

**UNITED STATES MARINE CORPS
FIELD MEDICAL TRAINING BATTALION
Camp Lejeune, NC 28542-0042**

FMST 304

Manage Biological Agent Casualties

TERMINAL LEARNING OBJECTIVE

1. Given a casualty and the absence of a CBRN team, necessary medical equipment and supplies, **manage CBRN injuries to prevent further injury or death within the scope of care.** (HSS-CBRN-2007)

ENABLING LEARNING OBJECTIVES

1. Without the aid of reference and in writing, **identify the procedures for treating biological agent casualties**, within 80% accuracy, per the Medical Management of Biological Casualties, current edition. (HSS-CBRN-2007b)

1. GENERAL GROUPS OF BIOLOGICAL AGENTS

Definition: The intentional use of living infectious microorganisms or toxins, derived from living organisms, to cause death or disease in humans, animals or plants. Laboratory analysis is the only definite way to confirm biological agent exposure.

Groups of Biological Agents

Bacteria - free living microorganisms that are naturally occurring or engineered. They work by overcoming the body's defense mechanism by invading cells. Most are killed by antibiotics.

Examples:

Anthrax
Plague
Brucellosis

Virus - an infectious agent, smaller than bacteria, that lacks independent metabolism and is able to replicate only within a host cell. Viruses produce diseases that do not respond to antibiotics. Supportive care is the only treatment.

Examples:

Smallpox
Venezuelan Equine Encephallitis (VEE)
Viral Hemorrhagic Fever (VHF)

Biological Toxins - A poisonous substance produced within living cells or organisms. . Toxins do not grow or replicate, but have been classified biological agents by the United States due to their ability to be biochemically engineered.

Examples:

Botulism
Ricin
Mycotoxins
Staphylococcal enterotoxin B

2. CHARACTERISTICS OF BIOLOGICAL AGENTS

Bacterial Agents

Anthrax (*Bacillus anthracis*) - an acute bacterial infection of the skin, lungs or gastrointestinal tract. Anthrax is endemic worldwide. Anthrax was weaponized in 1950.

Causes of Anthrax

- Primarily a disease of plant eating animals. Cattle, sheep and horses are the most common domesticated animal hosts.
- Cutaneous infection occurs when handling infected animal tissue, contaminated hair, wool, hides or products made from infected slaughtered animals.
- Respiratory infection results from inhaling anthrax spores.
- Intestinal infection results from ingesting infected meat.

Signs and Symptoms of Anthrax: Signs usually present within 48 hours. The incubation period for anthrax is hours to 7 days.

Cutaneous: on the skin

- Begins as a papule followed by the formation of a fluid filled vesicle
- Normally appears on hands and forearms first
- The vesicle typically dries and forms a coal-black scab. This scab is usually surrounded by mild to moderate edema (sometimes with small secondary vesicles).
- Pain is unusual, and if present, is caused by secondary infection

Inhalation: in the lungs

- Gradual and nonspecific onset of fever, malaise, fatigue, nonproductive cough and mild chest discomfort
- Initial symptoms are followed by a short period of improvement (hours to 2-3 days)
- Abrupt onset of severe respiratory distress with dyspnea, diaphoresis, stridor and cyanosis
- Septicemia, shock and death usually follow within 24-36 hours after onset of respiratory distress

Gastrointestinal: in the intestines

- Presents with severe sore throat or a local oral or tonsillar ulcer
- Nonspecific symptoms of nausea, vomiting and fever
- Followed by severe abdominal pain with hematemesis and diarrhea

Treatment for Anthrax:

- Ciprofloxacin 400mg IV every 8-12 hours or 500mg by mouth twice daily for four weeks
- Employ standard precautions for handling, treating, and moving all active cases

Prevention - Prophylactic vaccination series

Plague - caused by the bacterium *Yersinia pestis* which naturally infects rodents in certain parts of the world. There are three main types of plague: Bubonic, Pneumonic and Septicemic.

Causes of Plague

- The primary mode of transmission is flea bites
- A secondary source of infection is through aerosolized droplets of sputum from an infected person

Signs and Symptoms of Plague

Bubonic

- Acute onset fever, malaise, headache, nausea/vomiting
- Swollen lymph nodes in the groin or axilla region
- May have lesion at flea bite site
- Bubonic plague may progress spontaneously to the septicemic form with organisms spreading to the lungs and producing pneumonic disease

Pneumonic

- Acute onset of fever, chills and malaise
- Hemoptysis
- Nausea/vomiting/diarrhea and abdominal pain
- Dyspnea, stridor and cyanosis
- Death is caused by respiratory failure and circulatory collapse
- Almost always fatal if not treated within 24 hours

Septicemic Plague

- Fever, chills, malaise, nausea, vomiting and diarrhea
- Purpura (a rash from destroyed blood cells leaking into the skin)
- Acrocyanosis (discoloration of the extremities)
- Abdominal pain
- 25% of bubonic plaques progress to septicemic plague

Treatment for Plague

- Quarantine the casualty for the first 48 hours
- Maintain standard precautions for bubonic plague patients and droplet precautions for pneumonic plague patients
- Streptomycin 30mg / kg / day IM in two divided doses for 10 -14 days ***or***
- Doxycycline 200mg IV then 100mg IV BID, until clinically improved then 100mg PO BID for a total of 10-14 days
- Vigorous fluid resuscitation

Prevention - prophylactic vaccination series

Viral Agents

Smallpox - a systemic viral disease caused by the *variola virus*. Endemic smallpox was declared globally eradicated in 1980 by the World Health Organization (WHO). The only WHO approved repositories of the variola virus are in the Centers for Disease Control and Prevention (CDC) in Atlanta, GA and in the CDC's counterpart, Vector, in Koltsovo, Russia.

