

Decontamination for Chemical Attacks

Harun Gunes MD, Asist Prof.
Duzce University School of Medicine
Department of Emergency Medicine

While managing a chemical attack, decontamination is critical for the minimization of the damage

- Victims
- Facilities
- Equipment



High Risk Chemicals

| Group | Mechanism | Agents |
|--|---|--|
| Simple asphyxiants | Displace oxygen from air | CO, H, N, methane, butane, propane |
| Irritant gases or droplets | React with H ₂ O in upper respiratory tract | Ammonia, chloramine, SO ₂ , HCl, HF _l , chlorine, phosgene |
| Agents interrupting delivery of oxygen to tissues | Alter Hb so it cannot transport O ₂ ; or produce methemoglobin | CO, methylene chloride, nitrites, benzocaine, phenazopyridine |
| Chemical asphyxiants (oxygen utilization in mitochondria!!!) | Bind to cytochrome oxidase | Cyanide, HS, phosphine, sodium azide, CO |
| Nerve agents | Organophosphates, which bind to acetylcholinesterase | GA (tabun), GB (sarin), GD (soman), VX, GF |
| Incapacitating Agents | Immobilize victims in a variety of ways | Mace, narcotic vapors, LSD, BZ |
| Vesicants | Blistering to eyes, skin, mucous membranes, lungs | Sulfur mustard, phosgene oxime, lewisite |

Types of Contamination

- **Primary contamination**
 - Direct contact with the release.
 - People and the environment
- **Secondary contamination**
 - Rescue personnel
 - contact with a contaminated patient or environment.

Zones of Chemical Contamination

- Hot zone
 - Warm zone
 - Cold zone

Hot zone

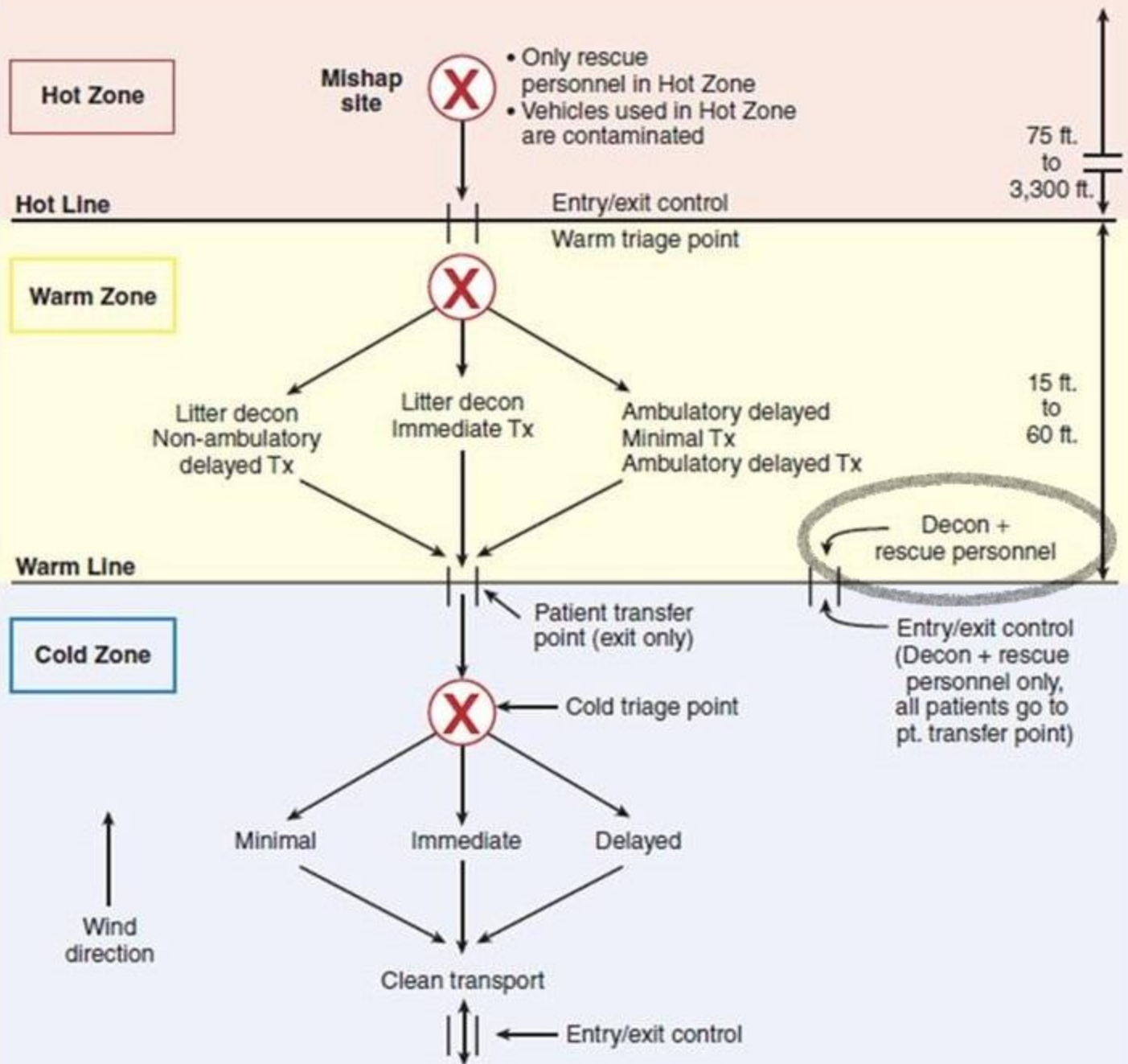
- The immediate area where the suspected chemicals and victims are located.
- Substantial risk of secondary contamination

Warm zone

A surrounding corridor, created outside the hot zone, through which each victim is *washed off and decontaminated.*

Cold zone

Where the patient is transferred to once he or she is appropriately decontaminated



?

