Basic principles of Decontamination

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Decontamination

It is the process of removing or neutralizing a hazard from the environment, property, or life form.

The purpose of decontamination

Is to prevent farther and enhance the potential for full clinical recovery of persons or restoration of infrastructure exposed to hazard substance and to prevent or reduce the likelihood of injury to responders.

Basic principles of decontamination

The management and treatment of contaminated casualties will vary with the situation and nature of the contaminant.

Quick

Versatile

Effective

Large capacity

Decontamination is essential

Casualties should not be forced to wait at a central point for decontamination.

Decontamination of casualties serves 2 purposes:

It prevents their system from absorbing additional contaminants.

Protects health care provider and other casualties from contamination.

Medical or patient decontamination

Process of cleaning injured or exposed individuals (patient decontamination) performed by HAZMAT team.
HAZMAT Team

a Hazardous Materials Response Team, a highly trained professional group that is specially equipped to respond to the release of any hazardous material that threatens the citizens of our County, their property or the environment.

Stages of decontamination

The process for decontamination of casualties involves in three stages.

Gross

Secondary

Definitive

Gross decontamination

Evacuate the casualties from the high-risk area, with limited available to conduct work in contaminated environment (method of triage need to be established)

Decontamination of those who can self evacuate or with minimal assistance to decontamination sites. Start decontamination with those require more assistance

Remove the expose persons clothing the removal and Disposal of clothing is estimated to remove 90% to 95%

Perform a 1-minute head-to-toe rinse with water (Six gallons of water for 1-minute over 22 square inches of surface exposed)

Secondary decontamination

Perform a quick full body rinse with water

Wash rapidly with a cleaning solution from head to toe. A fresh solution (0.5%) of sodium hypochlorite (HTH chlorine) is an effective decontamination solution for persons exposed to chemical or biological contaminants

Rinse with water from head to toe
Definitive decontamination

Perform thorough head to toe wash until clean. Rinse thoroughly with water

Dry victim and have them put on clean clothes

Personal protective equipment is three levels

PPE - A

PPE - B

PPE - C

Characteristics of PPE level - A

Provides maximum vapor and splash protection

Fully encapsulated suit with self contained breathing apparatus (SCBA) within the suit

Used in the highest threat environment such as the zone of release

Characteristics of PPE level - A

Provides maximum vapor and splash protection

Fully encapsulated suit with self contained breathing apparatus (SCBA) within the suit

Used in the highest threat environment such as the zone of release

Characteristics of PPE level - B

Not totally encapsulated

Less vapor protection than level - A (somewhat less skin protection)

SCBA on the outside of the suit or air supplied from external source by house
(in the instance of air supplied by hoes, a personal escape air bottle must be provided to be fully compliant with OSHA regulations)

Characteristics of PPE level - C

Less airway protection than level - B

Filtered air provided to user through one of two mechanisms
The user draws air across the filter much like a traditional gas mask.

Air is drawn across the filter by a battery.

Safe oxygen levels must be maintained in the working area (Level-C should not be used in low oxygen environment).

The detectors

radioactive

These sensitive-sized devices are designed to detect, locate and quantify any radioactive materials as Special Nuclear Materials (SNM) or as Radiological Dispersal Devices (RDD or Dirty Bombs).

biological and chemical

Proengin has developed biological and chemical warfare agent field detectors which use flame spectrophotometry technology.

Zone of operations

There are three zones.

Hot zone

Warm zone

Cold zone

Hot zone

The hot zone is the innermost zone and immediately surrounds the mishap.

In the hot zone victims are located, given basic life-saving measures and then transferred to the warm zone for decontamination limited to airway control, controlling hemorrhage and use of antidotes if available.

Only rescue personnel and (EOD) personnel with appropriate (PPE) should enter the hot zone.

Entry/exit from the hot zone is controlled at a single entry control point (ECP).

