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# Arkansas CSEPP and Chemical Awareness



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April 2004

**FEMA**

**Warning:**  
**Images included in this course may  
be disturbing to some people.  
These images are actual photos of  
blisters on humans as a result of  
mustard exposure. Reader  
discretion is strongly advised.**

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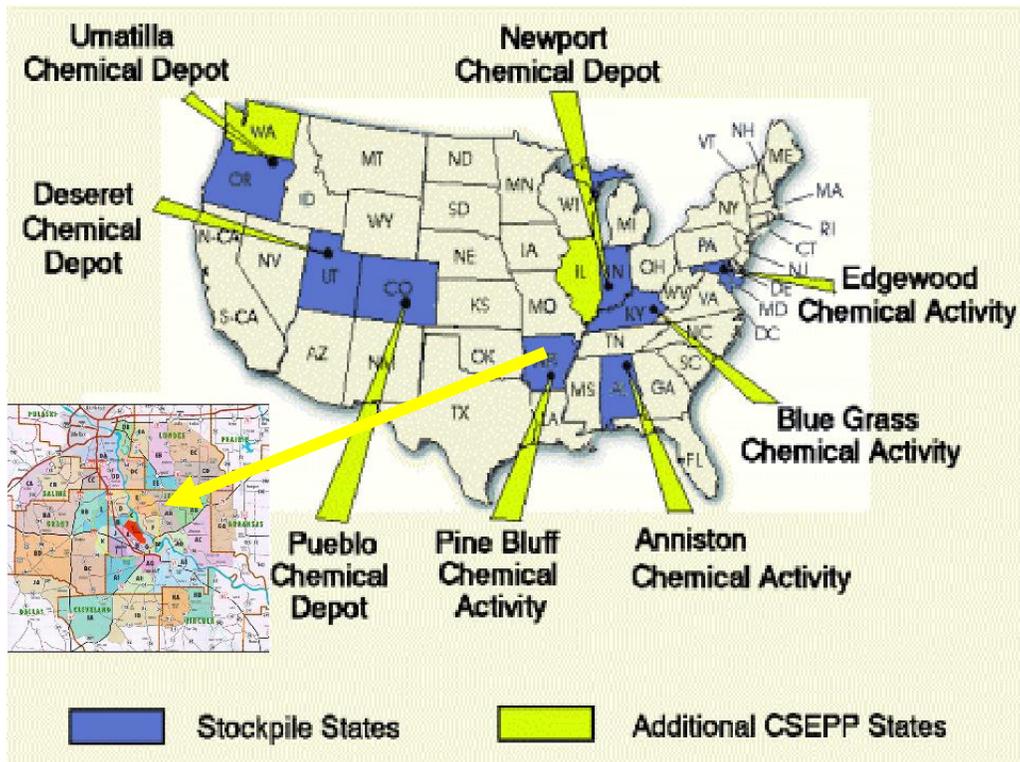
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# INTRODUCTION

This course is designed for those persons involved in emergency preparedness related to a chemical agent accident involving the stockpile located at Pine Bluff Arsenal. The course material will familiarize you with the Chemical Stockpile and its components. Additionally, you will learn about chemical agent characteristics, signs and symptoms of agent exposure and how to avoid contact with agents. Specifically, at the end of this training program you should be able to:

- Describe the types of chemical agents and munitions stored at Pine Bluff Arsenal and the potential threat for off-post release.
- Describe the potential hazards of nerve and blister agents: what the nerve and blister agents are called, what they look like, and how they affect the body.
- Identify the specific signs and symptoms of nerve or blister (vesicant) agent exposure.
- Describe the initial first aid treatment for nerve and blister agent exposure.
- Describe the role of the Chemical Stockpile Emergency Preparedness Program.

# U.S. CHEMICAL STOCKPILE AND CSEPP



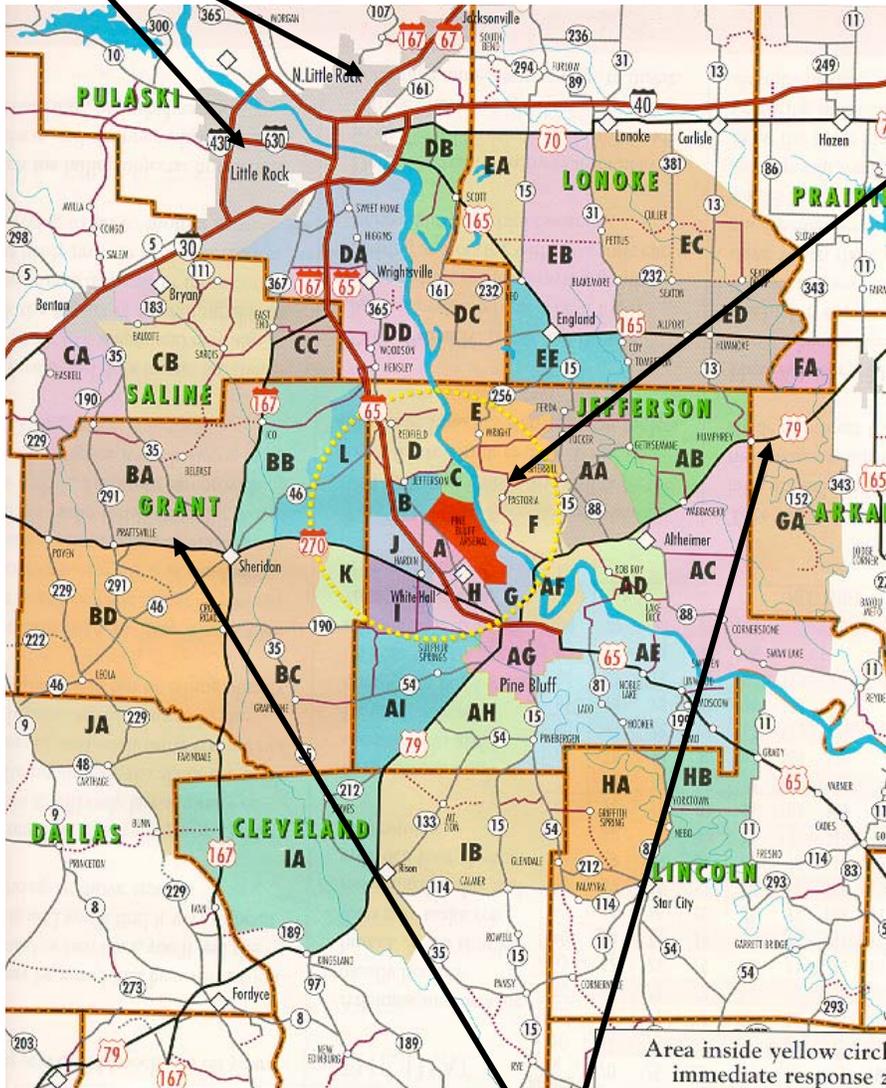
The Army currently has tons of stored chemical agents that were designed and produced for the sole purpose of warfare, with some of these agent dating back to the 1940's. This stored material is referred to as the "chemical stockpile". The types of chemicals stored include nerve and blister agents.

In 1985 congress mandated that the Army would dispose of all chemical warfare agents, with special emphasis on the maximum protection of the public and environment. This ultimately led to the creation of CSEPP, Chemical Stockpile Emergency Preparedness Program.

# The Arkansas CSEPP Jurisdiction

Host Cities

Little Rock and  
North Little Rock



IRZ  
(Immediate Response  
Zone)

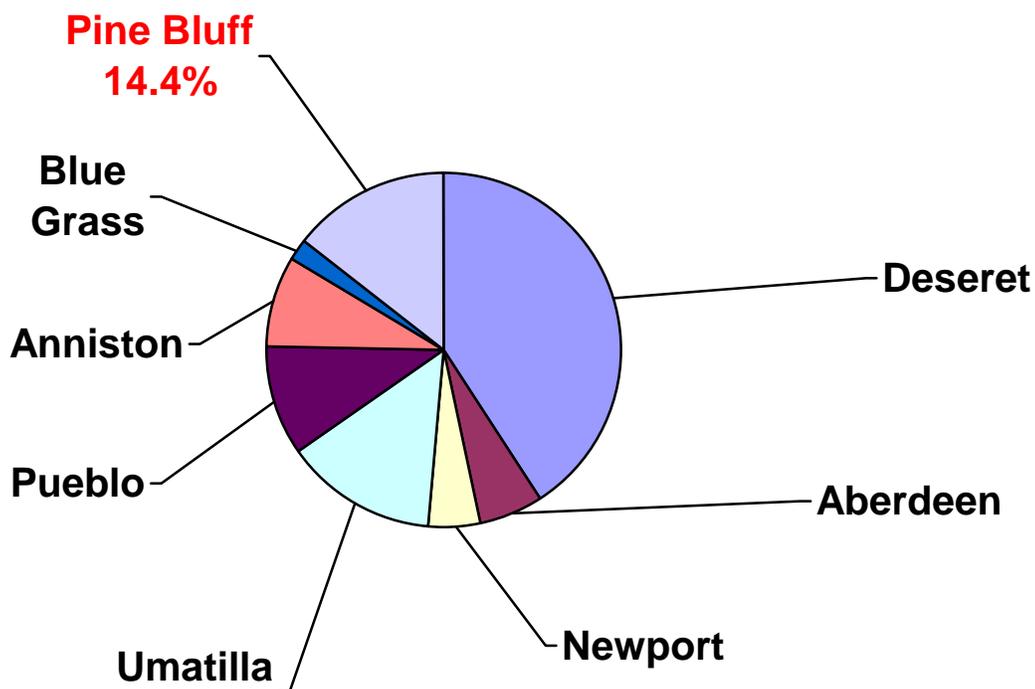
Jefferson and Grant  
Counties

PAZ  
(Protective Action Zone)

Jefferson, Grant, Dallas, Cleveland,  
Lincoln, Arkansas, Prairie, Saline,  
Lonoke, and Pulaski Counties

# Pine Bluff Arsenal's Chemical Stockpile

The portion of the original stockpile located at Pine Bluff Arsenal equals is the second largest at 14.4%



## How Is It Stored?

Chemical nerve agent GB is stored in rockets. Nerve agent VX is stored in rockets and landmines. Blister agents HD and HT are stored in one-ton steel containers. All the chemical warfare agents are stored in "earthen covered magazines" commonly referred to as igloos or bunkers. These igloos are located in a high security area that is surrounded by security fences, and equipped with appropriate security devices.



