



Cyanide

Information for the Public

What is cyanide?

Cyanide is a rapidly acting poison that can occur in many forms, including gases, liquids and solids. Hydrogen cyanide and cyanogen chloride occur as colorless gases, while sodium cyanide and potassium cyanide occur in solid crystal forms, (cyanide salts). There are many types of cyanide-containing compounds used in industry, including other cyanogens and nitrile compounds. Although cyanide is found naturally in many foods and plants and produced by many bacteria, fungi, and algae, there are no common home uses for cyanide compounds. Most cyanide in the environment results from industry or improper waste disposal.

While cyanide has been described as having a characteristic “bitter almond” odor, DO NOT rely on this property alone to protect yourself from exposure. Cyanide does not always give off odor and not everyone can detect this odor.

How is cyanide used?

Hydrogen cyanide gas and cyanide salts have a wide variety of uses, including electroplating, metallurgy, chemical and plastic manufacturing, photograph development, gold mining, and pest control. The use of cyanide as an intentional poison has a long history, dating back thousands of years to the Roman Empire. The Roman Emperor Nero used a naturally-occurring form of cyanide to poison his enemies, the Germans used hydrogen cyanide against their prisoners during World War II, and it has been speculated that this same gas was used against the Kurds of northern Iraq during the Iran-Iraq war of the 1980s. Hydrogen cyanide and cyanogen chloride are of particular interest to the United States military.

In addition to military applications, cyanide has been used in deliberate over-the-counter medication tampering. From 1982 to 1991, eleven deaths were caused by cyanide poisoning from three intentional product-tampering incidents. As a direct result of these incidents, “tamper-resistant” packaging for many products was instituted.

How can people be exposed to cyanide?

Cyanide can enter the environment from a variety of natural and man-made processes, but exposure is usually associated with industrial processes involving cyanide, eating food and/or water containing cyanide, or breathing smoke-filled air from a fire. Some nitrile compounds, which break down in the body to create cyanide if swallowed, can be found in cosmetic products including chemicals used to remove artificial nails.

Both hydrogen cyanide, the form of cyanide usually found in air, and cyanide salts, the form of cyanide dissolved easily in water, can persist in those states for some time.

Breathing – Inhalation of hydrogen cyanide is a common industrial route of exposure and poses the greatest danger when exposure is within an enclosed indoor space. Since the gas evaporates and disperses quickly in open spaces, the threat is less intense outdoors. Cyanide compounds may also be inhaled from industrial emissions, car exhaust, cigarette smoke, and certain paper and plastic products when they are burned. Airborne cyanide salts, (which are usually found as a powder), can also be inhaled.

Drinking / Eating – Some foods naturally contain cyanide compounds, including cassava roots, lima beans, and almonds. Exposure can also occur from drinking water that has been contaminated with a cyanide compound, which is most likely to occur with cyanide salts. People coming into contact with contaminated soils and surfaces who then eat and/or touch their hands to their mouth can also be exposed.

Touching – Cyanide compounds can be absorbed through the skin when in a liquid state (or as a vapor in very high concentrations). This can occur from direct skin contact with the chemical, from bathing in or drinking contaminated water, and from handling contaminated soils, objects or water with bare hands.

Eye contact – Exposure to liquid or vapor cyanide compounds can cause eye irritation and be subsequently taken up into the body, especially under conditions of high temperature and humidity. Cyanogen compounds are particularly irritating to the eyes and other moist tissues.

How can cyanide affect my health?

The degree of reaction to exposure to any chemical depends on three main factors: the amount one is exposed to, the route of exposure, (breathing, touching, etc.), and the length of time of the exposure. Generally, inhalation and ingestion exposures to cyanide produce symptoms within seconds to minutes, while exposure via skin or eye contact produces symptoms within 30 to 60 minutes.

Cyanide compounds cause adverse health effects by preventing the cells, tissues, and organs of the body from getting oxygen. When this happens, these cells will die. Exposure to cyanide can especially affect those organs that consume large quantities of oxygen to function (such as the heart and the brain).

Short-term (acute) effects – Short-term exposures to low levels of cyanide via inhalation, skin absorption or ingestion can lead to the following symptoms in a matter of minutes: rapid breathing and heart rate, restlessness, dizziness, weakness, headache, and nausea/vomiting. Moderate inhalation exposures can add confusion, anxiety, respiratory tract irritation, and shortness of breath to the previously listed symptoms. If cyanide is ingested, there may also be a burning sensation in the mouth and throat.

