WEAPONS OF MASS DESTRUCTION:

A SELF-STUDY MODULE

October 2001

OES Region IV EP Coordinators

Acknowledgements:
Kathy Nacey, Methodist Hospital
CBDCOM Domestic Preparedness Training Program

OUTLINE:

I. Purpose & Introduction

II. Routes of Entry

III. Weapons of Mass Destruction: **B-NICE**
- A. Biological Agents (**B** of B-NICE)
- B. Nuclear Devices (**N** of B-NICE)
- C. Incendiary Devices (**I** of B-NICE)
- D. Chemical Agents (**C** of B-NICE)
- E. Explosive Devices (**E** of B-NICE)

IV. Differences From Other Mass-Casualty Incidents

V. Hospital Response
- A. Activation of the Emergency Response Plans
- B. Decontamination
- C. Treatment

VI. Notification

VII. Conclusion

VIII. References and Information Resources

IX. Appendices
- A. Examples of uses of Weapons of Mass Destruction
- B. Summary of Biological Agents
- C. Biological Agents: Signs and Symptoms
- D. Biological Agents: Personal Protective Equipment & Isolation Precautions
- E. Summary of Chemical Agents

X. Post-Test

OBJECTIVES:

At the completion of this self-study module, the learner will be able to:

1. Identify the five categories of Weapons of Mass Destruction (WMD).
2. List the three types of Biologic Agents and give examples of each, including signs & symptoms and treatment.
3. List the five types of Chemical Agents and give examples of each, including signs & symptoms and treatment.
4. Discuss methods to prevent secondary contamination / transmission of chemical and biological agents.
5. Discuss the proper notification to the appropriate personnel and agencies in the event of a suspected weapons of mass destruction terrorist incident.

I. Purpose and Introduction

The federal government has recognized that the potential for the use (and the knowledge about, and availability of) weapons of mass destruction (WMD) to terrorist groups and individuals has increased and threatens society. To that end, Presidential Decision Directive 39 “United States Policy on Counterterrorism” was issued in June 1995 to help the U.S. prevent, investigate and manage the consequences of terrorist use of weapons of mass destruction. In 1996, Public Law 104-201 (commonly called the Nunn-Lugar-Domenici bill) directed the Department of Defense to develop a domestic preparedness program to improve federal, state and local emergency responses to WMD incidents. The DOD has given grant money and training to emergency responders (primarily fire departments and law enforcement agencies) in 121 cities. Sacramento is one of these cities, and could be considered vulnerable to such a terrorist attack for a variety of reasons. We are the state capital and the site of state/federal government buildings, host of the U.S. Olympic Track & Field Trials and the location of numerous places where large groups of people may be present (such as the Jazz Jubilee, the State Fair and sports events/concerts at Arco Arena). One needs to only look at recent headlines to realize that Sacramento has already experienced some acts of terrorism; bombings by the Unibomber and the plot to blow up propane tanks in Elk Grove are just some examples.

Since hospitals are an essential part of the emergency response system, it is essential that hospital staff become more knowledgeable about WMD events. Experts advise that local communities should be prepared to deal with the consequences of a terrorist event for the first 12-36 hours before federal agencies will be completely able to augment local response and provide specialized support. Tara O’Toole, a physician and Senior Fellow at the Center for Civilian Biodefense Studies at Johns Hopkins University, testified before Congress in September 1999

that, “hospitals would be the frontline institutions that manage the response to terrorism, regardless of the type or scale of the attack”. D.A. Henderson, the director of the Center for Civilian Biodefense Studies states, “the better prepared we are, the less likely we are to have such an event” because “if it’s recognized that we’ve prepared to respond quickly and effectively, then a weapon is less likely to be selected for use”. Henderson adds that the ”better prepared we are for WMD events, the more prepared health care facilities will be to treat naturally occurring infections and epidemics that are developing all the time”.

The purpose of this self-study module is to give staff a brief overview of the problem and some possible guidelines for dealing with the medical consequences of a WMD terrorist incident. This module is not intended to provide all the answers, but rather to help give staff a starting point for providing the best possible patient care in the event of a terrorism event.

Definition of terrorism: the unlawful use of force against persons or property to intimidate or coerce a government, the civilian population, or any segment there of, in the furtherance of political or social objectives.

Domestic terrorism: terrorist acts that are directed at elements of the U.S. government or population without foreign direction.

International terrorism: terrorist activities that are foreign based and/or directed by countries or groups outside the United States.

Terrorist acts using weapons of mass destruction can be conducted by an individual or a group. Some examples of terrorist groups can include ethnic separatist groups, left or right-wing radical organizations, racist groups or issue-oriented groups. The motivation of terrorists can be to protest government policies, further nationalist or separatist agendas, or for retaliation, revenge or extortion. The act may occur as a covert event in which people are unknowingly exposed, or as an announced event in which persons are warned that an exposure has occurred. This is often done to get immediate publicity for a cause. Terrorists do not always want to kill people; sometimes just making a
large group of people ill will meet their goals of disrupting services (ie. diversion of public safety and EMS resources from other community needs), creating chaos and inflicting long-term psychological stress.

Acts of terrorism are usually directed at “key assets” or an organization, system or physical plant, the loss of which could have economic or social impact. Potential targets of terrorist acts can be civilian or military government facilities, industries (especially those that are part of the “military-industrial complex” or that have high economic impact), financial institutions, infrastructure systems (mass transit, tele-communications, energy, etc.), storage installations for explosive devices, sports/special event venues, schools, hospitals/clinics, shopping centers (or places

with large groups of people) and places with historical or symbolic significance. Some examples of the use of WMD throughout history are included in Appendix A.