## The Stockpile Agents and Munitions

	<b>Rockets</b>	<b>Cartridges and Projectiles</b>	<b>Land Mines</b>	<b>Bombs</b>	<b>One-Ton Containers</b>	<b>Aerial Spray Tanks</b>
<b>Anniston</b>	<b>X</b>	<b>X</b>	<b>X</b>		<b>X</b>	
<b>Blue Grass</b>	<b>X</b>	<b>X</b>				
<b>Deseret</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>Edgewood</b>					<b>X</b>	
<b>Newport</b>					<b>X</b>	
<b>Pine Bluff</b>	<b>X</b>		<b>X</b>		<b>X</b>	
<b>Pueblo</b>		<b>X</b>				
<b>Umatilla</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>

	<b>GA</b>	<b>GB</b>	<b>VX</b>	<b>Mustard</b>	<b>Lewisite</b>
<b>Anniston</b>		<b>X</b>	<b>X</b>	<b>X</b>	
<b>Blue Grass</b>		<b>X</b>	<b>X</b>	<b>X</b>	
<b>Deseret</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>Edgewood</b>				<b>X</b>	
<b>Newport</b>			<b>X</b>		
<b>Pine Bluff</b>		<b>X</b>	<b>X</b>	<b>X</b>	
<b>Pueblo</b>				<b>X</b>	
<b>Umatilla</b>		<b>X</b>	<b>X</b>	<b>X</b>	

## M55 Rockets



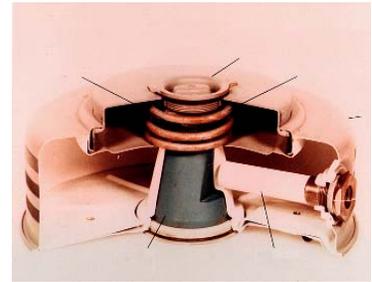
All of the rockets that contain GB or VX are obsolete and have been declared hazardous waste. M55 Rockets contain approximately 10 pounds of nerve agent in an aluminum warhead. The warhead contains a fuse to initiate the main explosive charge, which bursts it open. Solid propellant stored in the rocket motor body is used to propel the rocket.

Rockets are stored in a fiberglass shipping and firing container with aluminum ends. Fifteen shipping and firing containers are packaged together to form a pallet unit. In storage, rockets are always in earth-covered igloos and pointed toward the wall in the rear.

Since the rockets are all obsolete, there is no scheduled handling or maintenance of them. Instead, they are checked for leakage on a routine basis. Air samples are taken from the interior of the igloo, and inside the shipping and firing container of the individual rockets. Any leakage discovered is promptly contained by trained Army personnel.

The Army has performed tests to identify what would happen if one rocket in a pallet of fifteen exploded, which is considered to be a credible event. Those tests indicate that two rockets would explode, spreading their agent payload, and the other 13 rockets would leak. While highly unlikely to occur, this scenario again can be considered credible. Air modeling studies have shown that in this case, no off-post liquid agent threat would exist, and only low concentrations of vapor would likely migrate into the off-post community. It should be noted that there has never been a fatality associated with the chemical stockpile. The same cannot be said of conventional explosive munitions, which indicates the excellent safety program associated with the Army's chemical agent stockpile.

## M23 LANDMINE



The M23 Landmine contains 10.5 pounds of liquid VX nerve agent. The mine contains explosives used to burst it open and spread its agent payload upon initiation. Three mines are packed in a 16-gallon, waterproof, metal drum.

All mines are stored in igloos. The mine stockpile at Pine Bluff Arsenal has been very stable, and no leaks have ever been detected. The Army has determined that if a mine explodes, the other mines in the same drum would also detonate. Mines cannot spontaneously explode. Some external force such as fire must occur for an explosion to take place.



Army personnel check metal drums, containing the M23 landmine, for leaks

## One-Ton Steel Containers



One-ton containers are industrial steel containers manufactured for the storage of bulk liquids such as chlorine. There are no explosives or other energetic material involved. All of the bulk blister agents are stored in one-ton containers. Their capacity ranges from 1,500 to 1,800 pounds, depending on the particular agent stored. All one-ton containers are securely stored inside igloos. Routine inspection for leakage or defects is performed on a regular basis.



An Army Toxic Material Handler checks a one-ton for leaks

# ACCIDENT TYPES, HAZARDS AND AGENT DETECTION

What is a chemical accident? An accident can be defined in several ways. One definition is an unplanned release of chemical agents into the environment at levels, which exceed those, permitted by state or federal regulations. Another, and more conservative definition, is any unplanned event that could lead to the release of agent.

To determine what adverse effects a chemical release might have, we must explore several factors. We must take into account the amount of agent released and the weather conditions to determine how far downwind chemical agents will travel, and what the concentration will be. Additionally, one needs to take into consideration how close people are to the accident site, and their location with respect to the plume passage. The most likely accidents are small ones that do not pose a threat except to someone in very close proximity to the accident. Large accidents that could create a hazard for the community have a much lower probability of occurring.

## Leaking Agent

The Army is prepared to deal with leaking agent from any munition or container. Leaking liquid or vapor is controlled and contained until the item can be safely disposed. Generally the leaking item is placed in an approved overpacking container until it can be disposed of properly. Any surface that may have come into contact with liquid or vapor agents will be decontaminated using approved Army procedures.

Rockets filled with GB have caused the greatest concern over the years, due to their design and large numbers. It should be noted that in the current stockpile located at the Pine Bluff Arsenal is very stable and has experienced far fewer leakage problems than some of the other installations around the country.



Army personnel secure a leaking rocket in an over-pack container

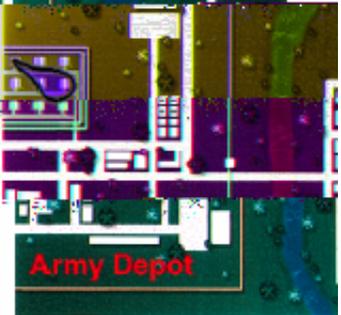
# CLASSIFICATION OF EVENTS

## I. Non-Surety Emergency

Events are likely to occur that may be perceived as a chemical surety emergency or that may be of general public interest, but which impose no chemical surety hazard.

## II. Limited Area Emergency

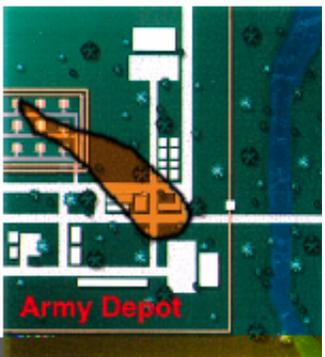
Events are likely to occur or have occurred that involve agent release outside originating controls or approved chemical storage facilities with chemical effects expected to be confined to the chemical limited area.



Army Depot

## III. Post Only Emergency

Events are likely to occur or have occurred that involve agent release with chemical effects beyond the chemical limited area. Releases are not expected to present a danger to the off-post public. Notification of IRZ, PAZ, and State-designated points of contact.



Army Depot

## IV. Community Emergency

Events are likely to occur or have already occurred that involve agent release with chemical effects beyond fire installation boundaries. Notification of IRZ, PAZ, and State-designated points of contact. All emergency response organizations are mobilized. IRZ and affected PAZ areas implement specified protective actions.



Army Depot

If a chemical accident were large enough to pose a threat to the public, the hazard would be from breathing agent-contaminated air. People in the community are not likely to encounter liquid agent. Three basic types of accidents can occur. The first is a **spill** of agent onto the ground or other surface. The resulting puddle of agent can evaporate into a vapor and float downwind. An explosion causes a second type of accident. An explosion causes droplets of agent to be generated. These droplets, because they are heavy, quickly fall to the ground. An explosion also releases aerosols and vapors. The third type of accident involves a **fire**. In such events, both aerosols and vapors are formed. Vapors and aerosols are lifted higher into the air because of the heat of the fire. The hazards are similar to an explosion. Vapors from any type of release pose a hazard when they are inhaled or come in contact with the skin or eyes. Agent vapors pose the greatest hazard when they are inhaled because the lung tissues rapidly absorb them.

## Agent Detection

The most probable form of chemical agent found off-post would be vapor. The Army's detection capability can be broken down into two main types. "Low Level" detectors will detect agent at a level that would produce no adverse health effects to an individual who breathed the agent vapors. "Gross Level" detectors will detect vapors at substantially higher concentrations that would be dangerous. The Army would most likely conduct any chemical agent detection conducted in the community.



RTAP (Real-Time Analytical Platform) conducting routine monitoring near the storage area

# **ROLE OF CHEMICAL STOCKPILE EMERGENCY PREPAREDNESS PROGRAM**

CSEPP was established to provide a consistent framework for emergency planning for states and communities at all eight storage locations. Each of the communities potentially affected by a chemical accident is responsible for deciding how to prepare for the possibility of a release of chemical agent.

In 1988, the Army and the Federal Emergency Management Agency (FEMA) signed a memorandum of understanding (MOU) whereby FEMA assumed responsibility for off-post emergency planning activities. The most current MOU was signed on October 8, 1997. The Army maintains its original program role for chemical stockpile storage and disposal.

Public protective action options available during a chemical emergency are largely self-protective, which involves mainly evacuation. The most critical function of local and state government in the unlikely event of a chemical agent emergency is timely and accurate public alert and notification. This is accomplished through the use of a public alert system that includes an outdoor siren system and indoor tone alert radios. Emergency response organizations, to include law enforcement, fire department and Emergency Medical Service organizations, as well as hospital personnel have received specialized training in treatment of chemical casualties. These organizations can provide assistance to those affected by a chemical agent release. Other participating organizations may provide staffing for reception centers and mass care facilities.

Once emergency response officials have been notified that a chemical accident may affect off-post areas, they must decide which protective actions are appropriate for different portions of the affected area. This complex decision will have to be made within tight time constraints. Elected officials are responsible for making protective action decisions at the time of an emergency, utilizing information provided by the Army.

The activities outlined above are similar to those followed in the event of any emergency; it is the charge of the CSEPP to provide assistance of making them possible within the jurisdictions subject to chemical agent threats.

## Protecting the Public

In the unlikely event of an accidental release of toxic chemicals, you must take action to ensure that you are not exposed to chemical agents. The two ways to accomplish this is through **evacuation** and **sheltering**.

### Evacuation

Evacuation is the preferred method to prevent exposure to chemical agents. It consists of individuals removing themselves from an area of actual or potential contamination to a safe area. It is the most effective of all protective actions provided it is accomplished before the toxic plume arrives. A **precautionary** evacuation is desirable because it occurs before the population is at risk. A **responsive** evacuation in contrast occurs after a release and could expose evacuees to the hazard. In order for evacuation to be effective, the following planning tasks are necessary to include coordination with all emergency response organizations:

- Estimation of the number of potential evacuees
- Identification of evacuation routes
- Traffic control requirements
- Estimation of time required for evacuation

Evacuation is the best protective action in response to a chemical vapor release, if time permits. In order for evacuation to be effective, you must be familiar with the local evacuation plan. Once you are familiar with the local evacuation plan, and its alert notification system, you should be prepared to implement it. When evacuating in your car, you will be informed of the proper routes to take to avoid agent contamination. You must remember to take whatever actions necessary to ensure that you reduce your exposure to the outside atmosphere, which could be contaminated.

## Shelter in Place

Sheltering in place is an approved method of avoiding contamination during a chemical warfare agent release. Although evacuation is the method of choice, there will be circumstances that may require sheltering in place. In the event of a very rapid release residents of sub-zones adjacent to the Arsenal do not have time to evacuate after the warning is given, having someone home alone without transportation, bedfast or other circumstances could require you to shelter in place. Whitehall Schools and NCTR have buildings that are overpressured and have plans to shelter in place if time does not permit them to evacuate. Should you have to shelter in place, go inside, bring pets indoors, seal all cracks around windows and doors with tape, turn off all ventilation systems, cover vents with plastic and tune to a local radio or television station for instructions.

