

BZ Recognition and Treatment

Chemical Warfare Agent Identification Fact Sheet Series

The incapacitating agent BZ (3-quinuclidinyl benzilate) is an odorless and colorless chemical warfare agent (CWA) that may be deployed in liquid or vapor form and may be inhaled or absorbed through the skin and eyes. Symptoms of BZ exposure appear anywhere between 1-24 hours after contact with the agent. BZ was designed to induce symptoms similar to anticholinergic syndrome, including hallucinations, dryness, difficulty seeing, and confusion; these symptoms are usually temporary but long-lasting.

- BZ is classified as an incapacitating agent that causes hallucinations, severe confusion, difficulty seeing, and diminished mucous secretions.
- Exposure to BZ is not normally lethal but can be in high doses. It is incapacitating even in small doses.
- BZ is odorless, tasteless, and colorless.
- The best protection against BZ is to avoid exposure.
- Leave the affected area if possible. If not, attempt to seal off a room by closing ventilation to the outside and sealing spaces under doors and around windows with wet towels to prevent gas from entering.
- Gas masks will only protect the eyes and lungs. Normal clothes provide little to no protection, as BZ will penetrate clothing and be absorbed across any body surface.
- A folded cloth placed over the mouth can help guard against inhalation and protect lungs.
- Do NOT eat food or drink water exposed to BZ gas.
- Signs and symptoms appear anywhere from 1-24 hours after exposure:
 - Severely altered mental status (hallucinations, giddiness, confusion)
 - Lack of secretions – dry mucous membranes » dry mouth, eyes, skin
 - Dilated pupils, blurred vision, nausea, vomiting
 - Large doses can result in coma with airway compromise
- Symptoms may last for up to three days.

continued

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This CWA 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. PHR hopes that, by referencing these fact sheets, medical professionals may be able to correctly diagnose, treat, and document evidence of exposure to CWAs.

Do **not** administer atropine; it will exacerbate the symptoms.

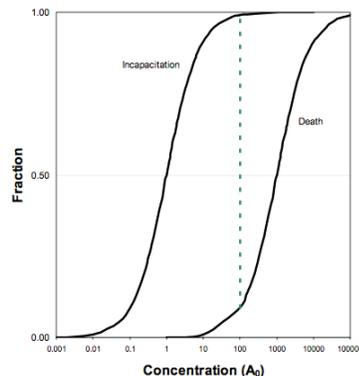
BZ Overview

continued

- A patient exhibiting the above symptoms has **not** necessarily been exposed to BZ:
 - Other incapacitating agents and recreational drugs can cause similar symptoms.
 - Heat stroke will classically present as “hot, dry, and mad.”
 - BZ exposure can only be detected in urine, blood, and sometimes hair samples.
- Decontamination is critically important – for both affected patients and rescuers.
 - Wear protective clothing, including a respirator, and use heavy rubber gloves for protection. If possible decontaminate in an area away from where treatment will be given.
 - Decontaminate all protective clothing, respirator, and gloves after exposure to contaminated clothing.
 - Equipment may have to be disposed of in sealed, impermeable plastic bags.
 - Work from head to toes.
 - Cut off clothes rather than pull them over the head to avoid further exposure to eyes, nose, and throat.
 - Gently wash skin with 10cc bleach per liter of water (saline).
 - If available, use neutralizing preparations such as chloramine solutions or fuller’s earth.
- Do NOT administer atropine; it will exacerbate the symptoms.
- Monitor patient closely.
- Remove any weapons immediately (confused patients can harm themselves and others).
- Restraints may be necessary.
- Inject 2-3 mg of physostigmine IM (antidote) every 15 minutes until patient begins to improve.
- Insert an IV drip of the antidote afterwards to continue a slow steady dose until the patient recovers.

Properties of BZ

The relationship between incapacitation and lethality.



Symptoms of exposure to BZ severely alter mental status.

Properties of BZ

continued

- Classified as an incapacitating agent
- Can be lethal in high doses
- Can be weaponized in a liquid, mist, or gas form
- Odorless and colorless
- Can be identified by the white cloud emanating from the delivery system
- Absorbed easily through the eyes and lungs; more slowly through the skin

Collect Samples to Test for Exposure (applies to all CWAs)

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

Hair-specific

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

Exposure to BZ is not normally lethal but can be in high doses.

Protection Against BZ

- 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.
 - Turn off ventilation systems if possible.
 - Set ventilation systems to only cycle air inside the building if gas is released outside.
 - Place wet towels, rags, or other airtight materials along openings under doors or around windows to prevent gas from seeping in.
- Do not consume food and water that has come into contact with BZ.

Recognizing BZ Exposure

- Physical reactions to BZ gas can manifest anywhere from 1-24 hours after exposure.
- Symptoms of exposure severely alter mental status:
 - Hallucinations
 - Confusion
 - Giddiness
 - Slurred or unintelligible speech
 - Disrobing
 - Ataxia
- Dry mouth, eyes, and skin from lack of secretions in mucous membranes
- Elevated body temperature, elevated heart rate
- Dilated pupils, blurred vision, nausea, vomiting
- Large doses can result in coma with airway compromised
- Symptoms may last for three days

A dilated pupil common in BZ exposure.