II. Routes of Entry

Hazardous and toxic materials can enter the body through 4 routes of entry:

A. Absorption - through the skin or the eyes
B. Injection - entering the bloodstream via open wounds or needle injections
C. Ingestion - by eating contaminated food/fluid or sprayed/splashed into the mouth or nose
D. Inhalation - inhaled into the mucous membranes of the nose, upper respiratory tract and lungs via aerosols or spray devices

III. Weapons of Mass Destruction

B-NICE is the acronym used for identifying five categories of terrorist weapons of mass destruction:

Biological
Nuclear
Incendiary
Chemical
Explosives

A. Biological Agents (**B**-NICE)

Biological agents are living organisms, that when in the form of liquid droplets, aerosols or dry powders cause harm or disease. The use of biological agents is attractive to terrorists because most of them are relatively inexpensive and do not require sophisticated technology to produce or deliver. Fortunately, however, most biological agents are difficult to effectively disperse via aerosol devices. Many agents are extremely sensitive to things like temperature, humidity and ultra-violet light; wind speed and direction may determine the extent of biological agent release.

The signs and symptoms of diseases produced by biological agents can take days to weeks to develop. The signs and symptoms are usually non-specific and may mimic natural infections/epidemics, like the flu. This is why a high index of suspicion is so important. This delay in onset of symptoms is one of the reasons the use of biological agents is attractive to terrorists, because it allows the terrorist to escape the area before detection.

Hospital personnel may be the first people to recognize whether patient presentation is "typical" of an infectious disease or "unusual". The epidemiological pattern will probably be the main sign that a bioterrorism attack has occurred so healthcare providers need to have a high index of suspicion. This is especially true because the symptoms are non-specific and patients will present at different locations. The following situations should alert health care workers to the possibility of a bioterrorism event:

- signs and symptoms that develop at an uncharacteristic time of the year, in an unusual pattern or in a normally healthy population
- groups of patients from a single location or event
- lower incidence of symptoms among people who have been indoors
- large number of fatalities
- unusual numbers of sick or dying people or animals
- vector-borne diseases without vectors
- any patient with a disease that is relatively uncommon and/or that has bioterrorism potential

The speed and accuracy with which healthcare workers recognize and report the suspicion of biological agent use, can directly impact mortality and morbidity.

Types of Biological Agents:

1. Bacteria – Self-sustaining organisms that do not require a host to reproduce. Some types may transform into a spore (anthrax).
   Anthrax Plague
   Cholera Tularemia

2. Viruses – Much smaller than bacteria and lack a system for their own metabolism, needing a host to survive. The host can be plant, animal, insect, bacteria, or human.
   Smallpox
   Venezuelan equine encephalitis (VEE)
   Ebola, Marburg, Lassa } (Hemorrhagic Fevers)

3. Toxins – Biological toxins are non-living, poisonous chemical compounds that are produced by living organisms (animals, plants, & microorganisms). These agents are up to 1,000 times more lethal than standard chemical agents, but unlike chemicals, are not typically volatile or able to cause illness through skin absorption. As a result, toxins are not prone to person-to-person transmission and are not very persistent when released.
   Botulism Ricin
   Staphyloccoccal enterotoxin B Myotoxins

These agents can produce diseases that can incapacitate or kill and because of the prolonged period of illness, can also have a tremendous impact on healthcare resources.

For further information on a Summary of Biological Agents, Biological Agents: Signs and Symptoms, and Personal Protective Equipment & Isolation Recommendations see Appendices B – D.

B. Nuclear Devices (B-**N**ICE)

A nuclear incident is an event in which a nuclear agent is used as a weapon of terrorism. It can involve the detonation (or threatened detonation) of a nuclear bomb or the detonation (or threatened detonation) of an explosive device that includes nuclear materials. Nuclear agents are the least likely weapon of mass destruction to be used by terrorists because of the difficulty of acquiring, building and using nuclear weapons. However, terrorists could cause a nuclear incident by detonating an explosive device (like a truck bomb) near a nuclear power plant or attacking nuclear cargo during transport. Food or other products could be contaminated with radioactive materials.

Types of Nuclear Devices:

1. Simple radiological device – spreading radioactive material without the use of an explosive device, such as placement of a high activity radioactive isotope in a public place exposing numerous individuals to various levels of radiation.
2. Radiological dispersal device – combination of an explosive agent with radioactive materials. The initial explosion kills or injures those closest to the bomb, while the radioactive substances remain to expose and contaminate survivors and emergency responders.
3. Reactor – sabotage of a nuclear reactor plant.
4. Improvised nuclear device – designed to cause a nuclear detonation. Construction of such a device to produce a nuclear detonation would be difficult as it is not easy to get the weapon to detonate correctly.
5. Nuclear Weapon – such as an “Atomic bomb”. The consequences of a one-kiloton yield bomb within one minute would be:
    - Blast range would reach a distance of approx. 400 yards.
    - Thermal radiation would reach the same distance as the blast.
    - Nuclear radiation (i.e., gamma and neutron) would reach approx. half a mile.
    - The radioactive fallout could produce very high exposure rates, up to half a mile.
    - The added factor of electromagnetic pulse, which only applies to high aerial bursts (several kilometers), would result in damage to electric equipment.

Types of Radiation:

1. Alpha particles – Are composed of 2 neutrons and 2 protons. They do not penetrate the skin and can be shielded by a thin layer of paper or clothing. Because the outer layer of skin is dead and several microns thick, the alpha particle is unable to penetrate through the dead layers of skin to reach the lower layers of living cells and generally will not cause any skin damage. If, however, an alpha emitter gets inside the body through inhalation, ingestion, or via a wound, the alpha emissions are near live tissue, and localized damage could occur.
2. Beta particles – May travel meters in air and is moderately penetrating. It can penetrate human skin to the "germinal layer", where new skin cells are produced. If beta emitting contaminants are allowed to remain on the skin for a prolonged period of time, they may cause skin injury. Beta emitting contaminants may be harmful if deposited internally. Personal protective equipment provides some protection against most beta radiation.
3. Gamma or X-ray (photons) – Is able to travel many meters in air and centimeters in human tissue. It readily penetrates most materials and is sometimes called "penetrating" radiation. X-rays are like gamma rays. Radioactive materials that emit gamma radiation constitute both an external and internal hazard to humans. Dense materials are needed to shield against gamma radiation. PPE provides little shielding from gamma radiation but will prevent contamination of the skin. Gamma radiation frequently accompanies the emission of alpha and beta radiation.
4. Neutrons – Are neutral particles emitted from the nucleus of an atom. Neutrons lose most of their energy through collisions with other atomic nuclei. Requires special consideration for shielding.