## Victim Care

If, individuals do become contaminated, they will be directed to a Personnel Processing Point by Law Enforcement so they can be decontaminated and receive any specialized treatments that may be necessary. There are over 30 decontamination units located strategically through out the IRZ and PAZ. These Personnel Processing Points can handle both mobile and immobile patients.



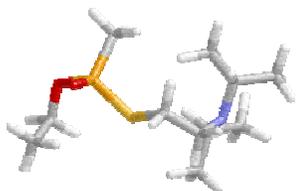
Decontamination training Grant and Jefferson Counties

# The Chemical Warfare Agents

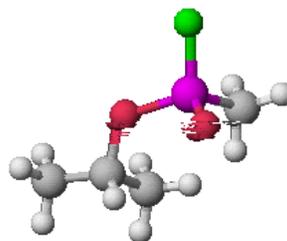
Chemical agents stored at the Pine Bluff Arsenal are either nerve agents (GB and VX), or blister agents (HD and HT).

## Nerve Agents

Toxic chemicals that are classified as "nerve agents" are so called because they are capable of adversely effecting the body's nervous system. Nerve agents are "organophosphate" compounds that are very similar to common household insecticides such as Malathion or Parathion. The major difference in the nerve agents, and common household insecticides is strength. Nerve agents are up to 1000 times more potent.



VX



GB (SARIN)

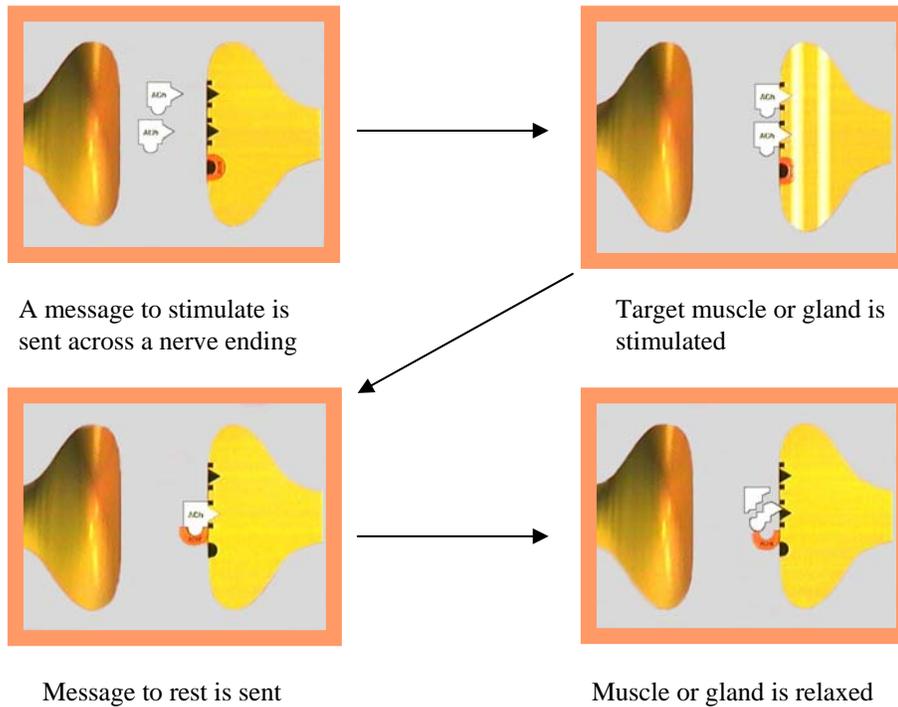
## Physical Properties

In their normal state, nerve agents are liquids. If they are heated, these liquids generate vapors. It is vapor that has the most potential for release into the community. Army studies have shown that there is little chance of liquid agent presenting a community threat. In the unlikely event of a fire or explosion, agent can be released in vapor form. Once in vapor form, the agent can mix with air and move with the prevailing wind currents.

The most distinguishable factors among nerve agent GB and VX is consistency of the liquid. GB is watery and non-persistent, while VX is oily and persistent. Non-persistent agents usually do not stay in the environment for long periods of time after release. Persistent agents may stay in the environment for weeks to months depending on weather conditions. GB was designed to present a vapor hazard of short duration, while VX produces a liquid hazard of long duration.

## How They Work

The nervous system controls body functions through the use of chemicals which act as "instructions" to nerves and to the muscles and glands. These instructions come in two forms: stimulate and relax.



When a nerve agent is present it interferes with the normal chemical instructions that direct the muscle (or gland) to return to an un-stimulated state and relax or rest.



By interfering with the normal chemical check and balance, the action of toxic nerve agents over stimulates the nerve endings and central nervous system. Over-stimulation of the nervous system causes muscles and certain glands to over-react and the various body organs to malfunction.

# Routes of Exposure

There are three main routes, or ways that a person can be exposed to a nerve agent. They are:

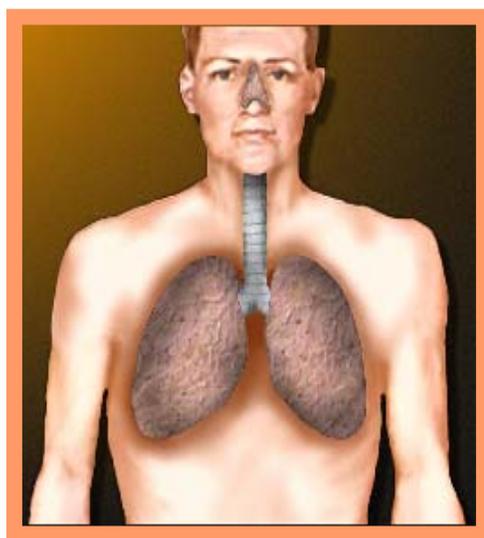
- Inhalation - breathing air that has been contaminated with nerve agent vapors
- Direct contact - absorption through the skin or eyes
- Ingestion - swallowing contaminated food or drink

A more descriptive explanation of each follows.

## Inhalation

Although the nerve agents begin as a liquid, they are easily changed into vapors. These vapors mix freely with the air. If a person breathes in the contaminated air, the toxic chemical enters the body through the respiratory system.

After the nerve agent has entered the lungs it is generally absorbed rapidly into the blood stream. The chief cause of death due to nerve agent exposure, from any route, is respiratory failure. The lethal dose from inhalation is smaller than a lethal dose by ingestion or skin exposure; that is, a less amount of agent is needed to kill via inhalation than by any other route.



## Direct Contact

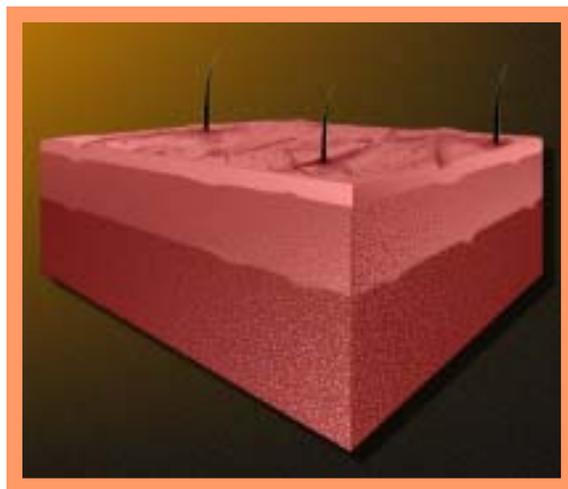
Although Army studies have shown that the probability of liquid agent migrating into the community is extremely low, you should be familiar with liquid agent hazards.

Direct contact occurs when the skin or eyes become exposed to liquid chemical agent. Nerve agents have no effect on the skin; rather, the skin absorbs the nerve agent. Once penetration of the skin has occurred, the nerve agent is circulated to the nervous system by the blood stream. Any type of "wound" will allow nerve agent to have direct access to the blood stream and nervous system.

All of the nerve agents (GB and VX) can be absorbed through the skin; however, agent VX tends to be absorbed much more completely because it does not evaporate as quickly. The persistence of VX causes it to remain on the skin, thus allowing more absorption time.

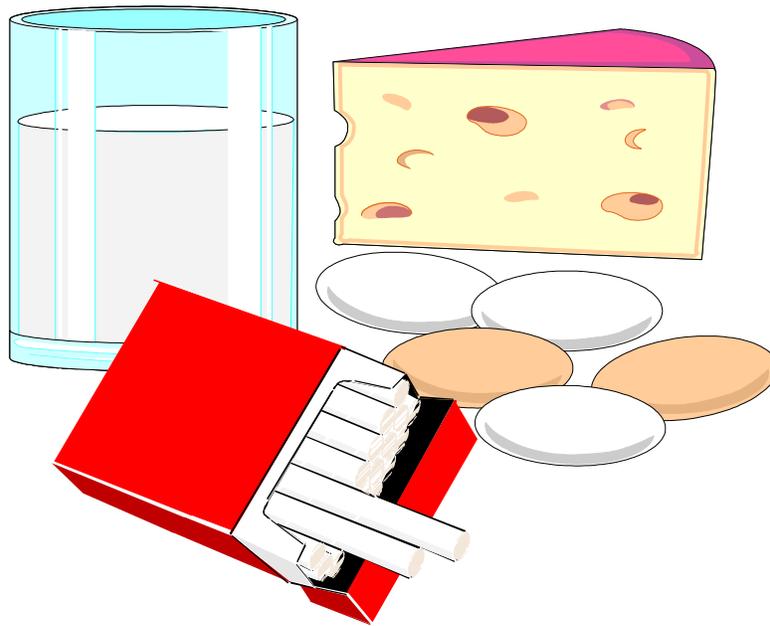
VX is "highly persistent"; it does not volatilize or degrade rapidly. VX persistence is weather-dependent. At 99° F, 90% of a VX droplet will evaporate in approximately 24 hours; at 50° F, the passage of 45 days would be required before 90% of a VX droplet would evaporate.

The more watery G-agents, on the other hand, have a tendency to evaporate quickly. Agent GB, in particular, tends to evaporate off the skin quickly rather than penetrate it. Cases of GB poisoning have occurred from skin exposure to liquid GB, but at much higher concentrations than those resulting in severe inhalation effects.



## Ingestion

If an individual ingests contaminated food or drink, the nerve agent can enter the body through the digestive system. Incidental hand-to-mouth contact and smoking are examples of potential sources of exposures by this route. Once the nerve agent has entered the body by way of the digestive system, access to the bloodstream can occur.



## Signs and Symptoms of Nerve Agent Exposure

Signs are objective evidence of a medical condition or disease, while symptoms are subjective in nature. The rescuer can see "signs", while symptoms must be communicated to the rescuer by the patient. There are several physical signs to look for in determining if someone has been exposed to a nerve agent. Not all signs and symptoms may appear in each exposed individual. Amount, duration and route of exposure make a difference. The following are signs and symptoms of nerve agent poisoning:

- Miosis - Pinpointing of the eye's pupil is one of the initial effects if the person is exposed to nerve agent vapor.



