

April 2022 Intel Chemical of the Month:

Arsine

The following information comes from the website of the Centers for Disease Control and Prevention.

What is arsine?

- Arsine is a colorless, flammable, non-irritating toxic gas with a mild garlic odor. Arsine is formed when arsenic comes in contact with an acid.
- Arsine is similar to a gas called stibine, which is formed when the metal antimony comes in contact with an acid. Stibine has health effects similar to those of arsine, but it is not as widely available, and it has a much more noticeable “rotten-egg” odor.

Where is arsine found and how it is used?

- Arsine was investigated as a warfare agent during World War II, but it was never used on the battlefield.
- Arsine is used most commonly in the semiconductor and metals refining industries.

How could you be exposed to arsine?

- Most reports of exposure to arsine have occurred after unintentional formation of arsine in the workplace.
- Breathing in the gas (inhalation) is the most likely route of exposure after arsine is released into the air.

- Arsine has **not** been known to be absorbed into the body through the eyes and the skin.
- Arsine vapor is heavier than air; so it would be more likely to settle in low-lying areas.

How does arsine work?

- The extent of poisoning caused by arsine depends on how much arsine a person has been exposed to and how long the person was exposed.
- Depending on the intensity of exposure to arsine, symptoms are likely to occur within the first 24 hours after exposure. However, exposure to high doses of arsine can be fatal immediately.
- After arsine enters the bloodstream, it damages the red blood cells and can lead to signs and symptoms of hemolytic anemia as a direct result of this damage.

Signs and symptoms of arsine exposure

At lower doses, people may not know they have been exposed to arsine, because it has no odor. At higher doses, a mild garlic odor has been reported (however, this cannot be reliably used as a warning). Stibine, on the other hand, has a strong odor, so people will probably be aware that they may have been exposed to something. People exposed to a low or moderate dose of arsine by inhalation may experience some or all of the following symptoms within 24 hours of exposure:

- Confusion
- Drowsiness

- Fatigue
- Headache
- Muscle cramps
- Nausea, vomiting, and/or abdominal pain
- Rapid breathing
- Red or dark urine
- Shortness of breath
- Weakness
- Yellow skin and eyes (jaundice)

Exposure to a large dose of arsine by any route may result in these additional health effects. (However, showing these signs and symptoms does not necessarily mean that a person has been exposed to arsine):

- Convulsions
- Loss of consciousness
- Paralysis
- Respiratory compromise, possibly leading to death

Long-term health effects of arsine exposure

If people survive the initial exposure, long-term effects may include kidney damage; numbness and pain in the extremities; and neuropsychological symptoms such as memory loss, confusion, and irritability.

How you can protect yourself, and what to do if you are exposed to arsine?

- Because no specific antidote exists for arsine exposure, the best thing to do is avoid it. First, get fresh air by leaving the area where the arsine was released. Moving to an area with fresh air is a good way to reduce the possibility of death from exposure to arsine.
 - If the arsine release was outside, move away from the area where the arsine was released.
 - If the arsine release was indoors, get out of the building.
- If you are near a release of arsine, emergency coordinators may tell you to either evacuate the area or to “shelter in place” inside a building to avoid being exposed to the chemical. For more information on evacuation during a chemical emergency, see “Facts About Evacuation” at <http://emergency.cdc.gov/planning/evacuationfacts.asp>. For more information on sheltering in place during a chemical emergency, see “Facts About Sheltering in Place” at <http://emergency.cdc.gov/planning/Shelteringfacts.asp>.
- If you think you may have been exposed to arsine, you should remove your clothing, rapidly wash your entire body with soap and water, and get medical care as quickly as possible.

- *Removing your clothing:*
 - Quickly take off clothing that may have arsine on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head.
 - If you are helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.
- *Washing yourself:*
 - As quickly as possible, wash any arsine from your skin with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies.
 - If your eyes are burning or your vision is blurred, rinse your eyes with plain water for 10 to 15 minutes. If you wear contacts, remove them and put them with the contaminated clothing. Do not put the contacts back in your eyes (even if they are not disposable contacts). If you wear eyeglasses, wash them with soap and water. You can put your eyeglasses back on after you wash them.
- *Disposing of your clothes:*
 - After you have washed yourself, place your clothing inside a plastic bag. Avoid touching contaminated areas of the clothing. If you can't

avoid touching contaminated areas, or you aren't sure where the contaminated areas are, wear rubber gloves; turn the bag inside out and use it to pick up the clothing; or use tongs, tool handles, sticks, or a similar object to put the clothing in the bag. Anything that touches the contaminated clothing also should be placed in the bag. If you wear contacts, put them in the plastic bag, too.

- Seal the bag, and then seal that bag inside another plastic bag. Disposing of your clothing in this way will help protect you and other people from any chemicals that might be on your clothes.
- When the local or state health department or emergency personnel arrive, tell them what you did with your clothes. The health department or emergency personnel will arrange for further disposal. Do not handle the plastic bags yourself.
- For more information about cleaning your body and disposing of your clothes after a chemical release, see “Chemical Agents: Facts About Personal Cleaning and Disposal of Contaminated Clothing” at <http://emergency.cdc.gov/planning/personalcleaningfacts.asp>.
- Seek medical attention right away.

How is arsine exposure treated?

Treatment consists of providing supportive medical care in a hospital setting. Blood transfusions and intravenous fluids (that is, fluids injected directly into a vein) may be

needed. Some people may need to have their blood cleaned by a machine if their kidneys fail. This process is called dialysis.

How can you get more information about arsine and stibine?

You can contact one of the following:

- Regional poison control center: 1-800-222-1222
- Centers for Disease Control and Prevention
 - Public Response Hotline (CDC)
 - 800-CDC-INFO
 - 888-232-6348 (TTY)
 - E-mail inquiries: cdcinfo@cdc.gov