California Specialized Training Institute

Terrorism Response
for the Hazardous Materials Technician and the Hazardous Materials Specialist

PARTICIPANT MANUAL

Cal OES
GOVERNOR'S OFFICE OF EMERGENCY SERVICES

September, 2020

California Office of Emergency Services-OES/CSTI

Terrorism Response for the Hazardous Materials Technician / Specialist

16-Hour Course: Participant Manual

May be used for training. Not for commercial use.

Citation of the California Specialized Training Institute (CSTI) as the source of these materials is appreciated.

While this course has been developed in, and primarily for, the State of California, presenters outside California are encouraged to insert local, state, and regional issues, incidents, and case studies in substitution for the California Standard(s) herein quoted.

Presenters, Facilitators, and Instructors are further encouraged to substitute graphics and media for the Standard herein utilized, in order to enhance the impact on the learning experience. Provided the text and intent accompanying the text is not altered, using photos, media/video of local case studies and occurrences aids in re-enforcing the key learning points of this program.

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Acknowledgments

This course, *Terrorism Response for the Hazardous Materials Technician and the Hazardous Materials Specialist*, is intended to support "hands-on" training from qualified instructors who are experienced in hazardous materials response. This course would not be possible without the knowledge and expertise of several dedicated instructors who, over the last 20 years, have taught hundreds of hazardous materials response courses from the awareness level to the specialist level.

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1. Inspector-Sergeant Matthew S. Krimsky, San Francisco Police Department, Retired / Emergency Management Coordinator/Instructor II and Current CSTI Course Manager
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9. Anthony Lukin, PhD., Emergency Management Coordinator/Instructor II, CSTI
10. William "Vance" Bennett, Emergency Management Coordinator/Instructor II, CSTI.

Course Description

Course Overview

The overarching goal of this course is to train technicians and specialists to respond safely and effectively to events involving chemical, biological, radiological/nuclear, and explosive (CBRNE) materials.

To that end, the content of this course addresses collecting and using intelligence in planning, response, and recovery; recognizing and responding to the release of chemical agents; engaging in rescue and rapid extrication of victims; conducting decontamination; providing assistance and medical support to victims of a CBRNE event; recognizing and responding to the use of biological agents; recognizing and responding to the deployment of radiological dispersal devices; and recognizing and responding to the detonation of explosives devices.

In addition to addressing the outcomes and content described above, this course incorporates many opportunities for asking questions and discussing various topics related to responding to a terrorist attack involving the release of a CBRNE substance. Small-group and independent exercises are structured to reinforce key points. In particular, small groups of participants engage in an in-class exercise to conduct field testing and sampling of suspected biological agents without contaminating themselves, the sample, or the environment; participate in a table top exercise of a chemical release in a mass casualty situation; and conduct a radiological survey for victim contamination.

Mission Area

This course supports National Priorities 4.2 (Strengthen the National Incident Management System and National Response Plan) and 4.6 (Strengthen CBRNE Detection, Response, and Decontamination Capabilities) identified in the *National Preparedness Guidelines*. In addition, this course addresses numerous activities under the Target Capabilities List Respond mission area for weapons of mass destruction (WMD) and hazardous materials response and decontamination. Specifically, hazardous materials responders gain the knowledge and skills to:

Develop and maintain plans, procedures, programs, and systems

Direct WMD and hazardous material response and decontamination tactical operations

Activate WMD and hazardous material response and decontamination

Identify the hazard

Assess the hazard and evaluate risk

Conduct rescue operations

Conduct decontamination and cleanup/recovery operations

The information and exercises in this course also support the acquisition of knowledge and skills to enhance onsite incident management; worker health and safety; public safety and security response; firefighting operations/support; chemical, biological, radiological/nuclear, and explosives (CBRNE) materials response and decontamination operations; emergency triage and pre-hospital treatment; citizen protection (evacuation and/or in-place protection); laboratory testing; and search and rescue operations as identified in the Linked Capabilities section of the Target Capabilities List.

This abbreviated version of the Participant Manual has been prepared to act as a general guide for Participants to draw specific knowledge of the modules incorporated within. The Instructor's Guide will cover, in greater detail, material to be presented in each class.

A digital library of topics, as well as additional information has been made available to Participants, further reducing the volume of data contained within this Manual.

Scope

This course on response to terrorist incidents involving CBRNE devices for hazardous materials responders complies with requirements for the state of California's Hazardous Substances Incident Response Training and Education Program (Government Code Section 8574). This code requires the California Emergency Management Agency to present to field responders approved training classes, taught by trained instructors, in hazardous substance response. These training classes are to be provided through outreach programs and are to certify participants who have completed these training classes. The regulations covering the requirements and course contents are contained in the California Code of Regulations Title 19–Section 2520.

National Fire Protection Association Standard 472

In addition to complying with the state and federal regulations for hazardous materials training mentioned above, this course addresses the core competencies for hazardous materials technicians identified in the National Fire Protection Association Standard 472, Competence of Responders to Hazardous Materials and Weapons of Mass Destruction Incidents (NFPA Standard 472). These core competencies include:

Analyze a hazardous materials/WMD incident to determine the complexity of the problem and potential outcomes.

Survey the hazardous materials/WMD incident to identify special containers involved, to identify or classify unknown materials, and to verify the presence and concentrations of hazardous materials through the use of monitoring equipment.

Collect and interpret hazard and response information from printed and technical resources, computer databases, and monitoring equipment.

Describe the type and extent of damage to containers.

Predict the likely behavior of released materials and their containers when multiple materials are involved.

Estimate the size of an endangered area using computer modeling, monitoring equipment, or specialists in the field.

Plan a response within the capabilities of available responses personnel, personal protective equipment, and control equipment.

Describe the response objectives for hazardous materials/WMD incidents.

Describe the potential response options available by response objective.

Select the personal protective required for a given action option.

Select a technical decontamination process to minimize the hazard.

Develop an incident action plan for a hazardous materials/WMD incident, including site safety and control plan, consistent with the emergency response plan or standard operating procedures and within the capability of the available personnel, personal protective equipment, and control equipment.

Implement the planned response to favorably change the outcomes consistent with the standard operating procedures and site safety and control plan.

Perform the duties of an assigned hazardous materials branch or group position within the local management system (IMS).

Don, work in, and doff personal protective clothing, including, but not limited to, both liquid splash—and vapor—protective clothing with correct respiratory protection.

Perform the control functions identified in the incident action plan.

Perform the decontamination functions identified in the incident action plan.

Evaluate the progress of the planned response.

Evaluate the effectiveness of the control functions.

Evaluate the effectives of the decontamination process.

Terminate the incident.

Assist in the incident debriefing.

Assist in the incident critique.

Provide reports and documentation of the incident.

Universal Task List

The information, objectives, and activities in this course also promote the acquisition of knowledge and skills in support of numerous target capabilities identified in Universal Task List (UTL).

The UTLs are:

(Com.A	9)	Develop and conduct training to improve all-hazard incident management capability.
(Com.A	9.3.1)	Coordinate training of responders, emergency staffs, health care providers and trainees.
(Res.A.2	1)	Establish procedures for the immediate incident scene.
(Res.A.2	1.3.1)	Monitor for primary and secondary threats.
(Res.A.2	1.3.2)	Report current monitoring activities and results.
(Res.A.2	1.4.1)	Coordinate with EOC/responders for situational awareness and public safety concerns.
(Res.A.2	1.5)	Classify incident scene areas.
(Pre.A.3	1.1)	Conduct technical processing and exploitation of strategic information.
(Pre.A.3	2.1)	Establish multiple agency evaluation teams to visit and assist intelligence and surveillance agencies at all levels.
(Pre.A.4	1.1.1)	Identify intelligence concerns and threats at all levels.
(Pre.A.4	3.2)	Conduct risk assessment.
(Pre.A.4	3.8)	Coordinate information gathering and sharing across emergency support functions.
(Res.B.1	2.1.1)	Deploy incident response teams.
(Res.B.1	2.2.1)	Implement personnel accountability procedures.
(Res.B.1	16.2)	Create and implement a site specific safety and health plan for site stabilization, rescue and recovery operations.
(Res.B.1	16.3)	Perform ambient and task specific worker exposure monitoring for hazardous substances and inform workers of relevant risks.
(Res.B.1	16.5)	Monitor and perform activities related to worker health and safety issues.
(Res.B.2	1.2.2.2)	Establish criteria for proper decontamination of health workers and for the population at large.
(Res.B.2	2.1.1.2)	Develop and implement training related to self-protection equipment.
(Res.B.2	3.2.1)	Coordinate and direct hazardous materials detection and assessment activities.
(Res.B.2	3.2.2)	Coordinate, integrate, and manage efforts to prevent, or mitigate, or minimize threat of potential releases.
(Res.B.2	4.2.2)	Direct the use of personal protective equipment (PPE).
(Res.B.2	5.1.1)	Identify hazardous materials and extent/scope of the incident.

(Res.B.2 5.1.1.1) Develop a monitoring and sampling plan, including laboratory support.

(Res.B.2 5.1.1.2) Require utilization of the laboratory response network (LRN) to test suspected biological threats.

(Res.B.2 5.1.1.4) Conduct contamination surveys.

(Res.B.2 5.1.1.5) Assess hazardous materials release situation.

(Res.B.2 5.1.4) Develop site-specific plans.

(Res.B.2 5.3.2) Identify and establish perimeter and hazardous materials zones (hot, warm, cold).

(Res.B.2 5.3.3) Extricate and rescue victims from within the hot zone.

(Res.B.2 5.3.4) Conduct containment activities.

(Res.B.2 5.3.4.1) Secure contamination source and affected areas.

(Res.B.2 5.3.5) Monitor status of leaks, spills and releases.

(Res.B.2 5.4) Ensure the safety of all on–scene responders.

(Res.B.2 5.4.2) Monitor all responders for exposure to hazardous materials.

(Res.B.2 5.4.4) Coordinate rescue efforts with law enforcement to ensure safety of rescuers while law enforcement secures incident site.

(Res.B.2 5.5.1) Identify assets required for decontamination activities.

(Res.B.2 5.5.2.1) Establish decontamination sites.

(Res.B.2 5.5.4.1) Conduct screening of affected persons.

(Res.B.2 5.5.4.2) Decontaminate affected persons, including injured victims, exposed to CBRNE materials.

(Res.B.2 6.2) Detect, identify, render safe, and dispose of IED.

(Res.C.1 4.3) Implement casualty management plan.

(Res.C.1 4.3.1) Triage and treat patients.

(Res.C.1 4.3.1.3) Triage and treat patients at the incident site.

Target Audience

The target audiences for this course includes fire service, law enforcement, emergency management, emergency medical services, hazardous materials, or in the course and scope of their employment, may be assigned to an incident that is the result of a terrorist attack.

Prerequisites to Participate in This Course

This course is intended for those who have been state-certified to the Hazardous Materials Technician/Specialist level. It is the responsibility of the jurisdiction to determine participants' eligibility for this course.

Duration/Course Length

This course has been developed as a 16-hour, instructor-led training delivered over two days.

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Objectives

Chapter 1

Terminal Learning Objective (TLO)

At the end of instruction for Chapter 1, participants will be able to explain why training on chemical, biological, radiological/nuclear, and explosives (CBRNE) agents is a critical need in today's geopolitical world.

Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

Define terrorism.

List the CBRNE materials that terrorists might use in an attack.

Identify resources for terrorism response.

Chapter 2

Terminal Learning Objective (TLO)

At the end of instruction for Chapter 2, participants will be able to describe the process by which information becomes intelligence and reaches hazardous materials teams, as needed.

Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

1. List the five phases of the intelligence cycle.

Name the seven steps in the terrorist planning cycle.

Identify components of consequence management.

Chapter 3

Terminal Learning Objective (TLO)

At the end of instruction for Chapter 3, participants will be able to identify the immediate consequences of a chemical agent incident on victims and the appropriate antidotes and treatments in the field.

Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

1. List five ways that chemical agents can become absorbed into the body.

Identify the clinical effects of exposure to nerve agents and how to treat victims.

Identify the clinical effects of exposure to blister agents and how to treat victims.

Identify the clinical effects of exposure to blood agents and how to treat victims.

Identify the clinical effects of exposure to choking agents and how to treat victims.

Chapter 4

Terminal Learning Objective (TLO)

At the end of instruction for Chapter 4, participants will be able to recognize the appropriate approach for rescue and rapid extrication of victims during response to a terrorist attack, given the situation and resources available.

Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

1. List four types of rescue.

Identify at least three factors that can harm the health and safety of responders during rescue operations and ways to minimize their effects.

Chapter 5

Terminal Learning Objective (TLO)

At the end of instruction for Chapter 5, participants will be able to recognize appropriate procedures for use in decontaminating victims and personnel during response to a terrorist attack.

Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

1. Define emergency decontamination.

List five types of technical decontamination.

Recognize mass decontamination procedures and how to sort victims for decontamination.

Chapter 6

Terminal Learning Objective (TLO)

At the end of instruction for Chapter 6, participants will be able to identify appropriate assistance and medical support for individuals affected by an incident involving chemical, biological, radiological/nuclear, or explosives agents (CBRNE).

Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

1. Identify causes of illness or injury related to an incident involving CBRNE agents.

Define the three basic criteria for multi-casualty field triage of adult victims.

List the advantages and disadvantages of JumpSTART for pediatric triage in an emergency situation.

Chapter 7

Terminal Learning Objective (TLO)

At the end of instruction for Chapter 7, participants will be able to recognize when hazardous materials teams should conduct field testing and sampling of suspected biological agents and how to do so without contaminating themselves, the sample, or the environment.

Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

1. Name the four main types of biological warfare agents.

List the common characteristics of biological agents.

Conduct field testing to rule out biological agents.

Conduct environmental sampling for suspected biological agents.

Chapter 8

Terminal Learning Objective (TLO)

At the end of instruction for Chapter 8, participants will be able to recognize the appropriate means for monitoring radiation levels and protecting themselves during response to a radiological incident.

Enabling Learning Objectives (ELOs)

This chapter's enabling (performance) objectives are to ensure participants will be able to:

1. Name two kinds of radiological weapons terrorists might use.

Identify the four types of ionizing radiation.

Name three critical means for protecting responders from contamination with radiation.

Identify two processes for radiological decontamination.

Chapter 9

Terminal Learning Objective (TLO)

At the end of instruction for Chapter 9, participants will be able to take appropriate precautions when explosive devices are suspected or known.

Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

1. List weapons of choice for terrorists.

Define booby trap.

List three signs that indicate a booby trap may be present.

Sample Course Schedule

Day One

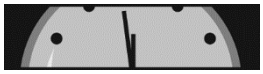
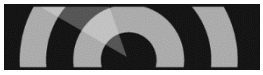
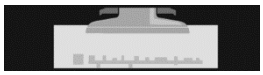
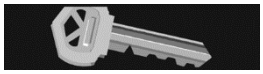
0800–0900	Welcome and Course Overview Pre/Post Test, Level 2 Chapter 1: Defining Terrorism for Hazardous Materials Response
0900–1000	Chapter 2: Intelligence and Risk Assessment
1000–1145	Chapter 3: Chemical Agents and Response Tactics
1145–1300	Lunch
1300–1400	Chapter 4: Rescue and Considerations During Terrorist Attacks
1400–1500	Chapter 5: Decontamination
1500–1630	Chapter 6: Medical Management of Terrorist Incidents

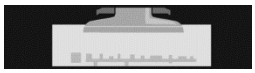
Day Two

0800–1000	Chapter 7: Field Tactics for Biological Agents
1000–1200	Chapter 8: Emergency Response to Radiological Incidents
1200-1300	Lunch
1300-1600	Chapter 9: Explosives, Improvised Explosive Devices, and Booby Traps
	Review and final examination, Course Closing

Icon Map

The following icons are used throughout the Instructor's Guide and Participant Guide to help instructors and learners find key elements in the course. This Icon Map describes the use of each icon.

	**Scope:** A scope statement is provided in each chapter (lesson). It describes the concepts, topics, and skills addressed in the chapter.
	**Time—Instructor/participant ratio—Method of instruction:** This icon locates the information for the time needed to complete the lesson, the ratio of instructors needed per participant, and the type of instruction.
	**Terminal Learning Objective (TLO):** Each chapter (lesson) has one TLO that describes the broad goal of the lesson.
	**Enabling Learning Objectives (ELOs):** Each chapter (lesson) has several ELOs that describe incremental learning objectives for the lesson and support the TLO.
	**Materials and Preparation:** This icon highlights the list of facilities, equipment, and materials needed to conduct the lesson. The specific materials that need to be copied are indicated (e.g., Pre/Post Test). This section also includes the Resource List, which identifies the lesson's supporting materials.
	**Practical Exercises (PEs):** This icon highlights the list of PEs for the lesson and indicates where in the lesson (the instructional step) to conduct the PE. The PEs reinforce key concepts addressed in the lesson.
	**Instructor Procedures:** This icon indicates where the steps for instruction start in the lesson.



Resources

Materials and Preparation

Seating and work stations for up to 30 participants

Laptop computer, projector, and screen

Instructor Guide and CD with PowerPoint presentation (1 for instructor)

Participant Guide (1 for each participant)

Resource List

Terrorism Defined

Targets of Terrorism

Hard vs. Soft Targets Checklist

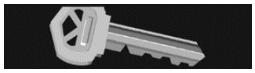
Resources for Terrorism Response

Reference List

See Reference List at the beginning of this guide.

Instructor/Participant Ratio

1/30



Practical Exercises (PE)

Note: No exercises have been assigned for this chapter.



Assessment Strategy

Pre/Post Test

Instructor Procedures

Step 1: Welcome participants and administer pre/post test.

Introduce the instructional team.

Ensure that all course participants have received training at the technician or specialist level. Ask participants to introduce themselves, identifying their departments and the length of time they have held their positions.

Provide information about the location of the facilities for the course and any other logistical facts, such as bathrooms, parking lots, breaks, etc., that participants may need to know over the next two days.

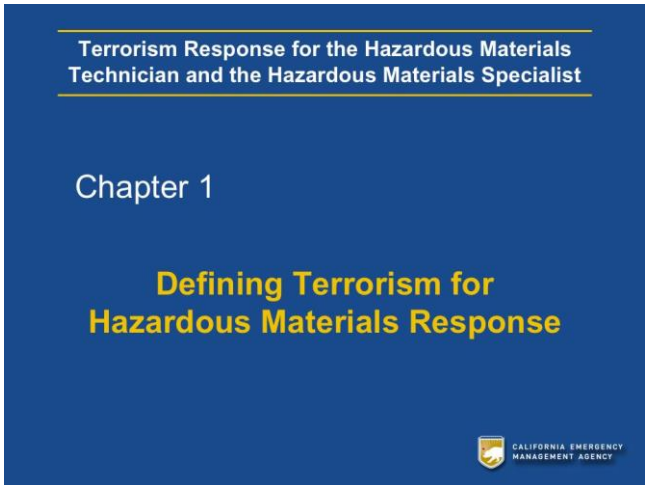
Administer full course Pretest. This is a closed-book test. Allow ten minutes for participants to complete the test. Collect papers.

Step 2: Introduce the course and review the chapter's objectives.

Slides 1.1 through 1.6

Have participants turn to this section in their guides and follow along with the lecture.

Clarify any questions participants may have about the course's content or the requirements for course completion. Explain that participants who successfully finish the course will receive a certificate of completion.



Slide 1.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

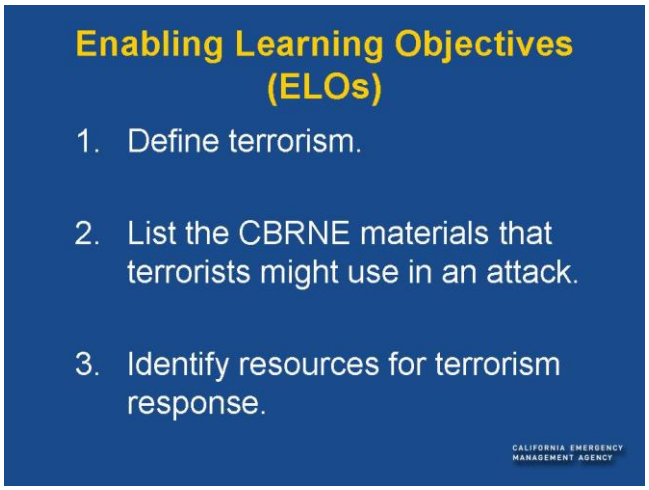
(Com.A 9) Develop and conduct training to improve all-hazard incident management capability.

(Com.A 9.3.1) Coordinate training of responders, emergency staffs, health care providers and trainees.



Slide 1.2

The terminal learning objective (TLO) of this chapter is to ensure that participants will be able to explain why CBRNE training is a critical need in today's geopolitical world.



Slide 1.3

This chapter's enabling learning objectives (ELOs) are to ensure participants will be able to:

Define terrorism.

List the CBRNE materials that terrorists might use in an attack.

Identify resources for terrorism response.

Before discussing this chapter's content, the next three slides provide a general overview of the entire course.



Slide 1.4

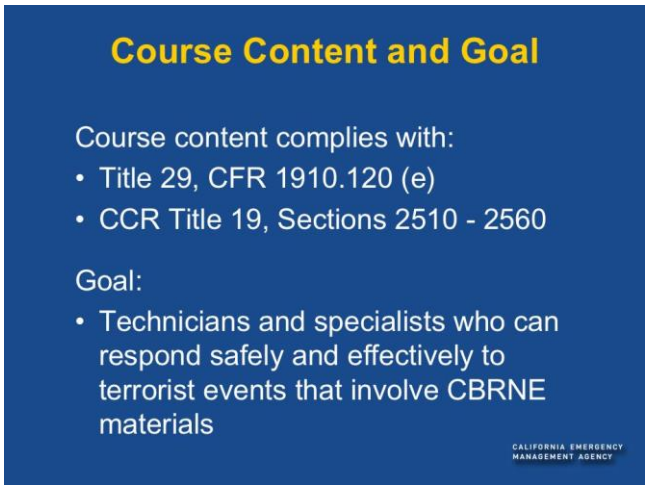
Why is this course necessary?

The United States faces continued threats from terrorist groups at home and abroad.

Despite having made great strides in protecting our nation from terrorist attacks, our society remains vulnerable.

The potential consequences of terrorist acts are far-reaching, deadly, and economically disastrous.

All these factors point to the urgent need for ongoing training and preparation for hazardous materials responders.



Slide 1.5

The content for this course complies with the training requirements addressed in:

Code of Federal Regulations (CFR), Title 29, 1910.120 (e)

California Code of Regulations (CCR), Title 19, Sections 2510–2560

The goal of this course is to train technicians and specialists to respond safely and effectively to events involving chemical, biological, radiological/nuclear, and explosive (CBRNE) materials.

To that end, this course will address collecting and using intelligence in planning, response, and recovery; recognizing and responding to the release of chemical agents; engaging in rescue and rapid extrication of victims; conducting decontamination; providing assistance and medical support to victims of a CBRNE event; recognizing and responding to the use of biological agents; recognizing and responding to the deployment of radiological dispersal devices; and recognizing and responding to the detonation of explosives devices.

In addition, discussions and hands-on activities are designed to reinforce key concepts and foster participants' development of essential knowledge and skills to safely and effectively respond to terrorist events that involve CBRNE materials.



Slide 1.6

A certificate of completion will be awarded to participants who:

Attend all classes.

Score a minimum of 70 percent on the final exam.

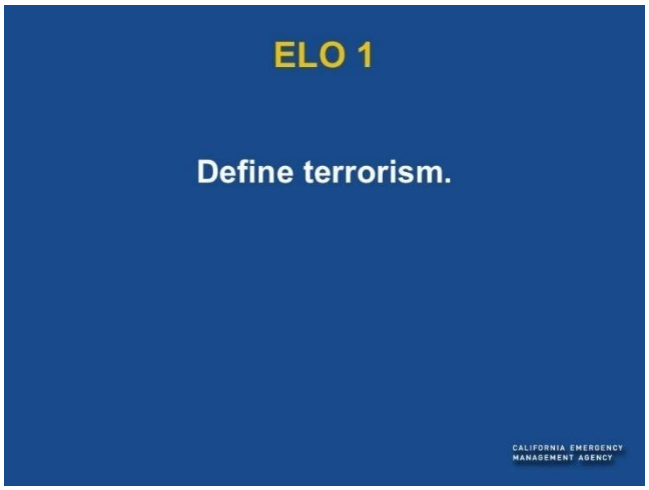
Participate in the assigned tabletop exercises.

ELO 1: Define terrorism.

Step 3: Address the differences and similarities of a hazardous materials response and responding to a terrorist attack.

Slides 1.7 through 1.11

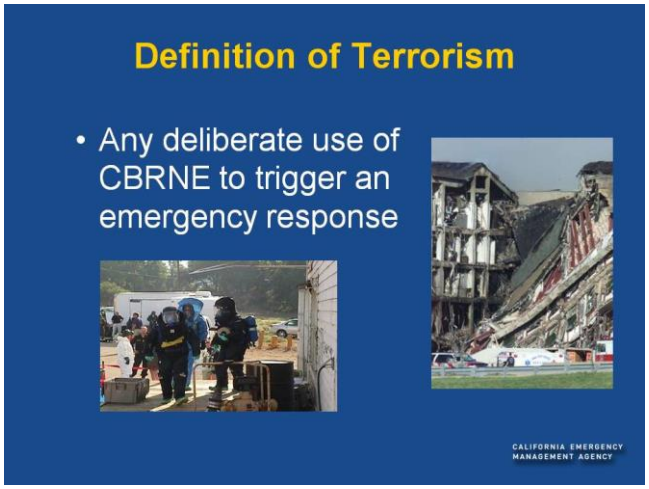
Have participants turn to this section in their guides and follow along with the lecture.



Slide 1.7

It is important to remember that there are many different definitions of "Terrorism."
The FBI definition, and the standard by which criminal acts vs. acts of terrorism is the:

- ***Unlawful use of force or violence***
- ***Intimidate or coerce***
- ***Government or civilian population***
- ***To further political/social objectives***



Slide 1.8

In this course, we are defining terrorism as any deliberate act that involves the use of chemical, biological, radiological/nuclear, or explosive materials to trigger an emergency response.

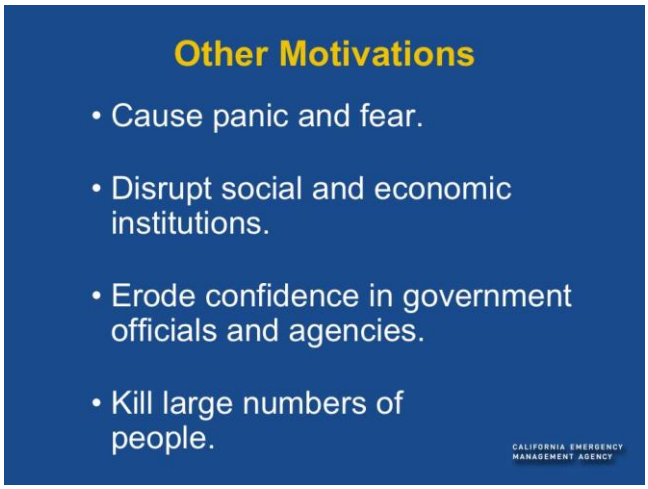
In terms of response, a hazardous materials incident and a terrorist event are virtually the same. The real difference between a hazardous materials incident and a terrorist event is intent. Most hazardous materials incidents are accidents. Terrorist acts, on the other hand, are deliberate. The location of the incident, therefore, becomes a crime scene. As a result, it is important for responders to conduct operations in a way that preserves as much evidence as possible.



Slide 1.9

Terrorists are motivated by a number of political, social, or religious agendas (such as the white supremacy, animal rights, eco-terrorism, anti-abortion, and anti-government movements).

Terrorists turn to violence and criminal activity to further their agenda and to publicize their cause.



Slide 1.10

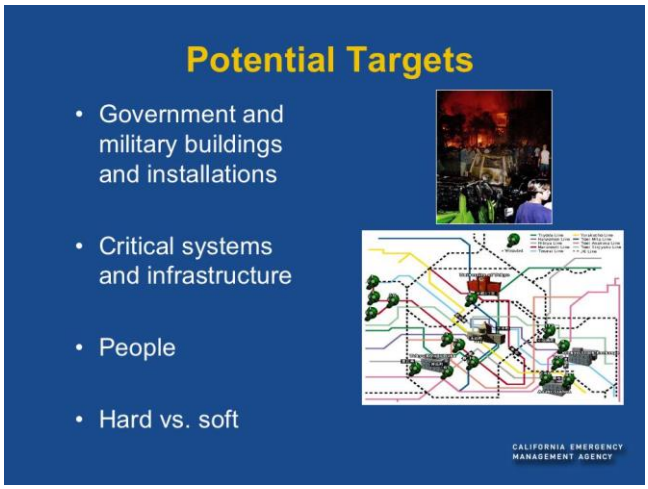
Terrorists also are motivated by other goals, such as:

Causing widespread panic and fear

Disrupting economic and social institutions

Eroding confidence in government officials and agencies

Killing large numbers of people



Slide 1.11

Almost any facility that symbolizes a terrorist cause can be a target. On the one hand, military complexes, nuclear power plants, and airports are potential targets because of the extent of damage or fear such an attack would cause. However, such facilities also tend to be under high security and would be difficult to successfully attack. Such targets are referred to as “hard” targets.

In contrast, many locations would be easy to attack while also killing large numbers of people and/or creating chaos and fear. Such targets are referred to as “soft,” or easy, targets. Examples of soft targets include:

Mass transit systems

Recreation facilities

Family planning/abortion clinics

Religious centers

Research facilities

Emergency responders

Step 4: Review and discuss resources.

Slide 1.12

Materials: **Terrorism Defined, Targets of Terrorism, Hard vs. Soft Targets Checklist**

Have participants turn to **Terrorism Defined** in the Resources section in their guides.

Briefly review the definitions of CBRNE and terrorism provided by the Occupational Safety and Health Administration, the Federal Bureau of Investigation, and the U.S. Department of Homeland Security.

Emphasize that while the events that lead to a hazmat or CBRNE incident may vary, the actions responders must take upon arrival typically are the same.

Have participants turn to **Targets of Terrorism** in the Resources section in their guides and briefly review these materials. Then have participants use the **Hard vs. Soft Targets Checklist** to identify the high-vulnerability soft and hard targets in their jurisdictions.



Slide 1.12

Review **Terrorism Defined** in the participant guide. This fact sheet provides additional definitions of terrorism.

Review **Targets of Terrorism** in the participant guide. This fact sheet provides more information on possible terrorist targets.

Turn to the **Hard vs. Soft Targets Checklist** in the participant guide. This checklist can be used to identify the potential high-vulnerability soft and hard targets in responders' jurisdictions and mutual aid response areas.

ELO 2: List the CBRNE materials that terrorists might use in an attack.

Step 5: Discuss CBRNE agents.

Slides 1.13 through 1.18

Have participants turn to this section in their guides and follow along with the lecture. (This should be a review of CBRNE agents for all participants.)

Engage participants in a general discussion on the use of CBRNE materials in a terrorist attack. For example, ask participants:

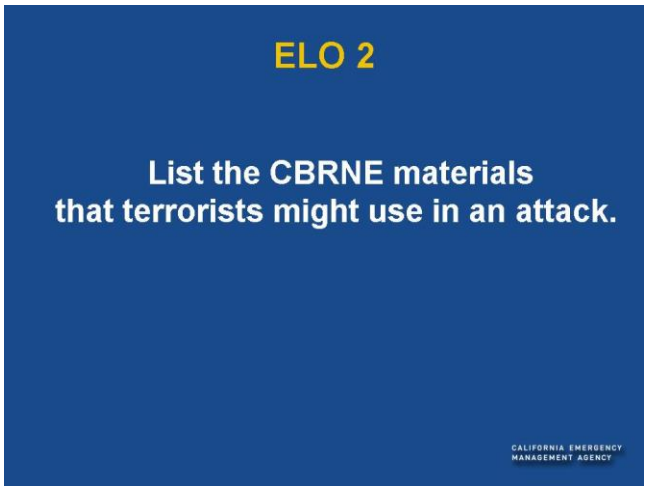
2. What are some of the reasons terrorists would want to use CBRNE? *(Causes panic, fear, and hysteria; potentially kills more people; creates economic disruption, etc.)*

What are some reasons terrorists would not opt to use CBRNE? *(Difficult to weaponize, lack of expertise, alienate supporters, etc.)*

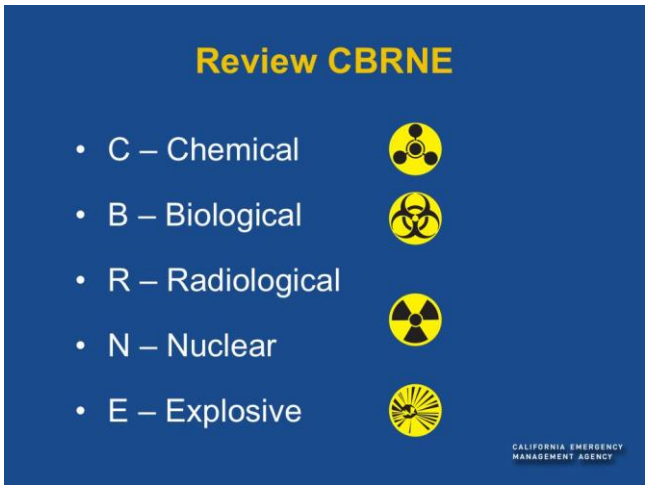
What are some warning signs or clues that might signal the use of CBRNE materials at an emergency response scene? *(The targets themselves, such as a school or a hotel; significant date; use of explosives; initial size up; large numbers of dead animals, birds, and insects; mass casualties with no apparent trauma; unusual or unscheduled sprays; abandoned spraying devices; in the case of nerve agents, specific odors, etc.)*

How might a terrorist attack be prevented or deterred? *(Gathering intelligence to determine if an attack is being planned, materials for weapons are being purchased, weapons are being prepared, and weapons are being delivered or planted; being vigilant around significant or anniversary dates, etc.)*

Are you and your agency prepared for a terrorist attack involving CBRNE materials? *(Answers will vary.)*



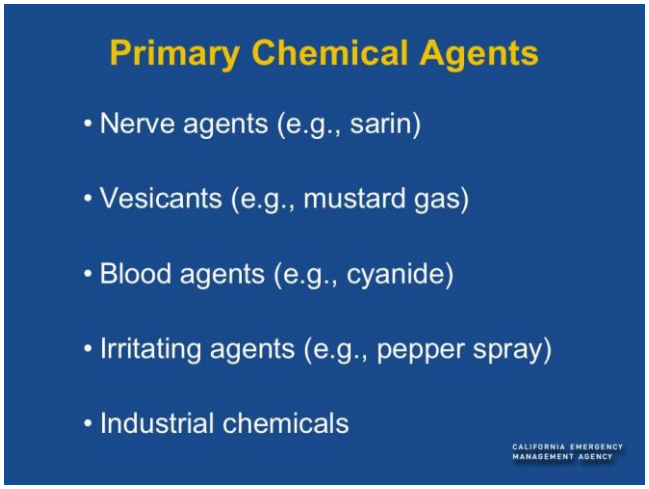
Slide 1.13



Slide 1.14

The types of weapons that might be used in a terrorist attack include chemical, biological, nuclear, radiological, and explosive devices. Collectively, these methods of mass destruction are known as CBRNE.