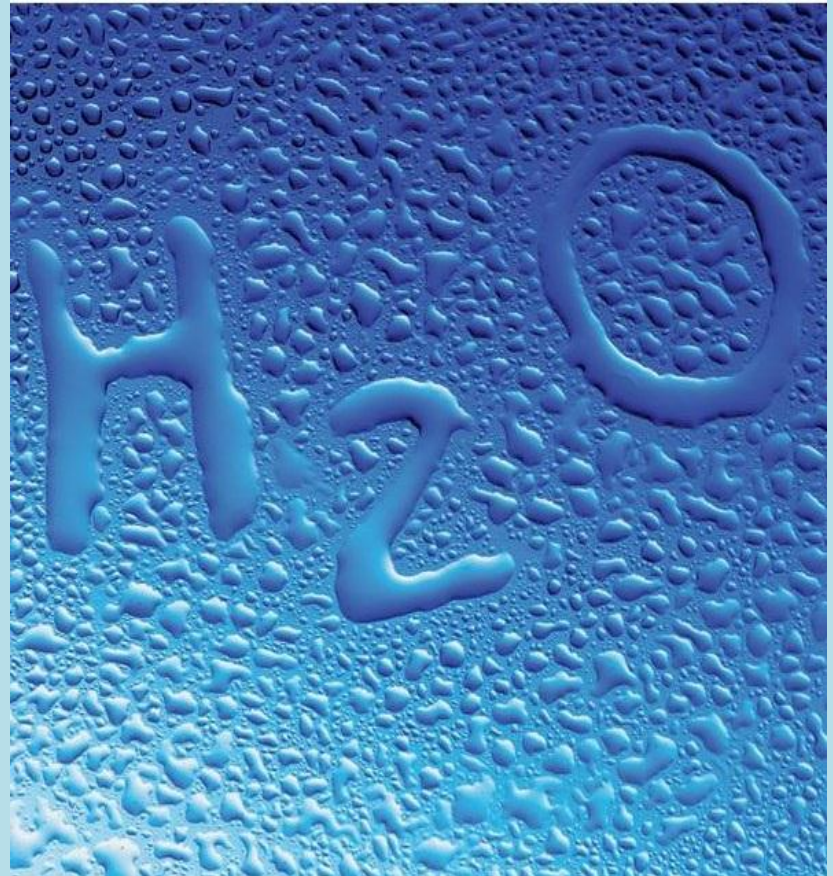
What to use for decontamination

Answer

Water is the universal decontamination agent

The basic way of decontamination

Washing victims and contaminated materials with *large volumes of water*



?

Patients needing decontamination

Answer

- Exposed to *solids, liquids, vapors or mists*
- Exposed only to a *fully dispersed gas*
 - Assess for pulmonary symptoms and systemic toxicity.
 - *Do not require decontamination.*

The first and most effective method

Remove clothing

+

brush off solid particles

+

wash and towel the face

?

Patients needing to
be hosed off with
water



Answer

- *Direct contact with either a liquid or a vapor*
- Occult areas where fluids can hide
 - Hair, skin folds, axilla, groin, toes, eyes.

Decontamination (“decon”) solutions

- Decontamination for nerve agents and vesicants
- Oxidize +/- hydrolyze the chemical agent.
 - Superiority over plain water???
- Alkaline hypochlorite solution (bleach)
 - Commonly used decon agent.
 - Decontamination of the *equipment and indoor surfaces* (corrosive)
 - Diluted 1/10
- Enzyme-based products???

?

- Be prepared to perform decontamination in the ED

X

- Rely solely on the prehospital system to completely decontaminate all victims

Tokyo March 20, 1995

- 5,500 People Exposed
- 3,227 Went to Hospital
- 550 Transported Via EMS
- Essentially no Decontamination of Patients



Tokyo Sarin Attack

Decontamination in the ED

- *Most individuals will self-rescue and make their way to a healthcare facility, and potentially contaminated patients will reach the ED by private transportation.*
- An organized plan
 - decontamination
 - mobilize a system for decontamination of multiple patients



Where to perform ED decontamination

Answer

- *Preferably* outside the ED
- Patients should enter the ED after appropriate decontamination.

Personal Protective Equipment

- Fully encapsulated air gear is not required...
- ED decontaminators should wear chemical-resistant covers for all body surfaces and use air-purifying respirator masks with filters designed for chemical threats.

- Level C personal protective equipment



Level C

Proper duration of decontamination

Hosing a patient from head to toe (or showering) for 5 min will decontaminate most ambulatory patients

Some specific groups

- Adherent materials
 - need additional scrubbing of hair and affected body parts **with soap**.
- Eye pain
 - Re-triage after whole-body decontamination
 - Eye irrigation with normal saline.
- Contaminated wounds
 - likely need additional irrigation of debris in the wound.

***Contain runoff water from the decontamination to
prevent environmental contamination***



Thank you