Miosis

Dilation

- Dim Vision - If a person has had a mild exposure, he or she may complain of general eye irritation or pain, describing the pain as "somewhere deep in my eye" or "somewhere deep in my head".
- Respiratory Problems - The patient may complain of difficulty in breathing and have a "tight chest" feeling. There may be increased oral and nasal secretions with drooling that interfere with breathing.
- Localized Sweating - If the nerve agent has affected nerves that are connected to sweat glands, the person may sweat profusely.
- Nausea and Vomiting - Nausea and vomiting may occur with any type of exposure.
- Abdominal Cramping - Increased activity of the intestines may lead to cramps or pain in the abdomen.
- Involuntary Urination or Defecation - The bladder and bowel, normally controlled through sphincter muscles, may become incontinent. The person may also exhibit diarrhea.

- Heartbeat Irregularities - Because the heart is a muscle, it too is susceptible to over-stimulation by the nerve agent.
- Generalized Weakness - Because the nerve agent also affects the portion of the nervous system that controls the skeletal muscles, the exposed person may have an overall weak feeling that increases with exertion.
- Twitching or Muscle Spasms - If the affected nerve is connected to a muscle, the muscle action becomes uncontrollable and repetitive. You may notice this effect as twitching or muscle spasms. Spasms of local muscle groups, usually at the site of exposure, resemble what has been likened to "a bag of worms." The term "fasciculation" is used to describe this type of motion. Muscle twitching and cramps may become more generalized.
- Convulsions and Coma - In severe cases, persons exposed to nerve agent may convulse, become comatose, and stop breathing.

Other symptoms associated with nerve agent exposure are:

- Headache
- Anxiety
- Restlessness
- Giddiness
- Irritability

## **Factors that Affect Nerve Agent Exposure Signs and Symptoms**

Time Factor (onset) - While the onset of signs and symptoms of nerve agent exposure is often immediate, they may also be delayed. In addition, some particular signs may appear much sooner than others. Reaction time, and whether or not the sign or symptom shows up at all, depends on several factors:

- Which agent is involved
- The dose that has been absorbed
- Duration of exposure

- Route of exposure (inhalation, direct contact, ingestion)
- Sensitivity of the person's system

As a general rule, the reaction time to a nerve agent is:

- IMMEDIATE if moderate to large amounts are inhaled or moderate to large amounts are spilled on the skin.
- DELAYED if small amounts are involved, or agent has been absorbed through the skin in a small-localized area.

## **Peak Effect**

If the exposure route is air with a high concentration of agent, effects can occur after a single breath. This "immediate" response occurs within 2-5 seconds. After the exposed person has been removed from the exposure, look for the effects to peak within 15-20 minutes. Generally, you can be reasonably certain that if the exposure was through air (only) and the time lapse has been 15 minutes or later, the effects have maximized, and they will not worsen after this time.

If the exposure route is through the skin, absorption may continue for hours. This is likely to continue even after decontamination is completed because of agent that has already penetrated the skin. The effects of direct skin contact may not occur for hours after exposure, and can range from 1 to 18 hours dependent on dose. Effects that occur many hours after exposure are usually non-lethal.

## **Other Possible Causes of Nerve Agent Signs and Symptoms**

The signs and symptoms described may be caused by health problems other than exposure to nerve agent; many of them may also be attributed to:

- Epilepsy
- Gastroenteritis
- Exposure to organophosphate and carbonate insecticides
- Emphysema
- Cerebrovascular accidents

- Head trauma
- Drug overdose
- Heat illnesses
- Strokes
- Allergies
- Upper respiratory illness

## **Initial First Aid and Treatment**

Treatment for a severe nerve agent exposure must be immediate and should be performed by properly trained and equipped personnel. Depending on the severity of the exposure, seconds can make the difference between life and death. The first aid treatment for persons who have been exposed to nerve agent is:

- Immediate removal from the source of contamination
- Decontamination
- Antidote administration
- Airway management if required

The nerve agent must be neutralized and/or removed as soon as possible. The reason for neutralizing or removing the agent is that the severity of effects is directly proportional to the absorbed dose. The ideal method of decontamination is removing all clothing, followed by a warm water and soap bath. Care must be taken to wash all cracks and crevices of the body. Only clear water should be used for decontamination of the eyes and body cavities.

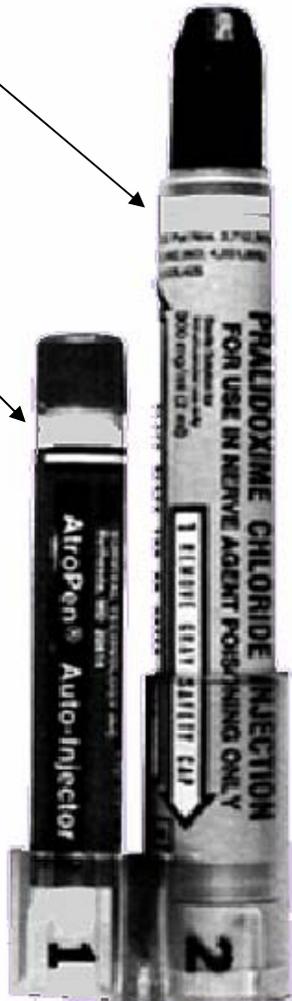
The antidote for nerve agent poisoning is highly effective, and consists of two drugs that are contained in the MARK I Chemical Agent Treatment Kit, or stored in bulk form:

- Atropine
- 2-PAM Chloride

Atropine treats the adverse effects of nerve agent, and 2-PAM Chloride acts by removing the nerve agent molecule from cholinesterase, restoring normal nervous system activity. If both drugs are given in a timely, appropriate manner, the outcome for nerve agent exposed patients is good.

2-PAM Chloride  
600 mg

Atropine  
2 mg



MARK 1 before use

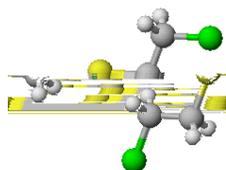


Mark 1 after use

# Blister Agents

Blister agents or mustards are poisons that destroy individual cells in all tissues that it comes into contact with. The most noticeable effects from these agents are blisters.

## Physical Properties



MUSTARD

In their normal state, blister agents are either solids or liquids. HD becomes a solid at 58 degrees F, and HT, 34 degrees F. If mustard is heated (57° F) it will generate harmful vapors. Blister agents are oily, and will burn if ignited. Both agents are pale amber to dark brown in color, and create a colorless gas. These agents get their name because of their smell, which is similar to mustard or garlic. Both mustard agents are very persistent when released into the environment, and can present a long-term liquid hazard.

## How Blister Agents Work

Blister agents were designed to inflict wartime casualties. They were used to restrict the use of terrain, to slow troop movements, and to hamper the use of materials and installations.

These agents can affect any skin tissue, but are especially dangerous to the more delicate tissues such as the soft membranes surrounding the eyes, the eyeball, lung tissue, and tissues of the mouth and throat. Both the liquid itself and the vapors generated from mustard create an extreme hazard. The greater the absorbed dose of either, the greater the damage. The effects of mustard are more severe during warm weather, on sweaty areas of the body. Mustard agent is a cellular poison; cell membranes are damaged within minutes after exposure. Severity of skin and tissue damage is highly dose dependent.

The delayed reaction is what makes blister agents insidious. There is little or no pain at the time of exposure. The development of chemical signs such as burning, stinging, redness or blisters is usually delayed between 2 and 24 hours, occasionally even up to 36 hours. Mustard agent is also a known carcinogen.

## **Routes of Exposure**

There are three main routes, or ways that a person can be exposed to a mustard agent. They are:

- Inhalation - breathing air that has been contaminated with mustard agent.
- Direct Contact - absorption through the skin or eyes.
- Ingestion - swallowing contaminated food or drink.

## **Inhalation**

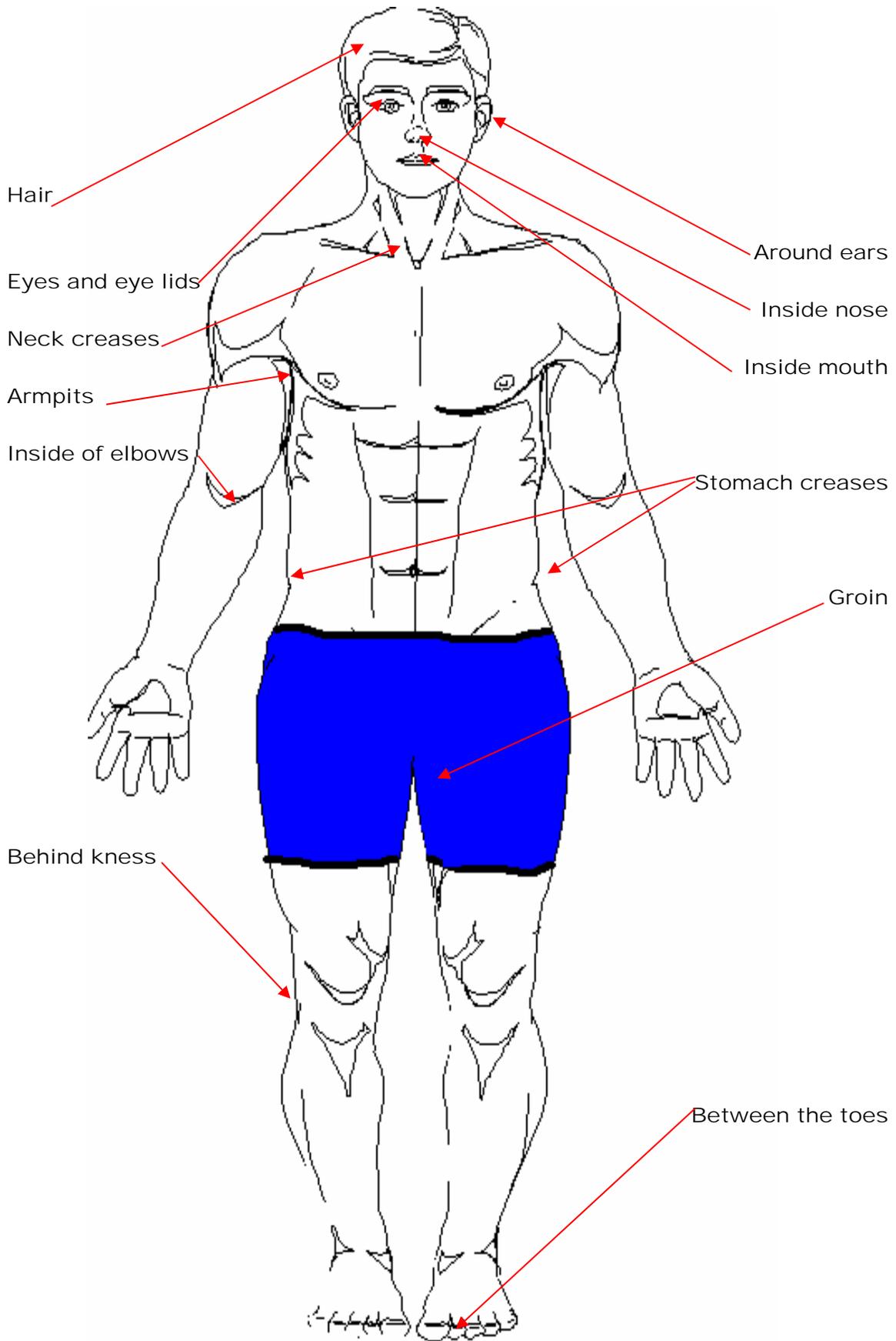
Although blister agents begin as a liquid, they are easily changed into vapors, which may be inhaled. These vapors mix freely with the air. If a person inhales the contaminated air, the toxic chemical enters the body through the respiratory system.