Although many different types of weapons are potentially available, some are easy to come by and deploy, while others are almost impossible for a terrorist to obtain. For example, nuclear warheads or bombs, while being the most devastating of the CBRNE weapons, are the most difficult to obtain. In contrast, explosives are the least devastating, but are the easiest to obtain and turn into weapons.



Slide 1.15

Nerve agents are the most toxic and rapidly acting of the known chemical warfare agents. They are similar to pesticides (insect killers) and prevent the nervous system from working properly.

Blister agents, or vesicants, are chemicals that severely blister the eyes, respiratory tract, and skin on contact.

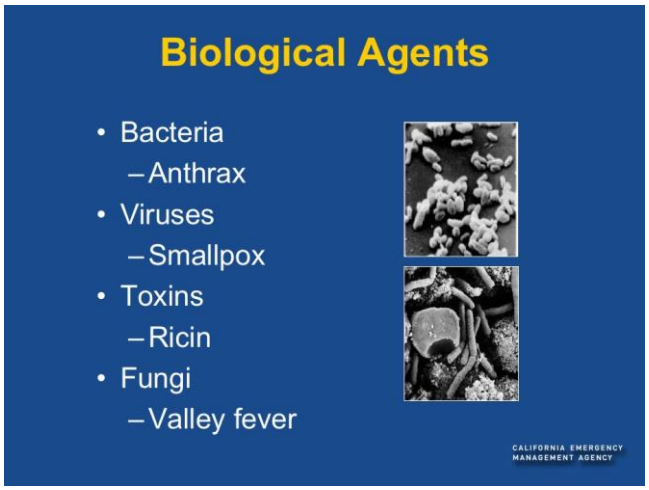
Choking agents are chemicals that cause severe irritation or swelling of the respiratory tract (lining of the nose, throat, and lungs).

Blood agents are poisons that affect the body by being absorbed into the blood.

Irritating agents are designed to temporarily debilitate, rather than kill, victims. These highly irritating agents are normally used by law enforcement for crowd control or by individuals for protection (for example, pepper spray and mace).

Industrial chemicals often are readily available and many contain hazardous substances. Examples of these industrial chemicals include organophosphate insecticides, dimethyl sulfate (DMS), and anhydrous ammonia. These chemical compounds pose the same threats to emergency responders as nerve, blister, blood and choking agents.

Most chemical agents have a military abbreviation. For example, sarin is GB, mustard gas is H, hydrogen cyanide is AC, and pepper spray is OC.



Slide 1.16

Anthrax, plague, and tularemia or "rabbit fever" (bacteria), hemorrhagic fevers and smallpox (viruses), and ricin and botulism (toxins) are known to be probable biological weapons. These pathogens pose a risk to national security because they:

Can be easily disseminated or transmitted from person to person

Result in high mortality rates and have the potential for major public health impact

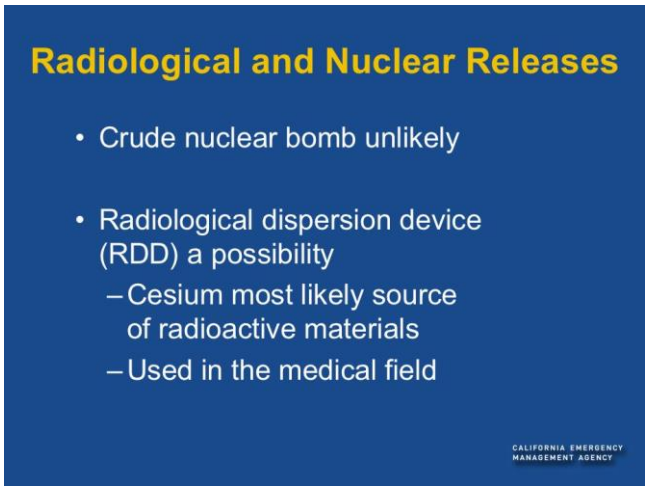
Might cause public panic and social disruption

Require special action for public health preparedness

Toxins are poisonous substances produced by living things. Many toxins are extremely lethal and small quantities can kill very large numbers of people. In many ways, a toxin attack is more like a chemical attack than a biological one.

Fungi are primitive life forms that cannot make their own food, so they live on living and dead organic matter. Valley fever is caused by fungi in the soil. These fungi can be stirred into the air by anything that disrupts the soil, such as farming, construction, and wind. The fungi can then be breathed into the lungs.

Refer to the LSU Biological agents Matrix for signs, symptoms, and types of diseases.



Slide 1.17

Of the five types of terrorist weapons described by the CBRNE acronym, a nuclear bomb, even a crude one, is the least likely weapon a terrorist organization would be able to obtain and use.

However, there is the potential for terrorists to get radiological materials, such as radioactive cesium, and use them in a radiological dispersal device (RDD), or "dirty bomb." The detonation of such a device could cause widespread contamination, as well as panic and fear.



Slide 1.18

Terrorists use explosives as their weapon of choice. In fact, 70 percent of terrorist attacks involve explosives. This is largely because explosives are easy to obtain and turn into a weapon. The three primary types of explosive weapons include:

Commercial energetic materials (e.g., dynamite)

Military ordnance (e.g., grenades)

Improvised explosive devices (IEDs) (e.g., pipe bombs)

One of the most readily available sources for explosives is ammonium nitrate and fuel oil, also known as ANFO.

Explosives can also be used to disperse other CBRNE materials.

Responders should be alert to the possibility of an ambush occurring when an incident involves an explosion. In an ambush, first responders are lured to an emergency scene created by a small explosion. When the incoming police, fire, and EMS units arrive, they become victims of a secondary explosion intended to kill large numbers of people.

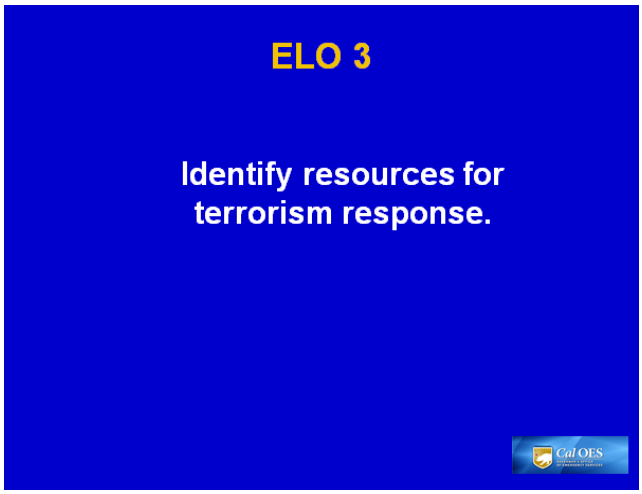
ELO 3: Identify resources for terrorism response.

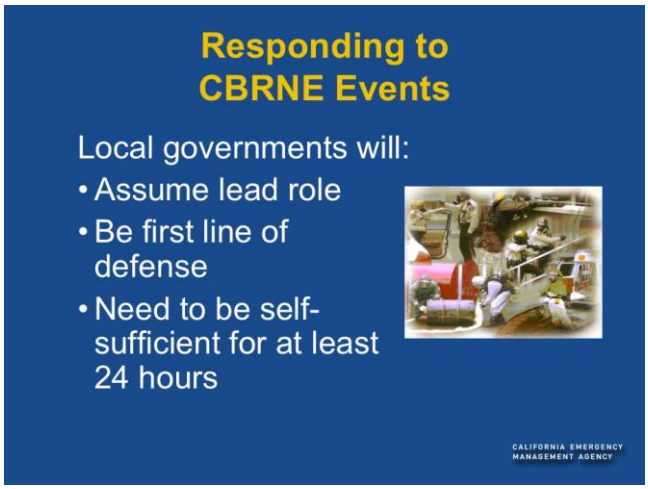
Step 6: Address steps agencies and jurisdictions can take to better prepare for responding to acts of terrorism.

Slides 1.19 through 1.24

Have participants turn to this section in their guides and follow along with the lecture. Emphasize the need for coordination across agencies and jurisdictions, as well as the critical need for ongoing training.

Slide 1.19





Slide 1.20

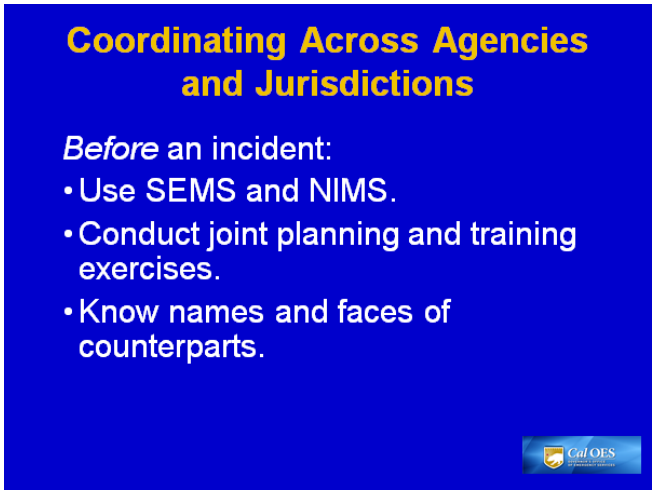
Local governments will assume the lead role in a terrorist event. They will be called upon to provide the first line of defense for its citizens. Response activities may include rescue, firefighting, EMS, security, radiation monitoring, decontamination, and protective actions.

One of the primary tactics terrorists use is the element of surprise, which makes such an attack a "no-notice incident." This will place great demands on staff and resources. Some local agencies may not be adequately prepared with sufficient or specialized resources to address a wide-scale no-notice situation.

Time is of the essence to protect life and safety in an incident involving CBRNE materials. However, it will take time before state agencies and resources can reach local governments. Local government must be self-sufficient for the first 24 hours or more. Remember Hurricane Katrina.

In terms of federal response and support, "wheel-up" time may take four hours and "on-scene" time is likely to take six to ten hours. For some teams, it may take as long as 48 hours before they arrive.

Coordination among responding agencies will be essential. Do you know which agency is responsible for coordinating field agencies and resources?



Slide 1.21

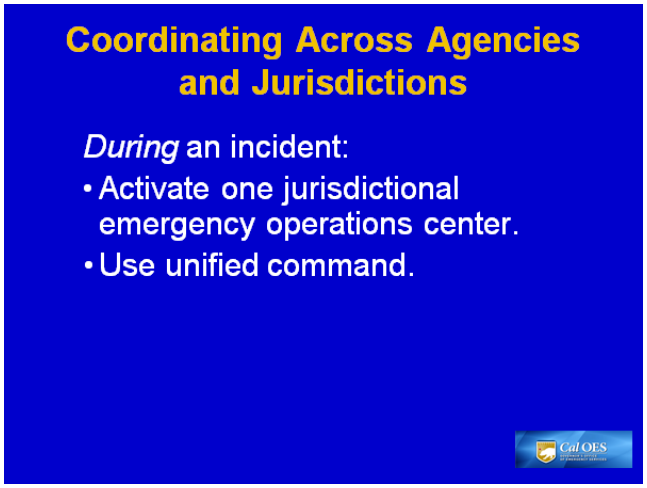
Responders and responding agencies can take many steps before, during, and after an incident to enhance coordination among local, state, and federal agencies.

Before an incident:

Use the state of California's Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS).

Conduct joint planning and training exercises with other agencies, both within your jurisdiction and across jurisdictions.

Get to know the names and faces of your counterparts in other agencies. Build relationships!

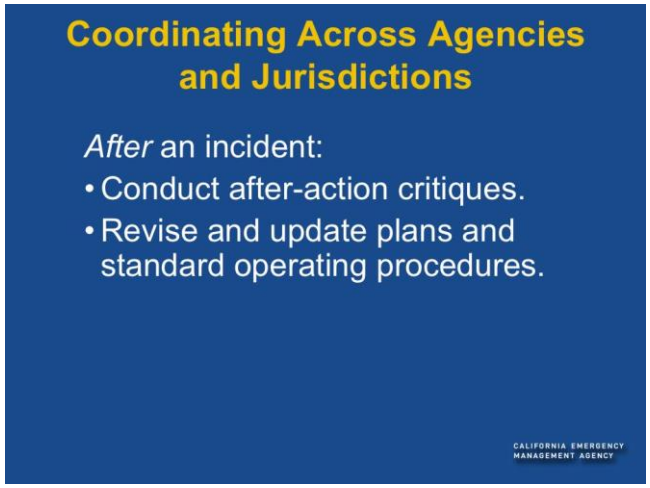


Slide 1.22

During an incident:

Ensure that only one emergency operations center has been activated within a jurisdiction.

Use unified command (UC). Unified command links all responder agencies and response organizations under SEMS and provides a forum for making decisions by consensus. At the same time, UC allows local governments to retain control of their response forces.



Slide 1.23

After an incident:

Conduct after-action critiques.

Revise and update plans and standard operating procedures (SOPs).



Slide 1.24

Numerous resources at the federal, state, and local levels are available for preparing for, responding to, and recovering from terrorist attacks involving CBRNE materials. Among those resources are

Federal plans and resources (for example, the National Response Framework)

State plans and resources (for example, the State Terrorism Response Plan)

California Specialized Training Institute (CSTI)

Other (for example, poison control centers)

Civil support (for example, terrorism task forces)

Some of these resources provide guidance for planning and management, some offer expertise and training activities, and others supply personnel and equipment.

It is important to keep in mind that requests for resources originate at the lowest level of government. If a request for resources cannot be met, then the request is forwarded to the next level until filled. For example, if a local emergency operations center cannot meet a request for resources, the request will be forwarded to the operational area, then on up the chain. State and federal resources will follow proper declarations and formal requests. Agencies and jurisdictions need to factor in time for requested resources to arrive.

Step 7: Discuss various federal, state, and local resources for terrorism response.

Slide 1.25

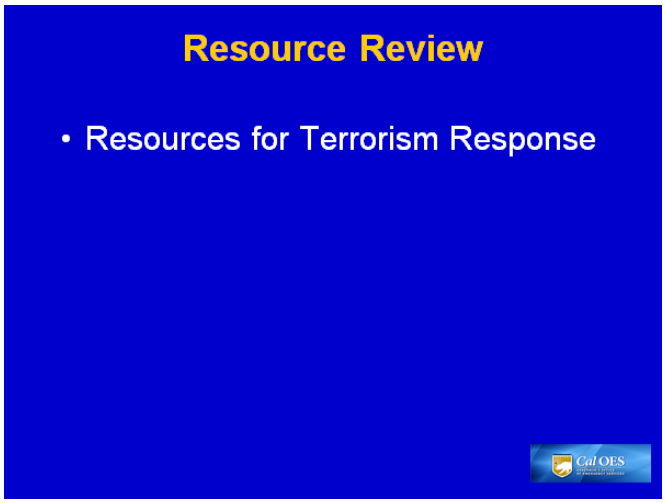
Have participants turn to this section in their guides and follow along with the lecture.

Materials: **Resources for Terrorism Response**

Have participants turn to the Resources section in their guides.

Highlight the fact that numerous resources are available at the federal, state, tribal, and local levels for preparing for, responding to, and recovering from terrorist attacks involving CBRNE materials.

Emphasize that state and federal resources will follow proper declarations and formal requests. As a result, agencies and jurisdictions will need to factor in time for requested resources to arrive.



Slide 1.25

Review the listed resources in the participant guide.

Step 8: Provide time to answer questions.

Slide 1.26

Use this opportunity to clarify any misconceptions or to answer any questions participants may have. Summarize by pointing out that this chapter provided an overview of the course, a review of CBRNE materials, and an opportunity to become familiar with various resources for terrorism response.

Emphasize that, in terms of response, a hazardous materials incident and a terrorist event are virtually the same. *Every* act of terrorism that involves the deployment of a CBRNE agent is a hazardous materials incident. Also, highlight the fact that the location of a terrorist attack becomes a federal crime scene. As a result, it is important for responders to preserve all evidence, where possible.

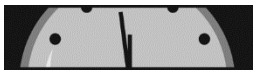


Slide 1.26

In a terrorist event, the primary goal for responders remains the same as for other emergency incidents: to protect the lives of the public and fellow responders. In addition, responders should make reasonable attempts to protect the environment and property.

To the extent possible, responders should also preserve on-scene evidence, as the site of a terrorist attack is a crime scene. As a result, responders must balance activities to save lives, preserve evidence, and engage in mitigation and recovery operations.

Chapter 2
Intelligence and Risk Assessment



Duration

1 hour to 1 Hour and 30 minutes

1 hour and 20 minutes for course instruction (Max)

10 minutes for Practical Exercise 2.1

Method of Instruction

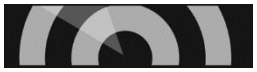
Facilitated seminar

Individual work/group discussion



Scope

This chapter provides an overview of the process by which information needs are identified, data are gathered, and usable intelligence for deterring or preventing a terrorist attack is developed. This chapter also discusses important documents that hazardous materials responders should use to assess incident risk, determine the potential for damage, and identify resources that will be needed in order to respond to the incident.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 2, participants will be able to describe the process by which information becomes intelligence and reaches hazardous materials teams, as needed.



Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

List the five phases of the intelligence cycle.

Name the seven steps in the terrorist planning cycle.

Identify components of consequence management.

Linkages to Universal Task List

The information, objectives, and activities in this chapter promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

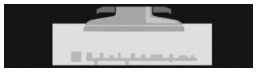
(Pre.A.3 1.1) Conduct technical processing and exploitation of strategic information.

(Pre.A.3 2.1) Establish multiple agency evaluation teams to visit and assist intelligence and surveillance agencies at all levels.

(Pre.A.4 1.1.1) Identify intelligence concerns and threats at all levels.

(Pre.A.4 3.2) Conduct risk assessment.

(Pre.A.4 3.8) Coordinate information gathering and sharing across emergency support functions.



Resources

Materials and Preparation

Seating and work stations for up to 30 participants

Laptop computer, projector, and screen

Instructor Guide and CD with PowerPoint Presentation (1 for instructor)

Participant Guide (1 for each participant)

Easel pad and markers

Resource List

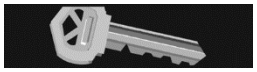
Understanding the Threat of Terrorism

Reference List

See Reference List at the beginning of this guide.

Instructor/Participant Ratio

1/30



Practical Exercises (PE)

See Step 10 for guidance on the classroom discussion.

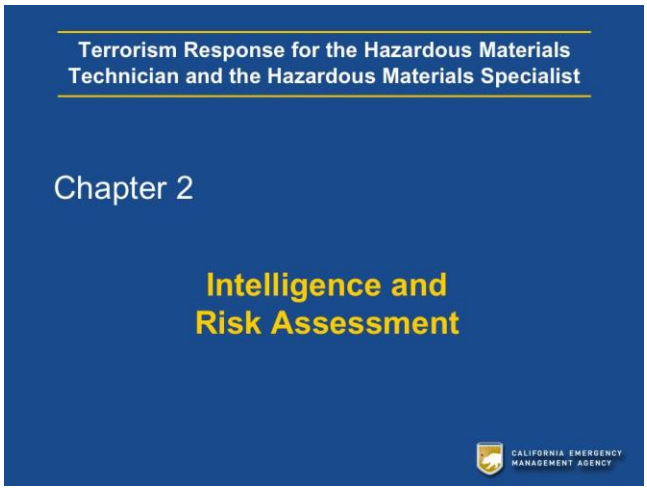
2.1 Developing Response Information Folders (Instructor Key).

2.1 Developing Response Information Folders (Exercise Sheet).



Assessment Strategy

Pre/Post Test



Slide 2.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

(Pre.A.3 1.1) Conduct technical processing and exploitation of strategic information.

(Pre.A.3 2.1) Establish multiple agency evaluation teams to visit and assist intelligence and surveillance agencies at all levels.

(Pre.A.4 1.1.1) Identify intelligence concerns and threats at all levels.

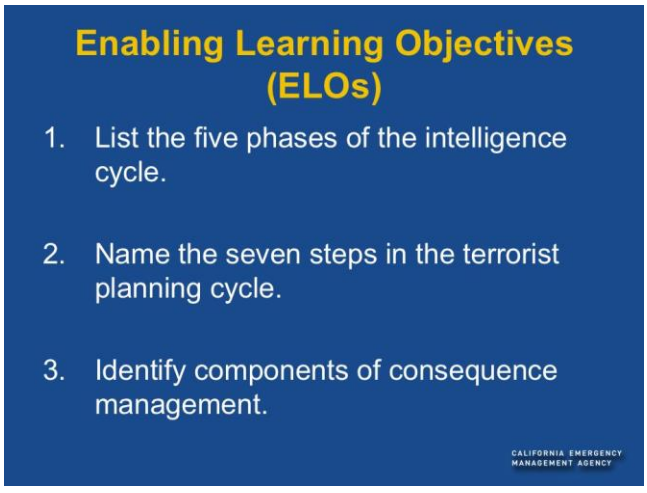
(Pre.A.4 3.2) Conduct risk assessment.

(Pre.A.4 3.8) Coordinate information gathering and sharing across emergency support functions.



Slide 2.2

The terminal learning objective (TLO) for this chapter is to ensure that participants will be able to describe the process by which information becomes intelligence and reaches hazardous materials teams, as needed.



Slide 2.3

This chapter's enabling learning objectives (ELOs) are to ensure participants will be able to:

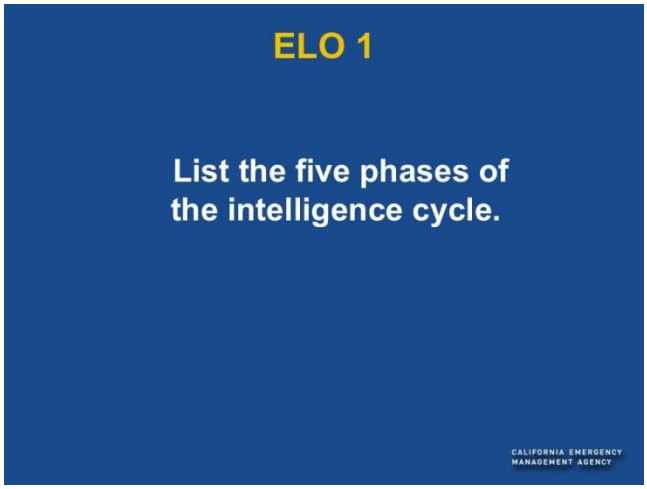
1. List the five phases of the intelligence cycle.
2. Name the seven steps in the terrorist planning cycle.
3. Identify components of consequence management.

ELO 1: List the five phases of the intelligence cycle.

Step 2: Address the process by which information needs are identified and raw data becomes usable intelligence.

Slides 2.4 through 2.11

Have participants turn to this section in their guides and follow along with the lecture.



Slide 2.4



Slide 2.5

For the purposes of preparing for and responding to a terrorist event, we say there are four categories of intelligence.

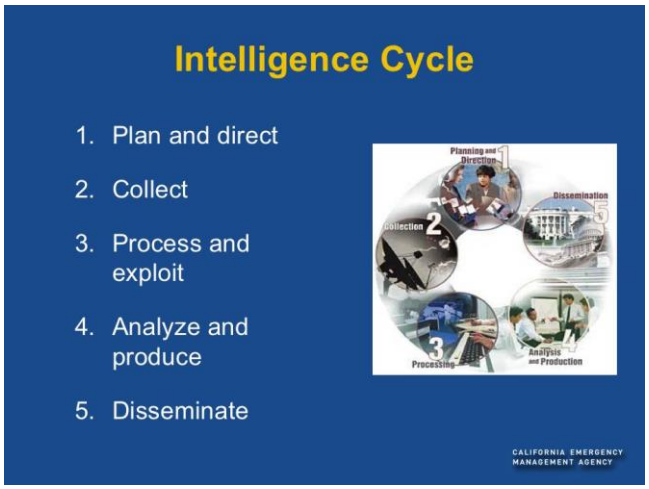
Strategic intelligence refers to the type of intelligence that policymakers and decision makers need to protect homeland security.

Operational intelligence refers to the type of intelligence that command staff and executives need to coordinate large-scale responses.

Tactical intelligence refers to the type of intelligence that personnel such as field commanders and detectives need to conduct their immediate, daily responsibilities. Actionable intelligence is tailored to meet the needs of the customer.

Intelligence must be current and provide accurate information on day-to-day events. Intelligence must also be estimative. It must include information that allows us to think in terms of "What if …" and plan accordingly.

Intelligence must also provide warnings, urgent notices of what is likely to happen, as appropriate. Intelligence may also be an in-depth study of an issue (research) or provide information on foreign technologies.

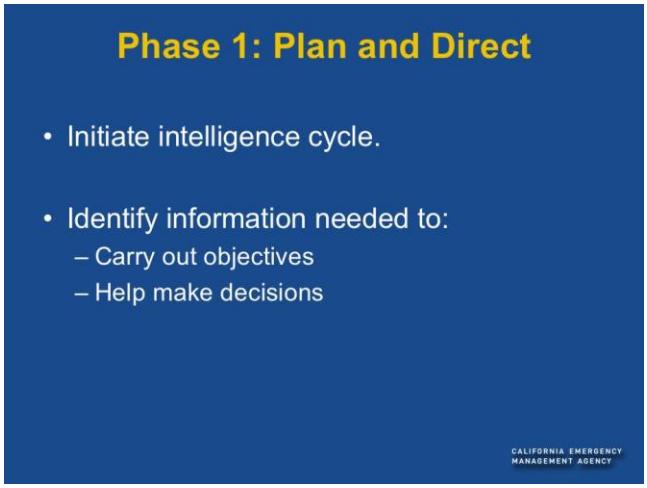


Slide 2.6

The intelligence cycle is an ongoing, five-phase process that loops back on itself.

It begins with identifying information needs, gathers information, gets that information (which by now has been converted into intelligence) into the right hands, and results in actions taken or identifying further needs for more information.

Many levels of government participate in this process.

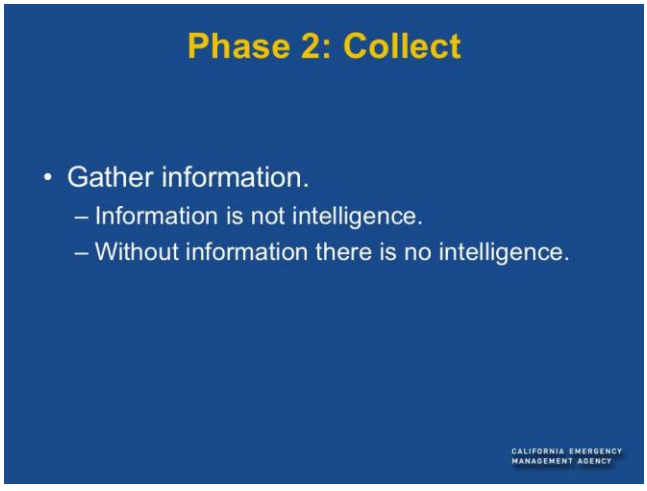


Slide 2.7

In Phase 1, the cycle is initiated. The management of the entire intelligence cycle begins here.

The kinds of information needed to carry out objectives and help make decisions are identified.

The intelligence team is directed to provide timely, accurate, appropriate, and usable (also called consumable) information. This information may influence when and how plans are implemented or it may point out intelligence gaps and the need for further information.



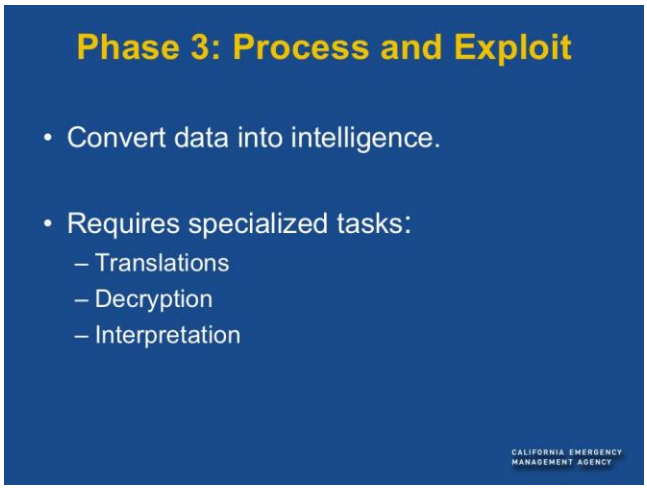
Slide 2.8

Once the specific needs for information have been identified, the information itself must then be gathered. The information collected is based on the likelihood and type of potential threat. This is Phase 2 of the intelligence cycle.

Information is not the same as intelligence. Information is raw data. Raw data can be derived from a variety of means, such as interviews, surveillance logs or footage, evidence from searches, and information from human sources, such as liaison officers.

In order to create intelligence, as much information as possible must be gathered. For without information, there will be no intelligence.

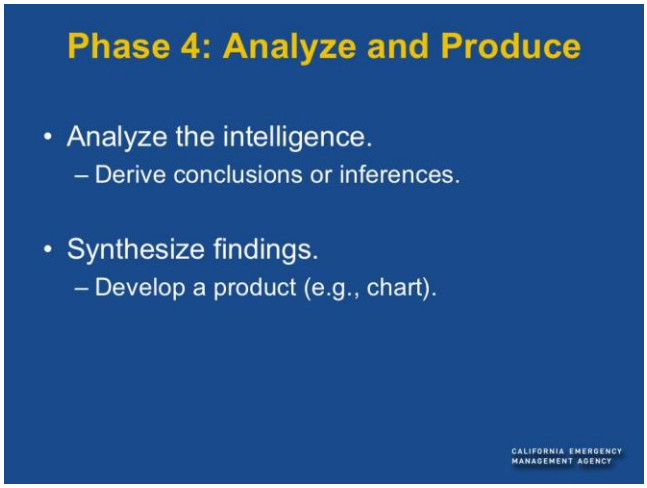
This information helps identify precursors to events that may pose a threat to local, state, tribal, and national security. This information must then be forwarded to the appropriate agencies, such as law enforcement and fusion centers.



Slide 2.9

In Phase 3 of the intelligence cycle, the vast amounts of raw data that have been collected, possibly from multiple sources, are converted into intelligence (that is, usable information).

This step typically requires highly specialized skills, such as translating, decrypting, and interpreting the raw data into usable form. This information also may be placed into databases, etc., for future use and analysis.



Slide 2.10

Once the intelligence has been put into usable form, it must then be analyzed. The intelligence is assessed, organized, and synthesized into a product. This is Phase 4 of the intelligence cycle.

Basically, this step pulls together all the intelligence and asks, “What does it all mean?”

Conclusions are drawn and inferences made. A product is developed that allows intelligence officers to connect the dots.



Slide 2.11

The last phase of the intelligence cycle is dissemination. The finished product developed in Phase 4 is distributed to key personnel, such as policymakers, law enforcement agencies, and public health officials, as necessary.

Officials will base their decisions for action on the intelligence received. Moreover, gaps in intelligence may be identified, requiring that the intelligence cycle resume.

Much of this intelligence may be law enforcement sensitive and distributed to the appropriate personnel, based on the “need to know.”

As a result, hazmat responders will receive only the intelligence that pertains to their function. Among the types of intelligence that hazmat/CBRNE responders might receive are

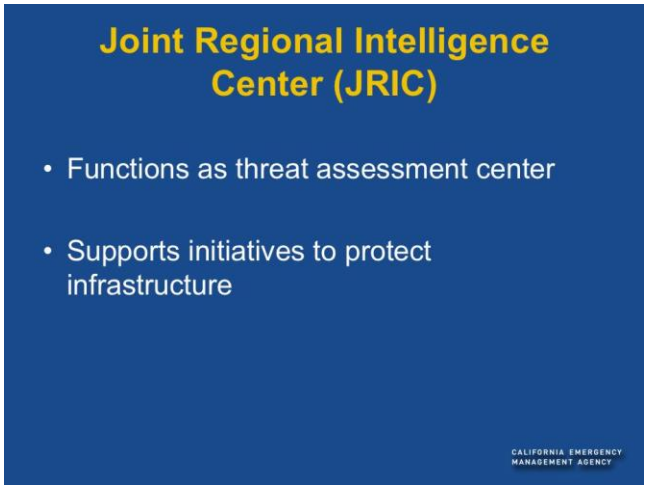
.

Step 3: Discuss the roles of Joint Regional Intelligence Centers and Terrorism Early Warning Groups.

Slides 2.12 through 2.15

Have participants turn to this section in their guides and follow along with the lecture.

Emphasize that many organizations and agencies at the local, state, tribal, and federal levels are collaborating in a systematic manner to gather and analyze information on threats of terrorism and to coordinate resources for response and recovery in the event of a terrorist attack.



