



Chemical Warfare Agent (CWA) Identification Overview

Chemical Warfare Agent Identification Fact Sheet Series

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This Chemical Warfare Agent (CWA) Identification Fact Sheet is part of a Physicians for Human Rights (PHR) series designed to fill a gap in knowledge among medical first responders to possible CWA attacks. This document in particular outlines differences between a select group of vesicants and nerve agents, the deployment of which would necessitate emergency medical treatment and documentation.

PHR hopes that, by referencing these fact sheets, medical professionals may be able to correctly diagnose, treat, and document evidence of exposure to CWAs. Information in this fact sheet has been compiled from publicly available sources.

A series of detailed CWA fact sheets outlining in detail those properties and treatment regimes unique to each CWA is available at <https://phr.org/issues/weapons/prohibited-weapons/chemical-weapons/chemical-weapons-fact-sheets/>

Collect urine samples, and blood and hair samples if possible, immediately after exposure

Physical Properties

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- | | |
|-----------------------------|---|
| VX
(Nerve Agent) | <ul style="list-style-type: none">• A lethal dose (10 mg) of VX, absorbed through the skin, can kill within minutes• Can remain in environment for weeks• Odorless/tasteless• Oily consistency• Amber color• Spread in aerosol or liquid form• Heavier than air |
|-----------------------------|---|

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|--------------------------------|---|
| Sarin
(Nerve Agent) | <ul style="list-style-type: none">• A lethal dose (1,700 mg) of sarin, absorbed through the skin, can kill within 5-10 minutes• Evaporates quickly• Odorless/tasteless/colorless• Absorbed slowly through skin• Spread in aerosol or liquid form• Heavier than air |
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| Tabun
(Nerve Agent) | <ul style="list-style-type: none">• A lethal dose (4,000 mg) of tabun, absorbed through the skin, can kill within 15-20 minutes• Evaporates quickly• Tasteless/colorless• Fruity odor• Spread in aerosol or liquid form• Heavier than air |
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- | | |
|--------------------------------------|--|
| BZ
(Incapacitating Agent) | <ul style="list-style-type: none">• Lethal only in very high doses• Odorless/colorless• White cloud accompanies delivery system• Spread in aerosol or liquid form |
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- | | |
|-----------------------------------|---|
| Mustard Gas
(Vesicant) | <ul style="list-style-type: none">• Is not usually lethal if advanced care is provided• Can remain in environment for up to a week (but much longer if buried beneath soil surface)• Pale yellow or amber color• Usually odorless but can smell like mustard, onions, or garlic• Heavier than air |
|-----------------------------------|---|

Exposure to higher concentrations of chlorine gas can rapidly lead to distress with airway constriction and accumulation of fluid in the lungs.

Collecting Samples to Test for Exposure

All Chemical Warfare Agents

- Collect urine samples, and blood and hair samples if possible, immediately after exposure.
- Collect follow-up samples at 24 hours and 48 hours and again 7 days after exposure.
- Blood and urine can be collected as long as 30 days after exposure and laboratory tests may reveal the presence of CWAs (mustard gas, nerve agents, and respective breakdown products).
- Use containers made of unbreakable plastic.
- Affix a means of identifying samples, record date taken, time taken; seal securely.
- Document all symptoms on paper and include with sample; note amount of time it took patients to begin experiencing symptoms after initial exposure.

Urine-specific

- Collect at least 10-30 ml of urine.
- Collect a control urine sample from a person who was not exposed.
- Collect urine in sterile urine cups.
- Ship urine sample with dry ice if possible so that sample is frozen, or at least kept cold.

Blood-specific

- Collect at least 10-15 ml of blood.
- Keep blood samples cold by placing on ice for as long as possible. Where possible, spin blood to collect plasma. If not possible, allow blood to coagulate and collect serum.

Hair-specific

- Collect a sample, preferably before it has been washed.
- The hair does not need to be collected at the scalp.

Mustard Specific

- Conduct a Complete Blood Count (CBC) test
 - A CBC is a regularly used test to examine the health of an individual by measuring the concentration of substances in the blood.
 - Red and white blood cell count may indicate presence of mustard gas.
 - Blood test is usually combined with a urine test to gather definitive proof of exposure.

BZ and Nerve Agents Specific

- Cholinesterase testing can detect organophosphate poisoning (this test will detect organophosphates, whereas urine tests can detect more specific chemical agents).
 - Significantly decreased cholinesterase levels can indicate poisoning.
 - Caution: decreased cholinesterase activity can also result from liver disease and malnutrition.

Place wet towels, rags, or other airtight materials along openings under doors or around windows to prevent CWAs from seeping in.

Protection

All CWAs

- Remain upwind of the affected area if possible.
 - Use gas masks to protect eyes and lungs.
 - Use full body gear to protect skin (normal clothing offers little protection).
 - Attempt to seal off room from contaminated air if unable to exit a contaminated building.
 - Stay in rooms without vents or windows for as long as possible and until shelling or bombing has ceased and agents have been dispersed by wind. Use judgment on how long to stay indoors.
 - Turn off ventilation systems if possible.
 - Set ventilation systems to only cycle air inside the building if a CWA is released outside.
 - Place wet towels, rags, or other airtight materials along openings under doors or around windows to prevent from seeping in.
 - Do not consume food and water that has come into contact with a CWA.
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Sarin Specific

- Liquid sarin on the skin can be wiped or blotted off to prevent absorption.
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BZ Specific

- A folded cloth placed over the mouth can help guard against inhalation and protect lungs.

All nerve agents will cause symptoms within seconds of exposure to vapors and minutes or up to 18 hours after exposure to liquid.