Once inhaled, the blister agents also have direct access to the lining of the nose, the throat, and the bronchial tubes. These warm, moist membranes are particularly vulnerable to the effects of the mustard agent. Mustard causes internal inflammation and hemorrhage, making the lungs susceptible to infection. Blister agents do the most damage in the upper airways, but with a heavy exposure, the air sacs in the lungs can be injured and filled with fluids.

## **Direct Contact**

Direct contact occurs when any skin surface or eye touches the liquid or a surface on which the agent has been deposited. It is through direct contact that contamination from one person to another is possible unless strict decontamination procedures have been followed. Unlike nerve agents, blister agents are highly damaging to the skin. Blister fluid is non-irritating and does not cause blistering upon contact with skin.

Warm, moist membranes are very susceptible to the effects of blister agents. This includes the lining around the eyelids, and the inside of the mouth and nose. Since warmth and moisture increase the blister agent's effect, other body areas are particularly susceptible to severe blistering. Examples of these areas are: between the toes, behind the knees, in the groin, the armpits, and behind the ears.



## Ingestion

If blister agent has been deposited on or in food items, drink, or anything that a person may place in the mouth, the agent can cause similar injury to the warm, moist tissues of the mouth, throat, and esophagus. Incidental hand-to-mouth contact, smoking, and swallowing airborne contaminants are also examples of potential exposure routes. Although the likelihood of the agent contaminating food or drink is small, you should be aware that it is possible for someone to become exposed through ingestion.

## Signs and Symptoms of Blister Agent Exposure

The severity of the signs and symptoms of blister agent exposure, and the rapidity with which they develop are greatly influenced by the weather conditions as well as degree of exposure. Hot, humid weather significantly increases the action of mustard.

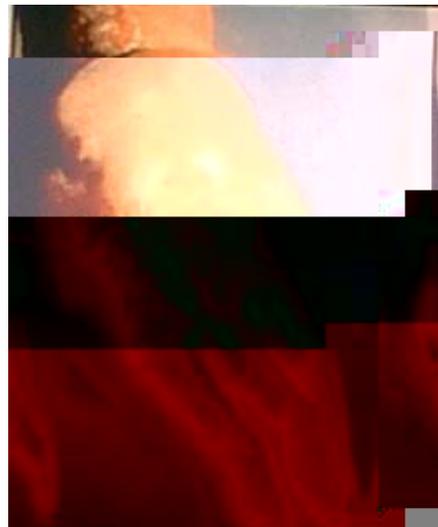
Following mustard exposure, the onset of clinical signs and symptoms is characteristically delayed for a period of hours. However, there are several physical signs to look for determining if someone has been exposed to a blister agent:

- Eye Irritation/Inflammation - The eyes are extremely sensitive to blister agent vapors. Effects include tearing, itching, blinking, reddening of eye tissue and a sensation of grit in the eye. These effects occur at lower doses more often than any other effect. For this reason injury to the eyes is the most sensitive indicator of a mustard agent exposure. The eyes can swell to the extent that they are completely closed. Burning pain can be severe. In severe cases, the cornea can become ulcerated.



Moderate, eye conjunctivitis.  
Department of Defense Image

- Photophobia - If the eyes are exposed to blister agent vapors, the person may experience photophobia, or pain caused by light.
- Erythema (reddening of the skin) - One of the earliest signs of dermal exposure is a skin rash or reddening that resembles sunburn. Itching and/or burning pain often accompany erythema. With mustard, erythema typically occurs between 4 to 6 hours after exposure. The range of onset time is 2 to 24 hours.
- Blisters - If not immediately decontaminated, or if exposure has been severe, the reddened skin develops fluid-filled blisters. The blisters, like serious chemical burns, may not be painful initially. However, pain and itching may occur not long after blisters develop. Care must be taken to avoid introducing infection into the blister wounds. Because of the damage to the skin, and the immunosuppressive action of mustard, the person's ability to fight infection will be diminished. Blisters may appear 2 hours after exposure; however, they often do not appear for at least 6 hours. In some cases, blisters may not appear for as long as 36 hours after exposure.

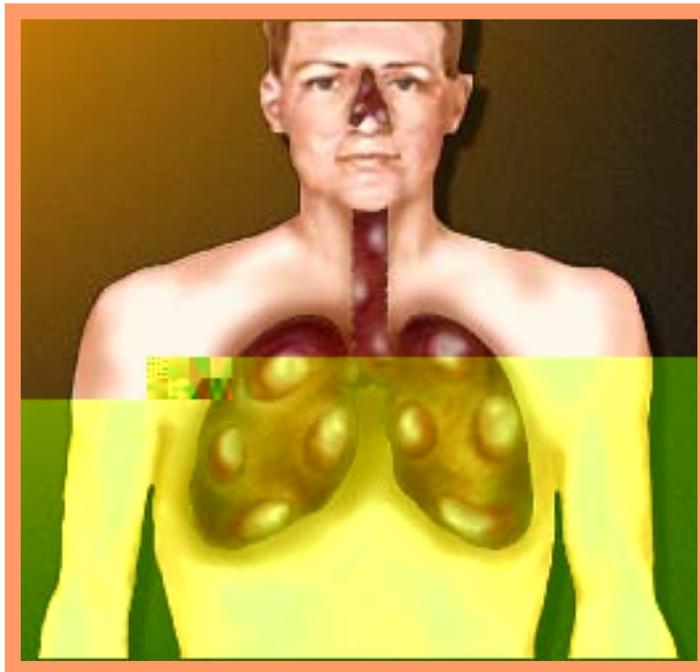


## Inhalation

- Inflammation of the Respiratory Tract - When blister agent is inhaled it will result in injury or death dependent on the dose. It causes swelling and necrosis of the mucus membrane of the airways, resulting in internal inflammation and blistering of the throat and lungs. Tracheobronchitis in the first 12 hours after mustard exposure is characteristic; and can be identified by hoarseness, hacking non-productive cough, chest tightness, and increased respiratory rate.

Depending on the severity of the exposure, the inflammation can cause a substantial amount of fluid to build up in the lungs. The combined effect of fluids and inflammation can obstruct the respiratory tract.

First signs of respiratory tract damage from mustard usually appear within 2 hours after exposure severity of response may increase for up to 24-48 hours later. For low-dose exposures, initial symptom onset may be delayed for up to 36 hours after exposure.



## **Systemic and Gastrointestinal Effects of Mustard**

Ingestion of food or water contaminated by liquid mustard produces nausea and vomiting, pain, diarrhea, and prostration. Mustard vapor does not significantly contaminate food or water. Exposure of only the skin to mustard may cause systemic symptoms such as malaise, nausea, vomiting, and fever at about the time the skin reddens. With severe exposures, particularly by extensive liquid contamination of the skin (which is not expected off post), these symptoms may result in prostration. Exceptional cases of severe systemic mustard poisoning may also present central nervous system symptoms such as cardiac irregularities. Shock may also occur. Severe systemic effects do not occur with lesser mustard exposures. With lesser skin or respiratory exposures to mustard, no apparent systemic lesions develop. Bone marrow, lymph nodes and the spleen may be injured with amounts approaching the lethal dose.

## **Factors that Affect Blister Agent Signs and Symptoms**

Time Factor (onset) - Although the signs and symptoms of mustard agent exposure are characteristically delayed, they may appear quickly if the person has been exposed to a large quantity. Depending on these factors, some signs may appear much sooner than others. Just as with nerve agent exposure, the onset of symptoms depends on the dose, duration, route of exposure, and the person's sensitivity to the agent.

If the blister agent has been inhaled, it causes a much quicker reaction than exposure through skin contact. This is because the agent is absorbed much faster in warm, moist areas such as the respiratory tract.

## **Peak Effect**

If the exposure route is inhalation, the effects can occur after a few hours of latency. Sneezing, coughing, and tracheobronchitis usually accompany the onset.

If the exposure route is dermal (liquid on the skin), the effects are usually delayed and absorption may continue for hours. This is likely to continue even after decontamination since the absorption may continue deep within the skin layer.

Some of the signs and symptoms described are very dependent on the dose received, the sensitivity of that individual, and the route of exposure.

## **Other Possible Causes of Blister Agent Signs and Symptoms**

The signs and symptoms described may be caused by health problems other than blister agent exposure; many of them may also be attributed to:

- hay fever (red eyes and runny nose)
- burns (thermal, sun, chemicals)
- poison ivy, poison oak, other contact allergies
- tear gas (large quantities)
- Certain drugs

## **Self Aid**

If you have reason to suspect that you have been exposed to chemical agent, you should apply self-aid principles, and wash any possible residue from your body and change clothes. Decontamination must take place immediately to prevent injury. Soap and water is the recommended decontamination solution for the State of Arkansas. The State of Arkansas Department of Health recommends you wash your entire body with soap and water to include any cracks and crevices. Only clear water should be used to wash the eyes.

## **Initial First Aid Treatment**

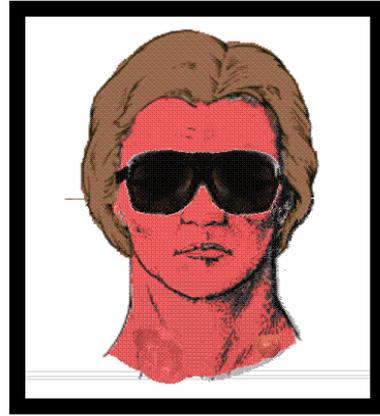
Treatment for a blister agent must be immediate. There is no antidote for blister agent poisoning. The best first aid treatment that can be offered consists of immediate removal or decontamination.

## **Treatment for Eye Contact**

If the agent has gotten into the eyes, speed in decontamination is especially critical. While the onset of blister agent effects on the skin may be delayed, irreversible damage may be done to the eyes and skin very quickly.

To the exposed person, the effects of blister agent are first evident in the eyes, though the onset may take 1-3 hours. Flush the eyes immediately with water by tilting the head to the side, pulling the eyelids apart with the fingers and pouring water slowly into the eyes.

Do not cover eyes with bandages, instead black opaque sunglasses should be used. Make sure that the hands and fingers used in this procedure are not contaminated with agent. If the eyes have been exposed to a blister agent, the person may experience photophobia or sensitivity to light.



## **Treatment for Skin Contact**

When performing decontamination procedures for blister agents, pay special attention to skin creases. These are the areas where the agent is most likely to cause severe blistering. Once at the hospital, additional treatment for the blisters may be given, as determined by the attending physician. This may include administration of antibiotics and other treatments common for burn injuries.