All personnel within the hot zone should be in appropriate (PPE).
(ECP) should be placed a minimum of 75 ft (25m) upwind from the source

the vehicles may be used in the hot zone must not cross the hot zone line until it decontaminated

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must not cross the hot zone line until it decontaminated

Clorox™ BLEACH: 20 gallons on shelves (5.25 percent hypochlorite solution) (for equipment)

Warm zone

The warm zone is ideally placed upwind and uphill from the hot zone in the warm zone victim and personnel are decontaminated

rescue decontamination and medical personnel are in this hot zone all must be in full protective gear

rescue personnel working in the warm zone enter / exit the zone via the (ECP) rather than the patient transfer point to avoid congestion

exit from the warm zone for all patients is via transfer point

zone should be a minimum 15 ft (5m) wide and it can be wider depending on the number of the worker and the victim

Cold zone

Is ideally upwind and uphill from the warm zone all personnel must have protective gear immediately at hand

The purpose of this zone is to provide medical care and to transport victim to higher care facilities

Patients enter via the patient transfer point and go through the cold triage point

Care is given in the treatment areas
The purpose of this zone is

Full spectrum of medical care can be given at the treatment areas depending on supplies personnel and expertise available

Patient transport to higher-level care is done from the treatment areas.

Location of decontamination site

Upwind / uphill from mishap site far enough away to be safe from any further blast or collapse.

Consider using a location with facilities that may aid decontamination such as car wash swimming pools fountains and so on

Agent removal

There are two basic decontamination methods with which emergency responder should be familiar they include chemical removal (or deactivation) and physical removal

Hypochlorite solutions

soap and water is the preferred method of removal of chemical agent from contaminated individuals however hypochlorite and water can still be used

Scraping

Scraping an area with a wooden stick such as a tongue depressor) can remove the bulk of an agent by physical means

Absorbent materials

Absorbent material can be used to reduce the amount of chemical agent that travels through the skin in emergency dry powders such as soap detergents earth and flour can be useful by wiping with wet tissue paper has been effectively used

Procedure

The example of emergency decontamination materials found at a local market

Dish washing soap .one gallon containers Tide ™ or other clothes washing compound Large boxes or other liquid container (for the skin)
Clorox ™ BLEACH: 20 gallons on shelves (5.25 percent hypochlorite solution) (for equipment)

Eyeglasses and contact lenses

Rescuers' hands must be decontaminated by washing with copious amounts of soap and lukewarm water and then thoroughly rinsed with water before removing contact lenses.

Chemical agents

Solid, liquid or gas

Chemical warfare (CW) agents have traditionally been thought of as chemicals used on the battlefield to kill or injure an enemy for example.

1. Phosgene
2. Chlorine
3. Cyanide

The most important nerve agents

Tabun, Sarin, Soman

Mechanism of Action

Nerve agents are extremely toxic and have very rapid effect. A nerve agent, either as a gas, aerosol or liquid, enters the body through inhalation, through the skin, or foods contaminated with nerve agents.

The route for entering the body

Is importance for the period required for the nerve agent to start having effect.

Generally, the poisoning works faster when the agent is absorbed through the respiratory system than via other routes.
Symptoms When exposed to a low dose of nerve agent

- increased production of saliva
- running nose
- feeling of pressure on the chest
- pupil of the eye becomes contracted
- Headache

Exposure to a higher dose

- difficulty in breathing and to coughing
- Vomiting
- Sweating
- muscular weakness
- local tremors or convulsions.

A simplified picture of a cholinergic synapse

In the presence of nerve agent the enzyme acetylcholinesterase, which is responsible for breaking down acetylcholine, is inhibited. The receptor keep on sending signals to the muscle cell, which leads to muscle cramp.

Antidotes

HI-6 (500 mg) and atropine (2 mg).

Remember

There are no antidotes for mustard and pulmonary agents.

Biohazard

biological hazard or biohazard

is an organism, or substance derived from an organism, that poses a threat to human health. This can include medical waste or samples of a microorganism, virus or toxin (from a biological source) that can impact human health. It can also include substances harmful to animals.
biohazard

It can be prepared and used either in liquid or dry form  •

The Taby of biohazards

Anthrax  •
Cholera  •
Glanders  •
Plague  •
Extra....................  •

Anthrax

Anthrax is a life-threatening infectious disease that normally affects animals, especially ruminants (such as goats, cattle, sheep, and horses). Anthrax can be transmitted to humans by contact with infected animals or their products or by biological warfare. Anthrax does not spread from person to person.

The incubation period

The incubation period (the period between contact with anthrax and the start of symptoms) may be relatively short, from one to five days. Like other infectious diseases, the incubation period for anthrax is quite variable and it may be weeks before an infected individual feels sick.

The treatments of anthrax

Three types of antibiotics are approved for preventing and treating anthrax: ciprofloxacin, tetracycline's and penicillin's. People who have been exposed to the germ but do not have symptoms are given an antibiotic for 60 days to reduce the risk of developing the disease.

المراجع

Handbook of disaster medicine
Janes (chem.-bio handbook)