Radiation Protection Principles:

1. Time – the shorter the time in a radiation field, the less the radiation exposure. Work quickly and efficiently. A rotating team approach can be used to keep individual radiation exposures to a minimum.
2. Distance – the farther a person is from a source of radiation, the lower the radiation dose.
3. Shielding – shielding offered by barriers can reduce radiation exposure.
4. Quantity – limit the amount of radioactive material in the working area to decrease exposure.

Types of Radiation Injury:

1. External Irradiation – occurs when all or part of the body is exposed to penetrating radiation from an external source. A similar thing occurs during an ordinary chest x-ray. Following external exposure, an individual is not radioactive and can be treated like any other patient.
2. Contamination – radioactive materials in the form of gases, liquids, or solids are released into the environment and contaminate people externally, internally, or both. An external surface of the body, such as the skin, can become contaminated, and if radioactive materials get inside

the body through the lungs, gut, or wounds, the contaminant can become deposited internally.

3. Incorporation – refers to the uptake of radioactive materials by body cells, tissues, and target organs such as bone, liver, thyroid, or kidney. Incorporation cannot occur unless contamination has occurred.

General symptoms of acute radiation sickness include dermal irritation and burns, nausea, vomiting, high fever and hair loss. The severity of symptoms is related to the amount and type of radiation and the length of exposure.

C. Incendiary Devices (B-N**I**CE)

An incendiary device can be mechanical, electrical or chemical and is used to start combustion and intentionally set fire to something else. These devices can be simple or complex, but usually consist of 3 basic parts: (1) a fuse or igniter; (2) a container (glass, metal, plastic or paper); and (3) incendiary material. Gasoline and rags may be used as accelerants to make the fire burn more quickly and at a higher temperature. Burns and smoke/toxic gas inhalation are common injuries secondary to incendiary devices.

D. Chemical Agents (B-NI**C**E)

Chemical agents differ from biological agents in that these agents act within minutes and people exposed will develop symptoms right away. The primary route of exposure for chemical agents is inhalation. The toxicity of the agent depends largely on the size of the particles and/or water solubility of the gas. Large particles and highly water soluble gases will be trapped in the nasopharynx and small particles and gases with low solubility will enter more deeply into the lungs. Quick decontamination is essential and antidotes are available for some chemical agents. See Appendix E for a Summary of Chemical Agents.

Types of Chemical Agents:

1. Nerve Agents - disrupt nerve impulse transmissions and are similar in nature to organophosphate pesticides. All are toxic at small concentrations.
   Nerve agents effect organs with cholinergic receptors:
   Muscarinic (smooth muscles and glands) Sites –
   - Increased secretions:
     Saliva
     Tears
     Runny nose
     Secretions in airways
     Secretions in gastrointestinal tract
     Sweating

- Smooth muscle contraction:
  Miosis of the eyes
  Bronchoconstriction of the airways
  Hyperactivity (nausea, vomiting, and diarrhea) of the GI Tract

Nicotinic Sites –

- Skeletal muscles:
  Fasciculations
  Twitching
  Weakness
  Flaccid paralysis
- Other (ganglionic):
  Tachycardia
  Hypertension

Examples:

GA (Tabun)	GB (Sarin)	VX
GD (Soman)	GF	

2. Blister Agents (Vesicants) - cause burns to the eyes, skin and respiratory tract tissues. They are toxic, but not as toxic as nerve agents. They can penetrate clothing and be absorbed into the skin.
   Symptoms include:
   - Red and tearing eyes
   - Swelling of the eyelids
   - Spasm of the eyelids
   - Skin itching
   - Redness
   - Burning pain and / or blisters (especially in warm, moist areas like the groin and axilla)
   - Burning sensation in the nose and throat
   - Hoarse voice
   - Shortness of breath and cough
   - Abdominal pain, bloody emesis, and diarrhea
   - Some victims may have a garlic-like odor.

   Examples of blister agents are Mustard and Lewisite.

3. Blood Agents - interfere with the ability of the blood to transport oxygen. All blood agents are toxic at high concentrations and can lead to rapid asphyxiation and death.
   Symptoms include:
   - respiratory distress
   - vomiting & diarrhea
   - vertigo
   - headaches.

   Fresh air and respiratory therapy may help some victims.

   Example of a blood agent is Cyanide.

4. Choking Agents - stress the respiratory tract and can result in asphyxiation. Edema can develop in the lungs and patient symptoms may resemble those of drowning victims.
   Symptoms include:
   - eye irritation
   - choking & coughing
   - respiratory distress
   - Victims may smell like chlorine or newly cut hay (phosgene)

   Examples of choking agents are Chlorine and phosgene.

5. Irritating Agents - cause respiratory distress and tearing with the intention of incapacitating the victim. Most of the time irritating agents are non-fatal but in some severe circumstances, these agents can result in asphyxiation.
   Symptoms include:
   - severe pain to the skin, especially moist areas of the body
   - burning and irritation of the eyes and throat
   - respiratory distress
   - coughing & choking
   - nausea & vomiting
   - Most exposed people smell of pepper or tear gas.

   Examples of irritating agents are riot control agents, tear gas and pepper spray.

E. Explosive Devices (B-NIC**E**)

An explosive device is any substance or article designed to explode, either by a rapid release of gas and heat or by a chemical reaction. Examples of explosive devices include
homemade bombs, pipe bombs, letter bombs, dynamite and military ordinances, and fertilizer bombs. The FBI reports that 70% of all terrorist attacks in the world involve explosives (usually bombs) and that 3,163 bombing incidents occurred in the U.S. in 1994. The FBI also states that: (1) public safety agencies have only a 20% chance of finding an explosive device; (2) only 4% of bombings are preceded by a warning or threat; (3) hundreds of "hoax" bomb incidents are reported each year; and (4) residential properties are the most common targets for bombers.
The dissemination of nuclear, biological, and chemical agents as aerosols may often be attempted through the use of bombs or explosives.