Differential Diagnosis

- A patient exhibiting the above symptoms has NOT necessarily been exposed to BZ.
- Exposure to BZ can be detected in urine, as well as in certain blood tests and possibly in hair samples.
- 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.

Symptoms of BZ exposure may last for up to three days.

Initial Treatment

- Do **not** give patients suffering from BZ contamination atropine; it exacerbates symptoms.

Safety

- Monitor patients closely; patients are confused and can harm themselves and others.
- Remove any weapons immediately; restraints may be necessary.
- Sedatives may exacerbate the coma-like symptoms.

Triage

- Should happen immediately
- Separate contaminated patients into three categories
 - Contaminated patients who are medically stable
 - Contaminated patients who require immediate stabilization prior to decontamination (patients with life-threatening bleeding, in cardiogenic shock, etc.)
 - Contaminated patients who have life-sustaining medical gear (tourniquet, airway adjunct) that will need to be replaced after decontamination

Decontamination/ Treatment

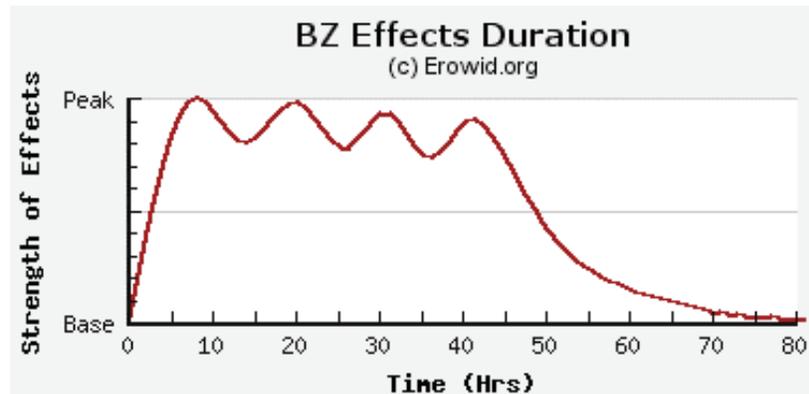
- Focus on decontamination.
- Start decontamination as soon as possible.
- Decontaminate in an area away from where treatment will be given.
- Wear protective clothing, a respirator, and use heavy butyl rubber gloves for protection over nitrile gloves if possible.
 - If unable to obtain butyl gloves, two layers of nitrile gloves will suffice.
- Start decontamination procedures at the head and end at the toes.
- Cut off any clothing that would have to go over the head to prevent further contamination.
- Remove contaminated clothing while taking proper precautions to keep the rescuer safe.
- Use a mixture of 10cc bleach per liter of water (saline) for decontamination.
- Wash the patient's skin and eyes thoroughly with water or saline solution.
 - Wash the eyes starting from the nose and moving toward the temples.
- Cut off or wash hair after a sample has been collected and stored in a plastic tube.
- After decontaminating patients, rescuers must be decontaminated.
 - Protective clothing, respirator, and gloves will require decontamination after working with contaminated clothing.
 - Equipment may have to be disposed of in sealed, impermeable plastic bags.
- Perform triage on decontaminated patients similarly to a typical mass casualty event.

Inject 2-3 mg of physostigmine IM (antidote) every 15 minutes until patient begins to improve.

Follow-Up Treatment

- Keep patients calm; reassuring them that they are safe will make treatment easier.
- Inject 2-3 mg of physostigmine IM (antidote) every 15 minutes until patient begins to improve.
- Insert an IV drip of the antidote afterwards to continue a slow steady dose until the patient recovers.
- Use an OPA (oropharyngeal airway) or endotracheal tube to maintain a patient's airway.
- Use positive pressure ventilation and oxygen as necessary.
- Cool patients with dangerously high temperatures with air circulation, ice packs, or cool mist.
- Ensure that patients are hydrated; intravenous hydration may be necessary.

BZ Effects Timeline



Population-Wide Precautionary Measures

- Locate safe, easily sealable rooms in homes and offices.
 - Store supplies listed below in these rooms.
 - Review with family members and colleagues how to access and exit these rooms in an emergency.

Supplies

- Clothes
 - Store extra clothing in airtight containers to have safe clothes to wear after decontamination.
- Decontamination materials
 - Store bleach / soap and water in safe, airtight containers.
- Food and water
 - Store food and water in airtight containers.
 - Decontaminate exterior of tin cans or aluminum cans before eating food.
- Cover open water sources such as wells with tarps to prevent contamination.
- Assume that water from aquifers is contaminated until tested.

BZ can be identified by the white cloud emanating from the delivery system.

Abbreviations

CNS – Central Nervous System

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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