Causes of Smallpox

- Contact with infected respiratory discharge
- Contact with infectious bed linens or clothing of casualties
- Contact with drainage from wound

Signs and Symptoms of Smallpox

- Sudden onset of nonspecific symptoms:
 - Fever
 - Headache
 - Backache that lasts 2-3 days
 - Vomiting
 - Malaise
- Two to three days after initial onset, a rash appears. It starts with face, hands and forearms, moves to the lower extremities and then to the trunk. Lesions will appear as minute macules, then papules, vesicles, pustules and finally scabs. Scabs form at 8 - 14 days and slough off at 14 - 28.
- Casualty is infectious throughout the entire term of the disease until the scab separates and falls off.
- All lesions occur simultaneously

Treatment for Smallpox

- Quarantine the casualty and maintain strict sterile procedures
- Supportive care

Prevention of Smallpox

- Prophylaxis: Vaccination of vaccinia virus. Revaccination should be carried out every 10 years for personnel who are at risk of infection.
- There are no routine immunizations of US forces for smallpox. When the threat indicates, senior leadership may direct vaccination of personnel.

Biological Toxins

Botulism - a biological toxin caused by the bacterium *Clostridium botulinum*. It is the most toxic substance to man. Due to its incredible potency and relative ease of manufacture, botulism toxin is considered a likely threat. Botulism acts as a neurotoxin.

Causes of Botulism

- Inhalation
- Ingestion

Signs and Symptoms of Botulism

- Blurred vision
- Dry mouth
- Dysphagia (difficulty swallowing)
- Diplopia (seeing double)
- Muscular weakness
- Symmetrical flaccid paralysis (Loss of tone and reflexes)
- Respiratory arrest (caused by flaccid paralysis of the diaphragm)

Treatment for Botulism

- Rest
- Oxygen, if available
- Cricothyroidotomy, if needed
- Mechanical ventilation
- IV and IM administration of trivalent botulinum antitoxin (ABE)

Ricin - a toxin made from the mash that is left over after processing Castor beans for oil. Castor bean processing is a worldwide activity; therefore, the raw materials for making ricin are readily available. The toxin may be either inhaled or ingested. Ricin acts directly on cells by inhibiting protein synthesis, which causes cellular death and tissue necrosis.

Signs and Symptoms of Ricin

Inhalation

- Acute onset of fever
- Respiratory Distress
- Hypoxia
- Cough
- Malaise (discomfort, weakness, fatigue)
- Myalgia (tenderness in the muscles)
- Pulmonary edema within 18-24 hours
- Death occurs within 36 to 72 hours

Ingestion

- Severe vomiting
- Abdominal cramping
- Diarrhea
- Shock
- Renal failure
- Circulatory collapse

Treatment for Ricin

- Give supportive care
- Isolation is not required
- There is no anti-toxin

3. FOUR PHASES OF DEFENSIVE MEASURES AGAINST BW AGENTS

Pre-attack Phase of Biological Warfare

- Train and inform personnel of possible agents.
- Discourage rumors.
- Practice good sanitation and hygiene.
- Ensure immunizations are up to date.
- Protect supplies and equipment.

**The key here is PRE,
something you want to do
BEFORE the attack!**

Attack Phase of Biological Warfare

Signs of attack include:

- Aircraft spraying or dropping objects.
- Lobbing of low blast shells or bombs, smoke or mist of unknown origin
- Dead animals with no visible cause
- Rapid increase of patients at sick call

**The key here is ATTACK,
things that you would
expect to see during an
attack or what to do during
the attack!**

Defensive measures include:

- Stop breathing and don protective mask.
- Give the alarm.
- Remain under cover, and move outside only after cloud has passed or "ALL CLEAR" is sounded.
- Cover exposed skin.

Post-Attack Phase of Biological Warfare

CONTINUE to practice an increased level of good health, field sanitation and hygiene discipline. Keep wounds, cuts, and scratches clean by using soap, water and utilize available first aid. Don't consume local foods. Eat and drink only approved food and water. Do not bathe in lakes, ponds and streams. Do not touch animals, especially dead ones. Observe BW contamination markers.

**The key here is POST,
things to do AFTER the
attack!**

Decontamination Phase

Designate an area for the decontamination station. Establish and operate the station. Provide personnel for monitoring teams. Post NATO Biological Warning Markers. A triangular shaped marker measuring 11" x 8" x 8" with blue background and red letters spelling "BIO". (See figure 1.)



Figure 1. NATO Biological Warning Marker

REFERENCE

Medical Management of Biological Casualties, Current Edition

Biological Agents Review

1. List the signs and symptoms of inhalation anthrax.
2. When and where does the smallpox rash develop?
3. Identify three facts about Botulism.
4. List three actions to avoid during the “Post-Attack” phase of biological warfare.