Acute exposure to high concentrations of cyanide can lead to death in a matter of minutes (generally under 10 minutes). In addition to the symptoms listed above, exposure to a large amount of cyanide can lead to convulsions, abnormal blood pressure and heart rate, lung injury, shock, coma, seizures, and ultimately, death from respiratory and/or

circulatory failure. People in Africa who ate large amounts of cyanide (from cassava roots, a primary food source) were found to have shortness of breath, convulsions, loss of consciousness and death in some cases.

Skin and/or eye contact with cyanide can locally produce irritation and sores. Usually it does not lead to whole-body effects when exposure is limited to the eyes. The irritation of skin and mucous membranes from moderate to severe exposures leads to a redness or flushing of the skin. This type of exposure can add to overall whole-body effects in the presence of inhaled and/or ingested cyanide.

Long-term (chronic) effects – Long-term exposures to low levels of cyanide may result in breathing difficulties, eye irritation, chest and/or heart pain, vomiting, loss of appetite, headaches, nosebleeds and enlargement of the thyroid gland (goiter).

People who survive a serious cyanide exposure may develop damage to the brain and the heart. In addition, injury to the central nervous system, (resembling the effects of Parkinson's disease), could persist for weeks following prolonged oxygen deprivation to this organ system.

There is no evidence that cyanide can cause cancers in humans or animals; however, birth defects were observed in rats with diets of cassava roots. In addition, reproductive system effects were noticed in mice and rats that drank water containing sodium cyanide, (cyanide salt).

What should I do if I am exposed to cyanide?

- If you think you have been exposed to a cyanide-containing solution (liquid or aerosol), remove clothing and wash your entire body thoroughly with soap and water. Seek medical care as soon as possible. Clothing that would need to be pulled over the head should be cut off the body to avoid further contact with skin. Place this clothing in a plastic bag, seal the bag, and place inside another plastic bag. Do not handle the bags and inform the health department, police, or emergency coordinators to their presence.
- If your eyes are burning or vision is blurred, rinse eyes with plain water immediately for at least 15 minutes, preferably 30 minutes. Seek medical care as soon as possible.
- If you have ingested or inhaled cyanide, do not induce vomiting and do not give fluids to drink. Avoid contact with stomach contents if you have vomited. Seek medical care as soon as possible.
- If your skin has come into contact with liquid cyanide, rinse the affected area(s) thoroughly with soap and water. Seek medical care as soon as possible.

How is cyanide poisoning treated?

Treatment involves removing the exposed individual from the source of exposure, removing residual cyanide from the body and providing supportive medical care in a hospital setting. Specific antidotes are available to treat cyanide poisoning. However, these should be administered by a doctor or other health care professional.

The most important thing to do is seek medical care as soon as possible.

Is a medical test available to determine exposure to cyanide?

The Michigan Department of Community Health (MDCH) can test urine for the presence of thiocyanate or to determine blood levels of cyanide. It should be noted that these results can be confounded by certain behaviors, such as cigarette smoking, exposure to second-hand cigarette smoke, and/or consumption of cassava roots or other vegetables. All potential clinical sampling must be coordinated by MDCH, in conjunction with the Federal Bureau of Investigation (FBI).

How can I prevent or minimize exposure to cyanide?

- Under normal occupational conditions, wear the appropriate protective clothing and make sure that hazard and warning information is posted in the work area.
- Under accidental or intentional release conditions, leave the area where the cyanide was released. If outdoors, move upwind and away from the release point. If indoors, leave the building immediately. Cyanide compounds differ with regard to vapor density: some are lighter than air and rise, (like hydrogen cyanide), while some are heavier than air and sink, (like cyanogens chloride). The best response is to get to an area of open space as soon as possible to allow for dilution of the cyanide in air to occur.

For more information on cyanide:

- Contact your local public health department. Check <http://www.malpb.org/page.cfm/108/> for your jurisdiction. A list of local public health departments is also available at http://www.michigan.gov/documents/June2003LHDLList_69658_7.pdf
- Visit the Michigan Department of Community Health website <http://www.michigan.gov/ophp>
- Call the Michigan Department of Community Health Toxics and Health Hotline (1-800-648-6942)
- Visit The Centers for Disease Control and Prevention (CDC) website, <http://www.bt.cdc.gov/agent/cyanide/index.asp>
- Call the Centers for Disease Control and Prevention Public Response Service Hotline:
English: 1-888-246-2675
Español: 1-888-246-2857
TTY: 1-866-874-2646
- Call the Agency for Toxic Substances and Disease Registry (1-888-422-8737)

**For immediate assistance, call the Poison Control Center hotline:
1-800-222-1222**