Explosive Properties:

- The larger the explosive charge, the greater the shock wave.
- Mechanism of injury can be –
  - Direct exposure to the blast wave
  - Reflective blast waves
  - Acceleration / deceleration forces
  - Penetrating and non-penetrating wounds
  - Burns and inhalation of toxic gases
  - Building collapse

IV. Differences From Other Mass-Casualty Incidents

Many aspects of WMD events are comparable to other medical / trauma / hazardous material mass casualty incidents and the emergency preparedness approach is similar. However, there are some significant differences that set WMD events apart. For example, terrorists have been known to time secondary events (such as booby traps, additional bombs or armed resistance) to inflict harm on emergency first responders, so EMS and law enforcement personnel can become victims also.

Secondly, a terrorist act is a criminal event so <u>everything</u> becomes evidence. This fact will require cooperation between hospital and law enforcement personnel.

In addition, fear and panic can be expected from both patients and healthcare providers. Concerns about infection and fear of contagion will need to be addressed and efforts made to reduce risks. Safety, security and crowd control will be big issues and hospitals will need to have contingency plans to deal with the probable large influx of upset, agitated and frightened patients. If available, police and/or national guard officers may be needed to augment hospital security.

Last but not least, in a WMD event, psychogenic casualties will predominate. Experts predict that there will be 10 people with psychological symptoms (the so-called "worried well") for every 1 person with actual symptoms. This is illustrated in data from Japan; 80% of the people seen by medical personnel following the Sarin attack on Tokyo were not injured but experienced psychological responses (horror, anger, panic, anxiety and paranoia) from the stress of the incident. Assistance from psychologists, social workers and the clergy will be needed.

V. Hospital Response

A. Activation of the Emergency Response Plans

Early activation of the Emergency Response Plans are critical. In the case of a chemical or biological situation activation will need to occur with the first patient that arrives. Early response can keep a situation from getting out of control. Plans need to be utilized and followed as close as possible. Most facilities have plans for the following situations and you should be familiar with them:

- Mass Casualty Incident
- Hazardous Materials Incident
- Decontamination Plan
- Bioterrorism Response Plan
- Facility Lock Down or Access Control

B. Decontamination

In many respects a WMD terrorist event is essentially a hazardous material MCI and a lot of the same rules utilized for hazardous material MCIs can be applied. Depending on the time of exposure, biological agent events usually don't require decontamination. The majority of the time exposure has occurred days prior to the person becoming ill. At that point in time, they have already showered and changed clothes. If the exposure has just occurred and contaminant is present, decontamination will need to occur but there is not as much urgency since exposure has already occurred. Isolation of the victim will need to take place, and staff protection is important until decontamination occurs. Even though decontamination of biological agent exposed victims may not need to take place, isolation is important to prevent spread of disease.
The primary responsibilities of hospital personnel are to:

1. recognize that a hazardous material situation exists.
2. protect yourself first, then other staff members. Staff safety is extremely important because staff must be protected from contamination and kept healthy so they will be able to provide care to others.
3. prevent contamination of the Emergency Department and hospital.
4. activate the hospital emergency preparedness plan.
5. make the proper notifications.
6. isolate and relocate unaffected patients to a safe area.
7. increase security to secure entrances and the decontamination area.

The acronym “SIN” explains this philosophy:

S -think **S**afety;
I -safely attempt to **I**solate and deny entry; and
N -make proper **N**otification and request resources.

The purpose of decontamination is to remove or lessen any potential contaminant from the patient’s body or clothing and prevent further exposure and spread of disease. The need for decontamination depends on the suspected time of exposure, route of entry and agent involved. **Exposure** means the patient does not have any residual contaminant on his/her body; however, he/she may have inhaled or ingested the agent. **Contamination** means that the patient has hazardous substances on his/her body and may transfer this substance to others; contaminated patients require decontamination.

The philosophy of most hazardous material incidents is that the victims should be decontaminated at the scene by EMS personnel to avoid relocating the event to the hospital. In most small scale hazardous material MCIs this is what actually occurs. However, the reality is that in a large scale event, EMS will not be able to capture or treat all potential contaminated victims. Studies indicate that almost 70% of patients in these incidents are never seen by EMS and self-refer themselves to the hospital. The least injured will often arrive first (the “walking wounded”) and will show up unannounced at the ED and other hospital entrances without prior decontamination. A large number of “worried well” will also arrive.

Primary consideration in managing victims exposed to hazardous materials are:

- to protect the facility.
- to remove the agent from the victim’s skin and clothing to reduce further possible agent exposure to others.
- to minimize additional exposure of the victim to the toxic substance.
- to protect hospital staff members and current patients from secondary exposure.
- to quickly determine the toxic identity and effects of the hazardous material and provide treatment.

Employee safety is very important! One important concept to keep in mind is that the information presented in this self-study module does not meet OSHA standards for hazardous material awareness training. To perform decontamination the facility needs to have Policies and Procedures in place. Training at the Haz Mat Awareness Level is needed to perform Directed Self Decon. To don respiratory protection and perform hands on decontamination, Haz Mat Operations Level training is required.
Decontamination needs to occur in a safe, designated location. If possible, decontamination should occur outside. This provides for a well ventilated location. Many parts of the country are not able to conduct decontamination outside because of weather issues. If the decontamination is performed indoors, the room needs to be a specially ventilated room (ventilates to the outside with rapid recycling).

Fortunately, the vast majority of contaminated patients are ambulatory and can be directed through the decontamination process (Directed Self Decon) without "hands-on" hospital staff assistance. Since staff does not come in physical contact with the patient, the only Personal Protective Equipment (PPE) required is Standard Precautions with splash protection. The patient can utilize a shower system or just a hose. A "Trash Bag Decon Kit" can provide for collection of valuables and privacy screening if needed.
For the non-ambulatory patient more equipment and resources will be needed. Personnel trained to perform decontamination and trained in higher levels of PPE will be required.