## Appendix I

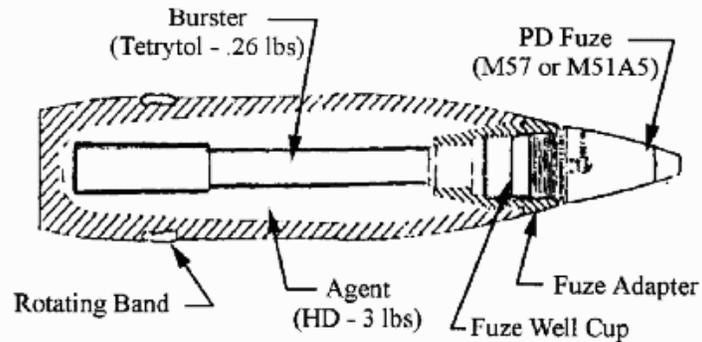
### OTHER STOCKPILE COMPONENTS

AERIAL SPRAY TANKS	CARTRIDGE AND PROJECTILES	BOMBS
	 	

	<b>GB</b>	<b>H,HD, or HT</b>	<b>VX</b>
<b>105 mm Cartridge</b>	<b>X</b>	<b>X</b>	
<b>155 mm Projectile</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>8 in Projectile</b>	<b>X</b>		<b>X</b>
<b>Weteye Bomb</b>	<b>X</b>		
<b>500 lb Bomb</b>	<b>X</b>		
<b>750 lb Bomb</b>	<b>X</b>		
<b>Aerial Spray Tank</b>			<b>X</b>

# Cartridges

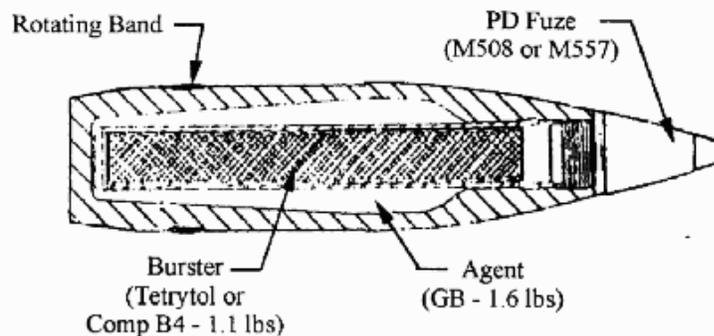
## 1315-C442 CARTRIDGE 105mm M60 HD



1315-00-028-4829 w/PD FZ M57  
1315-00-322-6365 w/PD FZ M51A5

The M60 105 mm Cartridge contained approx. 3 pounds of HD blister agent as well as .26 lbs of Tetryol burster. These rounds are stored 24 per wooden pallet.

## 1315-C441 CARTRIDGE 105mm M360 GB



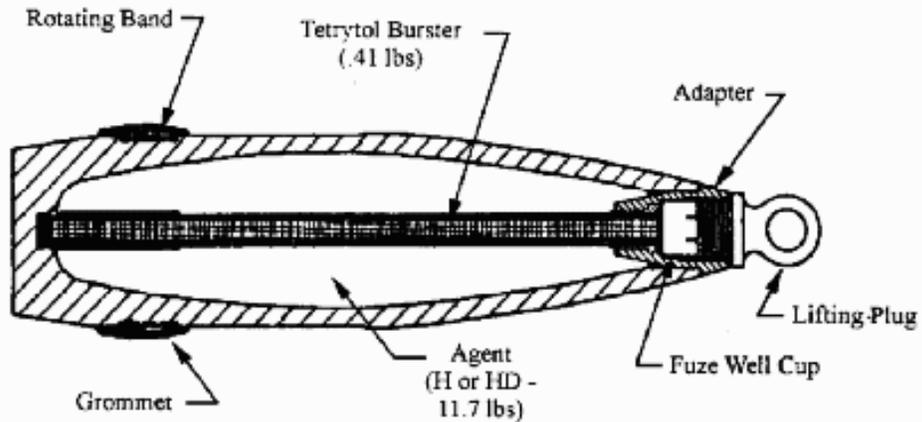
1315-00-203-8985 w/PD FZ M508  
1315-01-082-1234 w/PD FZ M557

The M360 105 mm contains 1.6 lbs of GB nerve agent and 1.1 lbs of either Tetryol or Comp B4 burster charge. Like the M60 the M360 is stored 24 rounds per wooden pallet.

# Projectiles

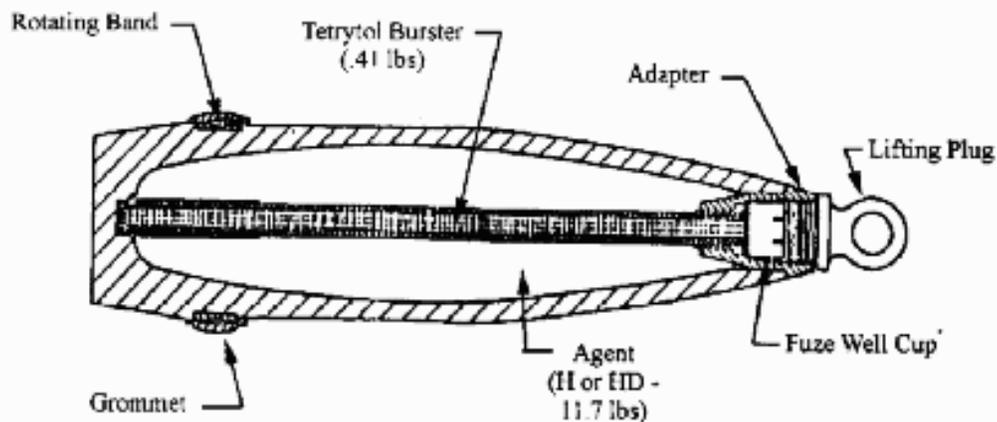
Projectiles come in a one of two sizes, 155 mm or 203 mm. The 155 mm are stored 8 projectiles per pallet and 203 mm are stored 6 per pallet. Below are cutaway diagrams of both sizes:

## 1320-D484 PROJECTILE 155mm M104 H, HD



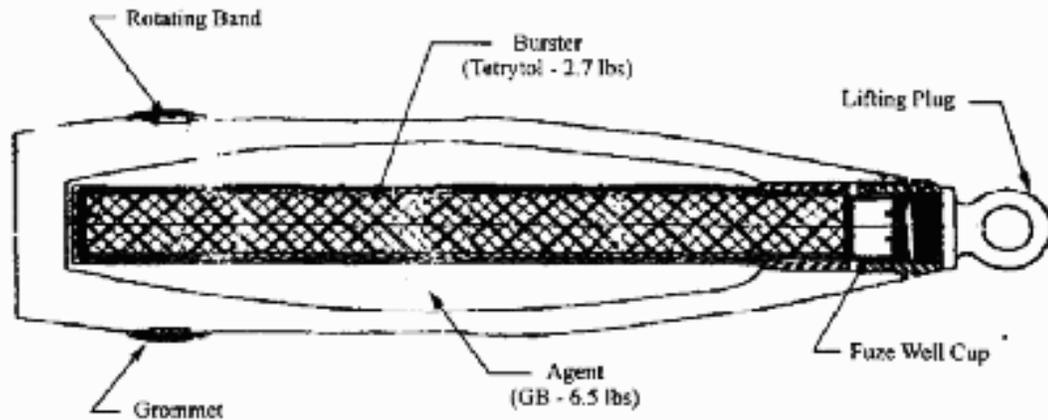
1320-00-028-4348 HD Uncrated  
1320-00-529-7350 HD 8/Pallet

## 1320-D543 PROJECTILE 155mm M110 H, HD



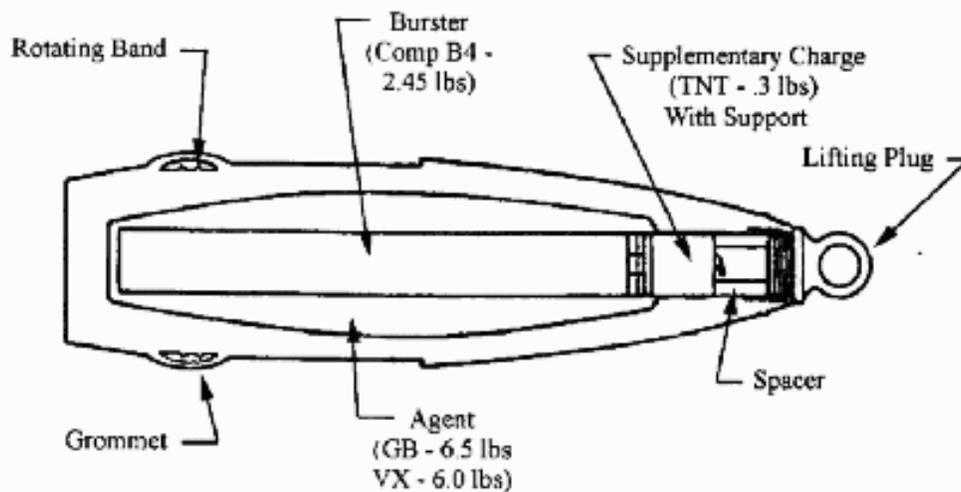
1320-00-096-3067 HD Uncrated  
1320-00-301-1824 H Uncrated  
1320-00-529-7352 HD 8/Pallet  
1320-00-529-7353 H 8/Pallet

### 1320-D542 PROJECTILE 155mm M121 GB



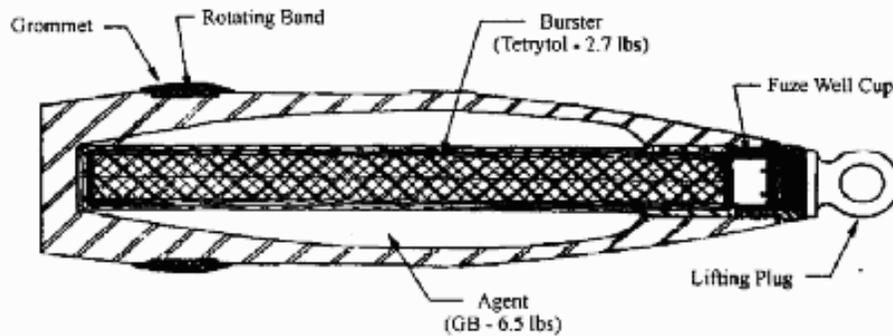
1320-00-529-7346 M121 8/Pallet  
1320-00-567-7909 M121 8/Wd box

### 1320-D542 PROJECTILE 155mm M121A1 GB 1320-D568 PROJECTILE 155mm M121A1 VX



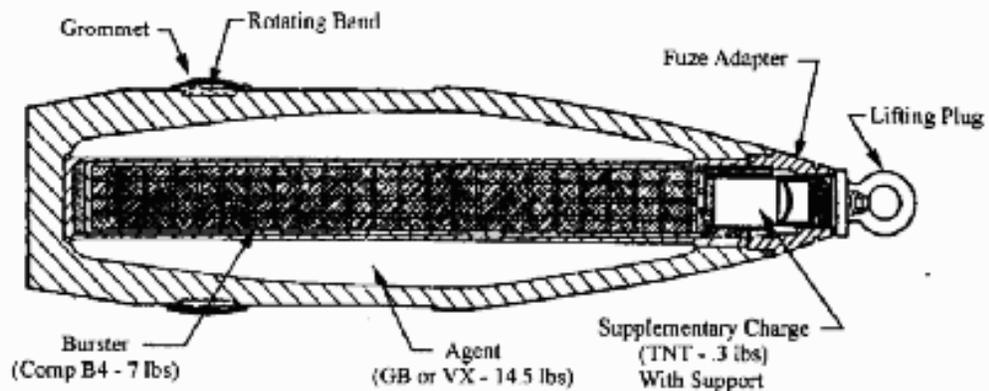
1320-00-143-7009 M121A1 8/Pallet  
1320-00-756-2888 M121A1 8/Pallet