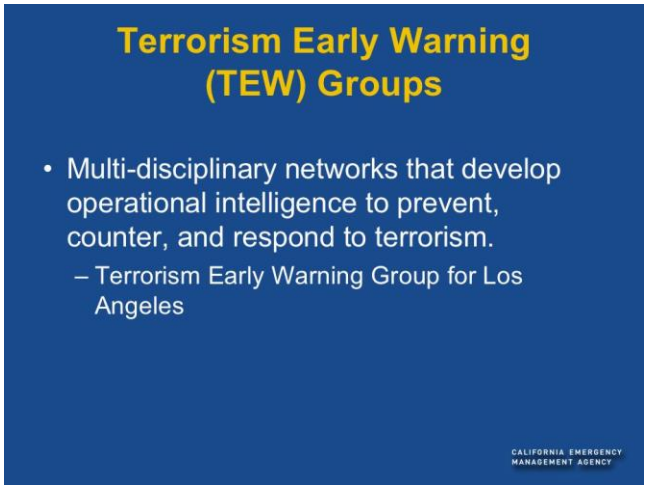
Slide 2.12

The Joint Regional Intelligence Center, or JRIC, in Los Angeles acts as an important conduit for the intelligence cycle. The JRIC functions as the State of California Regional Terrorism Threat Assessment Center (RTTAC).

The JRIC is a collaboration among federal, state, tribal, and local law enforcement and public safety agencies.

The JRIC receives, analyzes, synthesizes, and disseminates intelligence on criminal or terrorist threats. It converts information into operational intelligence to detect, deter, and defend against terrorist attacks and major crime threats within the seven counties of the Los Angeles office of the Federal Bureau of Investigation (FBI).

The JRIC also provides analytical support and threat assessments to bolster initiatives that protect local and regional infrastructure.



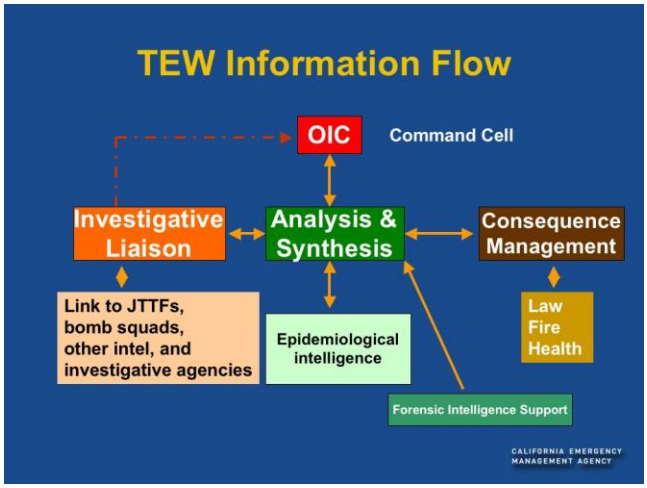
Slide 2.14

The Terrorism Early Warning Group, or TEW Group, is a concept that was first demonstrated in Los Angeles in 1996. TEW Groups are multidisciplinary networks that facilitate the sharing of information and synthesis of intelligence. The TEW Group concept is being replicated in many parts of the country.

TEW Groups increase opportunities for early warning of terrorist attack, provide local responders with information on terrorist threats, and offer decision-making information to community leaders so they will be able to deal effectively with threats and incidents.

The TEW Group for Los Angeles has expanded to a seven-county region, incorporating vast resources from a variety of agencies into one umbrella organization that is housed together and works together.

Among other organizations, the TEW Group for Los Angeles includes the JRIC, the Terrorism Liaison Officer Program, and the Regional Terrorism Threat Assessment Center, which offers subject matter experts to help with threat assessment and consequence management issues.



Slide 2.15

The purpose of the Operations Intelligence Center (OIC) is to collect, evaluate, collate, and analyze information and intelligence and then, as appropriate, disseminate this information and intelligence to the proper public safety agencies so that any threat of terrorism or criminal activity will be successfully identified and addressed.

Although they may be called something else, based on organizational structure, the functions depicted here show how information generally flows from the OIC, is transformed into intelligence, and reaches the field.

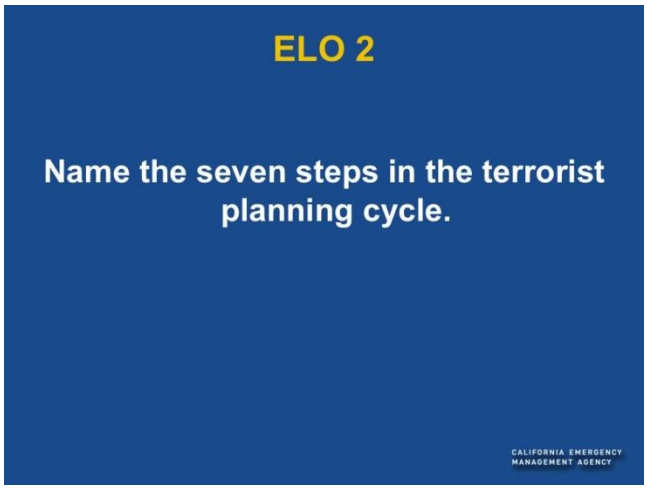
Epidemiological intelligence includes disease surveillance in humans and animals as well as food supply surety.

ELO 2: Name the seven steps in the terrorist planning cycle.

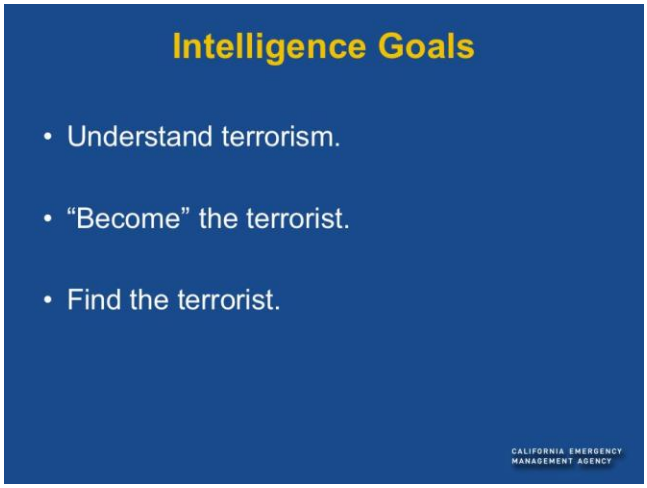
Step 4: Address the reasons our country must adopt a new mindset for combating terrorism.

Slides 2.16 through 2.20

Have participants turn to this section in their guides and follow along with the lecture.



Slide 2.16



Slide 2.17

The goal of risk assessment in regard to terrorism is to be able to know the who, what, when, why, and how of terrorism in order to prevent (ideally) or to lessen the impact of a terrorist attack.

As a result, the intelligence available to us must be so comprehensive and accurate that it allows us to:

Understand terrorism.

"Become" the terrorist.

Too often, in our efforts to "think like a terrorist," we have been confined within our own geopolitical, socio-economic, and demographic constructs. In other words, we "think like us, thinking like a terrorist."

This has proven to be a bad combination. We actually need to think as a terrorist does from all aspects, from the initial planning to the overall implementation to the escape.

Being able to think like a terrorist—from planning to escape—allows us to accurately assess the risks in each step.

Find the terrorist. To find the terrorist we need to know what has happened, what is happening, and what will happen.



Slide 2.18

What is actionable intelligence? Basically, it is accurate, timely information that can be acted upon to identify, track, intercede, and/or stop terrorist activities. This, too, is part of risk assessment.

Actionable intelligence drives data collection and identifies gaps. It sets priorities for countermeasures, fosters strategic assessment, describes trends, and enhances operations that may include indicators and warnings.

For the hazardous materials responder, examples of actionable intelligence include information that:

Identifies terrorists or criminals that may be active in the jurisdiction

Provides dates, times, and locations, etc., of planned events that may have public safety considerations

Identifies critical areas and potential targets within the jurisdiction

Identifies what information is needed (the intelligence requirements) for efficient, effective, and safe response and recovery activities

The ultimate goal of actionable intelligence is to inform.

The photograph in the slide shows an attack on a city bus. In a location where such attacks are relatively common, an example of actionable intelligence would be information that allows bomb squads, medical providers, transportation officials, and others to respond quickly and safely and to ensure that normal activities resume as soon as possible.



Slide 2.19

Over the last few decades, the United States has experienced many acts of terrorism, most of them at the hands of domestic terrorists.

The media reports all apprehensions of terrorists as well as the interdictions that prevented actual terrorist events.

Numerous agencies and countless individuals are working to stop, detect, and deter or catch the terrorist. We need to be right 100 percent of the time; the terrorist needs to be lucky only once.



Slide 2.20

The threat of terrorism on our soil is the new reality for our society. The fundamental aim of terrorism is to inflict terror. It is an attack on the target's resolve, psychological well-being, and ability to act.

The United States is at war. This war is unlike conventional warfare and requires new tactics and strategies, such as blending and cross-training.

Our domestic warriors are our law enforcement officers, our firefighters, and our healthcare providers.

Step 5: Discuss the terrorism planning cycle.

Slides 2.21 and 2.22

Have participants turn to this section in their guides and follow along with the lecture.



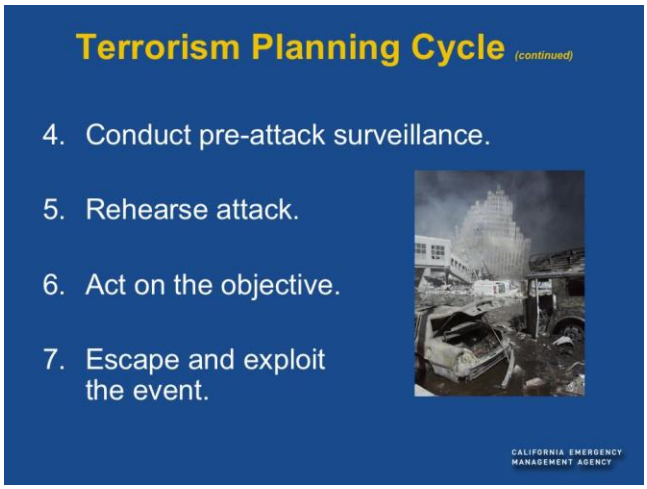
Slide 2.21

A terrorist attack does not occur in a single, isolated moment in time. Instead, a terrorist attack is the culminating action of a series of distinct, knowable, and observable activities. We call this series of activities the terrorism planning cycle.

In general, terrorists first consider a broad range of targets.

Then they gather intelligence about the possible targets and conduct surveillance to narrow the number of potential targets.

Based on the intelligence gathered (such as suitability, accessibility, maximum effect, etc.), a specific target is then selected.



Slide 2.22

Activities then ramp up with pre-attack surveillance and a rehearsal of the attack.

Once satisfied that the outcome will be as intended, terrorists act on the objective (attack), then escape and exploit the event by taking credit for it and using news coverage by the media to further their cause.

Understanding the terrorism planning cycle provides us with another valuable tool for risk assessment.

The photograph in the slide shows the ground level of the World Trade Center after the 11 September 2001 attack. The attacks on the World Trade Center and Pentagon that day involved extensive planning and coordination by terrorists long before the attacks were carried out.

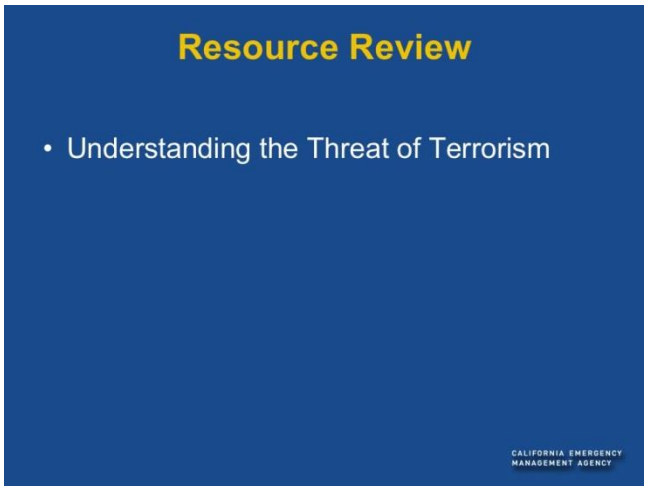
Step 6: Review and discuss fact sheet.

Slide 2.23

Materials: **Understanding the Threat of Terrorism**

Have participants turn to the Resources section in their guides.

Briefly review the materials with participants and answer any questions that may arise.



Slide 2.23

Review the listed resource in the participant guide.

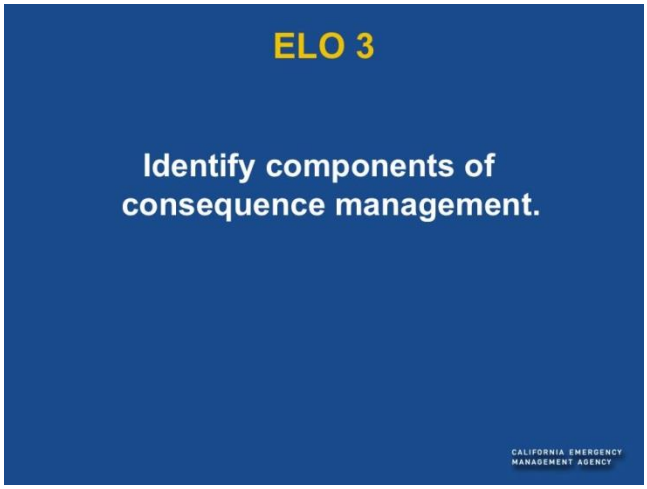
ELO 3: Identify components of consequence management.

Step 7: Discuss consequence management.

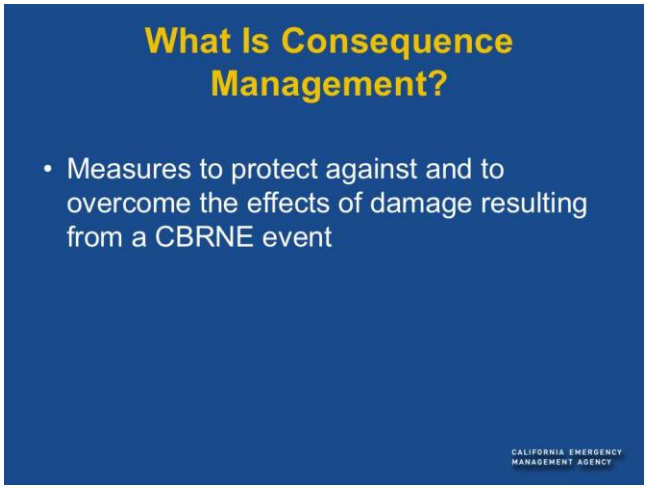
Slides 2.24 through 2.28

Have participants turn to this section in their guides and follow along with the lecture.

Highlight the fact that, in terms of consequence management, hazardous materials responders provide technical expertise on CBRNE response and recovery activities.



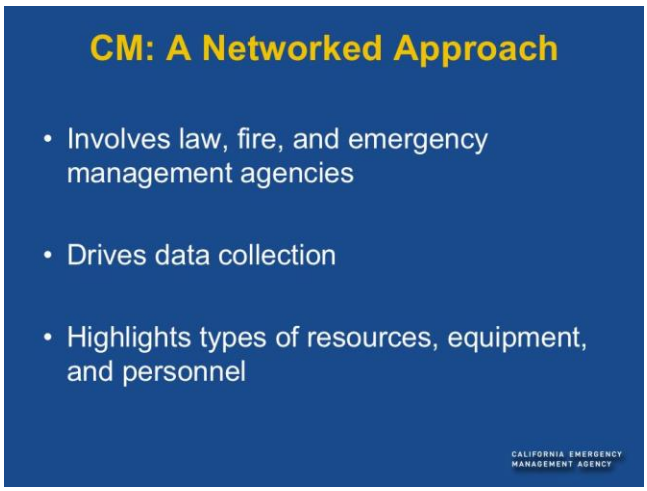
Slide 2.24



Slide 2.25

Consequence management, or CM, refers to measures taken to protect public health and safety, restore essential government services, and provide emergency relief to governments, businesses, and individuals affected by the consequences of a chemical, biological, nuclear, and/or high-yield explosive situation.

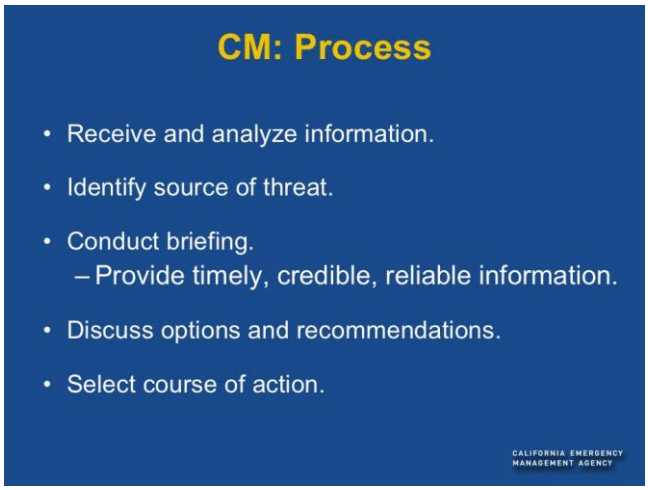
For domestic consequence management, the primary authority rests with the states to respond and the federal government to provide assistance as required. In an actual or potential terrorist incident, the Federal Emergency Management Agency (FEMA) is the federal lead for consequence management.



Slide 2.26

CM is predominately an emergency management function, involving joint operations by first responder agencies.

It describes the overall strategy, resources, and steps that will be needed to return to normal operational effectiveness.



Slide 2.27

The process of CM involves receiving and analyzing information, identifying the source of the threat, and conducting a briefing.

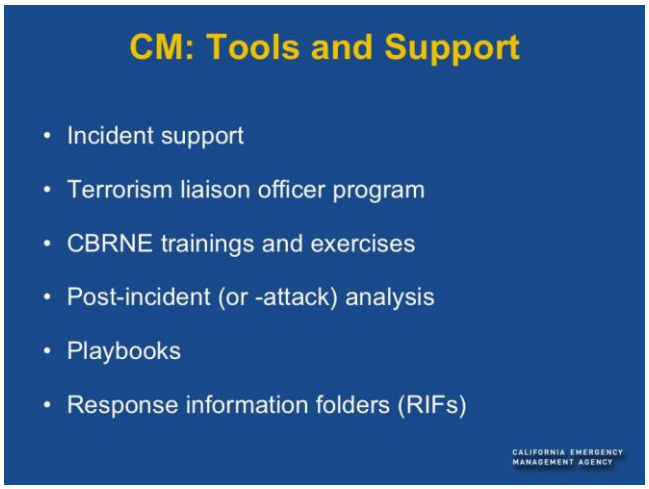
The briefing should provide timely, credible, and reliable information on the potential hazards, the likelihood that such hazards will be encountered, and the response activities that would be required (given those hazards) during a specific terrorist threat.

Research and typing is essential for ensuring that the hazards and necessary response activities are fully understood.

This information on hazards and appropriate response activities should be shared with key personnel and viewed within the context of a worst-case scenario.

Once the issues are discussed and recommendations made, a course of action is selected.

The hazardous materials responder acts in the capacity of technical expert on CBRNE response and recovery activities for consequence management.



Slide 2.28

The success of CM depends on knowledgeable and well-trained personnel and the use of numerous organizational products.

For example, incident support or epidemiological teams with specialized training may be called in. The fire department's terrorism liaison officer (TLO) program may help coordinate the flow of intelligence. Any and all trainings and exercises in preventing, preparing for, and responding to CBRNE events contribute to ensuring the efficacy and efficiency of emergency response personnel.

Various products, such as reports (for example, post-incident or post-attack analyses), standard operating procedures (playbooks), and response information folders (RIFs), also play a critical role in providing information upon which decisions will be based. In particular, playbooks and RIFs help assess risk and determine the potential for damage and resources affected.

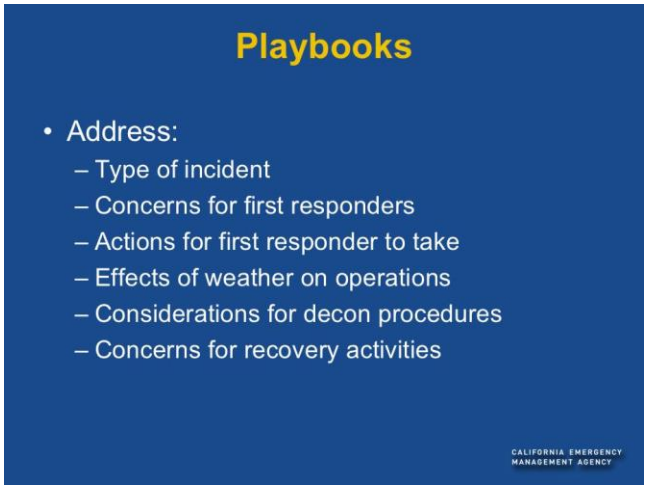
These products are especially important as tools to guide personnel who may not understand all the issues at play.

In addition, developing mission folders and course of action guidance and preparing intelligence for operations will help command staff and analysts make better decisions on short notice. These products also provide contact information for key personnel during off-hours.

Step 8: Discuss the components of playbooks.

Slides 2.29 through 2.31

Have participants turn to this section in their guides and follow along with the lecture.



Slide 2.29

It is important to have an organized format for all personnel to follow at every hazmat emergency. This template then becomes the team's "playbook," or standard operating procedures (SOPs).

These playbooks should describe what will likely be needed for each type of scenario and how those requirements will be met. Playbooks provide a synopsis of the incident and address the release of CBRNE materials in broad categories (i.e., threatened use, confirmed presence, actual release, initial response concerns, and community awareness and public health concerns).

Playbooks address issues such as concerns for first responders and the actions first responders will need to take (such as what kind of personal protective equipment or specialized resources will be required, identifying the source of contamination, setting up operation zones, and initiating protective actions).

In addition, playbooks address the effects weather might have on the operations, what will be needed for the specific decontamination procedures, and the requirements for recovery activities (such as managing mass casualties, site decontamination, and restoration).

The plans should be shared with all of the agencies that will need to work with them under emergency conditions, and they should be practiced. All team members should understand the format and develop checklists so nothing is overlooked at the emergency.



Slide 2.30

Playbooks should follow a standard format or design.

This format should:

Address a specific threat.

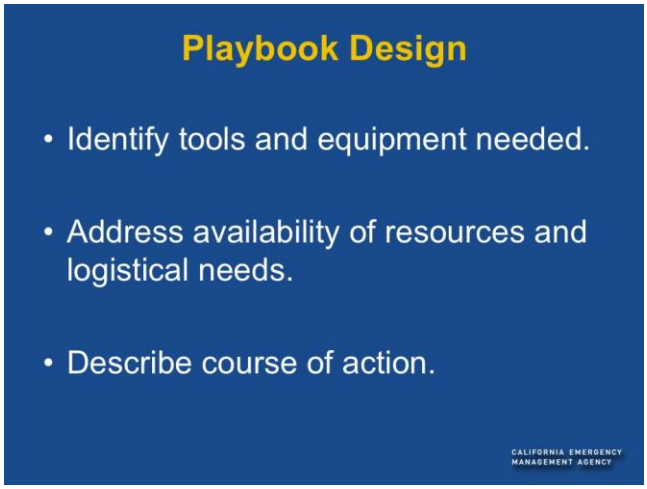
Include RIFs for particular venues.

Identify tactical information that should be shared and exchanged.

Provide references to experts on the specific threat or operation.

RIFS provide detailed information on a specific venue, such as its location; contact information; floor plans; photographs of the venue and surrounding area; who is likely to be there during the day and during the night; schematics of the power, water, and air conditioning systems; past threat history; symbolic value; vulnerability; microclimate; and response resource list.

The practical exercise at the end of this chapter will provide hands-on experience developing a comprehensive RIF.



Slide 2.31

The format for playbooks should also:

Identify tools and equipment that are likely to be needed for a specific threat and venue.

Address the availability of resources (tools, equipment, trained personnel, etc.).

Describe the course of action (including whether to initiate notifications, such as an alert, warning, or statement that an actual event has occurred).

Step 9: Provide time to answer questions.

Slide 2.32

Use this opportunity to clarify any misconceptions or to answer any questions participants may have.

Emphasize that, initially, an act of terrorism may not provide any discernible signature that identifies it as a terrorist event. Recognition of the event as an intentional act may be delayed.

Also, let participants know that next they will be engaging in a group activity that will provide them with hands-on experience in developing a comprehensive response information folder (RIF).



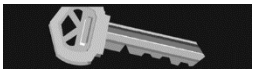
Slide 2.32

Initially, an act of terrorism may not provide any discernible signature that identifies it as a terrorist event. Recognition that the event is an intentional one may be delayed.

Moreover, threats of terrorism must be vetted to ensure their validity and to determine the likelihood they will be carried out and the scope of damage the threat would actually cause.

Many organizations and agencies, such as the California Anti-Terrorism Information Center, JRIC, and TEW Groups, are working together in a systematic manner to gather and analyze information on threats of terrorism and to coordinate resources for response and recovery in the event of a terrorist attack.

This intelligence is then provided to hazardous materials response teams, as needed, to ensure they will be able to respond effectively, efficiently, and safely to a CBRNE attack.



Step 10: Conduct Practical Exercise 2.1—Developing Response Information Folders

Introduction: Participants review and discuss a sample response information folder (RIF).

Action to Be Completed: Have participants work independently to familiarize themselves with the RIF form. Then have participants review the accompanying sample RIF (schematics, floor plans, maps, photographs, etc.) for the fictitious Kramer Arena.

Engage participants in a discussion about the usefulness or completeness of the sample RIF. For example:

Does the RIF include all the information they would want for pre-planning purposes?

Would the information be easier to use if it was organized like the RIF form? (For example, would it be helpful to mark the floor plans of Warren Hall and the Exhibit Building with the numeral eight?)

Are there any parts of the RIF documentation that they feel are incomplete or would benefit from more information? (For example, contact information, resource list, etc.)

Write these responses on the easel pad. Clarify information and answer questions, as needed.

Rationale: Participants become more familiar with RIFs, essential documents for helping command staff and analysts make sound, short-notice decisions. Once completed, RIFs provide an overview of the physical area concerned and potential hazards that may be encountered, using a standard format to organize this information.

Time Necessary to Complete: 10 minutes

Resources: Developing Response Information Folders: Exercise Sheet and Instructor Key, easel pad, and markers

Findings: Information found in RIFs includes:

4. Site name

Location

Type of incident

Hazards (MSDS)

Day and night populations

Point of Contact

Contact information

Floor plan

Photos

Power, water, and air systems (HVAC)

Downhill, downwind (orientation of site in respect to surroundings)

Location of lights and water

Intermodal links

Systemic impact

Past threat history

Symbolic value

Key dates for facility

Criticality (i.e., people, facility)

Vulnerability

Locations of landing zones, command post, staging areas, and decontamination areas

Communications capabilities and limitations

Microclimates and prevailing winds

Response resource list

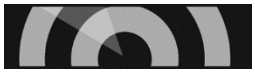
Participant Guide

Chapter 3
Chemical Agents and Response Tactics



Scope

This chapter provides an overview of the clinical effects of exposure to nerve, blister, blood, and choking agents and field tactics to save the lives of victims exposed to such agents.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 3, participants will be able to identify the immediate consequences of a chemical agent incident on victims and the appropriate antidotes and treatments in the field.



Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

List five ways that chemical agents can become absorbed into the body.

Identify the clinical effects of exposure to nerve agents and how to treat victims.

Identify the clinical effects of exposure to blister agents and how to treat victims.

Identify the clinical effects of exposure to blood agents and how to treat victims.

Identify the clinical effects of exposure to choking agents and how to treat victims.

Linkages to Universal Task List

The information, objectives and activities in this chapter promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

(Res.A.2 1.3.1) Monitor for primary and secondary threats.

(Res.B.1 16.2) Create and implement a site-specific safety and health plan for site stabilization, rescue, and recovery operations.

(Res.B.2 3.2.1) Coordinate and direct hazardous materials detection and assessment activities.

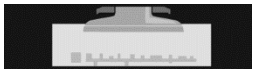
(Res.B.2 3.2.2.) Coordinate, integrate, and manage efforts to prevent, or mitigate, or minimize threat of potential releases.

(Res.B.2 5.1.1.5) Assess hazardous materials release situation.

(Res.B.2 5.3.4) Conduct containment activities.

(Res.B.2 5.3.4.1) Secure contamination source and affected areas.

(Res.B.2 5.3.5) Monitor status of leaks, spills, and releases.



Resources

Resource List

Safety Data Sheets (Nerve Agents: Sarin, Soman, Tabun, VX Agent)

Safety Data Sheets (Blister Agents: Sulfur Mustard, Distilled Mustard, Lewisite)

Safety Data Sheets (Blood Agents: Hydrogen Cyanide, Cyanogen Chloride)

Safety Data Sheets (Choking Agents: Chlorine, Phosgene, Chloropicrin)

Irritating Agent

Clandestine Manufacture

Reference List

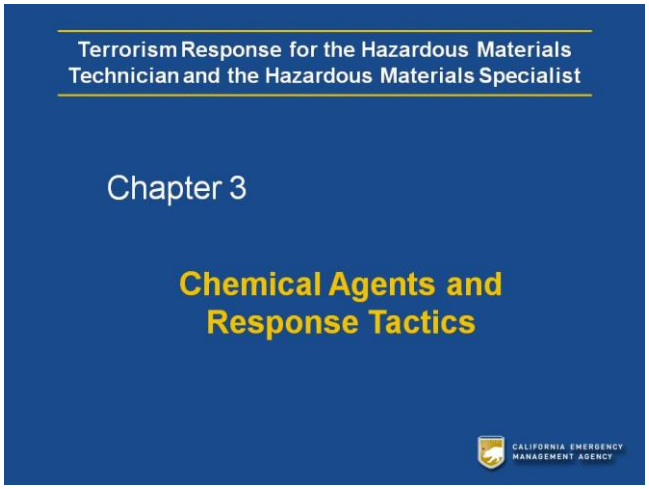
See Reference List at the beginning of this guide.

Practical Exercises (PE)

3.1 Responding to the Release of an Unknown Chemical (Exercise Sheet)

3.2 Tabletop Exercise: Responding to an Act of Terrorism Involving a Chemical Agent (Scenario)

3.2 Tabletop Exercise: Responding to an Act of Terrorism Involving a Chemical Agent (Exercise Sheet)



Slide 3.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

(Res.A.2 1.3.1) Monitor for primary and secondary threats.

(Res.B.1 16.2) Create and implement a site-specific safety and health plan for site stabilization, rescue, and recovery operations.

(Res.B.2 3.2.1) Coordinate and direct hazardous materials detection and assessment activities.

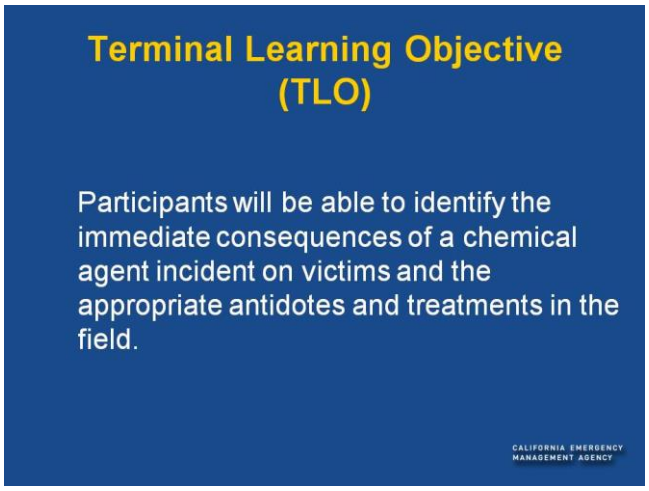
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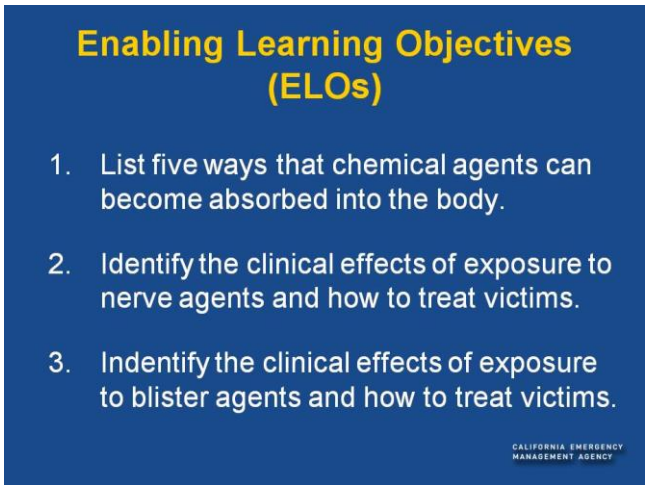
(Res.B.2 5.3.4.1) Secure contamination source and affected areas.

(Res.B.2 5.3.5) Monitor status of leaks, spills, and releases.



Slide 3.2

The terminal learning objective (TLO) of this chapter is to ensure that participants will be able to identify the immediate consequences of a chemical agent incident on victims and the appropriate antidotes and treatments in the field.



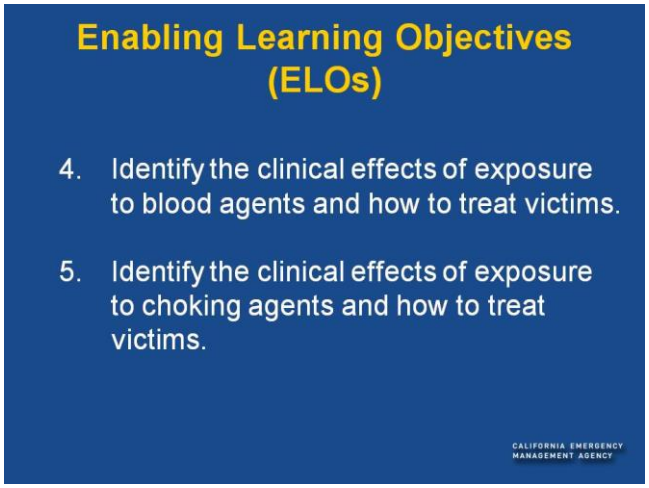
Slide 3.3

This chapter's enabling learning objectives (ELOs) are to ensure participants will be able to:

List five ways that chemical agents can become absorbed into the body.