C. Treatment

Medical Intervention:

If a patient presents and is contaminated with a substance, decontamination must occur first. This is a difficult concept for health care workers to grasp. The patient can receive a visual triage to evaluate need and priority of decontamination if there are multiple patients. If the person is contaminated with an unknown substance or something known to be harmful, then personnel should not come in physical contact with them. You may be able to direct other contaminated victims to help someone who needs assistance, such as directing them to put oxygen provided on them. Uncontaminated patients and the "worried well" can be sent to a holding area or Safe Refuge for further evaluation, observation and treatment if needed.

In cases of multi-casualty incidents without hazardous materials involved, patients will be triaged and are cared for according to priority. All hospitals have a Multi-casualty Response plan. These plans usually address alternative treatment areas and staffing plans. Plans usually address the issues of people massing at the hospital looking for loved ones or just looking for a safe place.

Diagnostic Studies:

Diagnostic studies like blood work, X-rays, cultures and more advanced tests can help detect the agent and direct treatment. Specimens may need to be sent to large laboratories with advanced testing capability (like the Public Health Department, CDC, Department of Defense or the U.S. Army Medical Research Institute of Infectious Diseases), and may require special packaging and transport for protection of the public and to maintain the chain of custody.

Pharmaceutical:

Doxycline, Atropine and Ciprofloxin should be readily available as these are some of the most frequently used drugs in the treatment of biological/chemical weapon victims.

Isolation and Infection Control:

Although most infections associated with biological agents cannot be transmitted from person-to-person, precautions may need to be taken. Patient transport should be minimized to prevent cross-contamination.
All patients should be managed utilizing standard universal precautions (handwashing, gloves, mask/eye protection or face shields and gowns) to prevent direct contact with body fluids. Certain disease and syndromes require additional precautions (ie. airborne, contact and/or droplet precautions). Information about PPE and isolation requirements for biological agents is included in the Appendix.

Resources:

If a large event were to occur in our community, most likely there would not be enough resources to manage the event. So planning has been made to acquire additional resources. The following is the process or chain of requisitions that would be made:

- hospital resources
- resources from hospital's health system
- activation of County Emergency Operations Center, will look at resources available in the county
- activation of OES Region IV Operations Center and resources
- activation of State OES resources
- activation of Federal resources. This activation could occur within hours depending on the event. When the Federal level is activated there is a Drug and supplies "12 hour Push Pack" from the CDC that may be sent. It takes about 12 hours for the Push Pack to be delivered but then it would take a day or two to distribute the contents.

VI. Notification

If a healthcare facility suspects that a WMD event has occurred, notification of the appropriate agencies should occur. Local infection control personnel, hospital administration, local and state health departments, the Poison Control facility, the Centers for Disease Control (CDC) and medical emergency services should be alerted. The California Department of Health Services has expertise in recognizing and treating anthrax, botulism, myotoxins, plague, Q-fever, smallpox and tularemia. DHS also has access to some anti-toxins and experts in aerosol physics (who can

tell you if a device is a credible delivery system for the WMD agent). Title 17 of the California Code of Regulations classifies Q-fever, SEE, tularemia, brucellosis, viral hemorrhagic fever and others as reportable communicable diseases that must be reported to the local health department. DHS also has the authority to take "any action necessary to preserve public health", so it is important to get them involved early.

The local field office of the FBI and local law enforcement agencies also need to be notified. The use or threatened use of a WMD is a criminal act; the crime scene needs to be secured to protect evidence and the terrorist need to be identified and caught. For this purpose, the FBI may want to collect clothing and other potential evidence from patients. In addition, law enforcement agencies can do a "threat assessment" and determine the credibility of the threat by ascertaining if the individual or group involved has the motive and more importantly, the ability to commit the crime.

VII. Conclusion

The philosophy of this self-study module is "plan for the worst-hope for the best". Being aware and having adequate preparation are crucial to combat terrorism and deal with the medical consequences of a WMD terrorist incident. The purpose of this self-study module is not to scare you, but rather to alert you to the issues and complexities associated with a community wide WMD terrorist event. Hopefully, increased awareness by hospital staff will enable our facility to respond more effectively in the event that terrorism does strike.

VIII. References and Information Resources

APIC Bioterrorism Task Force & CDC Hospital Infections Program Bioterrorism Working Group, Bioterrorism Readiness Plan: A Template for Healthcare Facilities, 1999. Web site: www.apic.org

Celentano, J., "Terrorism and Biological Threats", lecture at DHS Annual Disaster Management Conference, October 13, 1999.

DeLorenzo, R.A., "Cyanide", Journal of Emergency Medical Services, October 1999.

Department of Defense, Domestic Preparedness: Measured Response-Sacramento, Biological Terrorism Table-top Exercise, November 1999.

Department of Defense, Health and Medical Services Support Plan for the Federal Response to Acts of Chemical/Biological Terrorism, June 21, 1996.

Department of Defense, Domestic Preparedness Program: Medical Annex to the Chemical Terrorism Exercise Handbook, 1999.

Diamond, J. & Ciampanelli, G.M., "Integrated Emergency Management: Hospital Disaster Planning", Topics in Emergency Medicine, 20:2, June 1998.

Federwisch, A., "Silent Weapons", NurseWeek, 12:15, July 26, 1999.

Federal Emergency Management Agency, An Orientation to Hazardous Materials for Medical Personnel: A Self-Study Guide, April 1998.

Federal Emergency Management Agency Web Site, "Fact Sheet: Terrorism", January 10, 1998.

Franz, D.R., et al., "Clinical Recognition and Management of Patients Exposed to Biological Warfare Agents", Journal of the American Medical Association, 278:5, August 6, 1997.

Keim, M. & Kaufman, A.F., "Principles for Emergency Response to Bioterrorism", Annals of Emergency Medicine, 34:2, August 1999.

Lamb, J. & Tharratt, R.S., Guidelines for Hospitals and Emergency Departments: Managing the Victims of Hazardous Material Incidents, Sacramento Fire Department Hazardous Material Conference, October 1999.

Landesman, L.Y., ed., Emergency Preparedness in Health Care Organizations, 1996.