**1320-D483 PROJECTILE 155mm M122 GB**



1320-00-529-9033 M122

**1320-D695 PROJECTILE 8 INCH M426 VX  
1320-D696 PROJECTILE 8 INCH M426 GB**



1320-00-763-6878 VX w/Burster M83

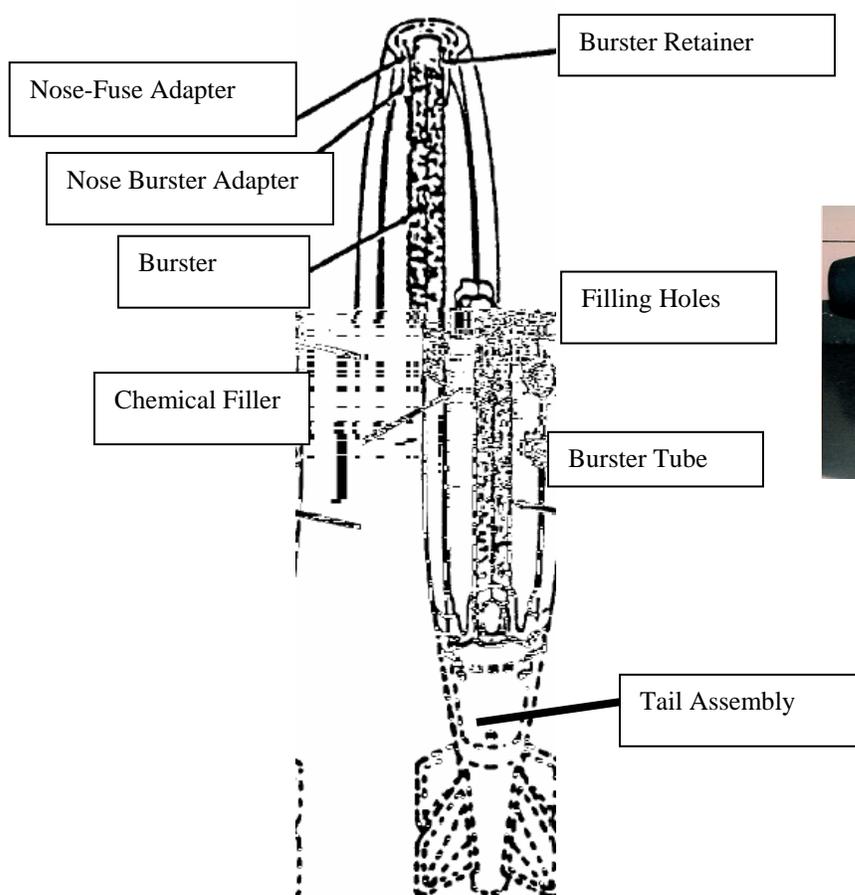
1320-00-763-6879 GB w/Burster M83

# Bombs

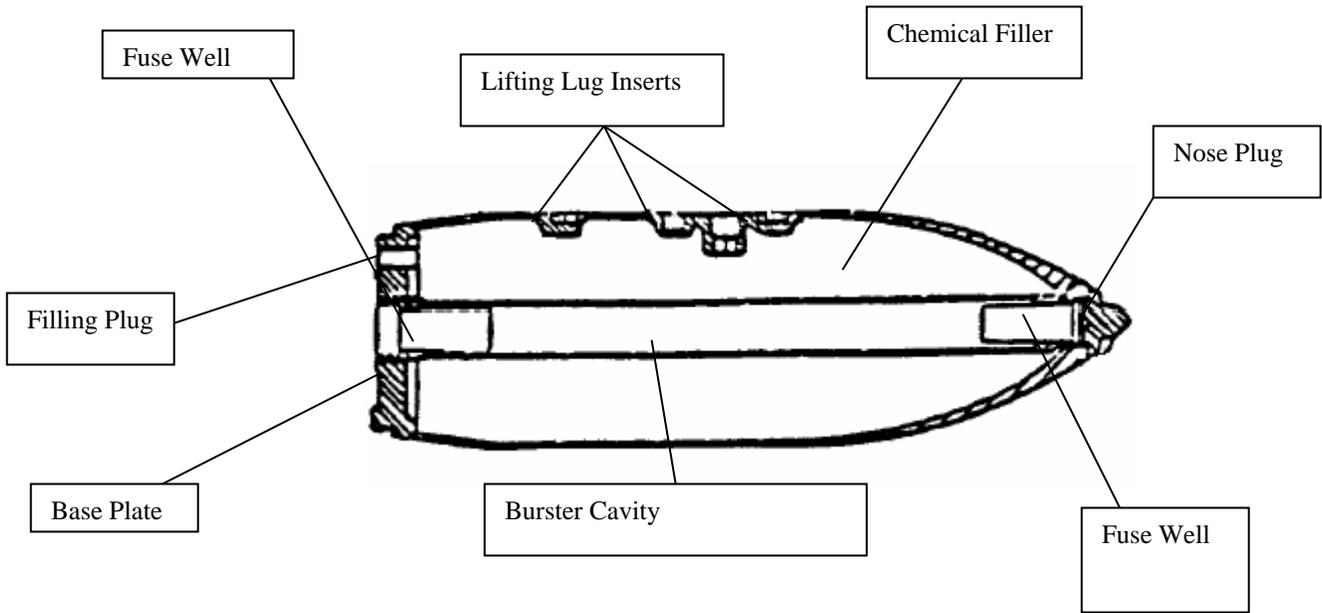
There are three different sizes of GB filled bombs: MC1 750lb, MK94 500lb, and the MK116 Weteye. The amount of agent contained in these munitions ranges from 105 to 350lbs. While in storage, none of these bombs are stored with the burster charges installed, eliminating the chances of an explosion. The bodies are either made of an aluminum alloy or steel. Those made from aluminum are packaged in a vapor proof container while the steel bodied ones are stored 1 or 2 per pallet as shown below. The most likely way of any leakage would be from vapor seeping out the welds towards the front of the bomb.

## MK94 500lb Bomb

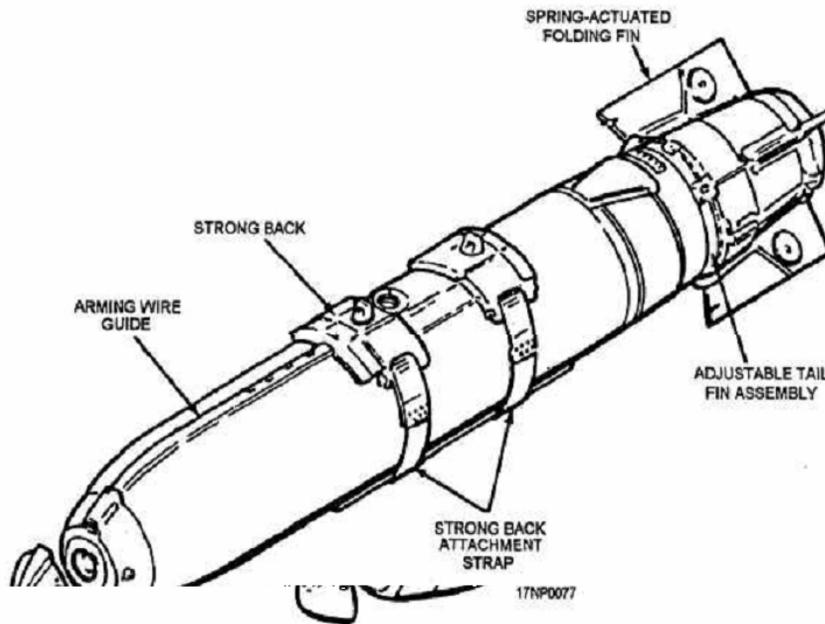
108lbs of GB Nerve Agent



**MC-1 750lb Bomb**  
220lbs of GB Nerve Agent

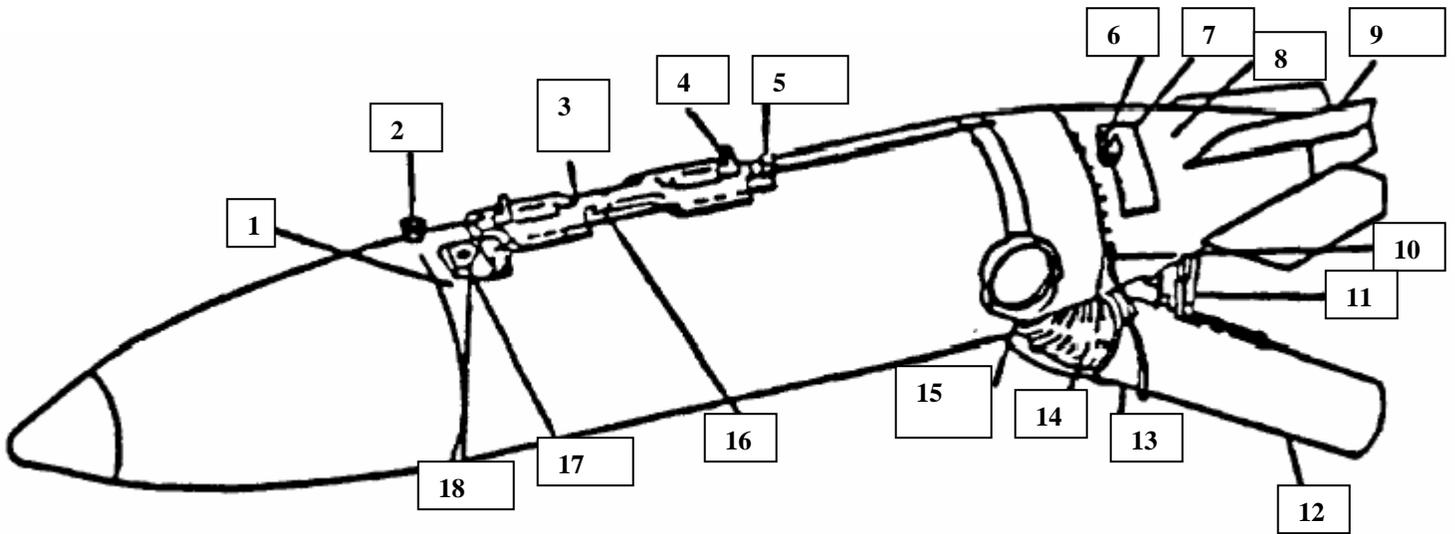


**MK 116 WETEYE Bomb**  
347lb of GB Nerve Agent



# Aerial Spray Tanks

The Aerial Spray Tanks contain 1365lbs of VX nerve agent in 1/8 inch steel tank. These tanks are over packed in a vapor proof modified jet engine holder. In the unlikely event of a leak any liquid or vapor would be contained in this over pack.



