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U.S. ARMY CHEMICAL MATERIALS AGENCY

Characteristics of Nerve Agents

What are nerve agents?

There are three types of nerve agents currently stored in chemical stockpiles in the United States: VX, GB and GA. All three nerve agents are members of the organophosphate family.

Nerve agent VX, a clear, odorless and tasteless liquid, has an appearance similar to motor oil. VX can become an aerosol (very small droplets) through explosion or a vapor through ignition. It is heavier than water and evaporates 2,000 times more slowly.

Highly toxic in its liquid, aerosol and vapor forms, VX is the most hazardous when absorbed through the skin. As a vapor or aerosol, it can be inhaled and absorbed through the lungs or through the digestive system if eaten or swallowed.

Nerve agent GB, also known as sarin, is one of the most toxic members of the organophosphate family. Under normal conditions, it is a clear to straw-colored liquid and has approximately the same density and evaporation rate as water.

GB presents the greatest hazard when released in vapor form. Such vapors can be released only by evaporation of the liquid or vaporization into the air.

Nerve agent GA, also known as tabun, is a colorless liquid with a slightly fruity odor. The agent inhibits nerve conduction very rapidly, within a matter of seconds or minutes.

Where is nerve agent stored?

Anniston Chemical Activity, Ala.; Blue Grass Army Depot, Ky.; Newport Chemical Depot, Ind.; Pine Bluff Chemical Activity, Ark.; and Umatilla Chemical Depot, Ore. store the nerve agent VX.

Nerve agent GB was previously stored at Anniston Chemical Activity, Ala.; Pine Bluff Chemical Activity, Ark.; and Umatilla Chemical Depot, Ore. The last of the GB CMA had responsibility for disposing of was destroyed on July 8, 2007 in Umatilla.

Both nerve agents VX and GB were previously stored at Deseret Chemical Depot, Utah, and Johnston Atoll, a group of islands about 800 miles southwest of Hawaii. Utah completed destruction of its nerve agent stockpile in June 2005. Disposal operations were completed in November 2000 at Johnston Atoll.

The nerve agent GA is stored at Deseret Chemical Depot, Utah.

What are the dangers of nerve agent exposure?

Exposure to nerve agent affects the nervous system by interfering with the signals sent from the brain to the vital organs and other parts of the body. Nerve agent inhibits the action of the enzyme acetylcholinesterase, preventing messages from the brain from reaching the nerve endings. As a result, hyperactivity occurs in the organs stimulated by these nerves.

When exposed to a low dose of nerve agent, the following symptoms could occur:

- increased saliva production
- runny nose
- chest pressure
- headache
- deterioration of short-range vision
- tiredness
- slurred speech
- hallucinations
- nausea

When exposed to a higher dose of nerve agent, the following symptoms could occur:

- difficulty breathing
- cough
- cramps
- vomiting
- involuntary discharge of urine and defecation
- powerful discharge of saliva
- running eyes
- sweating

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Characteristics of Nerve Agents (continued)

- muscular weakness
- tremors
- convulsions
- loss of consciousness
- death

Nerve agents can affect both the respiratory muscles and the respiratory center of the nervous system. The combination of these two effects causes death by respiratory failure.

First aid treatment consists of decontamination (household bleach can be used), the injection of atropine and 2 PAM Chloride (they must be injected immediately after exposure to be effective) and artificial resuscitation (when applicable).

Is the stored nerve agent a risk to the public?

It is unlikely that any accident in storage could cause a risk to the public in surrounding communities. It would take an extreme accident in storage such as an explosion or fire in order for the public to possibly be exposed to nerve agent; even then the likelihood of danger to the public is remote.

In a fire, most of the nerve agent would burn up, but some would stay in the smoke. Emergency officials call this smoky cloud and the invisible parts around it the plume.

As the plume drifts away from the scene of the accident, small drops of nerve agent may fall to the ground. These small drops are called the aerosol. The aerosol is harmful if it contacts the skin or if contaminated food or drink is ingested. This is very unlikely because the aerosol is heavy and falls out of the plume quickly, close to the accident site.

As the plume travels from the accident, some tiny parts of nerve agent, called vapor, stay in the plume. Vapor inhalation is harmful. Because the vapor travels farther from the accident than the aerosol, it is the greater danger to you. However, the vapor becomes less harmful the farther the plume travels because wind mixes clean air with the contaminated air as the plume travels. The clean air dilutes the agent until it is no longer harmful.

To better understand the difference between aerosol and vapor, think of perfume. Like nerve agent, perfume in a bottle is liquid. When sprayed, the liquid becomes

an aerosol. If perfume is sprayed on someone, drops will cling to the skin, hair and clothes. If sprayed on the other side of the room, the aerosol drops won't touch skin or clothing but the fragrance will still be detectable. That fragrance is the vapor. However, nerve agent vapor is invisible and has no odor.

What actions should be taken if nerve agent exposure occurs?

Avoiding the nerve agent vapor should always be the primary goal. However, if symptoms of nerve agent exposure develop, get medical help immediately.

Anyone outside before taking shelter or leaving the area who suspects nerve agent exposure can do several things. If in a sealed shelter, take off outer clothing, put them in a plastic bag and seal the bag. If water is available in the shelter, wash or take a cool to warm (not hot) shower, using a lot of soap and water. Do not put soap in eyes; just use lots of water. If leaving the area, tell responders or medical staff at of suspected exposure. Tell emergency responders about the sealed bag so that they can arrange for its safe removal after the emergency.

Treatment for nerve agent exposure varies. If nerve agent is inhaled, individuals should hold breath until a respiratory protective mask is in place, (if available). Mouth-to-mouth resuscitation can be given to a victim who has stopped breathing after agent inhalation except if facial contamination exists. Seek medical attention as soon as possible.

If nerve agent gets in the eyes, immediately flush with water for 10-15 minutes, and then put on a respiratory protective mask (if available). Seek medical attention.

If nerve agent comes in contact with the skin, put on a respiratory mask (if available) and remove any contaminated clothing. Immediately wash contaminated skin with copious amounts of soap and water, 10 percent sodium carbonate solution or 5 percent liquid household bleach. Rinse well with water to remove excess decontaminate and seek medical attention.

If nerve agent is ingested, seek medical attention immediately. The first symptoms are likely to be gastrointestinal, but vomiting should not be induced.