Identify the clinical effects of exposure to nerve agents and how to treat victims.

Identify the clinical effects of exposure to blister agents and how to treat victims.

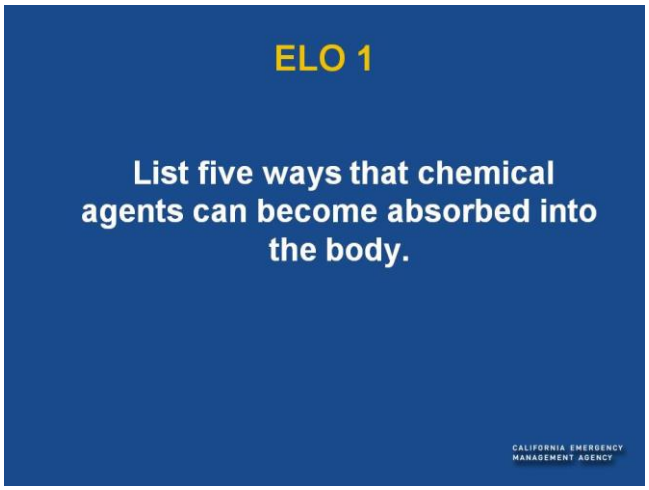


Slide 3.4

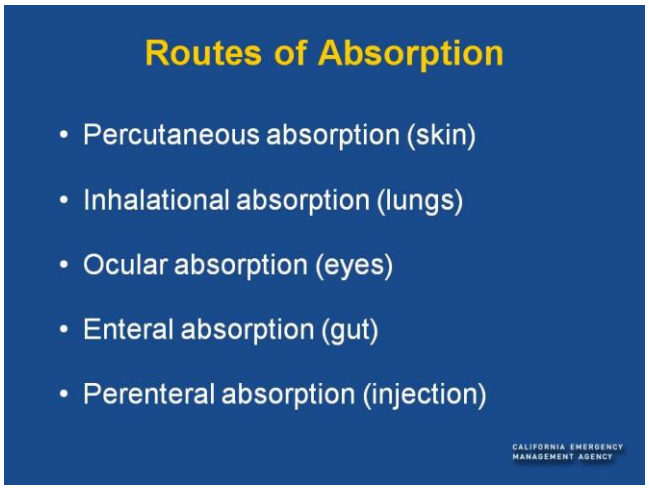
This chapter's ELOs will also ensure that participants will be able to:

Identify the clinical effects of exposure to blood agents and how to treat victims.

Identify the clinical effects of exposure to choking agents and how to treat victims.



Slide 3.5



Slide 3.6

Chemical agents can enter and attack the body through a number of routes, typically through the skin, the lungs, the eyes, or the gut.

Chemical agents can also be introduced into the body through intravenous or intramuscular injection.



Slide 3.7

The length of time chemical agents can remain in the environment depends on the volatility of the agent, wind, temperature, and the interactions between the agent and various surfaces.

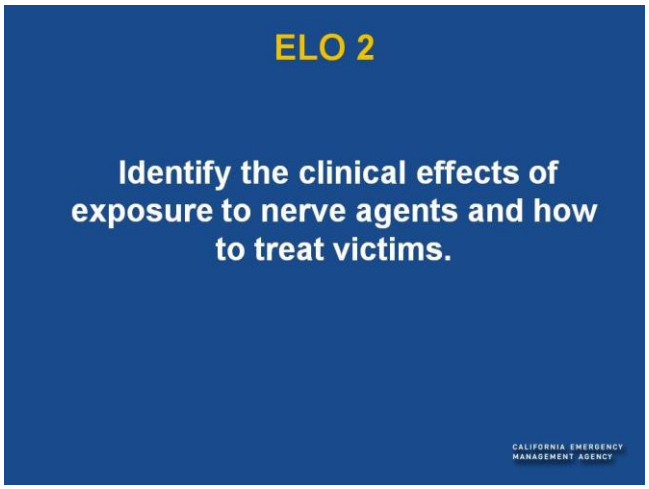
Some chemical agents, called persistent agents, can stay in the environment for a considerable time, creating a threat to responders.

Persistent agents include VX, fourth generation agents (also known as Novichok or A-series nerve agents)[1], lewisite (L), mustard-lewisite (HL), and thickened forms of nerve and blister agents, such as soman (TGD) and sulfur mustard (THD). Thickened chemical agents have been mixed with another substance to increase their persistency.

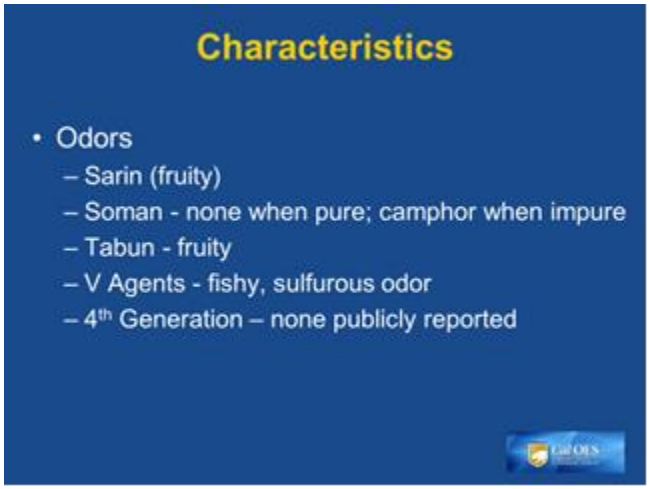
Non-persistent agents, such as tabun (GA), sarin (GB), soman (GD), chlorine (CL), phosgene (CG), hydrogen cyanide (AC), and cyanogen chloride (CK), usually disperse within 24 hours.

The initials, such as GB for sarin, indicate the military abbreviation for the specific chemical warfare agent.

[1] Reference - Novichoks: The Dangerous Fourth Generation of Chemical Weapons, International Journal of Molecular Sciences, Published online 2019 Mar 11



Slide 3.8

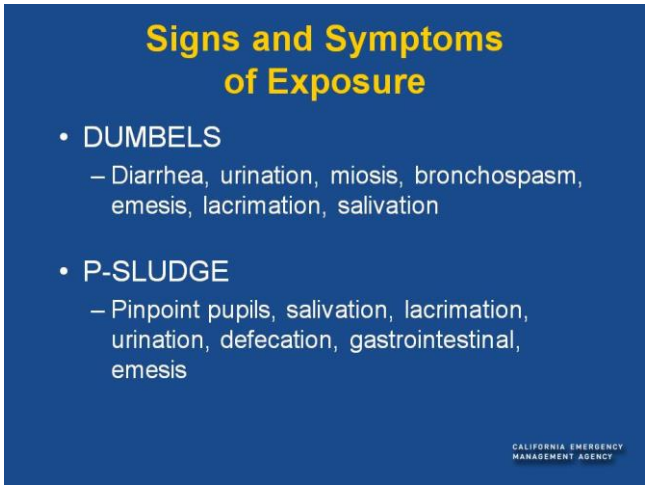


Slide 3.9

Most of the literature on nerve agents describes them as colorless and odorless. However, nerve agents may have a characteristic odor. Sarin, for example, can smell fruity.

Contaminants may mask the nerve agent's odor. As an example, the sarin used in the 1995 Tokyo subway attacks, which caused twelve deaths and 1,200 injuries, was described as foul-smelling.

It is important for responders to know which odors are associated with specific nerve agents. The intent is not to identify a specific chemical agent by smell. Instead, the intent is to use this knowledge as a warning sign that chemical agents may be present, especially if victims report smelling unusual odors. Olfactory fatigue can set in very quickly, making it impossible to smell agents, even after a short exposure.

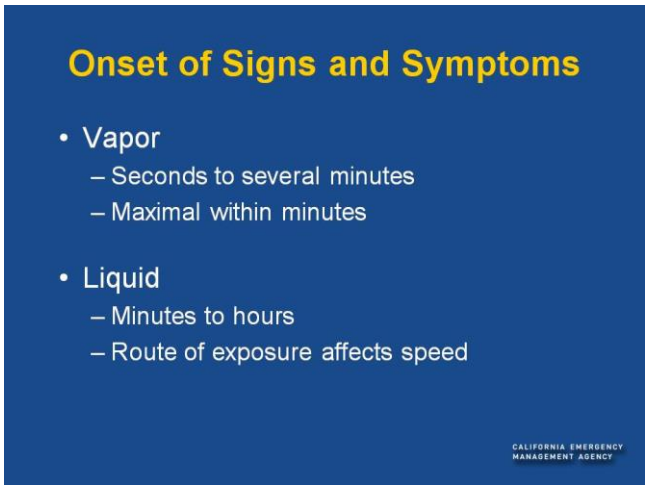


Slide 3.10

Basically, nerve agents over-stimulate the nerves, glands, and muscles.

"DUMBELS" and "P-SLUDGE" are two acronyms to help hazmat responders remember the typical signs and symptoms that indicate possible exposure to nerve agents.

Miosis is the medical term for pinpoint pupils. Bronchospasm is the medical term for the sudden, uncontrolled tightening of the band of muscles around the airways. For example, bronchospasms are typical symptoms of asthma.



Slide 3.11

The severity of symptoms depends on dose, amount of time exposed to the nerve agent, and route of entry.

It may take only seconds to several minutes for signs and symptoms of exposure to nerve agents through vapors to appear. (Signs and symptoms usually appear within minutes.)

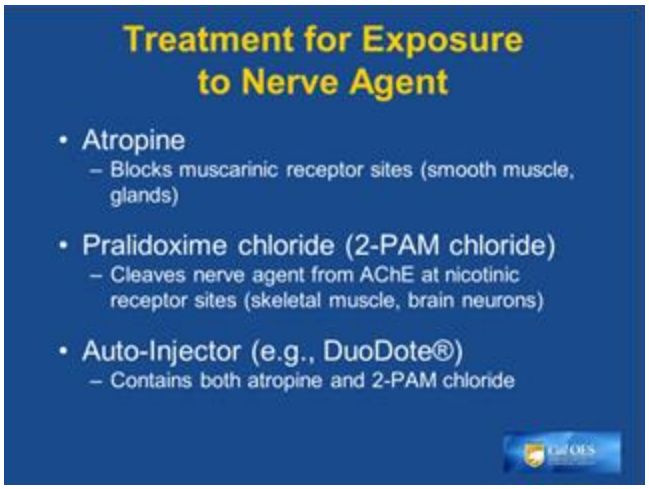
In general, once a person has been removed from the toxic vapor and exposed to fresh air for about fifteen minutes, no new signs or symptoms will appear.

The onset of signs or symptoms of exposure to a liquid nerve agent may be quick—within minutes—or it may be delayed.

The onset of symptoms will depend on where the liquid contacts the body, the concentration of the nerve agent, and how soon decontamination procedures occur. Novichok agents, specifically, may have a significantly delayed onset of symptoms.

The onset of symptoms will depend on where the liquid contacts the body, the concentration of the nerve agent, and how soon decontamination procedures occur.

Although decontamination will be addressed in a later chapter, the efficacy of expedient decon cannot be understated. In 2017, Kim Jong-nam (half brother to the leader of North Korea – Kim Jong-un) was assassinated in a Malaysian Airport by use of the nerve agent Vx. Two women approached him seconds apart as he was in the terminal, and smeared an unknown liquid on his face and walked away, believing the process to be a part of a television prank show. Kim Jong-nam's first observed symptoms, an unusual gait, appeared minutes after contamination, with further nerve agent symptoms following shortly after. However, the suspects, walked out of the airport and were arrested a day later when they returned to collect payment for the services. Despite not wearing gloves, neither of the suspects had displayed any signs of nerve agent poisoning. This validates the efficacy of quick decontamination.



Slide 3.12

The toxic effect of nerve agents depends on their ability to inhibit the enzyme acetylcholinesterase (AChE), which inhibits the action of acetylcholine.

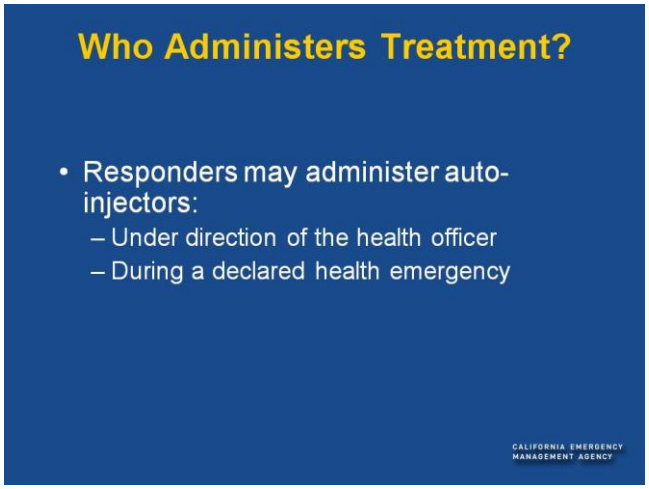
Acetylcholine is a common neurotransmitter, or chemical messenger, found in the cholinergic nervous system. There are two types of receptors for acetylcholine: muscarinic and nicotinic receptors.

One treatment for exposure to nerve agents is atropine. Atropine works by blocking muscarinic receptor sites, so that the acetylcholine that is already in the synapse cannot over-stimulate muscles or glands.

A normal dose of atropine is 2 mg injected intramuscularly, as needed. Typically, up to a total of three 2 mg doses may be administered for severe symptoms in the pre-hospital setting.

A complementary treatment for exposure to nerve agents is pralidoxime chloride, or 2-PAM chloride. 2-PAM chloride works by cleaving the nerve agent from AChE at nicotinic receptor sites in the brain and skeletal muscle. A normal dose of 2-PAM chloride for exposure to nerve agent is 600 mg, as needed. Typically, up to a total of three 600 mg doses may be administered for severe symptoms in the pre-hospital setting.

2-PAM is a critical part of the treatment protocol for exposure to nerve agents and organophosphates. Both atropine and 2-PAM chloride are available in auto-injector devices, which consist of a combined doses containing 2 mg atropine and 600 mg 2-PAM chloride. Administration of atropine and 2-PAM chloride should be performed in accordance with applicable jurisdictional protocols and administration devise manufacturer recommendations.

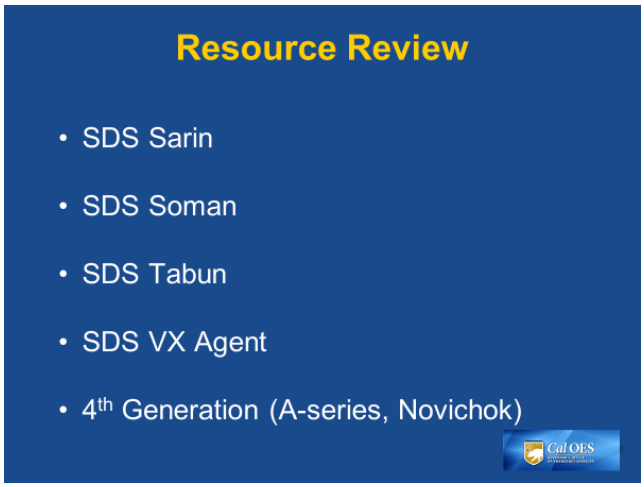


Slide 3.13

In any mass casualty event, especially one that may involve nerve agents, the local public health officer should be contacted early on.

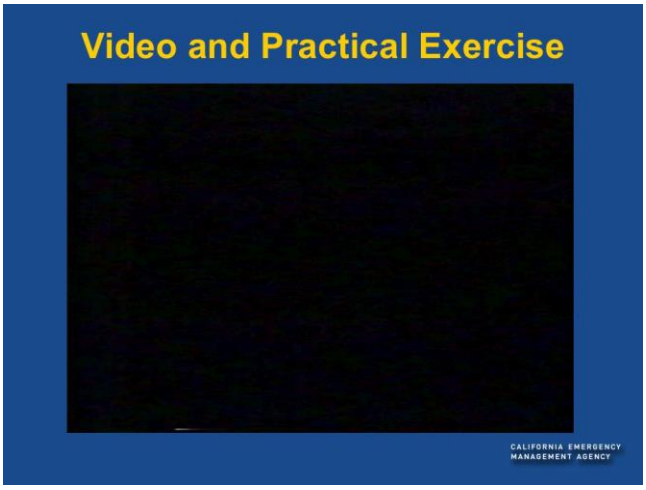
Responders who use auto-injectors while working under the direction of the health officer during a declared public health emergency receive considerable immunity from lawsuits.

Nerve agent antidote auto-injectors are not designed for pediatric use. However, criteria have been developed for pediatric doses, based on the average age and weight of a child.



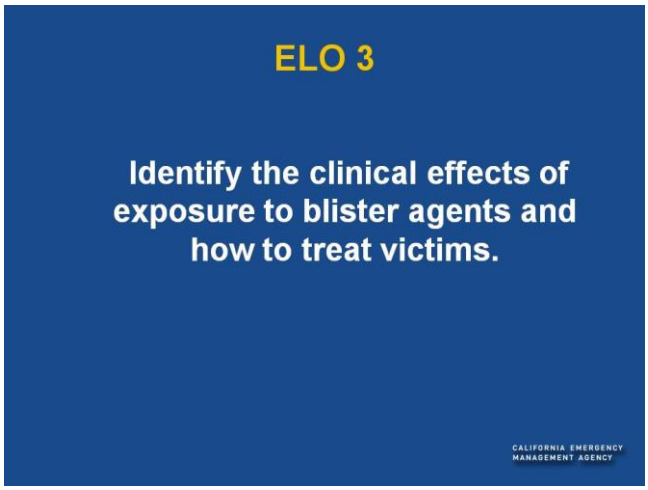
Slide 3.14

Review the listed materials in the participant guide.



Slide 3.15

In this video, organophosphates have been released at a farm supply store.



Slide 3.16



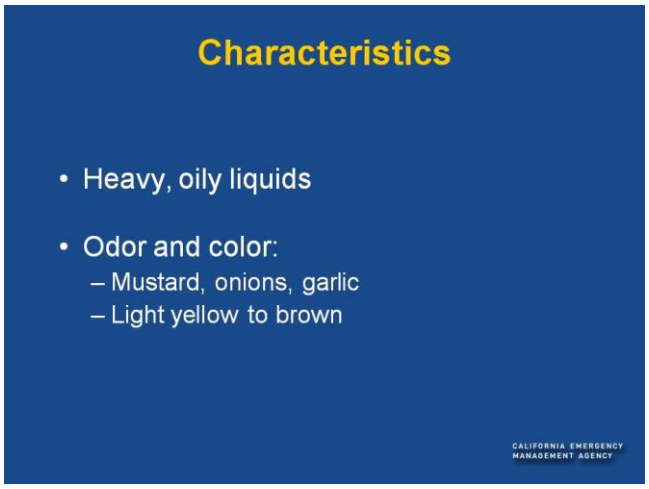
Slide 3.17

The mustard agents of World War I are probably the most familiar blister agents.

Mustards and lewisite are liquids. Phosgene oxime, on the other hand, is a solid; its melting point is 104˚ F.

Mustard agents, lewisite, and phosgene oxime all evaporate, which presents a vapor hazard to responders. Mustard agent freezes (becomes a solid) at 57˚ F.

T-2 mycotoxin, sometimes called yellow rain, is well-known as a blistering agent. Since it is derived from a fungi, it is technically a biological, rather than a chemical, agent.

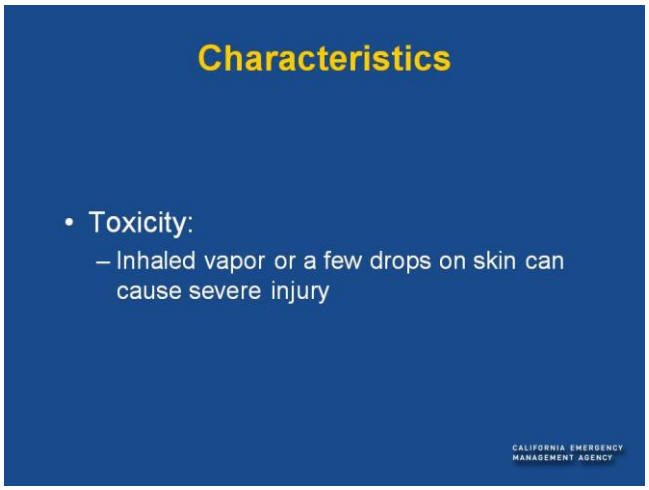


Slide 3.18

Blister agents, or vesicants, typically are heavy, oily liquids.

In a pure state, blister agents are colorless and nearly odorless.

In an impure state, they are dark-colored and have a strong odor that may resemble mustard, onions, or garlic.



Slide 3.19

Blister agents are extremely toxic.

Inhaled vapor or a few drops of mustard agent on the skin can cause severe injury.



Slide 3.20

Mustard agents are persistent. They affect the skin, eyes, and airways. Initial symptoms may include red, itchy, painful skin and blisters (although these may take hours or days to form).

Later symptoms may include pain or swelling in the eyes and lungs, tears in the eyes, and trouble breathing.



Slide 3.21

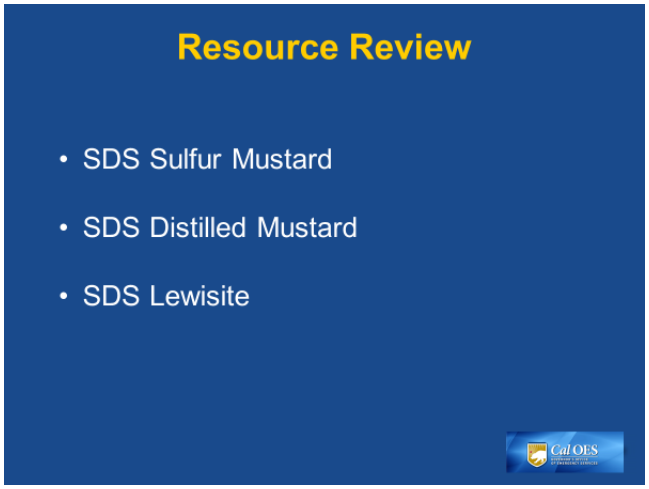
Mustard agents are not designed to kill. The death rate is only about 5 percent. Instead, they are designed to maim and injure. When absorbed, they can adversely affect bone marrow, the central nervous system, and the gastrointestinal tract.

Death usually occurs as a result of severely damaged pulmonary function and/or infection.

No antidote exists for mustard agents.

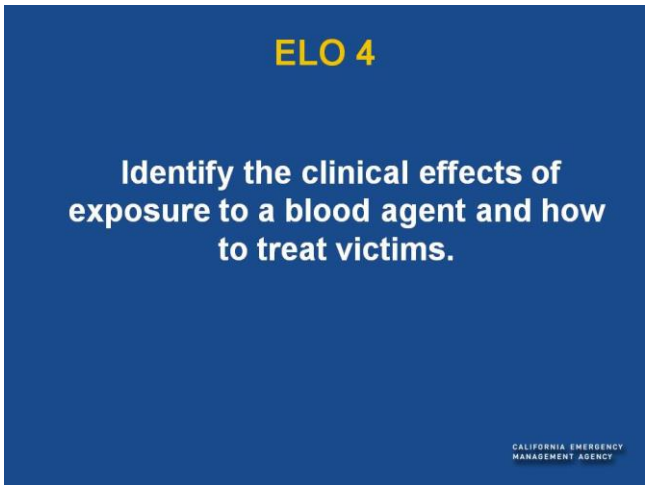
Quick decontamination is the only effective treatment: Provide oxygen, remove clothing, remove liquid agent from the skin (pat off with an absorbent rather than rubbing it off), and flush with water or soap and water (flush and lift the eyelids, too).

Follow with supportive care.

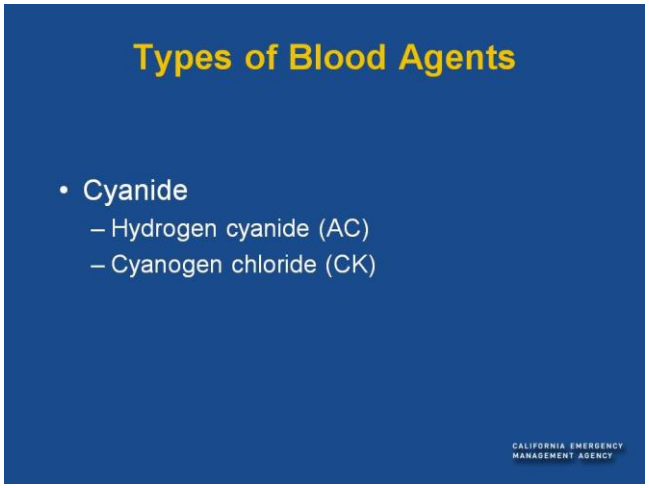


Slide 3.22

Review the listed materials in the participant guide.



Slide 3.23

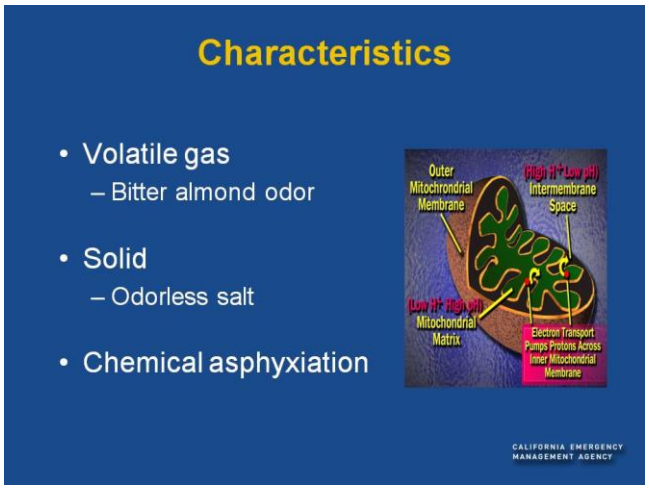


Slide 3.24

Cyanide compounds are the most familiar blood agents.

Hydrogen cyanide (gas) was considered for use as a chemical warfare agent, but was rarely used in military situations because its effectiveness was limited by its quick dispersion.

However, hydrogen cyanide was used by the Germans in World War II. In addition, the use of hydrogen cyanide as a chemical warfare agent has been attributed to both sides during the Iran-Iraq war. These materials present an additional hazard because little to no training is required to create reactions generating these gases. Furthermore, all of the precursors (Hydrochloric acid, Potassium cyanide, or even concentrated bleach) are readily available as industrial products.



Slide 3.25

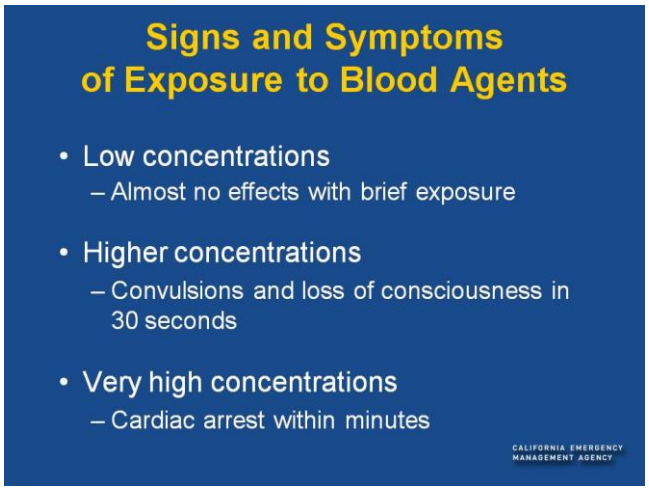
Blood agents, or cyanogens, tend to have odors when in gas form and typically are odorless when in solid form. As solids, Potassium Cyanide/Sodium Cyanide present no inhalation hazard until they have a reaction with acids or bases. When this occurs, the reaction products are formed, Hydrogen Cyanide (with a bitter almond odor) when mixed with acids, or Cyanogen Chloride (with an acrid pungent odor) when mixed with strong bases or bleach.

Blood agents produce casualties by interfering with the blood's ability to make use of oxygen in the cells, which leads to death by chemical asphyxiation.

Inhaled cyanide produces systemic effects and was thought to be carried in the blood; hence the term *blood agent*.

The term blood agent as a specific designator for cyanide really is a misnomer, as the widespread distribution of absorbed nerve agents and vesicants via the blood diminishes the term.

In addition, the use of the term *blood agent* carries the connotation that the main site of action of cyanide is in the blood, whereas cyanide acts primarily within the cell.



Slide 3.26

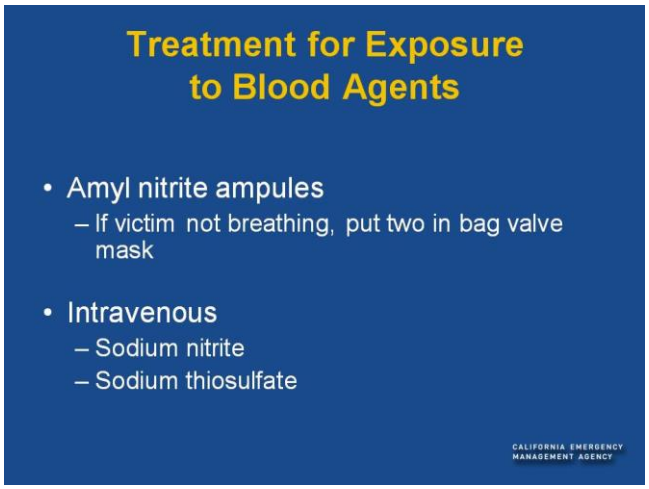
Although commonly thought to be a very deadly chemical, cyanide causes minor effects after a brief exposure to low concentrations.

The symptoms of exposure to a blood agent depend upon the concentration of the agent and duration of exposure.

In low concentrations, cyanide may produce nausea and dizziness, coupled with weakness and anxiety. However, symptoms typically regress after the victim has been exposed to fresh air for a while.

Higher concentrations or longer exposure may cause convulsions and loss of consciousness in 30 seconds.

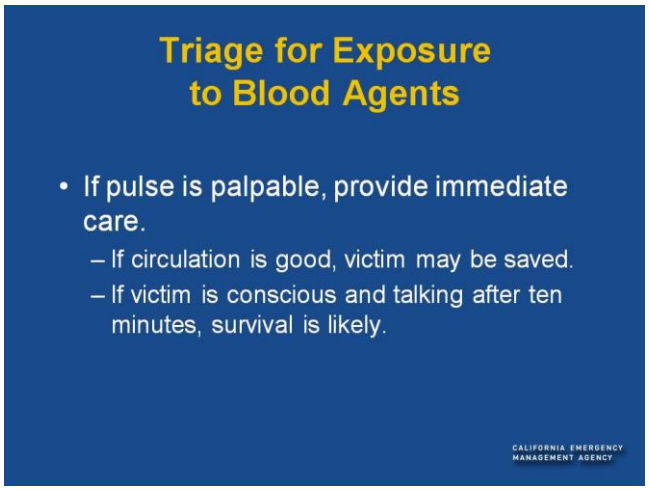
Very high concentrations lead to powerful gasping for breath, breathing stops in three to five minutes, and cardiac failure occurs within five to eight minutes.



Slide 3.27

If patients are alive upon the arrival of properly trained and equipped personnel, treatment with amyl nitrite, sodium nitrite, or sodium thiosulfate may be effective. (These three drugs make up the Lilly cyanide antidote kit.)

In 2006, FDA approved hydroxocobalamin, a novel cyanide antidote, available as the branded Cyanokit®[1]. The active ingredient in Cyanokit® is a precursor of vitamin B12. This ingredient works by binding directly to the cyanide ions, creating a natural form of vitamin B12, which is excreted in the urine. As a result, methemoglobin is not produced and the oxygen-carrying capacity of the victim's blood is not lowered. Pre-hospital care of Blood Agent exposure patients should be performed in accordance with applicable jurisdictional protocols and manufacturer recommendations.

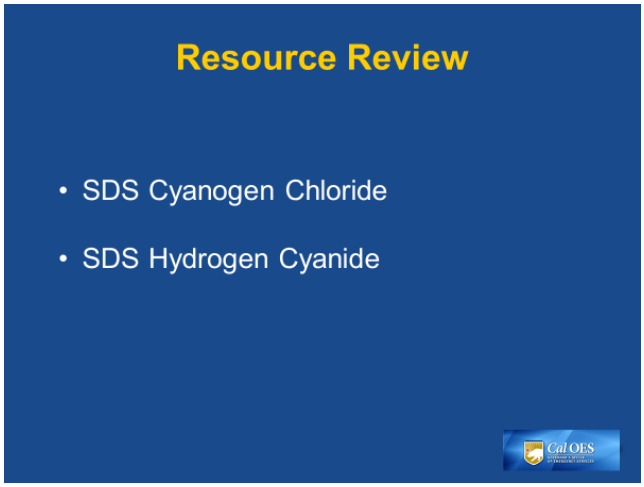


Slide 3.28

Careful observation, supplemental oxygen, and supportive care may be sufficient therapy for the victim who does not exhibit physical signs of cyanide poisoning.

If a victim's pulse is palpable, provide immediate care. If a victim's circulation is good, he or she may be saved. The chances of survival go up if the victim, once out of the contaminated environment for ten minutes, is conscious and talking.