Symptoms

Nerve Agents

- Miosis (pinpoint pupils)
 - Heavy sweating/drooling
 - Nausea and respiratory distress
 - Localized twitching and seizures
 - Altered mental status
-

VX Specific

- Symptoms will occur seconds after exposure.
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Sarin Specific

- Symptoms will occur within one minute after exposure.
-

Tabun Specific

- Symptoms will occur within 2-5 minutes after exposure.
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BZ

- Symptoms will occur within one hour after exposure and last up to three days.
- Severely altered mental status
- Dilated pupils
- Dry eyes, mouth, and skin
- Vision impairment
- Coma

A dilated pupil common in BZ exposure.



A urine sample can definitively determine whether a person was exposed to a CWA.

Symptoms

continued

Small pinpoint pupils, a common symptom of exposure to nerve agents, is evident in the eye on the left.

Mustard Gas

- Symptoms will occur within 2-24 hours after exposure.
- Skin irritation and blisters
- Severe irritation of eyes, nose, mouth, and throat
- Difficulty breathing, leading to pneumonia



Differential Diagnosis

Nerve Agents

- A patient exhibiting the above symptoms has not necessarily been exposed to a nerve agent.
- A urine sample can definitively determine whether a person was exposed to a nerve agent.
- All nerve agents will cause similar damage to individuals.
 - All nerve agents will cause symptoms within seconds of exposure to vapors and minutes or up to 18 hours after exposure to liquid.
- Patients with neurological conditions such as epilepsy can have seizures.
 - Epilepsy can be worsened by high levels of stress (e.g., conflict zones).
- Distinguish from effects of tear gas
 - Tear gas causes runny nose, respiratory distress, nausea, vomiting, and drooling.
 - Extreme amounts of tear gas can cause respiratory failure.
 - Symptoms are usually temporary and recede within an hour.
 - Tear gas is recognizable by the white plume emitted from the canister.
- Overexposure to some insecticides will have the same effect as a nerve agent.

BZ

- A patient exhibiting the above symptoms has not necessarily been exposed to BZ.
- Exposure to BZ can only be detected in urine.
- Other incapacitating agents and recreational drugs can cause similar symptoms.
- Heat stroke will present similar “hot, dry, and mad” symptoms.
- Fatigue can cause an altered mental status and lethargy.

continued

A patient exhibiting symptoms mentioned here has **not** necessarily been exposed to a CWA.

Differential Diagnosis

continued

Mustard Gas

- A patient exhibiting the above symptoms has not necessarily been exposed to mustard gas.
- A urine sample can definitively determine whether a person was exposed to mustard gas.
- Other vesicants in addition to mustard gas will cause similar damage to individuals.

Blisters

- Blisters similar to those seen in cases of mustard gas exposure can be caused by allergic reactions to certain insects or plants.
- Itching, rashes, and swelling are also common in many allergic reactions.
- Blisters can also be caused by diseases:
 - Bullous pemphigoid – common in people over 60
 - Dermatitis herpetiformis – a condition in which large blisters are intensely itchy and develop bilaterally
 - Chronic bullous dermatosis of childhood – where blisters form around the face, mouth, and genitals

Eyes

- Conjunctivitis can be caused by allergic, viral, or bacterial infections as well as mustard gas.

Respiratory Distress

- Other respiratory conditions such as bronchitis can cause a hoarse voice and pneumonia.
- Bacterial infections from a variety of sources can also cause pneumonia.
- Hot air or steam inhaled from fires, incendiary weapons, or caustic chemical fumes can also cause similar tissue damage to the respiratory system.

Cut off any clothing that would have to go over the head to prevent further contamination.

Decontamination

ALL CWAs

- Rapid decontamination is crucial to patient's well-being.
- Triage contaminated patients into three groups:
 - Medically stable
 - Require immediate stabilization (arterial bleeding, cardiogenic shock, etc.)
 - Patients with life-sustaining medical gear (tourniquet, airway adjunct) who will need new gear after decontamination.
- Wear protective clothing, heavy rubber gloves, and a respirator.
- Work from head to toes.
- Cut off clothes, do not pull over the head.
- Wash skin thoroughly with 10cc bleach per liter of water (saline).
- Cut off or wash hair after a sample has been collected and stored in a plastic tube.
- Decontaminate rescuers as well.

Mustard Gas Specific

- Decontamination within 2 minutes will prevent blister formation.
- Fluid inside blisters is not a chemical agent.
- Gently wash skin immediately with soapy water for decontamination. May use 10cc bleach per liter of water (saline), but take care not to damage skin.

Rapid decontamination is crucial to the patient's well-being.

Treatment

Nerve Agents

- Atropine at 2 mg IM and 600 mg of pralidoxime chloride.
- Atropine alone is also effective.
- Administer every 30 minutes up to 3 times – may have to be repeated more often.
- Administer a diazepam (Valium) IV to control convulsions.
- Suction airway – assisted ventilation may be necessary.
- Use an OPA (oropharyngeal airway) to maintain a patient's airway.

BZ

- Do not administer atropine.
- Administer 2–3 mg IM of physostigmine.
- Repeat every 15 minutes until patient improves.
- Remove weapons and keep patient calm.

Mustard Gas

- Apply petroleum jelly to eyelids to prevent them from sticking shut.
- Follow routine wound care for skin irritation and blisters.
- Use cool mist or steam to ease respiratory distress.

Abbreviations

IM – Intramuscular
IV – Intravenous
mg – Milligram
ml – Milliliter
OPA – Oropharyngeal Airway

* Information in this fact sheet has been compiled from publicly available sources, including: The Centers for Disease Control and Prevention, Emedicine, Emergency Medical Technician Transition Manual, Federation of American Scientists, Global Security, New York State Department of Health, QANDIL, US Army, and US Occupational Safety and Health Administration.



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