MacIntyre, A.C., et al., "Weapons of Mass Destruction Events with Contaminated Casualties: Effective Planning for Health Care Facilities", Journal of the American Medical Association, 283:2, January 12, 2000.

Mansfield, W.G., Hospital Management of Radiation Accidents, lecture at Emergency Nursing Update, August 1993.

Moran, G.J., "Biological Terrorism Part 1: Are We Prepared?", Emergency Medicine, February 2000.

Morris, C., et al., "Disaster Medicine", Emergency Medicine Clinics of North America, May 1996.

O'Toole, Tara, Congressional Hearing on Terrorism Preparedness: Medical First Response, September 22, 1999.

Pfaff, B.L., "Emergency Department Management of Nerve Agent Exposure", International Journal of Trauma Nursing, July-September, 1998.

Proehl, J.A., "The Next War. . .", Journal of Emergency Nursing, 25:1, February 1999.

Proper, C.B. & Solothin, K.C., "One Urban Hospital's Experience with False Anthrax Exposure Disaster Response", Journal of Emergency Nursing, 25:6, December 1999.

Richards, C.,et al., "How Would You Handle a Terrorist Act Involving Weapons ofass Destruction?", Emergency Department Management, 11:11, 1999.

Rigg, N.J., "NBC + WMD = Terrorism", 911 Magazine, 1998.

Taylor, R., "Bioterrorism Special Report: All Fall Down", New Scientist, May 11, 1996.

U.S. Army Soldier and Biological Chemical Command, Guidelines for Mass Casualty Decontamination During a Terrorist Chemical Agent Incident, January 2000.

U.S. Department of Health and Human Services, Managing Hazardous Material Incidents: A Planning Guide for the Management of Contaminated Patients, 1998.

Waeckerle, J.F., "Domestic Preparedness for Events Involving Weapons of Mass Destruction", Journal of the American Medical Association, 283:2, January 12, 2000.

Other Web Sites:

Centers for Disease Control:
www.cdc.gov
Bioterrorism: www.bt.cdc.gov

U.S. Army Medical Research Institute of Infectious Diseases at:
www.usamriid.army.mil/education/bluebook.html

Johns Hopkins Center for Civilian Biodefense at:
www.hopkins-biodefense.org

California Office of Emergency Services:
www.oes.ca.gov

California Department of Health Services:
www.dhs.ca.gov

California Emergency Medical Services:
www.emsa.ca.gov

Appendix A

EXAMPLES OF THE USE OF WEAPONS OF MASS DESTRUCTION

1346	Tatars catapulted plague-infected corpses over the wall into the city of Kaffa.
1763	In colonial America, the English deliberately gave the Indians blankets that had been used by smallpox patients.
1930-40's	Japan had laboratory-bred fleas feed on plague infested rats, and then released these fleas from aircraft over Chinese cities.
1972	Order of the Rising Sun put 30-40 kg of typhoid in the Chicago/St. Louis water supply.
1978	A Bulgarian exile, Georgi Morkov was attacked in London with a device Disguised as an umbrella which injected a tiny pellet filled with Ricin. He died several days later.
1980's	Iraq reportedly used cyanide against the Kurds.
1984	715 people suffered food poisoning after members of the Bhajwan cult in Oregon sprayed salmonella bacteria on restaurant salad bars to influence a local election.
	Red Army Faction tried to use botulinum in Paris.
1993	The World Trade Center in New York City was bombed, kills 6, injures 1000.
1994	The FBI reported that 3,163 bombing incidents occurred in the U.S.
	Aum Shinrikyo uses sarin in Matsumoto, kills 7, injures 280.
1995	The Murrah Federal Building in Oklahoma City was bombed, killing 168, injuring 759.
	Japanese cult Aum Shinrikyo released sarin gas into a Tokyo subway, kills 12, injures 5500.
	Microbiologist Larry Hams, a member of the Aryan Nation, used a forged letterhead to obtain samples by mail of the organism that causes bubonic plague from a microbiology clearing house.
	Iraq admitted to research in biological warfare and attempted to produce weapons using anthrax and botulinum toxins.

EXAMPLES OF THE USE OF WEAPONS OF MASS DESTRUCTION continued

1996	Khobar Towers bombing kills 19.
	Centennial Park bomb in Atlanta Georgia during Olympics.
1997	30 people underwent decontamination after an anonymous package labeled with the names anthrax and bubonic plague was sent to the Washington, D.C. office of B'nai B'rith, a Jewish public-service organization.
	Atlanta clinic and night club bombings, this was the first use of secondary devices in the US.
	15 to 25 countries thought to possess biological weapons and 5 countries known to support terrorism using biological weapons.
1998-99	6,000 people in California, Indiana, Kentucky and Tennessee were affected by anthrax threats (targets included abortion clinics, government buildings, retail establishments, office buildings, schools, hospitals and nightclubs).
2000	USS Cole bombing.
2001	World Trade Center and Pentagon bombings, plane hijackings, over 5000 dead.