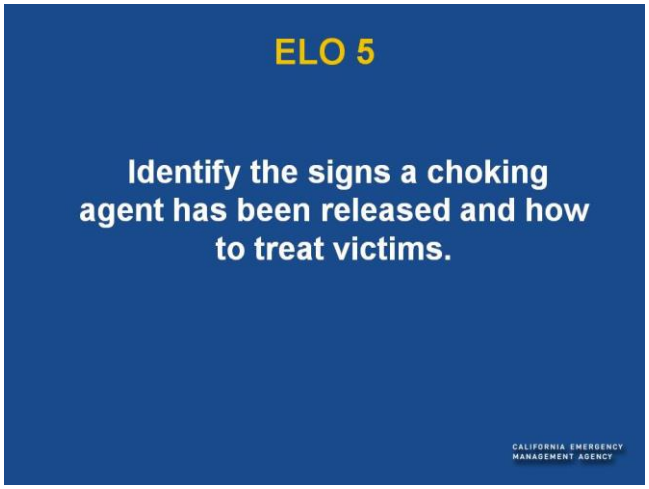
[1] Reference: American Journal of Health-System Pharmacy, Antidotes for Toxicological Emergencies



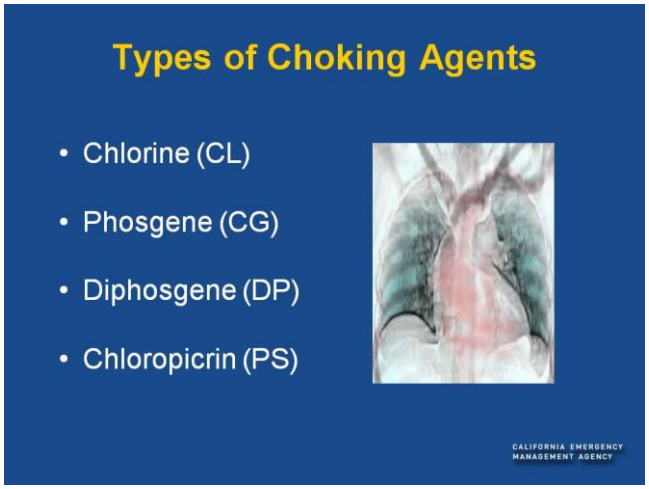
Slide 3.29

Review the listed materials in the participant guide.

The SDSs provide more detail on Cyanogen Chloride and Hydrogen Cyanide.



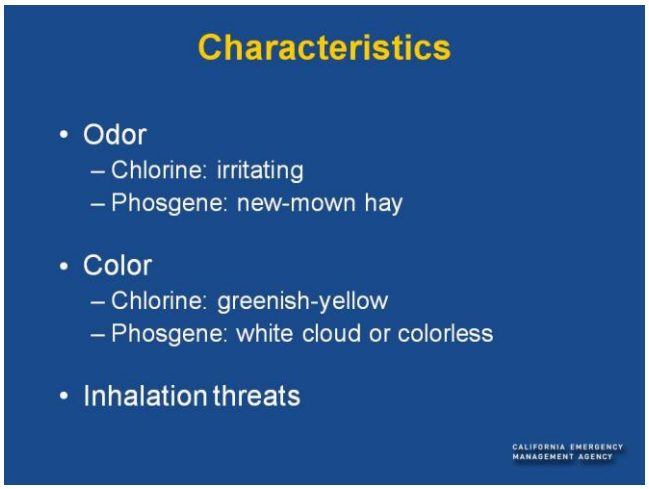
Slide 3.30



Slide 3.31

Examples of choking agents include chlorine, phosgene, diphosgene, and chloropicrin.

This chapter will discuss chlorine and phosgene.



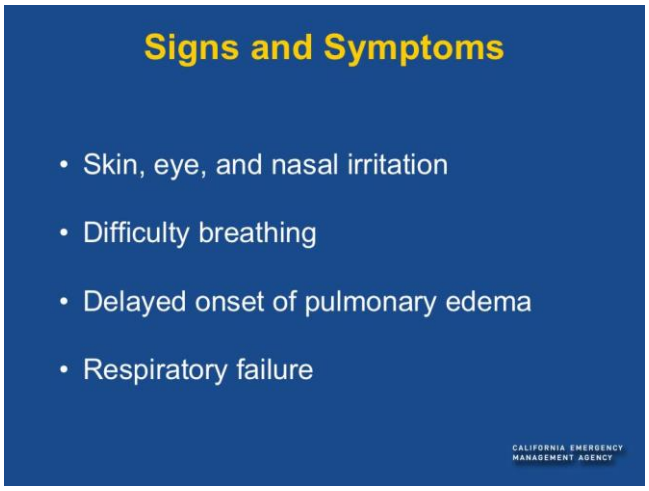
Slide 3.32

Both chlorine and phosgene have various industrial uses and large quantities of liquids are shipped daily throughout the United States.

Chlorine has an irritating odor, while phosgene may have the odor of new-mown hay.

Chlorine has a distinctive greenish-yellow color, while phosgene generally appears as a white cloud or may be colorless.

Upon release, they expand and evaporate rapidly, becoming non-persistent gases and therefore, inhalation threats.



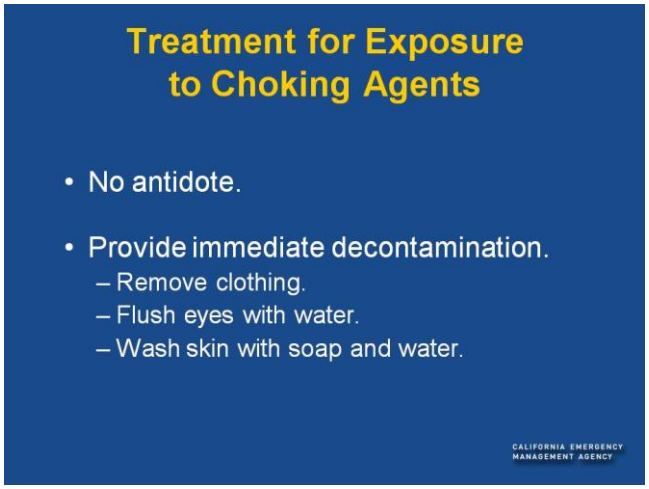
Slide 3.33

Choking agents inflict injury mainly on the respiratory tract, including the nose, throat, and especially, the lungs.

Victims typically inhale these agents, which can lead to pulmonary edema two to 24 hours after exposure and eventually, to respiratory failure.

These agents hydrolyze with mucous secretions, forming hydrochloric acid, which then burns the tissue. This irritation causes the mucous membranes in the trachea and the lining of the lungs to secrete additional fluid. Eventually, this fluid buildup is such that it interferes with oxygen flow. The lungs literally fill with fluid. This is sometimes referred to as “dry land drowning.”

Whereas the majority of chlorine exposure-induced deaths occur in the first 24 hours, victims who survive the initial exposure may live with minimal pathological or physiological sequelae.



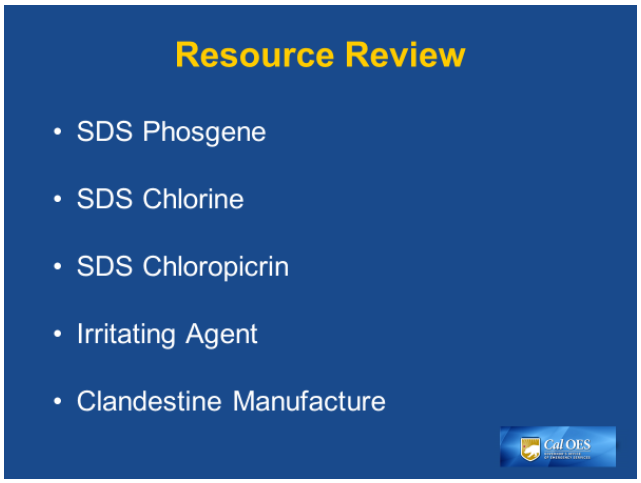
Slide 3.34

No antidote exists for exposure to chlorine or phosgene.

Provide immediate decontamination.

Decontamination consists of removing clothing as soon as possible, flushing the eyes with water, and washing the skin with soap and water. Follow with supportive medical care in a hospital setting.

Decontamination should not be attempted if the victim has frostbite from chlorine.



Slide 3.35

Review the listed materials in the participant guide.

The MSDS sheets provide more detail on chlorine and phosgene.

In addition, the Irritating Agents and Clandestine Manufacture resources provide information on these topics that hazardous materials responders should be aware of, although they were not covered in this presentation.



Slide 3.36

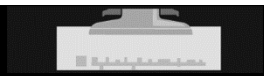
This presentation described many of the chemical agents that might be used in a terrorist attack, typical signs and symptoms of exposure, and guidance for treating victims who may have been exposed to those agents.

Hazmat responders must also ensure they are protected against contamination with and exposure to chemical agents.

Hazmat responders should use a NIOSH-certified chemical, biological, radiological, nuclear (CBRN) self-contained breathing apparatus (SCBA) with the appropriate level of chemical protective clothing when entering an area with an unknown contaminant or when entering an area where the concentration of the contaminant is unknown.

Level A protection should be considered until monitoring results confirm the contaminant and the concentration of the contaminant. All levels of PPE should always be considered, however, ultimate decisions should be based on the chemical/physical properties of the material of concern.

Chapter 3



Practical Exercises

Practical Exercise 3.1 Exercise Sheet Responding to the Release of an Unknown Chemical

Directions: After watching the video, draw on prior experience and information from this chapter to answer each of the following questions. Be prepared to share your responses with the entire class.

What actions should be taken immediately to minimize the potential for exposure to other responders?

_____

_____

What would the Incident Commander's (IC's) objectives be for the:

First hour?

_____

_____

Next four hours?

_____

_____

What actions would be needed to accomplish the IC's objectives?

_____

_____

What resources would be needed to accomplish these objectives?

_____

_____

What recommendations should be made for protective actions?

_____

_____

What steps should be taken to identify the chemical used?

_____

_____

What chemical protective clothing would the entry and rescue teams need?

_____

_____

Practical Exercise 3.1 Instructor Key Responding to the Release of an Unknown Chemical

Directions: After watching the video, draw on prior experience and information from this chapter to answer each of the following questions. Be prepared to share your responses with the entire class.

5. What actions should be taken immediately to minimize the potential for exposure to other responders?

(At a minimum, answers should include: Isolate victims, deny entry, wear proper PPE, and notify affected agencies.)

What would the Incident Commander's (IC's) objectives be for the:

First hour

(At a minimum, answers should include: Rescue victims, protect the public, and control the spill.)

Next four hours

(At a minimum, answers should include: Mitigate the spill, ensure proper cleanup, and conduct safe re-entry.)

What actions would be needed to accomplish the IC's objectives?

(At a minimum, answers should include: Locate and mitigate the spill; contain the spill to the building.)

What resources would be needed to accomplish these objectives?

(At a minimum, answers should include: Hazmat team, law enforcement for crowd control, fire department engine for water, and public health officer.)

What recommendations should be made for protective actions?

(At a minimum, answers should include: Shelter in place [this is a short-duration incident].)

What steps should be taken to identify the chemical used?

6. *Review pre-plan on response information folder (RIF).*
7. *Use monitors to check for hazards.*
8. *Field-test to identify hazards, if detected through monitoring.*

What chemical protective clothing would the entry and rescue teams need?

(At a minimum, answers should include: Consider standard turnouts and SCBA for rescue of living victims; use Level A chemical protective clothing for extended operations.)

Table Top Exercise 3.2 Scenario Responding to an Act of Terrorism Involving a Chemical Agent

Directions: Silently read the first two sections of this scenario (through "Initial Response") and review the maps and diagrams of the Santa Luisa Fairgrounds and Kramer Arena. Working independently, draw on prior experience and information from this chapter to formulate responses to the "General Questions for the Initial Response." Be prepared to share your responses to these questions with the entire class.

Then work together in your assigned group to develop responses to the "Position-Specific Questions for the Initial Response." Select one person to report out the group's findings to the entire class.

Finish reading the remainder of the scenario (through "Additional Threats"). Work together in your group to develop responses to the "Position-Specific Questions for the Scope Broadens." Also discuss the scenario's overall emergency response operations. Select one person to report out the group's findings to the entire class.

The Attack

The free concert in the Santa Luisa Fairgrounds Kramer Arena began at 6:00 PM as scheduled, with several thousand people eager to hear the country music band. Crowds lined the floor of the arena and filled the seats in the upper promenade. After about an hour, those who wanted to be closer to the musicians migrated downstairs to the stage area.

At this time, an unidentified male figure emerged from a rear door and approached the promenade railing in Section C. He was carrying a large garden type pump sprayer. According to eyewitness reports, the man was dressed in jeans and a sweatshirt with the logo for "Western Indoor Plant Maintenance" on the back. He had covered his head with the sweatshirt's hood. He also wore large dark glasses and what witnesses described as a spray mask respirator over his nose and mouth. Several witnesses also said they were quite sure he had on rubber gloves.

As soon as the man reached the promenade railing, he began spraying a liquid onto the crowd below. Many of those who were sprayed instinctively looked up to determine the source of the spray. Most of the victims whose skin came into direct contact with the sprayed liquid began to experience muscle spasms. Within minutes, a number of people were in violent convulsions on the floor, and the crowd was yelling and screaming. One man tried to stop the attacker from further spraying, but the assailant turned and sprayed him full in the face with the liquid. The would-be rescuer fell to the floor immediately, and the rest of the onlookers on the second floor fled in panic.

The assault lasted only for about three minutes, ending when the sprayer was empty. The escaping bystanders saw the attacker turn and run for the rear exit. The attacker seemed to vanish at that point.

Initial Response

Within seconds of the attack, the first calls from the arena requesting assistance for the victims reached the 9-1-1 system. The calls came in so rapidly and in such confusion that the call takers, dispatchers, and supervisors quickly perceived that a major emergency was occurring and dispatched an exceptionally large response team to the scene.

The first responders to arrive were from the Santa Luisa del Mar police and fire departments. They quickly confirmed the size of the incident and requested more resources. In the initial confusion, the circumstances surrounding the incident were unclear to the arriving units. In their hurry to provide aid to the victims, several police officers, firefighters, and paramedics came into contact with the sprayed substance and went into convulsions. Seeing this, the first-line supervisors withdrew their personnel immediately and began to establish a perimeter to contain the problem. Hazardous materials units were requested and chief officers from the fire department escalated their response to meet a major incident.



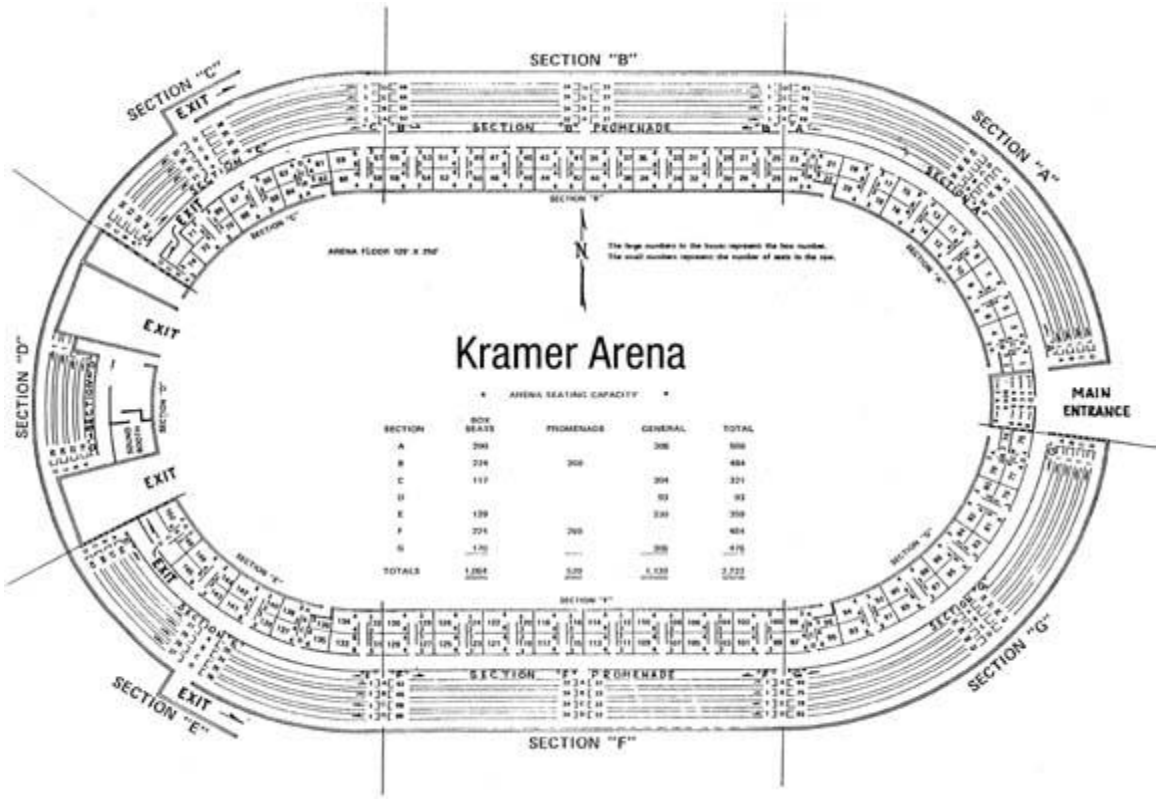
Aerial photo of the Santa Luisa Fairgrounds with the Kramer Arena in the center



Schematic of the Santa Luisa Fairgrounds



Photo of the main entrance into the Kramer Arena



Schematic showing main entrance and exits of the Kramer Arena.

The Scope Broadens

As details emerged, the Santa Luisa del Mar police department recognized that the incident was an attack and not the result of an accidental hazardous materials release. Unfortunately, before some of the individuals who had come into contact with the sprayed substance began exhibiting symptoms of poisoning, many were already outside the hastily established perimeter or had left the arena entirely. So, instead of undergoing a decontamination process, these victims were taken to local emergency rooms or picked up at various sites by other field EMS resources. As a result, healthcare providers and others who touched victims' contaminated skin or clothing also were unwittingly exposed to the dangerous liquid.

Officials at the various command centers soon began to understand the rapidly enlarging scope of the problem and issued appropriate orders to warn responders and medical facilities. Medical professionals quickly diagnosed the general symptoms of the dead and dying as poisoning from an organophosphate, and notified the area poison control center. Casualties at the arena included at least 50 fatalities, with more than 100 victims in critical condition, including 20 police, fire, and EMS personnel. Another 100 or more victims were either minimally affected or displayed hysterical symptoms that approximated actual poisoning. In addition, area emergency rooms treated at least 50 victims who were seriously ill. The news media began to descend on the scene at the arena and at area hospitals.

Once law enforcement agencies began to handle the incident as a criminal attack, the focus on identifying the substance narrowed to the probable use of a nerve agent. Within three hours of the initial response, hazardous materials field units that were specially trained in counterterrorism and the poison control center issued a preliminary identification of the substance as a form of VX (ethyldiisopropylaminoethyl methyhphosphonothioalate), a chemical warfare agent.

The duty agent for the Los Angeles field office of the Federal Bureau of Investigation (FBI) was then informed. The duty agent also contacted the local FBI specialist in weapons of mass destruction and advised the appropriate staff at headquarters in Washington, DC of the rapidly unfolding incident. The information regarding identification of the substance as a probable form of VX was passed on and appropriate plans were activated.

Additional Threats

Among the various calls that swamped the 9-1-1 system, one came in before the attack had been publicly broadcast. The caller took credit for the incident, correctly identifying VX as the chemical agent and threatening to carry out more attacks if "imperialist American troops did not immediately withdraw from the Middle East." The caller went on to mention nightclubs, restaurants, shopping centers, and major public transportation areas as potential targets.

Table Top Exercise 3.2 Exercise Sheet Responding to an Act of Terrorism Involving a Chemical Agent

General Questions for the "Initial Response"

Working on your own, answer the following questions:

9. What actions would you take immediately to minimize the potential for exposures to other responders?

Identify response routes and a staging area for local government responders and for state and federal assets.

What would the IC's objectives be for the:

First hour?

Next four hours?

What recommendations would you make for protective actions?

What steps would you take to identify the chemical used?

What chemical protective clothing would be required for the entry and rescue teams?

Position-Specific Questions for the "Initial Response"

Depending on the group you were assigned to, work together to answer the following questions:

10. If you were the Hazardous Materials Group Supervisor, what would your initial steps be?

_____
_____
_____

If you were the Assistant Safety Officer-Hazardous Materials, what would your initial steps be?

_____
_____
_____

If you were the Technical Specialist Hazardous Materials Reference, what would your initial steps be?

_____
_____
_____

If you were the Site Access Control Leader, what would your initial steps be?

_____
_____
_____

If you were the Entry Leader, what would your initial steps be?

_____
_____
_____

If you were the Decontamination Leader, what would your initial steps be?

_____
_____
_____

Position-Specific Questions for the "Scope Broadens"

Continuing to work as a group, answering the following questions:

11. If you were the Hazardous Materials Group Supervisor, are there any additional steps you would take? Would you change any of your initial actions?

_____

_____

_____

If you were the Assistant Safety Officer, are there any additional steps you would take? Would you change any of your initial actions?

_____

_____

_____

If you were the Technical Specialist Hazardous Materials Reference, are there any additional steps you would take? Would you change any of your initial actions?

_____

_____

_____

If you were the Site Access Control Leader, are there any additional steps you would take? Would you change any of your initial actions?

_____

_____

_____

If you were the Entry Leader, are there any additional steps you would take? Would you change any of your initial actions?

_____

_____

_____

If you were the Decontamination Leader, are there any additional steps you would take? Would you change any of your initial actions?

_____

_____

_____

Table Top Exercise 3.2 Instructor Key Responding to an Act of Terrorism Involving a Chemical Agent

General Questions for the "Initial Response"

Working on your own, answer the following questions:

12. What actions would you take immediately to minimize the potential for exposures to other responders?

(At a minimum, answers should include: Establish command, isolate the area from the public, control the crowd exiting into the refuge and safe refuge areas, ensure that personnel wear proper PPE)

Identify response routes and a staging area for local government responders and for state and federal assets.

(At a minimum, answers should include: Review the Response Information Folder from the previous chapter, identify parking lot #1 as the staging area)

What would the IC's objectives be for the:

First hour

(At a minimum, answers should include: Ensure responder safety, ensure victims are rescued, recommend protective actions, attempt to identify makeup of liquid spray)

Next four hours

(At a minimum, answers should include: Set up command; ensure all victims are treated and transported; ensure product is identified, if possible; coordinate with law enforcement on length of actions to protect the public)

What recommendations would you make for protective actions?

(At a minimum, answers should include: Set up safe perimeters, have public shelter-in-place offsite, complete rescue of victims and evacuation of arena)

What steps would you take to identify the chemical used?

(At a minimum, answers should include: Note signs and symptoms exhibited by victims; conduct entry for recon and sample recovery; use field identification kit, if sample can be obtained)

What chemical protective clothing would be required for the entry and rescue teams?

(At a minimum, answers should include: Initially, Level A protective gear should be worn; after testing the area for vapors, downgrading to Level B protective gear might be possible)

Position-Specific Questions for the "Initial Response"

Depending on the group you were assigned to, work together to answer the following questions:

13. If you were the Hazardous Materials Group Supervisor, what would your initial steps be?

At a minimum, answers should include:

Check in and obtain briefing from the Operations Chief or Incident Commander.

Ensure that control zones and access control points are set up.

Evaluate and recommend protective actions for the public.

Ensure that a site safety control plan is developed and put into place.

If you were the Assistant Safety Officer-Hazardous Materials, what would your initial steps be?

At a minimum, answers should include:

Check in and obtain briefing from the Hazardous Materials Group Supervisor.

Participate in the preparation and implementation of the site safety control plan.

Halt any unsafe acts, in particular personnel going into the Hall without proper chemical protective clothing.

Ensure that medical services for personnel are on-scene.

If you were the Technical Specialist Hazardous Materials Reference, what would your initial steps be?

At a minimum, answers should include:

Check in and obtain briefing from the Planning Chief or the assigned supervisor.

Provide and interpret environmental monitoring information (such as information from area monitoring and entry monitoring) to ensure work zones are safe.

Conduct field analysis of any samples.

Determine the appropriate chemical protective clothing.

If you were the Site Access Control Leader, what would your initial steps be?

At a minimum, answers should include:

Check in and obtain briefing from the Hazardous Materials Group Supervisor.

Oversee the placement of the exclusion control line and the contamination control line.

Keep unnecessary personnel out of the hazard zones.

Prevent the spread of contamination.

Establish a safe refuge area.

Ensure that injured or exposed individuals are decontaminated before they leave the hazard site.

If you were the Entry Leader, what would your initial steps be?

At a minimum, answers should include:

Check in and obtain briefing from the Hazardous Materials Group Supervisor.

Supervise entry operations.

Recommend actions to mitigate the situation within the exclusion zone.

Carry out actions as directed by the Hazardous Materials Group Supervisor.

Maintain communications with other unit leaders.

Direct rescue operations in the exclusion zone.

If you were the Decontamination Leader, what would your initial steps be?

At a minimum, answers should include:

Check in and obtain briefing from the Hazardous Materials Group Supervisor.

Establish a contamination reduction corridor.

Ensure that decontamination is conducted on people and equipment that have been identified as contaminated.

Ensure transfer to the medical group for decontaminated victims who require medical attention.

Position-Specific Questions for the "Scope Broadens"

Continuing to work as a group, answering the following questions:

14. If you were the Hazardous Materials Group Supervisor, are there any additional steps you would take? Would you change any of your initial actions?

At a minimum, answers should include:

Advise all personnel of the chemical involved.

Advise all personnel of the signs and symptoms of exposure to the chemical.

Advise personnel what to do if they believe they've been exposed (for example, develop symptoms later in the day).

Determine if any equipment is out of service as a result of contamination.

If you were the Assistant Safety Officer, are there any additional steps you would take? Would you change any of your initial actions?

At a minimum, answers should include:

Ensure that those who require medical attention are transported to an appropriate medical facility.

Ensure that medical records are maintained.

If you were the Technical Specialist Hazardous Materials Reference, are there any additional steps you would take? Would you change any of your initial actions?

At a minimum, answers should include:

Continue to provide advice on public protection.

If you were the Site Access Control Leader, are there any additional steps you would take? Would you change any of your initial actions?

At a minimum, answers should include:

Continue to ensure that access is limited only to essential personnel in the exclusion zone.

If you were the Entry Leader, are there any additional steps you would take? Would you change any of your initial actions?

At a minimum, answers should include:

Assist law enforcement, if required, in collecting samples that may be used as evidence in a criminal case.

If you were the Decontamination Leader, are there any additional steps you would take? Would you change any of your initial actions?

At a minimum, answers should include:

Continue decontamination operations as long as personnel are on-scene.

Ensure that contaminated clothing, equipment, and samples are properly handled, stored, and transferred from the contamination reduction zone as evidence or as directed by the public health officer.

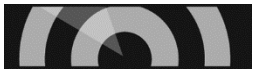
Participant Guide

Chapter 4
Rescue Considerations During Terrorist Attacks



Scope

This chapter provides an overview of four types of rescue and emphasizes time, distance, and shielding as means to protect responders.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 4, participants will be able to recognize the appropriate approach for rescue and rapid extrication of victims during response to a terrorist attack, given the situation and resources available.



Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

List four types of rescue.

Identify at least three factors that can harm the health and safety of responders during rescue operations and ways to minimize their effects.

Linkages to Universal Task List

The information, objectives and activities in this chapter promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

(Res.A.2 1.3.1) Monitor for primary and secondary threats.

(Res.A.2 1.5) Classify incident scene areas.

(Res.B.1 2.1.1) Deploy incident response teams.

(Res.B.1 2.2.1) Implement personnel accountability procedures.

(Res.B.1 16.5) Monitor and perform activities related to worker health and safety issues.

(Res.B.2 4.2.2) Direct the use of personal protective equipment (PPE).

(Res.B.2 5.3.3) Extricate and rescue victims from within the hot zone.

Resources

Resource List

Risk/Benefit Analysis for Rescue and Rapid Extrication

Reducing Chemical Concentrations

Quick Response Guidelines for a Suspected Chem/Bio Attack

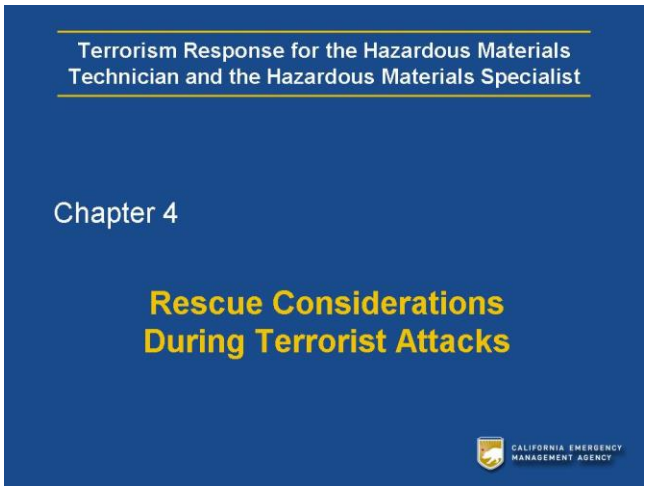
Work Mission Duration Form Instructions

Work Mission Duration Form

NBC Recognition Indicator Matrix

Reference List

See Reference List at the beginning of this guide.



Slide 4.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

(Res.A.2 1.3.1) Monitor for primary and secondary threats.

(Res.A.2 1.5) Classify incident scene areas.

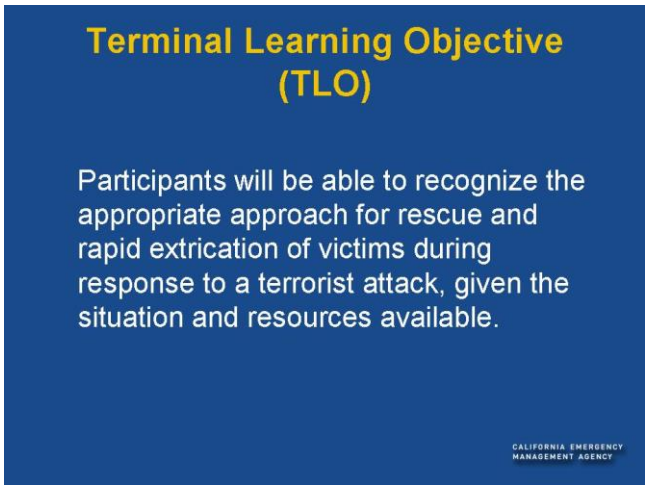
(Res.B.1 2.1.1) Deploy incident response teams.

(Res.B.1 2.2.1) Implement personnel accountability procedures.

(Res.B.1 16.5) Monitor and perform activities related to worker health and safety issues.

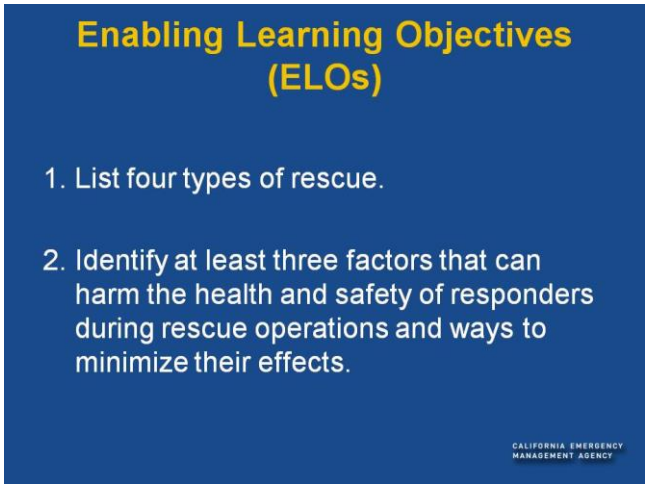
(Res.B.2 4.2.2) Direct the use of personal protective equipment (PPE).

(Res.B.2 5.3.3) Extricate and rescue victims from within the hot zone.



Slide 4.2

The terminal learning objective (TLO) for this chapter is to ensure that participants will be able to recognize the appropriate approach for rescue and rapid extrication of victims during response to a terrorist attack, given the situation and resources available.

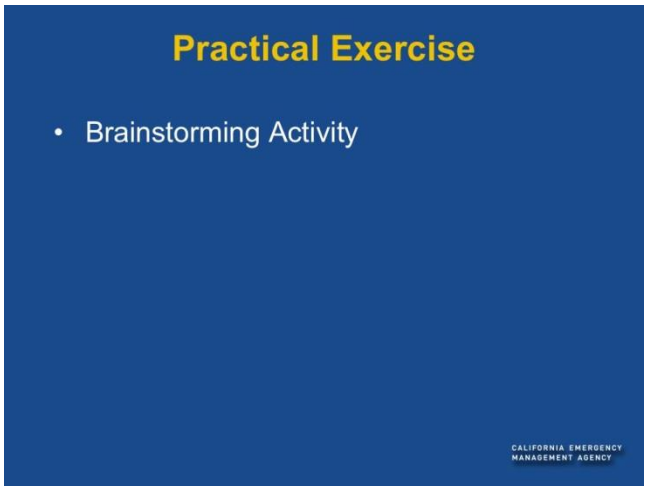


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This chapter's enabling learning objectives (ELOs) are to ensure participants will be able to:

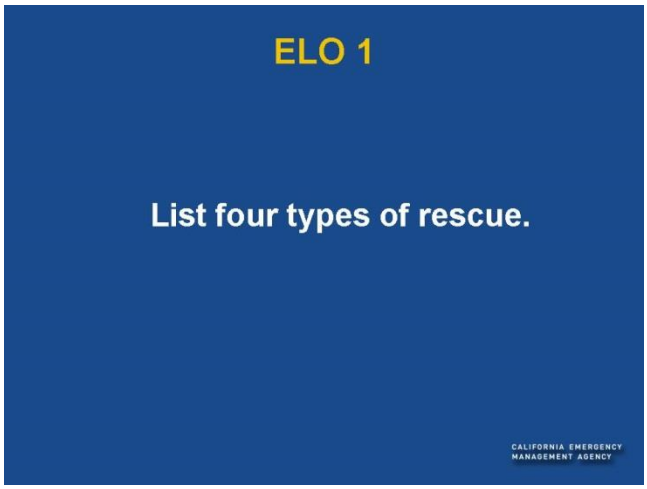
List four types of rescue.

