury combined with other elements such as sulphur, oxygen or chlorine. They are mostly white powders or crystals.

Most of the mercury released from man-made activities is elemental mercury released into the air due to mining ore containing mercury, burning fossil fuels and incinerating waste. Mercury also enters the soil from fertilizers, fungicides and from solid waste i.e. thermometers or electrical switches.



Elemental mercury is used in the electrolysis of sodium chloride to make caustic soda and chlorine and used to make lamps, batteries, electrical switches, thermometers and barometers. Dental amalgam contains elemental mercury mixed with a silver-tin alloy. Inorganic mercury compounds have been used in pharmaceuticals, fungicides and antiseptics.



Exposure to mercury may occur from breathing contaminated air, eating contaminated food or water, or by skin contact. Everyone is exposed to mercury to a small extent from air, water and food. Many people are also potentially exposed to elemental mercury from dental amalgam fillings, although the amounts released are very low. The contribution of dietary intake and amalgam fillings to mercury exposure are similar. Spillages of elemental mercury from broken thermometers or barometers may result in exposure to mercury vapour.

People working in factories making equipment containing mercury or in chemical processing plants that use mercury may be exposed to mercury vapour. Dentists may also breathe in mercury vapour whilst making amalgam fillings.

If exposed to mercury, the harmful effects that may occur largely depend on the way people are exposed and the type of mercury they are exposed to. After swallowing small amounts of elemental mercury, very little enters the body, whereas after breathing elemental mercury vapour, about 80 % enters the blood from the lungs. Inorganic mercury compounds do not vaporise hence are not generally breathed in and only small amounts may pass through the skin. If swallowed, up to 40 % may enter the body.

Breathing in elemental mercury vapour for a short time affects the nervous system and lungs leading to tremors, walking difficulties, chest pains and breathlessness, respectively. After longer periods, the lining of the mouth and lungs may be damaged. Kidney damage may also occur as well as stomach irritation, nausea, vomiting and diarrhoea. Eating food or drink contaminated with inorganic mercury damages the kidneys, stomach and intestines and nervous system.

The International Agency for Research on Cancer could not classify mercury and its compounds as to their carcinogenicity to humans.

Production and Uses

Key Points

- Mercury is used to make lamps, batteries, switches, thermometers and barometers
- Mercury is used as a cathode in the electrolysis of sodium chloride in the production of caustic soda and chlorine
- Inorganic mercury was used as fungicides, antiseptics and pharmaceuticals
- Dental amalgam contains mercury mixed with a silver-tin alloy

One of the major uses of mercury is its use as a cathode in the electrolysis of sodium chloride to make caustic soda and chlorine. Mercury is also commonly used to extract gold from ore, to make lamps, batteries, electrical switches, thermometers and barometers. Various inorganic mercury compounds were used in preservatives, pharmaceuticals, fungicides and antiseptics although their use in these areas has been largely discontinued over the last few decades. Some folk remedies, however, still contain mercury. Dental amalgam contains mercury mixed with a silver-tin alloy.

Frequently Asked Questions

What is mercury?

Mercury exists in three forms, metallic mercury, inorganic mercury and organic mercury. Metallic mercury is a silver-white metal that is liquid at room temperature. Inorganic mercury compounds contain mercury as well as sulphur, oxygen or chlorine. They are mostly powders or crystals at room temperature. Organic mercury compounds consist of mercury and carbon, the most common one being methylmercury. This has different toxicological effects than the other two forms and is not considered in this review.

How does mercury get into the environment?

Small amounts of mercury exist in the environment in soil, water and air owing to natural and anthropogenic processes. Metallic and inorganic mercury get into the environment from mining ore containing mercury, from emissions of coal-fired power plants, from burning waste containing thermometers, batteries or electrical switches and during the production of cement. Organic mercury is formed in terrestrial environments by micro-organisms present in the soil.

How will I be exposed to mercury?

The presence of mercury in the environment does not always lead to exposure. Clearly, in order for it to cause any adverse health effects you must come into contact with it. You may be exposed by breathing, eating, or drinking the substance or by skin contact. Following exposure to any chemical, the adverse health effects you may encounter depend on several factors, including the amount to which you are exposed (dose), the way you are exposed, the duration of exposure, the form of the chemical and if you were exposed to any other chemicals.

Everyone is exposed to mercury to a small extent as it is naturally occurring in the environment in air, water and food. People may be exposed to mercury from amalgam fillings, which contain 50 % mercury. Once the amalgam has hardened, minute amounts of mercury may be released into the air or saliva due to corrosion of the surface. Mercury from fillings is thought to account for about the same amount of exposure as that from the diet, and therefore does not pose a significant health risk. People may be exposed to metallic mercury vapour if they come into contact with broken thermometers, fluorescent light bulbs, thermostats or barometers. Metallic mercury and vapours are difficult to remove from household furniture and clothing. After spillages items must be thoroughly cleaned to prevent a continuous exposure. Handling contaminated soil may also be a potential source of exposure to mercury.

Occupational exposure to mercury can occur in a number of work places that use mercury, such as in factories making electrical equipment or thermometers or chemical processing plants. Dentists may be exposed to metallic mercury vapour whilst making fillings.

If there is mercury in the environment will I have any adverse health effects?

Breathing in high amounts of mercury vapour for a short time damages the lining of the mouth and lungs, causing breathlessness, coughing, burning sensation in the lungs and chest pains. Damage to the nervous system may also occur, causing irritability, nervousness, tremor and visual disturbances. Other effects such as stomach irritation, nausea, vomiting, diarrhoea, skin rashes, eye irritation and increased blood pressure may also occur. If small

amounts of mercury are inhaled over a long period, such as in a work environment, the lining of the mouth and lungs may be damaged.

Swallowing inorganic mercury can cause stomach irritation, leading to nausea, vomiting and diarrhoea. Ingesting large amounts of inorganic mercury can cause stomach ulcers.

All forms of mercury accumulate in the kidney causing kidney damage, although this is largely reversible when mercury is removed from the body.

Can mercury cause cancer?

International Agency for Research on Cancer classified elemental mercury and mercury compounds as category 3 carcinogens i.e. not classifiable as to the carcinogenicity to humans

Does mercury affect children or damage the unborn child?

Effects seen in children following exposure to mercury are similar to those seen in adults. Breathing in metallic mercury over a short period of time can cause lung, stomach and intestinal damage. Short term exposure to inorganic mercury can cause increased blood pressure and heart rates as well as weight loss, swollen gums, diarrhoea, abdominal pain and muscle twitching, as well as kidney damage.

If exposed to metallic or inorganic mercury for a long period, children may develop acrodynia, resulting in muscle cramps, irritability, skin redness, peeling of skin, itching, fever and sweating.

Few data have been reported on the possible adverse effects of inorganic mercury on reproductive function or during pregnancy and lactation.

There is no evidence that maternal dental amalgams cause fetal abnormalities.

What should I do if I am exposed to mercury?

You should remove yourself from the source of exposure.

If you have got mercury on your skin, remove soiled clothing, wash the affected area with lukewarm water and soap for at least 10 – 15 minutes and seek medical advice.

If you have got mercury in your eyes, remove contact lenses, irrigate the affected eye with lukewarm water for at least 10 – 15 minutes and seek medical advice.

If you have inhaled or ingested mercury seek medical advice.

What should I do if I spill mercury or break a mercury-containing device?

A step-by-step guide to cleaning up spills of mercury is available online at the following URL: http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1195733821650

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