Appendix B Summary of Biological Agents

Disease	Transmissable to Man?	Incubation Period	Signs and Symptoms	Diagnostic Tests	Key Differential Diagnosis	Treatment	Lethality
Inhalation Anthrax *(bacterial agent)*	No (except cutaneous form)	1-6 days (up to 45 days)	Fever, malaise, cough, mild chest discomfort; onset dyspnea, diaphoresis, stridor, cyanosis, shock. Hemorrhagic meningitis in up to 50%. Death 24-36 hours after onset of severe symptoms.	Nasal swabs; serology, GS & culture of blood/CSF, polymerase chain reaction (PCR); CxR- widened mediastinum. Rarely pneumonia.	Pneumonia, medistinitis, mediastinal tumor, dissecting aortic aneurysm, Hantavirus Pulmonary Syndrome (HPS)	Abx (limited efficacy post sx eruption)	High- 100% if untreated
Pneumonic Plague *(bacterial agent)*	High	2-3 days	High fever, chills, headache, hemoptysis and toxemia, rapid progression to dyspnea, stridor, and cyanosis. Death from respiratory failure, shock and bleeding.	Nasal swabs; GS & culture of blood/sputum, serum immunoassay for capsular antigen, PCR, immunohistochemical stains (IHC)	HPS, TB, tularemia, community acquired pneumonia, meningococcemia	Abx	High unless treated within 12-24 hours
Tularemia *(bacterial agent)*	No	1-10 days	Fever, headache, malaise, chest discomfort, anorexia, non-productive cough. Pneumonia in 30-80%. Oculoglandular from inoculation of conjunctiva with periorbital edema.	Nasal swabs; serology, GS & culture of blood/sputum, PCR, IHC; CxR-pneumonia, mediastinal lymphadenopathy or pleural effusion	Atypical community acquired pneumonia, Q fever, Brucellosis	Abx	Moderate- 10-35% untreated
Smallpox *(viral agent)*	High	7-17 days	Fever, back pain, vomiting, malaise, headache, rigors. Papules 2-3 days later, with synchronous progression to pustular vesicles. Abundant on face and extremities initially (centrifugal spread).	Nasal swabs; blood/sputum for PCR & viral cultures; IHC, electron microscopy, Guarnieri bodies on Giemsa or modified silver stain	Varicella, vaccinia, monkeypox, cowpox, disseminated herpes zoster	Supportive	High- 30% or greater
Filoviruses (Ebola, Marburg) *viral agent*	Moderate	2-19 days	Fever, severe headache, malaise, myalgia, maculopapular rash day 5; progression to pharyngitis, hematemesis, melena, uncontrolled bleeding, shock and death days 6-9.	Nasal swabs; blood/sputum for PCR & viral cultures. Serology including liver function tests, IHC, electron microscopy. Leukopenia, thrombocytopenia, proteinuria common.	Meningococcemia, TTP (thrombocytopenic purpura), HUS (hemolytic uremic syndrome), typhus, malaria, leptospirosis, borreliosis, arenaviruses	Symptomatic (some may respond to Ribavinn)	High- up to 90% dependent on strain
Venezuelan Equine Encephalitis *viral agent*	Low	1-5 days	Fever, severe headache, malaise, myalgia, photophobia and rigors. Nausea, vomiting, cough, sore throat and diarrhea may follow.	Nasal swabs; blood/sputum for PCR & viral cultures. Leukopenia and lymphopenia common.		Supportive	Low

Appendix B Summary of Biological Agents continued

Disease	Transmissable to Man?	Incubation Period	Signs and Symptoms	Diagnostic Tests	Key Differential Diagnosis	Treatment	Lethality
Botulinum toxin *biological toxin*	No	1-5 days	Ptosis, blurred vision, diplopia, generalized weakness, dizziness, dysarthria, dysphonia, dysphagia 24-36 hours after exposure followed by symmetrical descending flaccid paralysis and respiratory failure.	Nasal swabs; blood/sputum for PCR & toxin assays; serology with anaerobic cultures; stool cultures; electromyography studies	Guillan Barre, myasthenia gravis, organophosphate poisoning, tick paralysis, Mg++ intoxication, polio	Early antitoxin	High mortality without vent. support
Ricin *biological toxin*	No	4-8 hours	Weakness, fever, progressive cough, pulmonary edema, chest tightness, dyspnea, cyanosis, nausea and arthralgias. Severe respiratory distress and death from hypoxemia in 36-72 hours.	Nasal swabs; blood/sputum for PCR & toxin assays; tissues for immunohistological stain	Staphylococcal enterotoxin B, Q fever, tularemia, plague, some chemical warfare agents such as phosgene	Symptomatic	High
Staphylococcal Enterotoxin B *biological toxin*	No	3-12 hours	Fever, chills, headache, myalgia, nausea, diarrhea and non-productive cough.	Nasal swabs; blood/sputum for PCR & toxin assays; urine for immunoassays	Influenza, adenovirus, mycoplasma	Symptomatic	Low- < 1%

Appendix C Biological Agents: Signs and Sypmtoms

Biological Agents:	Anthrax	Plague	Tular-emia	Brucel-losis	Q Fever	Bacterial Diarrhea	Small-pox	Viral Enceph-alitides	VHF	Botu-linum	Entero-toxins	Ricin	Myco-toxins
SIGNS & SYMTOMS													
Fever	X	X	X	X	X	X	X	X	X	X	X	X	
Fatigue	X			X									
Non-productive cough	X	X	X	X	X	X	X				X		
Chest discomfort	X	X	X	X	X	X	X		X				X
Shortness of breath	X	X	X								X	X	X
Cough with Bloody sputum		X											
Chills		X	X	X	X		X		X		X		
Headaches		X	X	X	X	X	X	X	X		X		
Muscular pain		X	X	X	X				X		X		
Muscle rigidity							X						
Vomiting		X	X			X	X	X	X	X	X	X	X
Skin lesions	X	X	X				X						X
Drowsiness								X					
Sore throat		X	X		X			X	X				
Diarrhea		X	X			X		X	X	X	X		X
Hemorrhage (bleeding)			X						X				X
Hypotension (low blood pressure)									X		X	X	X
Flaccid paralysis, usually neck										X			
Progressive weakness of extremities										X			
Respiratory failure/distress	X									X	X	X	X
Shock	X								X		X		
Skin inflammation							X		X				X
Weakness/prostration		X	X	X	X		X			X		X	
Abdominal pain	X	X	X			X	X		X		X		X
Swollen lymph nodes	X	X	X									X	
Nausea		X			X	X			X		X	X	