Identify at least three factors that can harm the health and safety of responders during rescue operations and ways to minimize their effects.

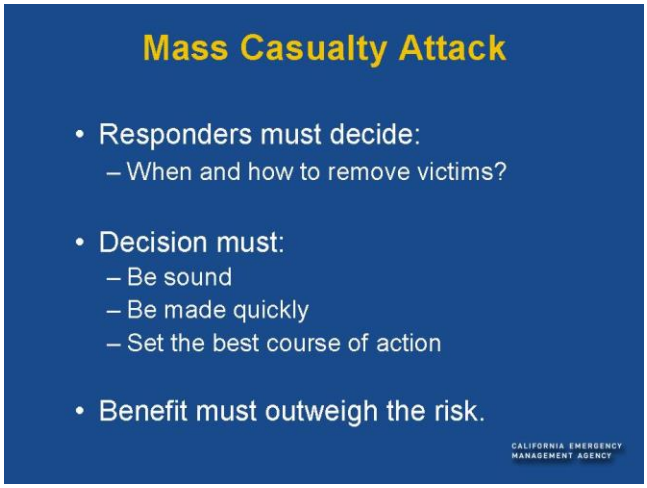


Slide 4.4

Discuss safety issues for rescue operations in an environment where a hazardous material has been released.



Slide 4.5

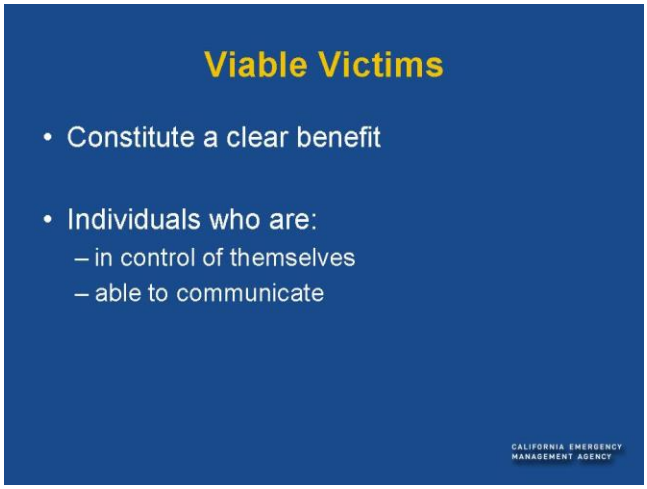


Slide 4.6

A terrorist attack involving mass casualties is different from other hazardous materials incidents. For example, one of the most difficult decisions that responders must make under these conditions is when and how to remove victims.

This decision must be made quickly, it must be sound, and it must determine the most appropriate course of action—given the circumstances of the incident, time, training, personnel, and resources available—for the response.

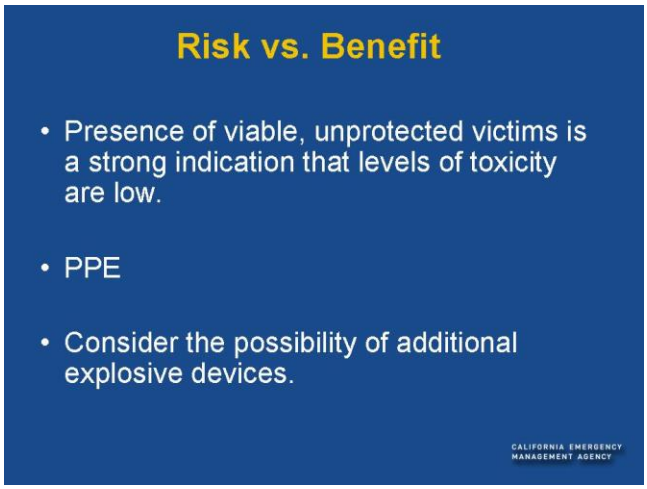
Moreover, the benefits of attempting a rescue must outweigh the risks to responders.



Slide 4.7

What constitutes a clear benefit for attempting a rescue? Viable victims.

Viable victims are defined as individuals who are in control of themselves and can communicate. For example, a viable victim is someone who can sit, kneel, or stand, or is able to communicate, either verbally or physically.



Slide 4.8

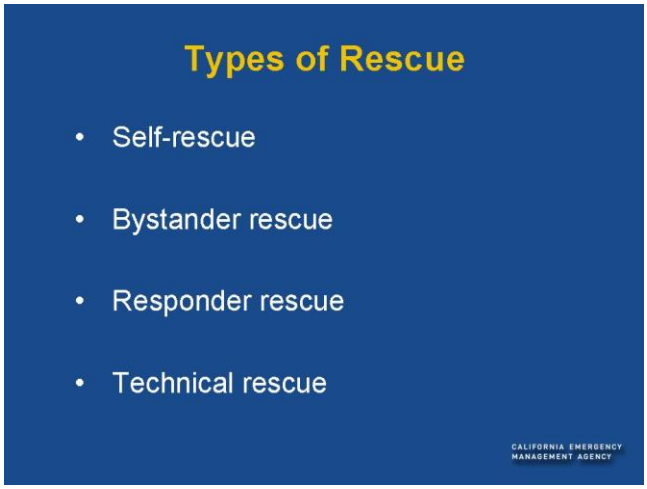
Although risk cannot be eliminated completely, rescue attempts must be analyzed for achieving the highest benefit at the least risk.

Many factors go into this analysis, such as survivability potential (i.e., weapon used), conditions that are immediately dangerous to life and health (IDLH), and viability of the rescue process (i.e., structural integrity, confined space entry).

In addition, the integrity of the personal protective equipment (PPE) for the work environment must be ensured. Is PPE adequate to protect emergency responders, given the situation? Sharp or jagged debris holds the risk of rips and tears to suit material. If responders must crawl through a tight area, they may need additional protection from physical damage. Leakage from damaged pipes or containers may present vapor hazards.

Perhaps most importantly, responders must take every precaution to ensure that they do not become victims themselves. Responders must consider the possibility of additional explosive devices.

Rescuers must also consider the possibility that, instead of being viewed as the heroes, emergency responders may actually be the target of the attack. In this scenario, the terrorist lures emergency responders to a scene by detonating a small device. When police, fire, and EMS response units arrive on scene, they become the intended victims of a secondary explosion.



Slide 4.9

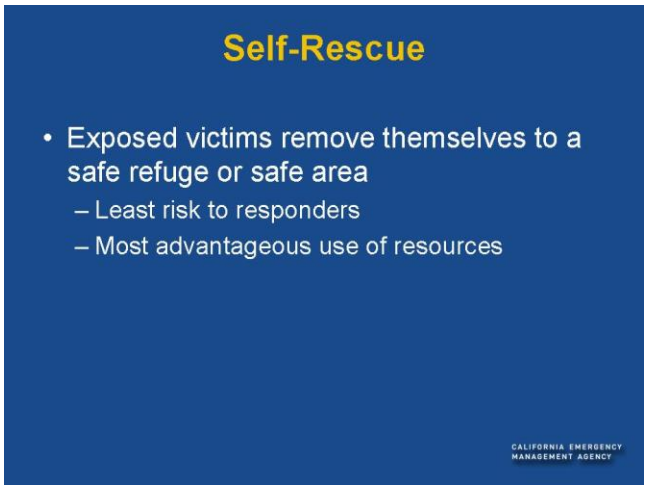
In a terrorist event involving chemical, biological, radiological/nuclear, or explosive devices (CBRNE), responders must evaluate how to do the most good for the most people—without becoming victims as well.

Responders must decide if the resources at hand can best be used to decontaminate and treat the walking wounded, or if the resources available can do more than one task.

First-to-arrive emergency workers will evaluate the use of resources on a sliding scale, concentrating on protecting themselves, containing the incident, and decontaminating self-extricated victims.

As more resources arrive, responders can then start the process of rescue.

The next four slides will describe each of the types of rescue listed above.

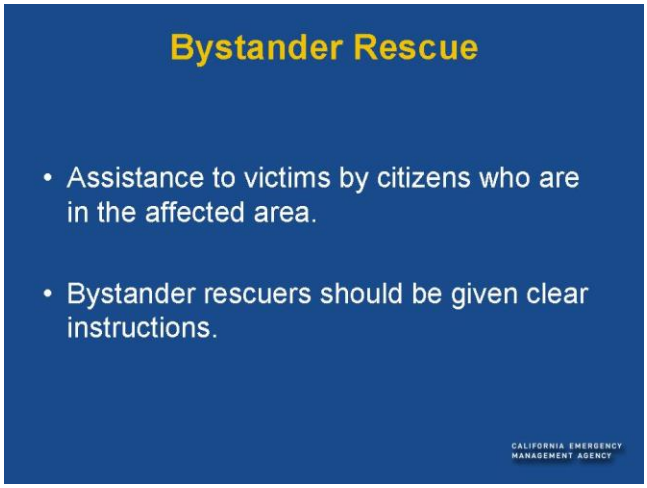


Slide 4.10

Whenever possible, victims who are conscious, coherent, and ambulatory should be directed to remove themselves from the contaminated area and go to a safe refuge or safe area.

This option, self-rescue, poses the least risk to responders.

It also is the most advantageous type of rescue in that it uses the fewest resources.



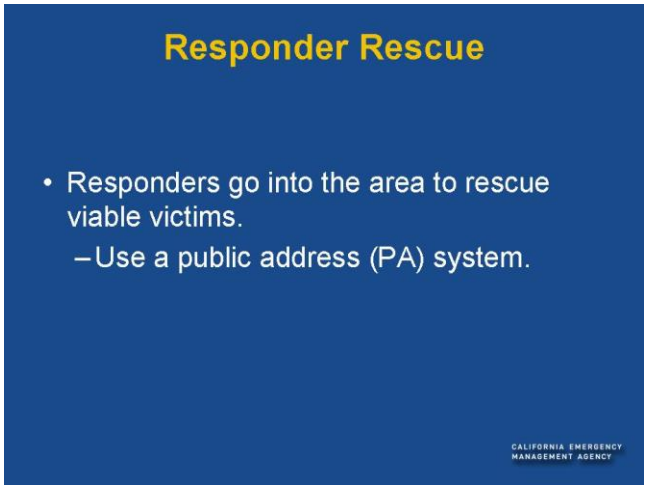
Slide 4.11

Bystander rescue is another low-risk, high-benefit option for rescuing victims.

Bystander rescue is performed by citizens, possibly victims themselves, who are in the affected area and still capable of assisting others nearby.

However, communication is essential for this strategy to work. Responders should provide bystander rescuers with clear instructions on the tasks to be performed.

Equally important, whenever bystanders are asked to help, emergency responders must take into consideration bystanders' safety and well-being.



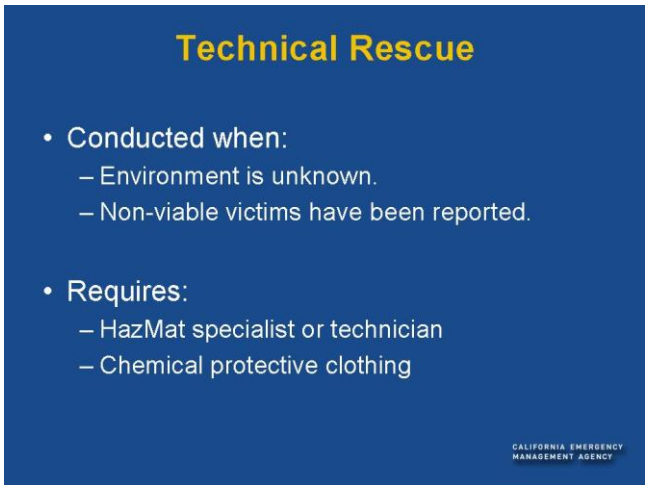
Slide 4.12

As the title implies, in this type of rescue, responders go into the area to rescue viable victims.

When this alternative is considered, the benefits must outweigh the risks to responders. For many first responders, the only option for PPE may be standard turnouts, which may not provide an adequate level of protection for the situation.

Responders should consider using the public address (PA) system on the emergency apparatus to communicate with victims. Much like sirens, these systems are directional, so point the PA system toward the victims. This step may prevent the need for responders to expose themselves needlessly to toxic substances.

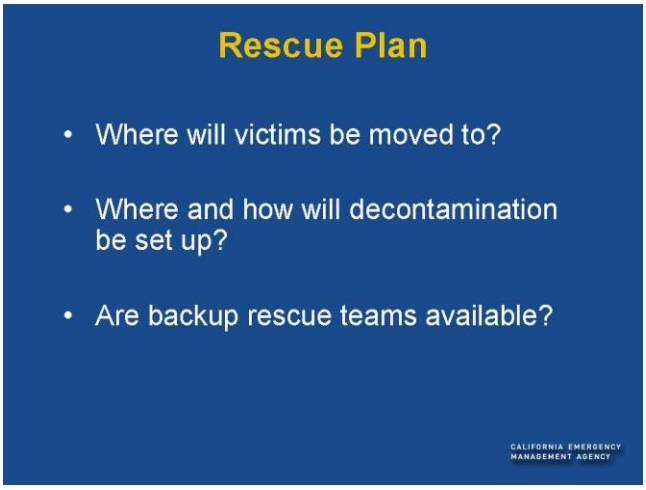
If responders go into a chemical environment wearing standard turnouts to save lives, they must use proper doffing procedures and undergo decontamination.



Slide 4.13

The risk-benefit scale tips toward greater risk in situations where the environment is unknown or the presence of non-viable victims has been reported. These situations call for a technical rescue.

In a technical rescue, entry into the affected area is conducted by a hazardous materials specialist or technician who is wearing chemical protective clothing.



Slide 4.14

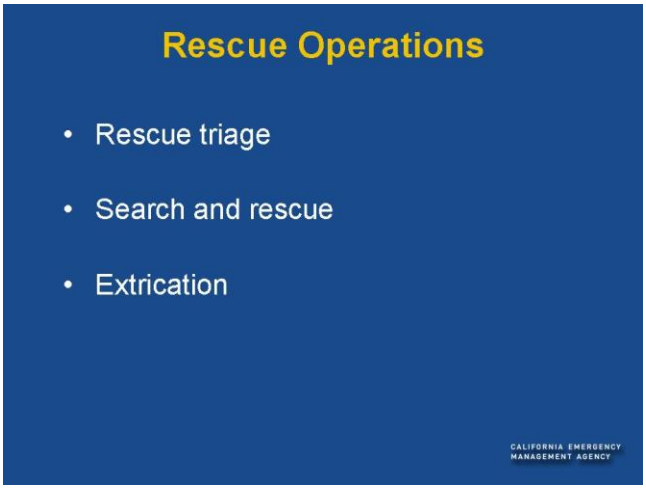
Regardless of which rescue method is used, a rescue plan needs to be developed.

Among the questions that must be answered are

Where will victims be moved to?

Where and how will decontamination be set up?

Are backup rescue teams available?



Slide 4.15

Rescue operations address several activities: rescue triage, search and rescue, and extrication.

Rescue triage entails five basic steps:

Step 1: Assess the affected area.

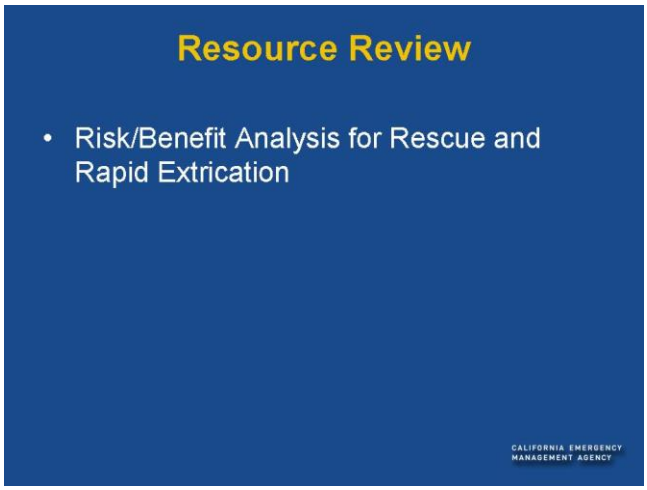
Step 2: Evaluate the stability of the emergency scene, including structures, electrical hazards, cargo tanks, etc.

Step 3: Determine the most likely locations for finding victims.

Step 4: Consider all potential hazards that could threaten the health or safety of rescuers.

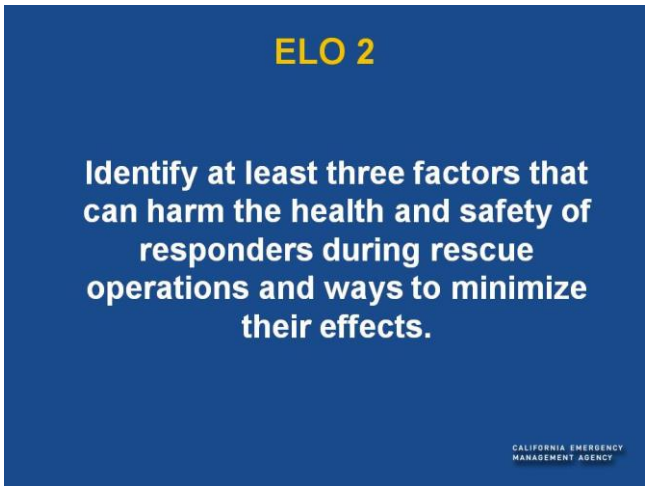
Step 5: Remove surface victims. Direct the “walking wounded” to the safe refuge or refuge area. Physically remove victims who can be seen on the surface (ground, rubble, etc.) to the areas designated in the rescue plan.

Once surface victims have been removed, search and rescue activities may begin for victims who are accessible and viable. Then extrication operations for entrapped, viable victims should begin.

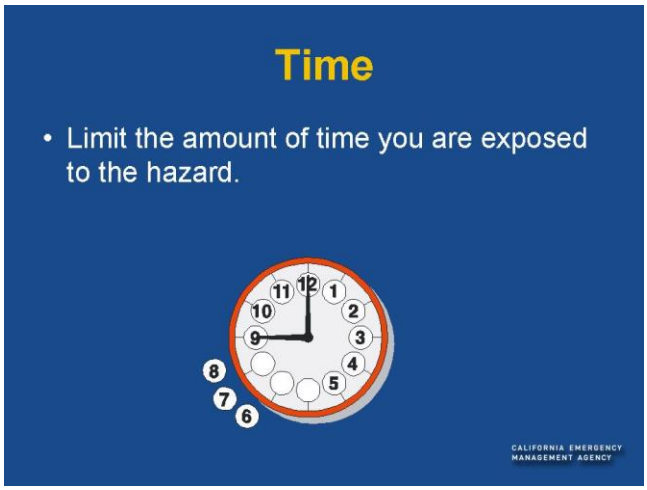


Slide 4.16

Review the listed resource in the participant guide.



Slide 4.17

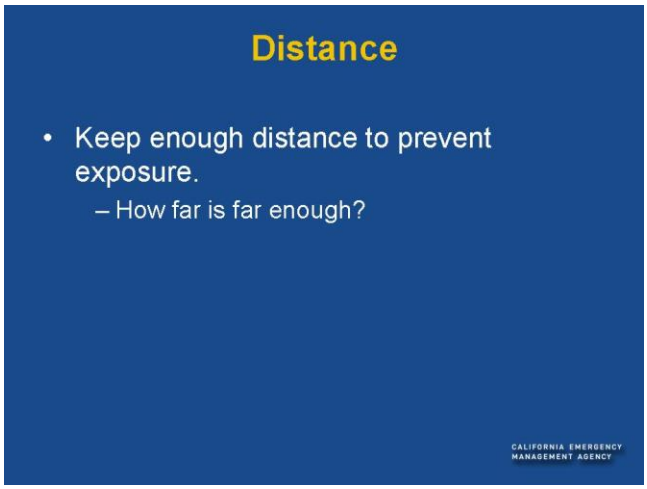


Slide 4.18

One of the critical measures for protecting the health and safety of responders during a terrorist attack is to limit the amount of time they are exposed to the hazard. Limiting responders' exposure to any hazard, regardless of the type or cause, is considered a basic, on-scene safety practice. Another safe practice is to limit the number of responders in the hazard area when operating in a collapse zone.

Chemical warfare agents are highly toxic, so even very short periods of exposure can cause serious injury. In fact, chemical warfare agents are so dangerous that the Occupational Safety and Health Administration has not set permissible exposure limits (PELS) for these agents.

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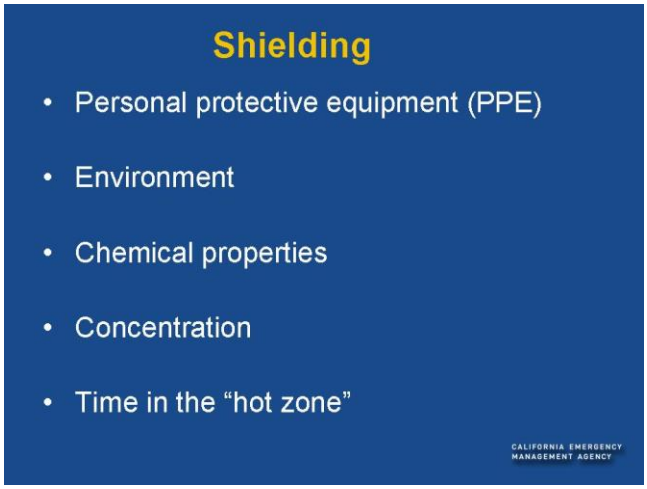
Slide 4.19

Just as it is important to limit exposure time, it is essential, when possible, to keep a safe distance from the toxic agent to prevent exposure.

One resource for determining safe distances and setting up zones is the Emergency Response Guidebook (ERG), a joint project of the U.S. Department of Transportation, Transport Canada, and the Secretariat of Communications and Transportation of Mexico. The ERG lists chemical warfare agents in the Table of Initial Isolation and Protective Action Distances. Additional information is available in the ERG section titled *CRIMINAL/TERRORIST USE OF CHEMICAL/BIOLOGICAL/RADIOLOGICAL AGENTS*.

It is important to keep in mind, however, that the distances provided are for agents in pure form when used in pure form as weapons. These distances do not take into account impure forms or precursor chemicals and additives. (For example, the sarin used in the Tokyo subway attack was not pure; it was approximately 20–25 percent pure and contained additives.) The distances given in the ERG are for worst-case scenarios. Weather and local conditions will also affect recommendations for safe distances.

Responders must also take into account the potential for explosives and increase isolation and protective action distances accordingly. The ERG includes recommended standoff distances for improvised explosive devices (see ERG page 374, Improvised Explosive Device Stand Off Distance)



Slide 4.20

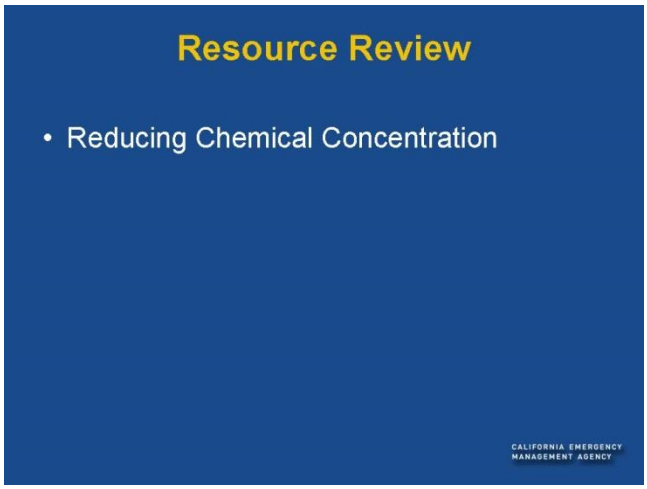
Another means of protecting the health and safety of responders is through shielding. Traditionally, shielding has referred to personal protective equipment (PPE) to prevent responders from coming into contact with any hazardous chemicals.

However, when dealing with a potential terrorist incident and the use of CBRNE agents, other factors, such as environment, chemical properties, concentration of the agent, and time in the “hot zone,” will influence how well protective clothing works.

Environment plays an important role in exposure. Is the incident occurring inside or outside? If it’s occurring inside a building, what is happening with the HVAC system?

The properties of the chemical agent are important considerations, too. For example, does the agent have a very high vapor density that will make the chemical sink? What is the concentration of the chemical? Is it very high in the hot zone?

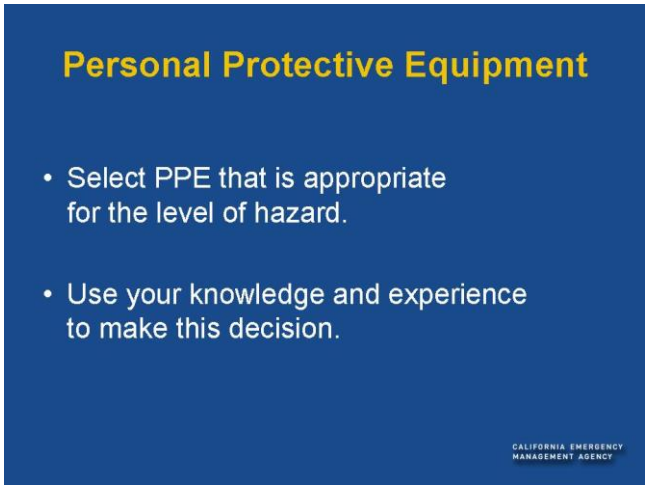
In terms of time in the hot zone, how long can a rescuer work in a hot zone involving extremely toxic materials?



Slide 4.21

Review the listed resource in the participant guide.

Reducing the concentration of chemical agents in the on-scene atmosphere can greatly enhance the survivability for victims and reduce the risk of injury to responders.



Slide 4.22

PPE must be appropriate for the level of hazard to which responders might be exposed.

Hazardous materials technicians and specialists should use their experience to make this decision.

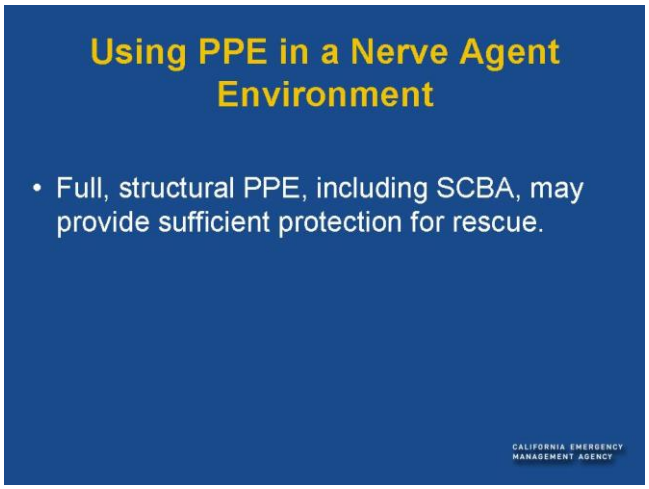
Ask questions such as:

What is the severity of victims' symptoms?

What do their signs and symptoms say about the type of agent used?

What do their signs and symptoms say about the agent's concentration?

These observations will drive decisions regarding rescue and selection of PPE.



Slide 4.23

Very few scientific tests have been conducted on the topic of using PPE in a nerve agent environment. The U.S. Army Soldier and Biological Chemical Command (SBCCOM) Domestic Preparedness Chemical Team, however, has produced guidelines, using simulants for its testing, on the use of standard turnouts in protecting the wearer against the effects of chemical agents.

These guidelines were published in the 1999 report "Guidelines for Incident Commanders' Use of Firefighter Protective Ensemble with Self-Contained Breathing Apparatus for Rescue Operations During a Terrorist Chemical Attack."

A strong indication that the area's toxicity levels are low is the presence of viable, unprotected victims. In that case, full, structural turnouts, including self-contained breathing apparatus (SCBA) may provide sufficient protection for a rescue.

Among other findings, the report suggests that first responders wearing standard turnout gear with SCBA may be protected from nerve gas if:

Living victims are present fifteen minutes after the incident.

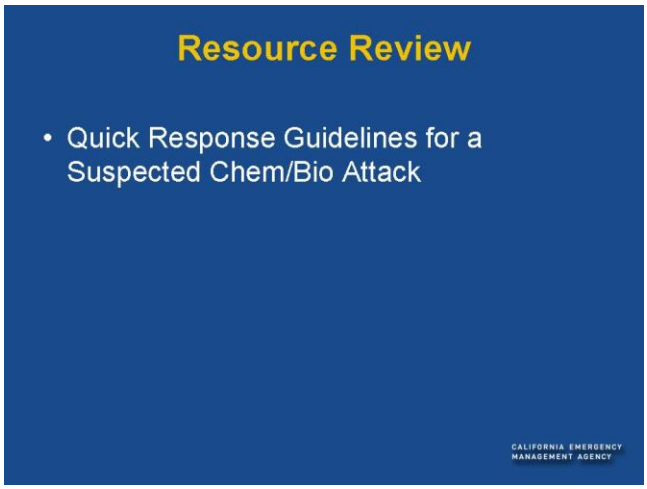
The rescuer is properly wearing all gear and the SCBA face piece fits the wearer.

The rescuer has not come in contact with the chemical agent.

In 2003 SBCCOM Homeland Defense Business Unit Improved Response Program issued a revised report titled *Risk Assessment of Using Firefighter Protective Ensemble with Self-Contained Breathing Apparatus for Rescue Operations During a Terrorist Chemical Agent Incident*. This report supersedes the previous report dated August 1999. This report concluded that the "initial assessment of the protection afforded by FFPE and the risks associated with performing rescue operations in a terrorist incident involving military chemical warfare agents were substantiated. Application of the new chemical agent vapor challenge concentrations specified in the NIOSH CBRN Standard did not change the overall associated risks to firefighters. Based on this reassessment, FFPE, with SCBA, continues to afford limited protection, which is sufficient to allow firefighters to perform quick rescue operations in a chemical agent environment."

The report further stated "Incident Commanders must be aware that there is a higher degree of risk to firefighters using FFPE and SCBA than there is to firefighters using certified CBRN protective clothing. In addition to certified protective clothing, SCBA used for chemical agent response should be certified to meet the NIOSH CBRN SCBA Standard."

Responders are strongly encouraged to familiarize themselves with these, and any other applicable, guidelines. However, regardless of the findings within this report, response operations should be conducted in accordance with the Authority Having Jurisdiction (AHJ) policies and procedures.



Slide 4.24

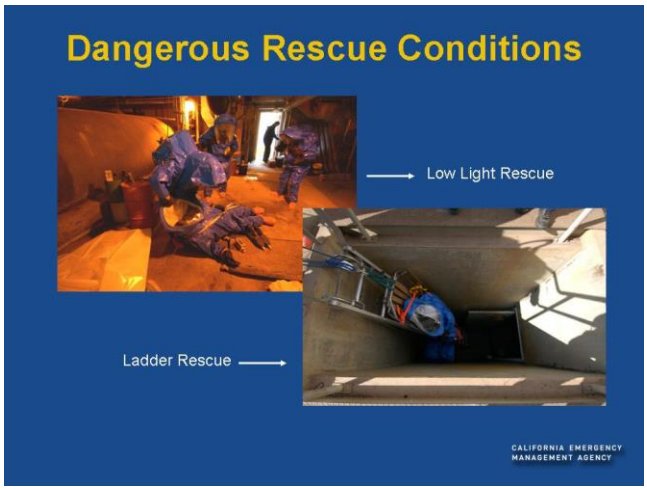
In addition, the report states that:

Standard turnout gear with SCBA may provide a first responder with sufficient protection from nerve agent vapor hazards inside interior or downwind areas of the hot zone to allow 30 minutes rescue time for known live victims.

Self-taped turnout gear with SCBA may provide sufficient protection in an unknown nerve agent environment for a 3-minute reconnaissance to search for living victims (or a 2-minute reconnaissance if HD is suspected).

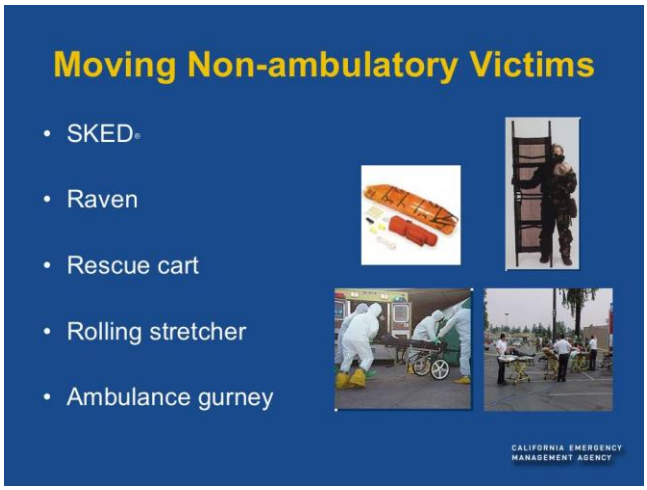
To fully understand the information in the SBCCOM report, it is highly recommended that first responders read the entire document, not just the quick response guidelines.

Review the listed resource in the participant guide.



Slide 4.25

Some conditions that responders will encounter, such as confined space, low light, or ladder use, have inherent hazards.



Slide 4.26

Moving non-ambulatory victims to refuge areas can quickly and easily fatigue rescuers. The use of specialized stretchers and litters—such as the SKED®, Raven, rescue cart, rolling stretcher, and ambulance gurney—can help prevent this fatigue.

The SKED® is a collapsible stretcher made of hard plastic material. It's an effective tool for moving non-ambulatory victims. A victim can be placed upon the SKED® without being lifted.

One responder can then tow the victim along most surfaces with little effort, saving energy and allowing for

the rescue of a number of victims during entry.