- |                              |                                            |
|------------------------------|--------------------------------------------|
| 1. AGENT CONTAINER           | 10. ARMING PIN                             |
| 2. FILLER BOSS               | 11. SWAYBRACE                              |
| 3. HARDBACK ASSEMBLY         | 12. <b>DISSEMINATION NOZZLE</b> (EXTENDED) |
| 4. suspension LUGS (TYPICAL) | 13. CONNECTOR DUCT SHIELD                  |
| 5. ELECTRICAL RECEPTICAL     | 14. CONNECTOR DUCT                         |
| 6. ACTUATOR                  | 15. OUTLET CUTTER                          |
| 7. ACCESS DOOR               | 16. NAMEPLATE                              |
| 8. TAIL CONE                 | 17. INLET CUTTER                           |
| 9. TAIL CONE FIN             | 18. AIRSCOOP "                             |

## **SOURCE DOCUMENTS AND INFORMATION**

The major sources used for the development of this document were:

*CSEPP Chemical Awareness Course*, by Emily D. Copenhaver and Annetta P. Watson, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Arkansas State and County Emergency Operations plans.

CSEPP Chemical Awareness Course, Lockheed Martin Energy Research Corporation

[www.globalsecurity.org](http://www.globalsecurity.org)

[www.fas.org](http://www.fas.org), Federation of American Scientist

Arkansas Specific ACT FAST Course, Arkansas Dept. of Emergency Management

Arkansas Specific Chemical Awareness Home Study Course, by George Cossey March 2000

<http://www.dtic.mil>, The Defense Technical Information Center

# EXAM ANSWER SHEET

## CHEMICAL AWARENESS

Please darken the square that corresponds with your answer.

1. A  B  C  D
2. A  B  C  D
3. A  B  C  D
4. A  B  C  D
5. A  B  C  D
6. A  B  C  D
7. A  B  C  D
8. A  B  C  D
9. A  B  C  D
10. A  B  C  D
11. A  B  C  D
12. A  B  C  D
13. A  B  C  D
14. A  B  C  D
15. A  B  C  D
16. A  B  C  D
17. A  B  C  D
18. A  B  C  D
19. A  B  C  D
20. A  B  C  D
21. A  B  C  D
22. A  B  C  D
23. A  B  C  D
24. A  B  C  D
25. A  B  C  D

**NAME:** \_\_\_\_\_

**ADDRESS:** \_\_\_\_\_

**AGENCY:** \_\_\_\_\_

**AGENCY ADDRESS:** \_\_\_\_\_

**SOCIAL SECURITY NUMBER:** \_\_\_\_\_

**DAYTIME PHONE:** \_\_\_\_\_ **EVENING PHONE:** \_\_\_\_\_

**MAIL CERTIFICATE TO:** HOME  AGENCY

**NOTE:** If you are an Arkansas Basic EMT please complete the CEU Form at the end of this document.

## FINAL EXAM

1. Actions the general public would probably take in the event of a chemical warfare agent incident where the agent plume crossed the boundary of the Pine Bluff Chemical Activity would be
  - a Move to a center room of your home
  - b Go into their storm shelter
  - c Evacuate or shelter in place
  - d None of the above
2. Agents stored at the Pine Bluff Chemical Activity are nerve and blister.
  - a True
  - b False
3. Chemical warfare agents stored at the Pine Bluff Chemical Activity are stored
  - a In earthen covered bunkers (Igloos)
  - b In tightly guarded secure areas
  - c Unprotected in the open
  - d Both a and b
4. Nerve agents are classified as "nerve agents" because
  - a They adversely effect the nervous system
  - b They make anyone who is exposed very nervous
  - c They cause the nerves to shut down and not function
  - d None of the above
5. Nerve agents are very similar to what other chemical agents?
  - a Insecticides containing organophosphates
  - b Malathion
  - c Parathion
  - d All the above

6. Nerve agents in their normal state are
- a Solids because they freeze at a very high temperature
  - b Liquid and if heated generate vapors
  - c Very watery and have no color or odor
  - d A high risk for explosion
7. Blister agents are so named because
- a The antidote for blister agent causes blisters
  - b When water is applied to the effected body part, it forms blisters
  - c It was named after the person who created it Dr. William Samuel Blister P.H.D.
  - d They destroy individual cells they come into contact with and cause blisters
8. In their normal state blister agents are
- a Either solid or liquid
  - b Liquid only
  - c Become a solid at 58° F
  - d Both a and c
9. Rockets stored at PBCA are
- a Considered hazardous waste
  - b Contain approximately 10 pounds of agent
  - c Contain a solid rocket propellant
  - d All the above
10. The obsolete rockets are
- a Checked for leakage on a routine basis
  - b Moved from igloo to igloo to allow for cleaning of storage facility
  - c Placed in overpacks if they start leaking
  - d Both a and c

11. There has never been a fatality associated with the Chemical Stockpile Emergency Preparedness Program.

- a True
- b False

12. The M23 Landmine contains 25 pounds of VX nerve agent.

- a True
- b False

13. The M23 Landmines are

- a Stored in igloos
- b Stored three mines to a 16 gallon container
- c Stored in a container that is waterproof
- d All the above

14. The one-ton containers located at the Pine Bluff Chemical Activity

- a Are stored in the open with no security since they cannot be moved due to weight.
- b Contain an explosive device to release the agent
- c Are stored in an outside storage yard
- d Do not require routine inspection due to the construction of the heavy steel container.

15. The Pine Bluff Chemical Activity has in the past experienced fewer leaking rockets many other facilities around the nation.

- a True
- b False

16. Rockets containing\_\_\_\_have been the greatest safety concern over the years of storage.

- a Mustard
- b GB and VX
- c GB
- d Both a and b

17. What factors determine the adverse effects of a chemical release?

- a Quantity of agent released
- b Weather conditions
- c Concentration of agent
- d All of the above

18. What year did FEMA and the Army sign the initial memorandum of understanding?

- a 1991
- b 1997
- c 1988
- d 1986

19. The most important thing that local government can do in the event of a chemical agent release that threatens the off post community is

- a Keep the evacuation routes open
- b Provide reception centers for evacuees
- c Accurate and timely notification
- d Open emergency shelters

20. The steps to shelter in place are

- a Take your pets and go indoors
- b Shut off the ventilation system
- c Seal all vents from outside air
- d All the above

21. Based on the CSEPP doctrine in Arkansas, how would you perform self-aid for nerve agent exposure?

- a Remove all clothing and wash with soap and water paying close attention to cracks and crevices.
- b Wash exposed areas of skin with soap and water, it is not necessary to change clothing since the agent cannot penetrate fabric materials.
- c Induce vomiting
- d None of the above

22. The chemical warfare agents stored at the Pine Bluff Chemical Activity are

- a GB, VX and Lewesite
- b GB, VX and nerve agent
- c GB, VX and blister
- d VX and mustard

23. What are the ways that you may be exposed to nerve agents?

- a The wind blows it off the Arsenal
- b From a truck or train hauling the agents
- c By living down wind from the facility that manufactures the agent on the Pine Bluff Chemical Activity
- d By inhalation, direct contact or ingestion

24. If the eyes of an individual have been contaminated with a blister agent and they experience pain caused by light, this is called

- a Miosis
- b Conjunctivitis
- c Photophobia
- d Opticalinversion

25. If exposed to the clear fluid from the blister of a victim of blister agent contamination, you can become contaminated also.

- a True
- b False

CHEMICAL STOCKPILE EMERGENCY PREPAREDNESS PROGRAM

**STUDENT INFORMATION**

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**CHEMICAL AWARENESS HOME STUDY COURSE**

---

\_\_\_\_\_  
LAST NAME

\_\_\_\_\_  
FIRST NAME

\_\_\_\_\_  
MIDDLE INITIAL

\_\_\_\_\_  
SSN OR DL NUMBERR

\_\_\_\_\_  
DATE OF BIRTH

\_\_\_\_\_  
ORGANIZATION NAME

\_\_\_\_\_  
ADDRESS

\_\_\_\_\_  
(STREET)

\_\_\_\_\_  
(CITY)

\_\_\_\_\_  
ZIP CODE

\_\_\_\_\_  
TELEPHONE #

\_\_\_\_\_  
COUNTY

WHICH OF THE FOLLOWING ARE YOU ASSOCIATED WITH:

\_\_\_\_ POLICE

\_\_\_\_ FIRE

\_\_\_\_ FEDERAL GOVERNMENT

\_\_\_\_ STATE GOVERNMENT

\_\_\_\_ COUNTY GOVERNMENT

\_\_\_\_ CITY GOVERNMENT

\_\_\_\_ OTHER

# CHEMICAL STOCKPILE EMERGENCY PREPAREDNESS PROGRAM COURSE PARTICIPANT EVALUATION FORM

COURSE TITLE: CHEMICAL AWARENESS HOME STUDY COURSE

COURSE CODE: HS-CHEM CITY: \_\_\_\_\_ STATE: \_\_\_\_\_ REGION: VI

COMPLETED DATE: \_\_\_\_\_

The information will be used to compare responses provided in the overall assessment of the course content. Please mark the appropriate response.

**1. Indicate the type of agency or organization in which you are employed:**

Government	Private Sector
Federal ____	Business/Industry ____
State ____	Volunteer Service ____
Local ____	Other (please indicate) _____

**If you work in a local government, indicate the population size:**

Below 10,000 ____	10,000-49,999 ____	50,000-149,999 ____	Over 150,000 ____

**Indicate the emergency service in which you are employed:**

Emergency management ____	Social Service ____
Fire Service ____	Education ____
Law Enforcement ____	EMS/Health Care ____
Public Works/Utilities ____	Other (please indicate) _____

**Years of experience in this service:**

Less than 1 ____	1-5 years ____	6 to 10 years ____	11-15 years ____	16-20 years ____
Over 20 years ____				

**2. This information will be used to assess the effectiveness of the course and improve course content.**

On a scale of 1 to 5, with 5 being the highest, please circle the response which best reflects your opinion.

Requirements and objectives were clear	1 2 3 4 5
Activities supported course objectives	1 2 3 4 5
Printed materials were complete and well organized	1 2 3 4 5
Contributed to my knowledge and skills	1 2 3 4 5
Was worth recommending to others	1 2 3 4 5

COMMENTS:

\_\_\_\_\_

What would you do to improve this course?

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**3. This information will be used to assess and improve the quality of the course content.**

On a scale of 1 to 5, with 5 being the highest, please rate each module or unit of instruction. Please make comments about each module in the space below.

INTRODUCTION	1 2 3 4 5
CHEMICAL STOCKPILE	1 2 3 4 5
AGENT CHARACTERISTICS	1 2 3 4 5
STOCKPILE COMPONENTS	1 2 3 4 5
ACCIDENT TYPES, HAZARDS AND DETECTION	1 2 3 4 5
ROLE OF CSEPP	1 2 3 4 5
AVOIDING EXPOSURE	1 2 3 4 5
NERVE AGENTS	1 2 3 4 5
BLISTER AGENTS	1 2 3 4 5
EXAM	1 2 3 4 5

COMMENTS:

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