Appendix D Biological Agents: Personal Protective Equip and Isolation Recommendations	BACTERIAL AGENTS	Anthrax	Brucellosis	Chloera	Glanders (rarely seen)	Bubonic Plague	Pneumonic Plague	Tularemia	Q Fever	VIRUSES	Smallpox	Venez. Equine Encephalitis	Viral Encephalitis	Viral Hemorrhagic Fever	BIOLOGICAL TOXINS	Botulism	Ricin	T-2 Mycotoxins	Staph. Enterotoxin B
Isolation Precaution																			
Standard Precautions for all aspects of patient care		X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X
Contact Precautions			X								X			X					
Airborne Precautions					X						X								
Use of N95 mask by all individuals entering the room											X								
Droplet Precautions							X					X							
Wash hands with antimicrobial soap			X	X							X			X					
Patient Placement																			
No restrictions		X						X	X							X	X	X	X
Cohort 'like' patients when private room unavailable				X		X	X		X				X						
Private Room			X	X	X	X	X				X	X		X					
Negative Presure											X								
Door closed at all times					X						X								
Patient Transport																			
No restrictions		X						X	X				X			X	X	X	X
Limit movement to essential medical purposes only			X	X	X	X	X				X	X		X					
Place mask on pt to minimize dispersal of droplets					X		X				X	X							
Cleaning, Disinfection of Equipment																			
Routine cleaning of room with hospital-approved disinfectant upon discharge				X	X			X	X		X	X	X			X	X	X	X
Disinfect surfaces w/ bleach/water sol. 1:9 (10% sol.)		X	X			X	X							X					
Dedicated equipment disinfected prior to leaving room			X								X			X					
Linen management as with all other patients		X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X
Routine medical waste handled per internal policy		X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X
Discharge Management																			
No special discharge instruction necessary		X		X	X			X	X			X	X			X	X	X	X
Home care providers should be taught principles of Standard Precautions		X	X			X	X							X					
Patient not discharged from hospital until determined to be no longer infectious							X				X			X					
Patient generally not discharged until 72 hours of antibotics completed							X												
Post-mortem Care																			
Follow principles of Standard Precautions		X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X
Droplet Precautions							X												
Airborne Precautions											X								
Use of N95 mask by all individuals entering the room											X								
Negative Pressure											X								
Contact Precautions											X			X					
Routine cleaning of room with hospital-approved disinfectant upon autopsy			X	X	X			X	X		X	X	X			X	X	X	X
Disinfect surfaces with bleach/water sol. 1:9 (10% sol.)		X				X	X							X					

APPENDIX E Summary of Chemical Agents

CHEMICAL	ONSET	EFFECTS	ANTIDOTE	SKIN DECON	MEDICAL TREATMENT
NERVE: GA (Tabun), GB (Sarin), GD (Soman), GF, VX	***VAPOR:*** Seconds ***LIQUID*:** Minutes to Hours	***VAPOR:*** Miosis, rhinorrhea, dyspnea ***LIQUID:*** Sweating, emesis ***BOTH:*** Seizures, apnea	Atropine 2-PAMCl (Mark I kits) 1-3 times, & Diazepam for severe symptoms.	Soap & water or .5% sodium hypo-chlorite	Subsequent doses of Atropine are titrated to the severity of the nerve agent signs and symptoms.
VESICANTS: (Blistering) H (Mustard), CX L (Lewisite), HD	HOURS (Except Lewisite, which is acute.)	Erythema, blisters, irritation of eyes, cough, dyspnea	BAL for Lewisite only. None for all other vesicants.	Soap & water or .5% sodium hypo-chlorite	Pulmonary care, wound care and treat volume depletion.
CYANIDE: (Blood Agent) AC, CK	SECONDS	Loss of consciousness, seizures, apnea	The Cyanide Antidote Kit contains amyl nitrate, sodium nitrate and sodium thiosulfate.	Soap & water	02, fluids, sodium bicarbonate and hyperventilation for acidosis.
PULMONARY: (Choking) Ammonia, Phosgene, PFIB, and Chlorine	HOURS	Dyspnea, coughing	Chlorine is given for Ammonia only. None for all other pulmonary agents.	Soap & water and eye irrigation	**Ammonia:** milk, bronchodilators, Silvadene, GI endoscopy, watch for mediastinitis, liquefaction necrosis. **Phosgene:** IVF, monitor volume, 02 vent. support, steroids. **PFIB:** Monitor 02, watch for pulm. edema. **Chlorine:** Broncho dilators, steroids, vent. support, & bronchoscopy.
RIOT CONTROL: (Irritant Agent) CN (Mace), CS (Tear gas), OC (Pepper spray)	SECONDS	Burning, stinging of eyes, nose, airways, skin	None	Soap & water and eye irrigation	Remove any foreign bodies from eyes, broncho-dilators for wheezing/broncho-spasms, treat dermatitis with frequent irrigation & soothing ointments.

WMD Self Study Module: POST TEST

Name: _____

Facility: _____ **Unit:** _____ **Date:** _____

1. TRUE FALSE One of the main goals of a terrorist attack is to intimidate or coerce people through acts of violence.

2. TRUE FALSE Many nerve agents present symptoms similar to organophosphate pesticide poisoning.

3. TRUE FALSE Most biological agents used in terrorism produce non-specific symptoms and involve a longer incubation period than chemical agents.

4. TRUE FALSE Anthrax can be transmitted from one person to another.

5. TRUE FALSE The use of nuclear weapons is the most probable WMD to be used by terrorists.

6. TRUE FALSE An unusual epidemiological pattern will probably be the main indication that a bioterrorism attack has occurred.

7. TRUE FALSE Ciprofloxin is the antidote for many biological warfare agents.

8. TRUE FALSE Completion of this self-study module is training enough to be able to don Respiratory Protection and perform decontamination.

9. Explosive devices account for what percentage of terrorist activities?

   a. 60 % b. 20 % c. 70 % d. 90 %

10. A large number of people presenting with a rapid onset of similar, non-traumatic symptoms could suggest which type of event?

    a. incendiary b. chemical c. explosive d. nuclear

11. What is the acronym and meaning of each letter used for identifying the 5 categories of weapons of mass destruction?

    _____ _____

    _____ _____

    _____ _____

    _____ _____

    _____ _____

12. List the 3 types of biological agents and give 2 examples for each:

    _____: a._____ b._____

    _____: a._____ b._____

    _____: a._____ b._____

Post Test continued

13. List the 5 types of chemical agents and give 1 example for each:

    _____: _____

    _____: _____

    _____: _____

    _____: _____

    _____: _____

14. What does SIN stand for?

    S:_____ I:_____ N:_____

15. What is the difference between the following:

    Exposure:_____

    Contamination:_____