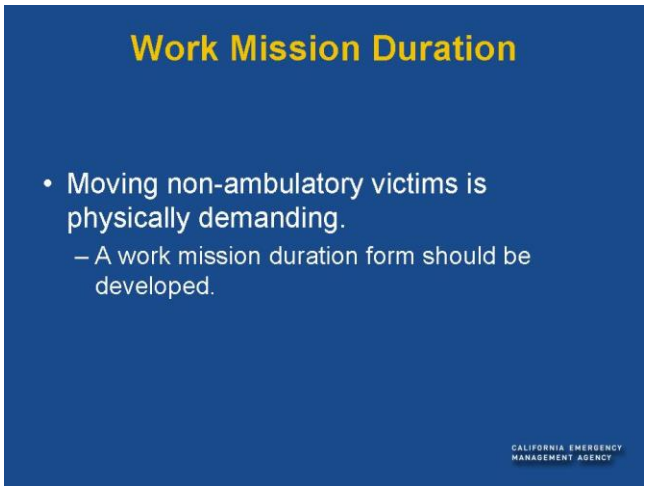
The Raven, a type of collapsible wheeled stretcher, is effective for moving victims over light to moderately obstructed terrain. The main benefit is that the victim's weight is primarily carried by the device. However, it requires at least two responders to securely load and move the victim on the device.

Rescue carts are an energy-efficient tool for moving victims. Once the victim is lifted into the cart, the cart carries the weight as the victim is rolled away.

Rolling stretchers, which have wheels on one end, are an effective way to move non-ambulatory victims, because they can be operated by one person. However, they require considerable exertion, so the rescuer will not be able to move as many victims as with other types of stretchers.

Ambulance gurneys are another alternative to moving non-ambulatory victims. Two rescuers are normally required to safely operate ambulance gurneys and they typically do not roll well on rugged terrain.

Rescuers can also make use of everyday objects, such as sheets, carpeting, and tarps, for stretchers or litters.

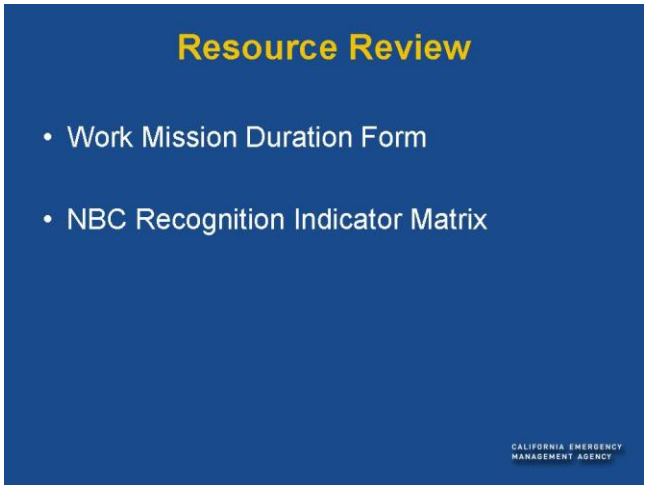


Slide 4.27

Moving non-ambulatory victims is very physically demanding, no matter which method is used.

Entry team leaders and safety officers should always be aware of the dangers that wearing PPE presents to the responder. In fact, before personnel actually begin work in their PPE, the duration of the work mission should be estimated to ensure that rescuers do not become victims of heat-related illness.

A work mission duration worksheet should be developed for this purpose.



Slide 4.28

Review the listed resources in the participant guide.

The Work Mission Duration Form is an important tool for ensuring that responders do not become victims of over-exertion or heat-related stress.

The NBC Recognition Indicator Matrix was designed to help responders recognize nerve agents, based on the signs and symptoms of victims as well as environmental clues



Slide 4.29

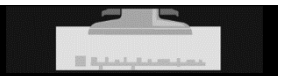
Keep in mind that responding to an incident that is an act of terrorism is different than an industrial accident involving hazardous materials.

Ignoring the warning signs that an incident was a deliberate act may jeopardize the safety of all on-scene responders. In an act of terrorism, responders themselves may be the target.

In addition, hazardous materials response personnel must be able to recognize their limits, work within the capabilities of PPE, operate within their individual training, and ask for technical assistance when needed.

Moreover, hazardous materials response personnel must also examine the situation and available options before taking action. The benefits must always exceed the risks. The presence of viable victims constitutes a clear benefit for attempting a rescue.

Chapter 4



Resources

Risk/Benefit Analysis for Rescue and Rapid Extrication

15. An incident involving chemical, biological, radiological/nuclear, or explosive (CBRNE) materials is not "just" another hazardous materials (hazmat) incident. For example, emergency responders are used to being welcomed as heroes upon arriving at an emergency scene. With terrorism, the rules have changed. To the terrorist, we are not heroes; we may be the enemy. Ignoring the warning signs that an incident was a deliberate act may jeopardize the safety of all on-scene responders. In an act of terrorism, responders themselves may be the target.

16. Hazardous materials responders also must be able to recognize their limits, work within the capabilities of personal protective equipment, operate within their individual training, and ask for technical assistance, when needed.

17. Perhaps most importantly, hazmat responders must evaluate the situation beforehand in order to do the most good for the most people—without becoming victims as well. Hazmat responders must decide if the best use of available resources would be to decontaminate and treat the walking wounded. Or would the best use of resources be to undertake more than one task? The first emergency workers to respond will have to concentrate on protecting themselves, containing the incident, and decontaminating victims who are able to extricate themselves from rubble. As more resources arrive, responders will then be able to start the process of rescue and rapid extrication.

18. Before beginning rescue and rapid extrication operations, the situation must be assessed from a safe area. The facts and probabilities must be evaluated as part of clear, decisive planning. This assessment is called a risk/benefit analysis.

Evaluating the Facts and Probabilities

19. Many factors go into a risk/benefit analysis for rescue and rapid extrication. Among them are survivability potential, viability of the rescue process, integrity of personal protective equipment (PPE) for the work environment, the makeup of the victim population, and whether to shelter in place or evacuate. Following these steps will help in planning rescue and rapid extrication operations that protect responder safety and do the most good for the most people.

1. Determine Survivability Potential.

A. Identify the weapon, based upon:

Personal observations of victims' signs of exposure and environmental conditions

Reports from other responders

Direct reading of instruments

Reports from victims

Reports from bystanders

B. Evaluate if immediately dangerous to life or health (IDLH) conditions are present, based upon:

Concentration of agent released

Properties of agent released

Chemical

Physical

Routes of entry

Toxic mode of action

Victim confinement

Duration of exposure

Distance and shielding

Other physical hazards

2. Assess Viability of Rescue Process.

A. Evaluate structural integrity.

B. Consider confined space entry:

Maintain capability for self-rescue or buddy-rescue

Maintain communications during entry (consider potential interference caused by the structure, debris, and distances)

3. Evaluate Integrity of PPE Required for the Environment.

A. Determine potential for rips and tears of suit material:

Sharp or jagged debris

Necessity to crawl through tight areas may require enhanced protection from physical damage.

B. Consider potential for secondary explosions:

Additional devices

Leakage from damaged piping or containers

C. Identify if information on suit material compatibility is available (it may be nonexistent).

4. Ascertain Makeup of Victim Population.

A. Determine if first responders are becoming victims:

If so, reassess the situation and adjust any action plan in order to stop “delivering victims to the scene.”

B. Consider the likelihood that more victims may be outside the immediate vicinity:

Triage may indicate that the most good for the most people would be achieved by committing resources to the areas that are least affected first.

5. Opt to Shelter-in-Place or Evacuate.

A. Weigh options when persons are encountered within a temporary safe haven inside the exclusion zone:

Keep in place and provide added protection, such as self-contained breathing apparatus (SCBA), air purifying respirators (APRs), and fog steam barriers.

Provide for victim safety during extraction through a contaminated area.

Rescue Operations

20. Set priorities for rescue operations by working through the following steps.

Rescue Triage

21. Rescue triage should be applied during entry to commit limited resources to people with the best chance of survival.

1. Assess impacted area:

Evaluate structural stability.

Determine locations where victims are likely to be found.

Identify hazards that may present risks to rescuers.

2. Remove surface victims.

3. Search for and rescue viable victims in voids and accessible spaces.

4. Extricate entrapped, viable victims.

Entry Considerations

22. A number of hazards are associated with entry, any one of which can injure or kill rescuers.

1. Reinforce the buddy system (two in–two out) and have additional backup personnel who have the same or *higher* level of protection.

2. Maintain communications at all times:

Use line of sight, if possible.

Dedicate a radio channel for rescuers.

Clear use of radios with bomb squad or explosive ordnance disposal team, if incident involves explosives.

3. Eliminate, if possible, any unnecessary noise at the scene to enhance rescuers' ability to locate victims.

4. Postpone medical treatment, with the exception of reasonable attention to C-Spine precautions, when in the exclusion zone.

5. Limit entry time to the absolute minimum.

Allow for the possibility of additional time to decontaminate rescuers.

Injured Team Member in the Exclusion Zone

23. One of the worst situations that responders can encounter is an injury to a team member. Injury to a team member delays incident mitigation and, perhaps more importantly, it affects all response personnel on an emotional level. As a result, response personnel must anticipate such situations and plan how to deal with them.

24. If a rescue team member is injured, his or her "buddy" should evaluate the mechanism of injury. If it appears that the cause of injury is chemical permeation through the suit, the rescue team should leave the exclusion zone, go to the safe refuge area, and advise the backup team of the danger. The backup team should then perform the rescue. If chemical permeation does not appear to be the cause of injury, the buddy should stand by and offer whatever assistance is possible, until the backup team arrives. The buddy should then leave the exclusion zone, go to the safe refuge area, and wait for instructions.

Hazardous Materials Incidents Involving Mass Casualties

25. A mass casualty incident involving hazardous materials will require many of the same procedures as any other mass casualty incident. For example, once rescue personnel are able to safely get to victims, they are triaged using the START (Simple Treatment and Rapid Transport) and JumpSTART pediatric systems. Victims who are labeled "Immediate" are decontaminated and sent to medical care first. Initial treatment is limited to repositioning the airway and controlling bleeding with directed pressure, as needed.

26. *Note:* More information on START and JumpSTART is provided in Chapter 6.

27. However, a hazmat mass casualty incident also requires some significantly different procedures. One difference is that a safe refuge area must be established at the edge of the contamination reduction corridor and upwind/uphill of the chemical release. A manager for the safe refuge area must be appointed. Ambulatory patients from the exclusion zone should be directed into the safe refuge area.

28. The National Fire Protection Association Standard 473 (NFPA 473) allows for appropriately trained and equipped Emergency Medical Services (EMS)/Hazardous Materials Responders to perform assessment and treatment of victims relative to the criticality of the victim's injuries (medical condition). Most medical treatment at hazardous materials/WMD incidents will be delivered in the support zone, after victim decontamination. However, in some cases delivery of medical treatment in the contamination reduction or exclusion zone prior to, or concurrent with, decontamination may be necessary. Responders must balance the need for life-saving interventions with the nature and severity of the incident (work area), and the need to perform decontamination prior to rendering care. Responders providing initial treatment shall wear the appropriate level of protective equipment. Chemical protective clothing limits movement and dexterity, so tasks must be kept simple. Intravenous therapy and other invasive procedures are not appropriate or practical in the exclusion zone. See NFPA

472 and 473 for additional information.

29. After decontamination, victims are transferred to a treatment area in the support zone for continuation of care and transportation to an emergency care facility. A transportation officer should be assigned to ensure that victims are transported to an appropriate facility and to keep track of victims' destinations. It is important for this individual to confirm that receiving facilities are not overwhelmed and are able to receive additional victims.

Reducing Chemical Concentrations

30. The vapor concentration of chemical agents generally can be reduced through three methods: natural ventilation; ventilation through the fixed heating, ventilation, and air conditioning (HVAC) system; and positive pressure ventilation (PPV).

31. Natural ventilation, opening doors and windows, may have a positive effect on reducing the vapor concentration of chemical agents. However, natural ventilation normally is unreliable in terms of the time it will take to ventilate a building.

32. Ventilating a space through the use of fixed HVAC systems is a very dependable method for reducing the vapor concentration of a chemical agent. Theoretically, displacing a roomful of air can reduce the vapor concentration of an agent by 63 percent, if the air is well mixed. However, experience shows that internal barriers, room size, and other factors inhibit the mixing of air. In reality, the use of HVAC systems for ventilation reduces the vapor concentration of chemical agents by a much lower factor, perhaps by only 10 percent.

33. Fully opening the HVAC's fresh air intake can significantly increase the rate that vapor concentration is reduced. Many HVACs are set to operate at 15 to 25 percent open. Fully opening the fresh air intake (to 100 percent) can increase the rate of agent removal by a factor of six. The consequences of turning the building ventilation system on or off should be considered. Building blueprints or building maintenance personnel may be needed to turn the ventilation system on or off.

34. The American fire service has widely used positive pressure ventilation (PPV) fans for many years. Preliminary data indicate that PPV fans are highly effective and may reduce by 40 to 75 percent the vapor concentrations of chemical agents within ten minutes of emplacement and operation.

35. The rate of natural ventilation (RVI) is not nearly as effective as is PPV or negative pressure ventilation. For example, tests have shown that the forced air ventilation rate while using a 30-inch PPV gas fan is 43 times faster than the natural ventilation rate. In ranking the efficacy of PPV fans to reduce the vapor concentrations of chemical agents:

Larger fans had the best performance

Gas fans were better than electric fans

Tilting the fans to redirect their airflow improved the performance significantly

Smaller, non-tilted fans were less effective

Fans operated in the negative pressure ventilation mode produced similar results to fans operated in the PPV mode

Strategic Considerations

1. Choose Defensive or Offense Interventions.

A. Agent identification:

As identification progresses toward a high level of confidence, strategy may evolve from defensive to offensive.

Chemical and physical properties will determine which offensive tactics will be most effective.

B. Potential for continued release:

Determine the status of the release:

Is the agent fully discharged or is the dispersion mechanism still functioning?

Is the contaminated and threatened environment capable of being isolated?

Can isolation measures be undertaken indirectly?

Can the known site of release be part of a series of multiple sites?

C. Potential for secondary or additional devices:

This possibility must always be considered.

Hazards from additional devices may differ from the primary device.

Coordinate with law enforcement to assess crowds and the surrounding area.

D. Hazard and risk assessment:

Will defensive containment actions suffice?

Is an entry required to attempt control?

Are options available for a viable control measure?

Will a substantial benefit be assured by carrying out an offensive control plan?

Maximize the protective factors of time, distance, and shielding.

Ensure that a system, beyond the standard components of a hazmat group, is adequate to support an entry:

Have appropriate antidotes in sufficient quantity and medically trained personnel to administer them.

Integrate the presence of law enforcement to ensure the safety of the hazmat group from additional threats.

2. Select Defensive Intervention Tactics.

A. Ventilation control:

Heating, ventilation, and air conditioning (HVAC) system may be shut down:

Secure power to the system or site.

Activate the fire alarm system.

Compartmentalization:

Close all natural openings (such as doors, windows, and vents that are accessible from outside).

Keep in mind that activation of the fire alarm may automatically close some interior doors and dampers.

B. Airborne release to outside atmosphere:

Consider setting up water streams to capture or disperse agent:

Significant environmental impact may occur, but should be weighed against the potential benefit to life safety.

If possible, establish runoff control.

3. Select Offensive Intervention Tactics.

A. Identify areas of known contamination and potential safe areas within the exclusion zone.

Use direct reading of instruments and observation for identification.

Compartmentalize areas by closing off doors, HVAC vents and dampers, and other interior openings.

Keep in mind that all chemical warfare agents, with the exception of hydrogen cyanide (AC), are heavier than air and relatively clear areas may exist at high or low areas.

Quick Response Guidelines for a Suspected Chem/Bio Attack

EN ROUTE

Indicators of a Chem/Bio Attack

- Large volume of calls reporting sick or injured persons with no known reason.
- Numerous persons reporting similar illness (signs/symptoms).
- Numerous calls from the same general geographic area or large gathering of people (e.g. a sporting event) reporting unusual illness.
- Symptoms indicative of chemical agent exposure (drooling, tearing, shortness of breath, difficulty breathing, irritation of the eyes, nose, throat, and/or skin, redness or itching of skin).
- Report of an explosion with little or no structural damage.
- Reports of unexplained liquids (droplets, oily substances).
- Reports of unusual odors (mowed grass, garlic, bitter almonds).
- Reports of a release of a spray (hissing sounds, presence of a mist or vapor).
- Suspicious devices/packages (spray devices, damp/wet packages or bags, explosive device that causes little explosive damage).
- Unexplained dead wildlife/animals.
- Discarded PPE (masks, gloves, gowns).

SCENE ASSESSMENT

Scene Assessment and Safety

- Don PPE (firefighter turn-out gear and SCBA).
- Stage apparatus upwind and upgrade at least 300 feet away from scene.
- Observe plume direction.
- Secure the perimeter/deny access.
- Avoid contact with all liquids.
- Establish Hot Warm and Cold zones.
- Move uninvolved civilians to safe zones.
- Be alert for the possibility of secondary devices. If device is found:
  - Don't touch or disturb,
  - Do not use radios or cell phones within 300 feet,
  - Notify police and request bomb squad, and
  - Evacuate area around device.
- Remember the perpetrator maybe among the victims.
- Request HazMat and police response.
- Shut down the HVAC system.
- Do not perform treatment in the hot zone.
- Remember it is a crime scene, do not disturb evidence.
- Establish accountability system for all personnel.

SCENE ASSESSMENT

Determine if there are Live Victims?

- Look through windows/doors to determine if there are any live victims.
- Incident Commander must determine if rescue of victims will be conducted by using firefighter turnout gear and SCBA or to wait for arrival of HazMat teams with level A protection.
- If there are live victims, turnout gear and SCBA provide sufficient protection for 30 minutes to rescue known live victims in a nerve agent vapor hazard.

If there is the possibility of live victims and you are unable to visually see them from the outside, taped turnout gear and SCBA provide sufficient protection to conduct a 3 minute reconnaissance to search for live victims in an unknown nerve agent environment. **Two minutes if mustard agent is suspected.**

Note: The risks associated with entering a contaminated area in turnout gear with SCBA must be understood prior to making the decision on performing rescue operations.

OPERATIONS

Rescue of Ambulatory Victims

- Use bull horns and vehicle public address (PA) system to instruct live ambulatory victims to evacuate.
- Instruct ambulatory victims to evacuate alive non-ambulatory victims.
- If victims cannot be evacuated, instruct them to shelter in place in a safe area.
- After victims have been rescued, move them immediately to the decontamination areas for decontamination ASAP.
- Avoid physical contact with victims.

U.S. Army Research, Development and Engineering Command, Edgewood Chemical Biological Center
AMSSB-REN-HD
5183 Blackhawk Road
Building E3331
Aberdeen Proving Ground, MD 21010
http://www.ecbc.army.mil/hld

OPERATIONS

Rescue of Non-Ambulatory Victims

- Don firefighter turnout gear and SCBA, tape all openings. Follow procedures as outlined in Firefighter Quick Response Guidebook.
- In a known or suspected bio incident, standard turnout gear with SCBA will provide enough protection for Bio agents.
- Use PPV fans to decrease chemical agent vapor concentration and to increase protection that standard turnout gear will provide.
- Consider the downwind hazard of unprotected people before using PPV.
- Use negative pressure for ventilation of closed interior rooms.
- If all victims are dead or dying, do not make a rescue attempt.
- Use stretchers to move victims.
- If rescuer comes in contact with the liquid, decontaminate immediately.

Triage

- Follow the Simple Triage and Rapid Treatment (START) system
- Segregate victims and prioritize victims to go through decon based on
  - Casualties closest to the point of release
  - Casualties reporting exposure to vapor or aerosol
  - Casualties with serious medical symptoms
- Casualties with conventional injuries

Decontamination

- Instruct all victims to disrobe and to go through gross decon ASAP.
- Bag and tag all personal items.
- Use high volume/low pressure water to decontamination.
- Attempt to control water run-off. However, decontamination of live victims takes priority over controlling water run-off.
- Have a separate decon for responders.
- Use Ladder Pipe Decontamination System (LDS) or the Emergency Decontamination Corridor System (EDCS).
- Nozzle pressure should be between 60 and 90 PSI.
- Consider cold weather decontamination issues when contamination is less certain and time permits decontaminate victims using the following guidelines:
  - When the ambient temperature is 65°F and above, disrobing, decontamination and post-decontamination processing can proceed outdoors.
  - When the ambient temperature is greater than 35°F and less than 65°F, disrobing and water decontamination can proceed outdoors, but after showering, victims should be moved into a heated shelter.
  - When the ambient temperature is 35°F or below, disrobing, water decontamination and post-decontamination processing should take place in heated shelters.
- Asymptomatic victims may need to be decontaminated for psychological impact.

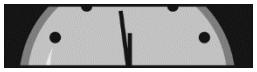
CHEMICAL AGENT SYMPTOMOLOGY

AGENT	PHYSICAL STATE	SIGNS AND SYMPTOMS	ODOR	DECONTAMINATION	PERSISTENCE	DOT ERG
NERVE						
GA/GB/GD	Liquid	Pinpoint Pupils, SLUDGE -**S**alivation, **L**acrimination (tearing), **U**rination, **D**efecation, **G**astro-Intestinal distress, **E**mesis (vomiting), twitching, convulsions	Fruity	Remove contaminated clothing. Flush with soap and large volumes of water.	Minutes, days in Heavy Concentration	153
VX	Like oil		Sulfur		Days to weeks	
BLISTER						
Mustard	Liquid	Eye pain, gritty eyes, reddened skin, large fluid-filled blisters	Garlic	Remove contaminated clothing. Flush with soap and large volumes of water.	Days to years	153
Lewisite	Liquid	Immediate eye pain and burning lungs, bee sting blisters, grayish skin	Geraniums		Hours to Days	153
BLOOD						
Hydrogen Cyanide	Gas	Bright red lips and skin, headache, gasping, nausea	Bitter Almonds	Remove contaminated clothing. Flush with soap and large volumes of water.	Minutes	117
Cyanogen Cloride						125
CHOKING						
Phosgene	Gas	Coughing, choking, pneumonia	New-mown hay	Remove contaminated clothing. Flush with soap and large volumes of water.	Minutes	125
Chlorine	Gas	Coughing, choking	Bleach			124

Work Mission Duration and Indicator Matrix forms are available digitally

Instructor Guide

Chapter 5
36. Decontamination



Duration

1 hour

50 minutes for course instruction

10 minutes for Practical Exercise 5.1

Method of Instruction

Instructor-led facilitated seminar

Individual work/full group discussion



Scope

This chapter addresses appropriate procedures for decontaminating victims of a terrorist attack.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 5, participants will be able to recognize appropriate procedures for use in decontaminating victims and personnel during response to a terrorist attack.



Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

Define emergency decontamination.

List five types of technical decontamination.

Recognize mass decontamination procedures and how to sort victims for decontamination.

Linkages to Universal Task List

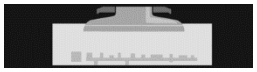
The information, objectives, and activities in this chapter promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

(Res.B.2 5.5.1) Identify assets required for decontamination activities.

(Res.B.2 5.5.2.1) Establish decontamination sites.

(Res.B.2 5.5.4.1) Conduct screening of affected persons.

(Res.B.2 5.5.4.2) Decontaminate affected persons, including injured victims, exposed to CBRNE materials.



Resources

Materials and Preparation

Seating and work stations for up to 30 participants

Laptop computer, projector, and screen

Instructor Guide and CD with PowerPoint Presentation (1 for instructor)

Participant Guide (1 for each participant)

Easel pad and markers

Resource List

Appendix A: *Chemical Emergency Preparedness and Prevention Alert*: First Responders' Environmental Liability Due to Mass Decontamination Runoff

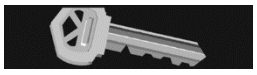
Lessons Learned: Mass Decontamination during an Anthrax Scare

Reference List

See Reference List at the beginning of this guide.

Instructor/Participant Ratio

1/30



Practical Exercises

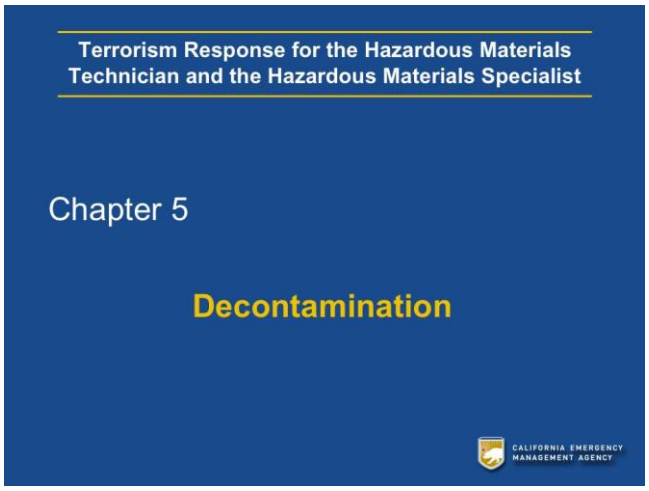
See Step 7 for exercise instructions.

5.1 Discuss lessons learned from a case study on mass decontamination and from direct experience.



Assessment Strategy

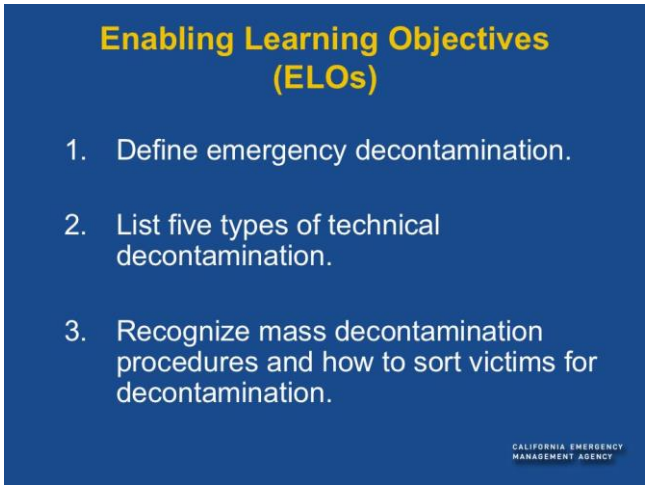
Pre/Post Test



Slide 5.1
The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:
(Res.B.2 5.5.1) Identify assets required for decontamination activities.
(Res.B.2 5.5.2.1) Establish decontamination sites.
(Res.B.2 5.5.4.1) Conduct screening of affected persons.
(Res.B.2 5.5.4.2) Decontaminate affected persons, including injured victims, exposed to CBRNE materials.



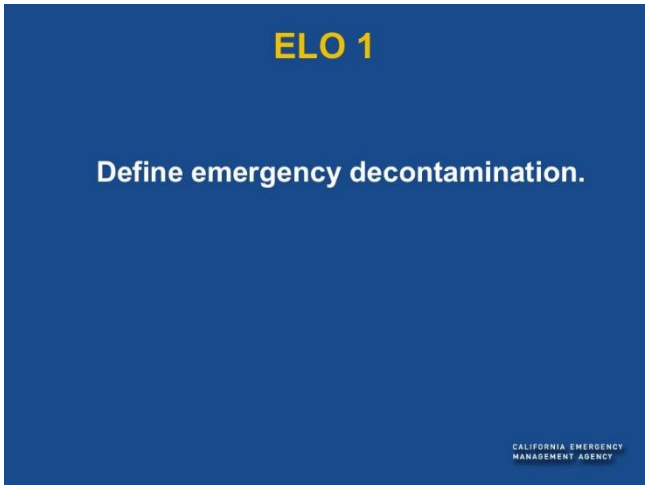
Slide 5.2
The terminal learning objective (TLO) for this chapter is to ensure that participants will be able to recognize appropriate procedures for use in decontaminating victims and personnel during response to a terrorist attack.



Slide 5.3
This chapter's enabling learning objectives (ELOs) are to ensure participants will be able to:
Define emergency decontamination.
List five types of technical decontamination.
Recognize mass decontamination procedures and how to sort victims for decontamination.

ELO 1: Define emergency decontamination.

Step 2: Discuss the decontamination process and emergency decontamination procedures.
Slides 5.4 through 5.10
Have participants turn to this section in their guides and follow along with the lecture.



Slide 5.4



Slide 5.5

Decontamination, or "decon," is defined as the physical or chemical process of removing contaminants that have accumulated on persons, tools, and equipment.
The Occupational Safety and Health Administration (OSHA) defines decontamination as "the removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects."
[29 CFR 1910.120(a)(3)].
It is important to understand that even though a standard definition for decontamination exists, no absolute standards have been established for the decontamination process. There are only guidelines.
This is, in part, because the levels of contamination will vary depending on the agent/s involved. In addition, the types and levels of protective clothing used for decon may vary from agency to agency. However, decontamination must be performed anytime contamination is suspected.

Effective decontamination can be an involved and arduous process. It is extremely important to

follow a logical order based on best practices. Places where contaminants typically hide, such as pass-throughs, garment folds, and modesty areas (arm pits and crotch), are easily overlooked. The protective clothing that decon personnel wear can also hinder effective decontamination.

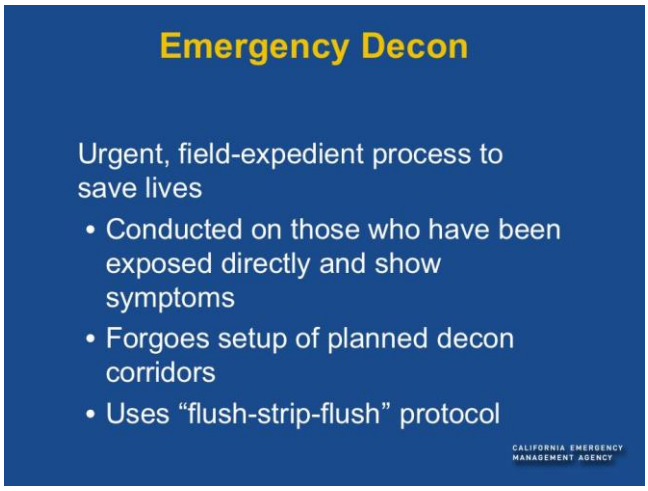


Slide 5.6

The three main reasons for conducting decontamination procedures are to:

1. Remove a contaminant, reduce exposure, and lessen the potential for adverse health effects.
2. Protect emergency responders from secondary contamination.
3. Provide psychological comfort for victims and responders.

Removing contaminants from personnel and equipment is critical to reducing the potential for contaminants to be transferred beyond the hazard area. Proper decontamination is especially important when victims or injured personnel must be transported to medical facilities.



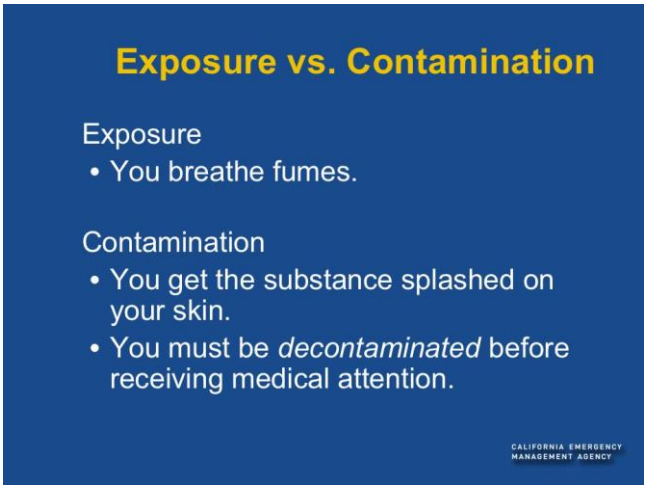
Slide 5.7

Emergency decontamination is an urgent and field-expedient process. It is most often performed on civilians or response personnel who have been exposed directly to a hazardous solid, liquid, mist, smoke, or certain gases, and who display related symptoms of exposure. The goal is to remove as much product or agent as possible from the victim to allow emergency treatment and protect the life of the victim. This process forgoes the usual setup of a planned decontamination corridor. Concerns about the environment and victim modesty are secondary to protecting victims’ lives.

The first engine company to arrive on-scene usually performs emergency decontamination, using the “flush-strip-flush” protocol. (Once victims are in the refuge area, spray with flooding quantities of water; then remove victims’ clothing down to their underwear; spray again from head-to-toe with water and apply soap, if available.)

At the same time, care must be taken not to spread the contaminant. Emergency decon generally is *not* needed for biological or radiological contamination. In such cases, a slower technical decon usually is better.

Instead of rushing to conduct emergency decontamination, involve technical experts in making this decision, especially when victims do not show related signs or symptoms of exposure.



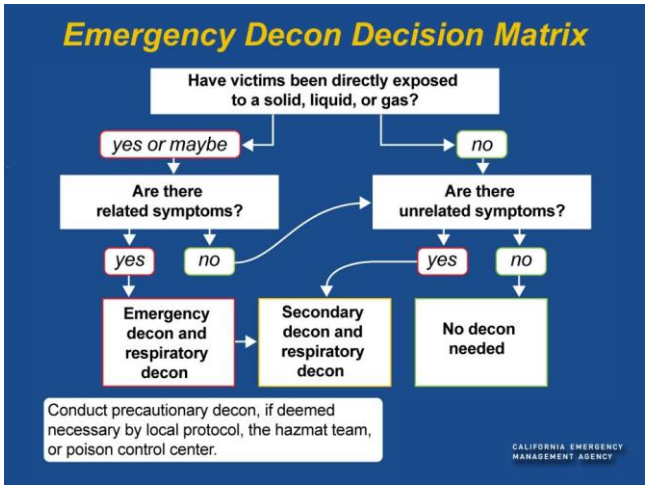
Slide 5.8

There is a difference between being *exposed* and being *contaminated*. Exposure means a person has been subjected to a toxic or harmful agent. For example, if a person breathes the fumes of a hazardous liquid, he or she would then be considered "exposed" and may need medical attention.

However, if the product were to be splashed on a person's skin, he or she would be "contaminated." That person would need to be decontaminated *before* receiving medical treatment.

It is important to identify who has been exposed and who has been contaminated, and, therefore, who should be decontaminated. If in doubt, have a person go through the decontamination process as a precautionary measure.

Contaminated victims should *not* be placed in transport vehicles or transported to medical facilities. Doing so could contaminate ambulances and emergency rooms, putting them out of service.



Slide 5.9

Not every situation calls for emergency decontamination.

This simple but effective matrix can help determine if emergency decontamination is needed.

Emergency decontamination may be followed by precautionary decontamination, if local protocol, the hazardous materials team, or poison control center deems it necessary.



Slide 5.10

Whether it's emergency decontamination or technical decontamination, pediatric victims present a complex problem for responders. To begin with, most teams do not have adequate supplies for pediatric emergencies. Systems need to be designed or adjusted so they can be used with children of all ages, including infants and children with special needs.

In addition, children lose body heat much faster than adults, so special care must be taken to minimize their exposure to cool water, to ensure they have dry clothing, and, ideally, to provide them with a source of heat after decontamination. Warm water at a low pressure should be used for the decontamination process.

Equally important, children should be allowed to stay with a parent at all times during the decontamination process. Separating children from parents or siblings can create a great deal of stress for both young victims and parents.

ELO 2: List five types of technical decontamination.

Step 3: Discuss technical decontamination.

Slides 5.11 through 5.14

Have participants turn to this section in their guides and follow along with the lecture.



Slide 5.11



Slide 5.12

This process differs from emergency decon in that teams have time to set up a process for responder or precautionary decontamination.

Responder decontamination refers to procedures that are performed on personnel who work in the exclusion zone or the contamination reduction zone at an event involving hazardous materials (hazmat) or CBRNE agents. This generally includes hazmat entry and decontamination teams working in Level A or Level B protective clothing, but may include law enforcement force protection squads and emergency medical service (EMS) personnel who work in Level C chemical protective clothing.

Precautionary decontamination generally refers to procedures conducted on civilians who have been through emergency decon and display symptoms related to contamination. Precautionary decon may also be appropriate for those who may have been exposed to hazardous chemicals, but who do not display any related symptoms of contamination.

Precautionary decon allows enough time to contain runoff water and to protect victims' modesty through the use of containment basins or showers, tents, trailers, and tarps. (In situations where injuries or exposures are immediate and life-threatening, measures to contain runoff water and protect modesty are generally too time-consuming. Instead, emergency decon should be conducted.) Precautionary decon may be a first step if emergency decon is not required.



Slide 5.13

Respiratory decontamination is conducted on individuals who have been exposed to a toxic gas, but who pose little or no risk of secondary contamination to rescue and EMS personnel. Respiratory decon may be required as victims begin to display symptoms related to exposure. Respiratory decon involves removing victims from the hazardous environment and relocating them to a clean and safe location. Respiratory decon may include the administration of oxygen. Victims' bulky clothing, which is capable of trapping gas, should be removed out of doors before the victims are turned over to medical personnel.

Equipment decontamination refers to cleaning equipment that has been contaminated during incident mitigation, so that it can be returned to service, or to additional cleaning of personal protective equipment (PPE) once responders have returned to the station.

Examples of decon solutions recommended for equipment include mixtures of sodium hypochlorite (bleach), isopropyl alcohol, and calcium hypochlorite.



Slide 5.14

Directed self-decontamination refers to the process of having victims conduct decontamination procedures on themselves.

Victims who are conscious, alert, and ambulatory should be directed to disrobe to the appropriate level and to wash themselves.

It is important to warn victims that it is easy to overlook places where contaminants typically hide, such as in garment folds and modesty areas (arm pits and crotch).

Directed self-decontamination is important for a number of reasons. It tends to be more effective than when responders perform decon on victims, it helps reduce victims' psychological trauma, it is sensitive to gender and cultural differences, and it saves valuable resources by freeing responders to do other things.

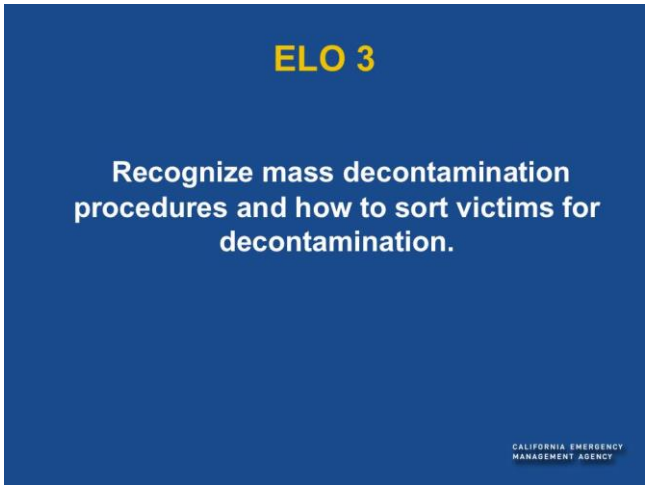
Whenever possible, have victims conduct directed self-decontamination.

ELO 3: Recognize mass decontamination procedures and how to sort victims for decontamination.

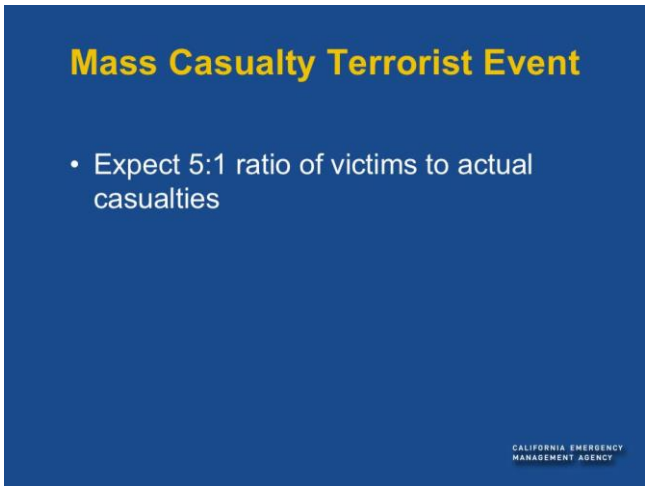
Step 4: Discuss procedures for mass decontamination and for sorting victims for decontamination.

Slides 5.15 through 5.28

Have participants turn to this section in their guides and follow along with the lecture.



Slide 5.15



Slide 5.16

Without a history of directly related incidents, it is difficult to provide a realistic characterization of the potential distribution of casualties after a terrorist event with a chemical agent.

However, to provide on-scene commanders with a perspective on the probable types and range of victims for an out-of-doors incident, the U.S. Army's Mass Casualty Decontamination Research Team (MCDRT) suggests anticipating a 5:1 ratio of victims to actual casualties.

In other words, for every casualty that actually has been exposed to a chemical agent, more than five victims who have not been exposed to the chemical agent will be evaluated.

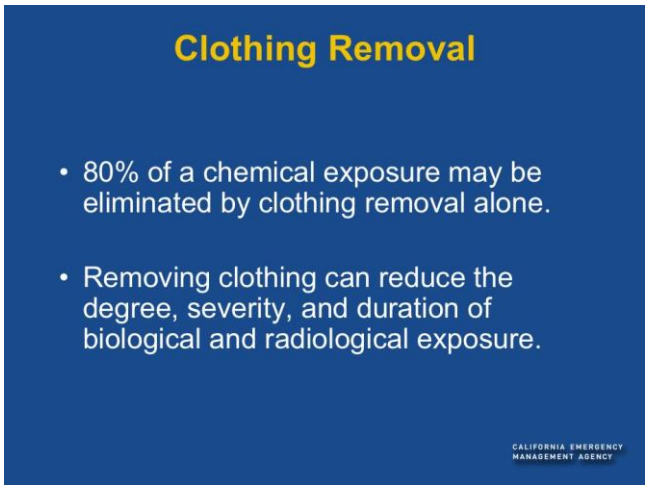


Slide 5.17

Mass decontamination refers to the need to decontaminate a number of victims. Depending on the number of responders and resources available, this process may overwhelm first responders.

Rapid physical removal of a chemical agent from the victim is the single most important action associated with effective mass decontamination. Physical removal may include scraping or blotting off of visible agent from the skin, disrobing, using adsorbents to soak up the agent, and flushing or showering with large quantities of soap and water.

After a chemical exposure, vapor or aerosol hazards may still be present, especially if the chemical was disseminated within an enclosed structure. Potentially toxic levels of hazardous vapor may be trapped inside clothes and can continue to affect people even after they leave the incident site.

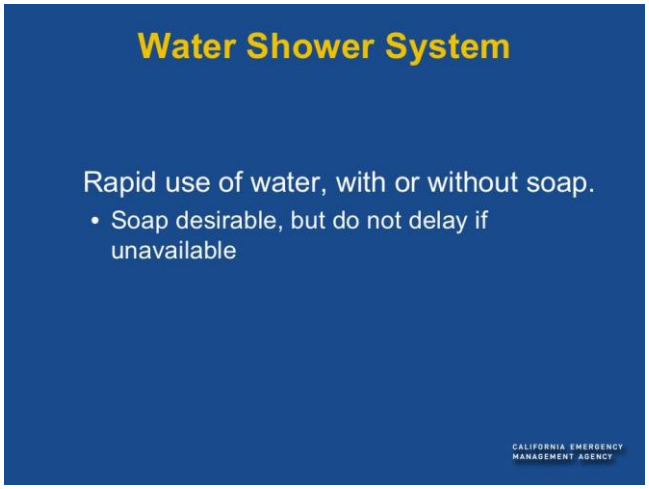


Slide 5.18

A number of methods can be used to decontaminate victims from exposure to harmful materials. The first step in mass decontamination should be the simple act of clothing removal. It is estimated that up to 80 percent of a chemical exposure can be eliminated by clothing removal alone.

Removing clothing can reduce the degree, severity, and duration of biological and radiological exposure. While complete removal may be necessary under some circumstances, at a minimum, victims should be advised and encouraged to remove all outer clothing (down to uncontaminated undergarments).

Victims who decline or refuse to remove clothing should not be forced to do so, but should be isolated as soon as possible from those who have been decontaminated fully.

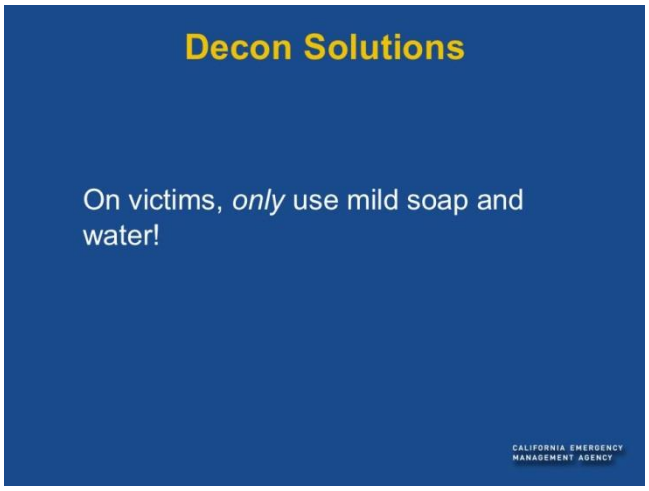


Slide 5.19

Since the most important aspect of decontamination is the timely and effective removal of the agent, the precise methods used to remove the agent are not as important as the speed with which the agent is removed.

Based on research of the effectiveness of different types of solutions in preventing chemical effects and the availability of quantities of water for rapidly decontaminating large numbers of people, the MCDRT has determined *that mass decontamination can be most readily and effectively accomplished with a water shower system.*

The use of soap is recommended, but the decontamination process should not be delayed if soap or another alternative is unavailable.



Slide 5.20

Only use mild soap and water as a solution for decontaminating victims.

Flushing or showering uses sheer force and dilution to physically remove chemical agents from the skin. Water alone is an excellent decontamination solution.

Solutions other than water and surfactants (soap) should not be used on the skin or mucous membranes of victims without direct medical supervision.

Adding soap marginally improves decontamination as a result of ionic degradation of the chemical agent. Liquid soaps are quicker to use than solid forms of soap and reduce the need for mechanical scrubbing. Do not abrade victims' skin when washing.

Soap aids in dissolving oily substances such as mustard or blister agent. However, using soap also may hydrate the skin, possibly increasing damage by blister agents.

One disadvantage of soap is the need to have an adequate supply on hand. In addition, extra time may be spent employing it.



Slide 5.21

Most fire departments do not have the capabilities to treat mass casualties inside the "hot zone."

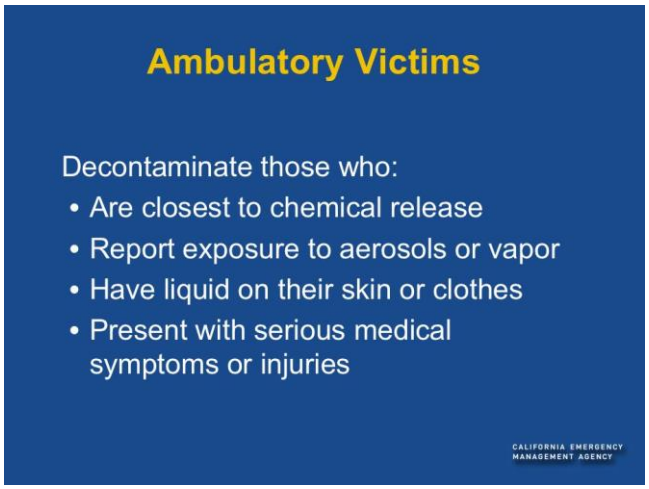
Instead, first responders need to have a method for setting priorities about which victims will be first to be decontaminated so they can then receive treatment and medical transport.

Sorting victims for decontamination can be performed effectively and in a manner that will maximize treatment, while minimizing the number of emergency responders who become exposed to the chemical agent.

Whenever large numbers of victims are involved, victims should be divided into two categories: ambulatory and non-ambulatory.

Ambulatory victims are those who are able to walk unassisted, understand directions, and speak.

Non-ambulatory victims are those who are unconscious, unresponsive, or unable to move without assistance.



Slide 5.22

In terms of ambulatory victims, priority for decontamination should be based on those who:

Are closest to the chemical release

Report exposure to aerosols or vapor

Have liquid on their skin or clothes

Present with serious medical symptoms (such as shortness of breath or chest tightness) or conventional injuries



Slide 5.23

Non-ambulatory victims may be more seriously injured than ambulatory victims. They should be kept in place until a comprehensive prioritization for decontamination occurs.

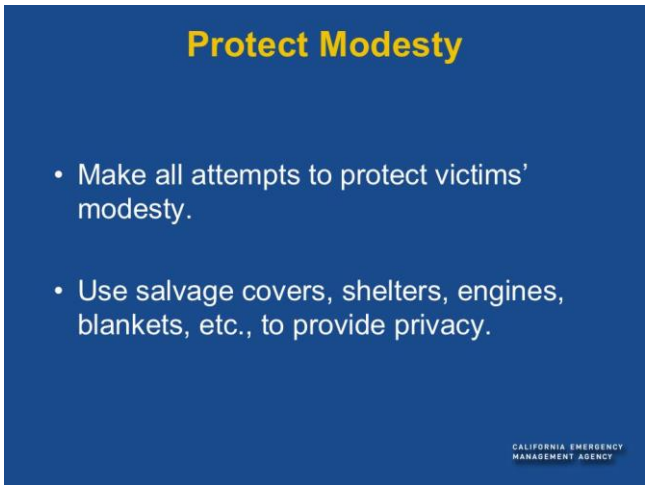
One method for prioritizing non-ambulatory victims for decontamination is to use a medical triage system, such as Simple Triage and Rapid Treatment/Transport (START).

Many public safety agencies are familiar with and use the START system because of its simplicity. Even personnel with only a basic knowledge of first aid can use START, which prioritizes victims into four categories:

1. Green (minimal): requires minimal medical attention
2. Yellow (delayed): medical attention may be delayed
3. Red (immediate): requires immediate medical care
4. Black (expectant): no care needed as victim is dead

Most ambulatory victims are triaged as minimal (green tag or ribbon), unless severe signs or symptoms are present.

In addition, responders should practice keeping clean backboards and stretchers in the support zone to receive clean victims. (This process often presents many problems for responders.)

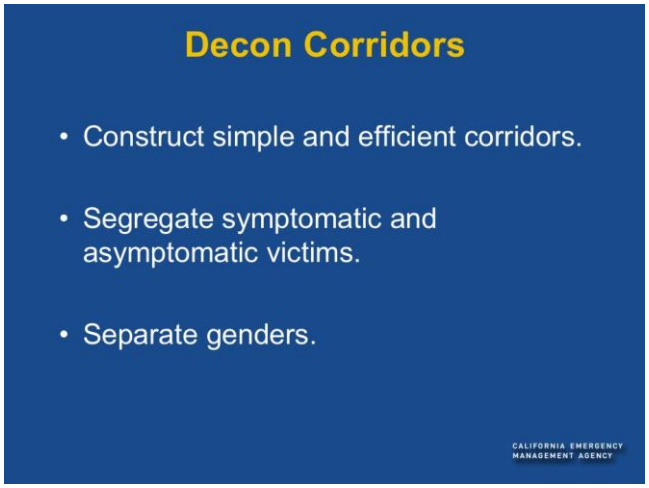


Slide 5.24

Make all attempts to protect victims' modesty in situations where they are required to remove their clothing.

Many items, such as salvage covers, shelters, engines, blankets, etc., will be available to provide privacy.

Most agencies have purchased shelters to protect victims' modesty during decon.



Slide 5.25

Decon corridors should be constructed simply and efficiently, keeping in mind that time is critical. (They should not take more than a few minutes to set up.)

Consider erecting dual corridors to separate genders. Also, consider segregating symptomatic and asymptomatic victims, as time and resources permit.



Slide 5.26

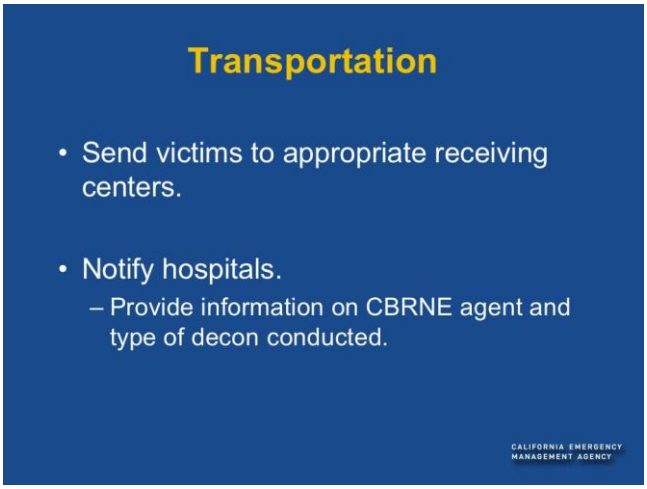
This slide illustrates the Emergency Decontamination Corridor System (EDCS), which uses fire apparatus, ladders, and salvage covers to create a privacy barrier and corridors for decontaminating victims.

Typically, two pumpers are positioned approximately 20 feet apart and parallel to each other. Three ladders (or ropes) are placed across and secured to the top of each pumper.

Another ladder is centered atop and perpendicular to the three ladders and secured. Two nozzles are secured to this ladder and allowed to hang into the corridors. Salvage covers are attached to or draped over the ladders (or ropes) to provide two separate corridors. Water from the two nozzles is used to shower victims as they pass through the corridors.

Inside the corridor, two covers can be suspended from the ladder, one on each side of the nozzle. These covers provide additional privacy to the person who is showering and allow other people to prepare for showering in the corridor. A salvage cover (or other translucent or opaque material) is placed on top of the two corridors to provide privacy from building tops and news media helicopters.

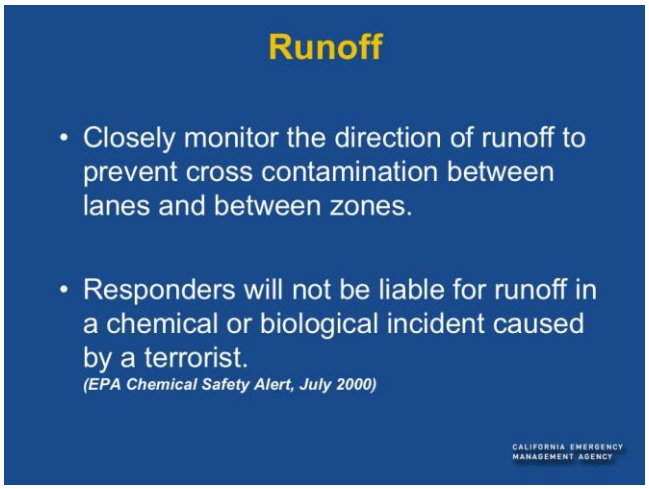
With planning and practice, an EDCS can be set up within 15 minutes of arriving at an incident.



Slide 5.27

As mentioned earlier, contaminated patients should *not* be placed in transport vehicles or transported to hospitals.

As soon as possible, notify hospitals that they will be receiving patients and the nature of victims' injuries (i.e., CBRNE event and information on the type of agent, if available), as well as the kind of decontamination they have received.



Slide 5.28

Although the primary concern in mass decontamination is saving lives, responders should also monitor the direction of runoff. Personnel should control runoff to the extent possible and have a good idea where the runoff is going. This will prevent cross-contamination between lanes and between zones and prevent runoff that may flow into clean areas or cause more casualties. If at all possible, given the available resources, confine the runoff to an isolated area. This is more critical for radiological materials, which cannot be neutralized.

The incident commander should notify the wastewater treatment facility as soon as possible when runoff is entering the sanitary sewer system or storm drains. For chemical warfare agents, some materials will be hydrolyzed by water and will not present a long-term problem downstream. Mustard agents and VX are notable exceptions; however, both can be diluted with large volumes of water. For biological agents, downstream contamination will vary depending on the agent and how well it survives in treated water. For radiological materials, downstream “hot spots” (where the materials have collected as sediments) can cause a radiation hazard.

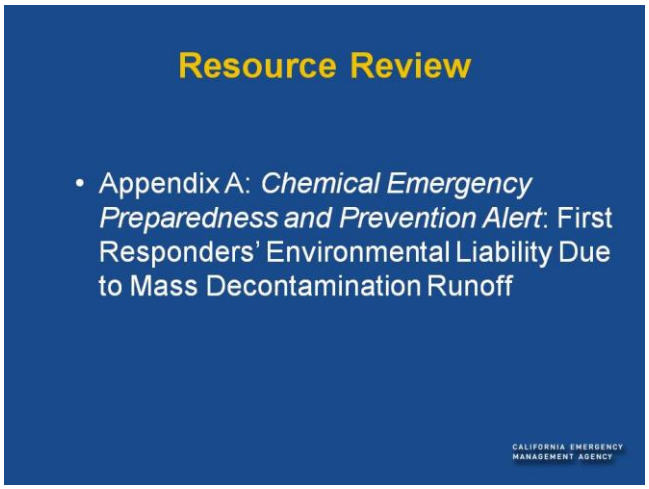
When decon is conducted to save lives, responders will not be held liable for runoff in a chemical or biological incident caused by a terrorist. Dry decon options may eliminate this concern.

Step 5: Review and discuss resource.

Slide 5.29

Materials: **Appendix A: *Chemical Emergency Preparedness and Prevention Alert*: First Responders’ Environmental Liability Due to Mass Decontamination Runoff**

Have participants turn to Appendix A in their guides. Briefly review the materials with participants.



Slide 5.29

Review the listed appendix in the participant guide.

Appendix A provides the complete text for the EPA's findings on acceptable levels of contamination in runoff and first responder liability for the spread of contamination caused by efforts to save lives.

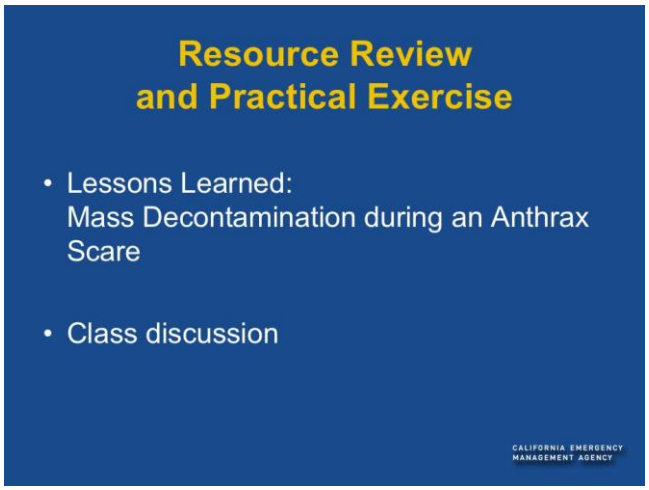
Step 6: Review and discuss resource.

Slide 5.30

Materials: **Lessons Learned: Mass Decontamination during an Anthrax Scare**

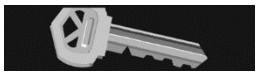
Have participants turn to the Resources section in their guides.

Briefly review the materials with participants.



Slide 5.30

Review the listed resource in the participant guide, then engage in class discussion on the unique features of the Mervyn's mass decontamination incident.



Step 7: Conduct Practical Exercise 5.1—Discuss lessons learned from a case study on mass decontamination and from direct experience.

Introduction: Participants will engage in a class discussion on solutions to problems encountered during mass decontamination.

Action to Be Completed: Have participants read the case study on mass decontamination to themselves. As a class, have participants discuss the unique features of the Mervyn's incident. In addition, have participants discuss other—or similar—issues they may have encountered during mass decontamination.

Rationale: This exercise is intended to help participants understand the importance of directed self-decontamination and to share lessons learned from their own experiences of incidents involving mass decontamination.

Time Necessary to Complete: 2 minutes to read case study; 8 minutes for class discussion

Resources: Lessons Learned: Mass Decontamination during an Anthrax Scare, easel pad and markers

Findings: Emphasize procedures or ideas that may be helpful in dealing with mass decontamination. (For example, very few jurisdictions have the decon leader use the entry team's radio channel when the entry team goes into decon. This may make communication easier for entry personnel in the decon corridor.)

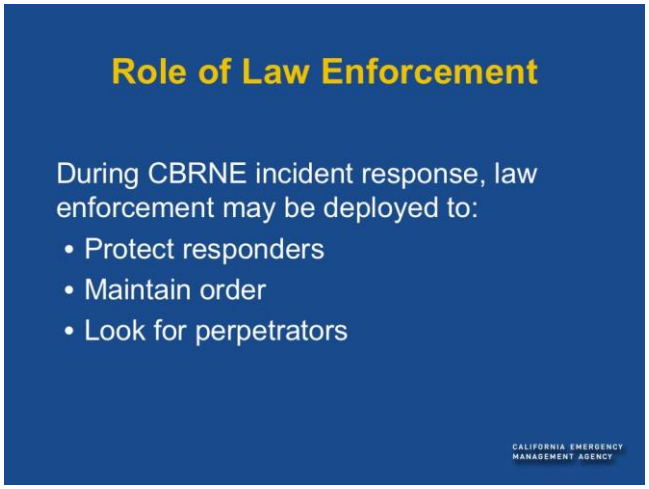
Write all findings on the easel pad. Have participants take note of the findings their respective jurisdictions might be able to incorporate into standard operating procedures.

Seat Time: 10 minutes

Step 8: Discuss the role of law enforcement officers during CBRNE incident response.

Slides 5.31 through 5.32

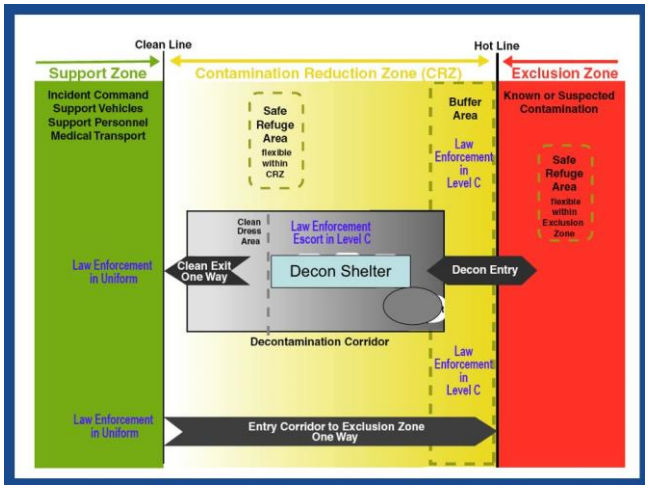
Have participants turn to this section in their guides and follow along with the lecture.



Slide 5.31

Many law enforcement officers have been trained in "force protection." The goal of force protection is to protect responders, maintain public order, and look for perpetrators.

These law enforcement officers usually will be wearing splash suits and are equipped with air purifying respirators.



Slide 5.32

This diagram shows a law enforcement zone, typically in front of the decontamination corridor, where officers may be positioned for search and force protection operations.

When contamination is suspected among the force protection group, these personnel will have to go through responder decontamination. (This technical decontamination will require the removal of firearms and other protective equipment.)

As a result, teams should be prepared to decontaminate responders other than members of the hazmat team and for the potential need for replacement workers in the decontamination corridor.

Step 9: Provide time to answer questions.

Slide 5.33

Use this opportunity to clarify any misconceptions or to answer any questions participants may have.



Slide 5.33

The decontamination process can be technically involved and extensive.

In general, follow these recommendations for decontaminating victims:

Decontaminate as soon as possible.

Opt for self-directed decontamination, if possible.

Consider clothing removal (head-to-toe; the more removal the better).

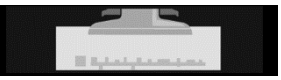
Flush with water.

First responders can readily use water-pumping capability to set up showers quickly. The next steps are to get people disrobed and through the showers, before further effects of the chemical agent can occur.

When time allows for a planned decontamination, responder safety can be ensured and important issues, such as runoff, cultural sensitivity, and modesty,also can be addressed.

As with any procedure for emergency response, successful implementation of decontamination requires regular training and practice.

Chapter 5



Resources

Lessons Learned: Mass Decontamination During an Anthrax Scare

On December 24, 1998, an anthrax scare occurred at a Mervyn's department store in Palm Desert, California. The entry objective for the hazardous materials (hazmat) response team was to locate a suspicious device or substance. The hazmat team made two Level B entries to search the entire store. Nothing was found to indicate the presence of anthrax.

Decontamination procedures began before the arrival of the hazmat team. Precautionary field decontamination was conducted on 229 potential victims of anthrax contamination in the parking lot outside the department store. Three decontamination areas, including separate areas for men and women, were set up. Women and children were decontaminated first. The entire decontamination process took approximately six hours. The fire department kept some victims' personal belongings for as long as two days, and then returned them to their rightful owners.



A parking lot became the Safe Refuge Area.

Victims were generally cooperative. While they were in the Safe Refuge Area waiting to be decontaminated, they were informed about the decontamination process. Many victims expressed a great deal of concern about being disrobed in a public situation. In turn, their concerns were treated with respect.

To separate the women from the men, two different corridors were set up. In addition, victims were provided with a poncho, Tyvek® coverall, hospital sheet, or hazardous materials chemical suit after going through the decontamination process to protect their modesty.



Separating genders was easily accomplished using ladders draped with salvage covers.



Victims' modesty was protected by providing them with decontamination ponchos, Tyvek® coveralls, hospital sheets, or hazardous materials chemical suits.

As part of the precautionary field decontamination process, the Medical Group received victims who had gone through the decontamination process. The Medical Group obtained victims' personal contact information and conducted medical assessments on the victims. In addition, decontaminated victims were routed to a bus staging area where they received general information on anthrax from the Health Officer.



A victim experiencing chest pain while waiting for decontamination is treated by paramedics.

Problems Encountered

Although many things went well, such as protecting victims' modesty, during the mass decontamination process, many problems could have been averted with adequate personnel and equipment—and more training in such incidents. Some of the problems included:

Lack of knowledge, training, and experience in such incidents. Threats representing a low probability/high impact incident need to be addressed and incorporated into training. In addition, personnel who had *not* been trained in hazmat response staffed decontamination units.

Inadequate numbers of personnel to respond to the scope of the incident. The hazmat group was stretched too thin. No backup personnel were available to provide much needed relief to decontamination units. The lack of personnel also led to problems controlling site access.

Inadequate logistics resources, such as PPE.

Handling of victims' belongings created stress and confusion. For example, some personal belongings were not clearly identified, and keys and wallets were left in pants and purses. Many personal items were not returned until two days after the incident.

Other problems encountered in the safe refuge area:

elderly persons

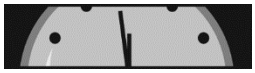
women who were menstruating

fainting due to lack of food and water

Lessons Learned

Although some of the problems encountered during the mass decontamination for this incident were unavoidable, many problems would not have arisen if directed self-decontamination had been available at the time. In fact, the kinds of problems encountered in incidents such as the Mervyn's anthrax scare led to the development of the directed self-decontamination process.

37. Medical Management of Terrorist Incidents



Duration — Method of Instruction

1 hour and 15 minutes

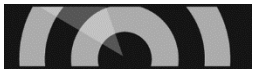
1 hour for course instruction — Facilitated seminar

15 minutes for Practical Exercise 6.1 — Individual work



Scope

This chapter provides guidelines for triage and medical management of mass casualties, including children, of a CBRNE incident.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 6, participants will be able to identify appropriate assistance and medical support for individuals affected by an incident involving chemical, biological, radiological/nuclear, or explosives agents (CBRNE).



Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

Identify causes of illness or injury related to an incident involving CBRNE agents.

Define the three basic criteria for multi-casualty field triage of adult victims.

List the advantages and disadvantages of Jump-START for pediatric triage in an emergency situation.

Linkages to Universal Task List

The information, objectives, and activities in this chapter promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

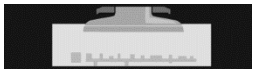
(Res.B.2 5.3.3) Extricate and rescue victims from within the hot zone.

(Res.B.2 5.4.2) Monitor all responders for exposure to hazardous materials.

(Res.C.1 4.3) Implement casualty management plan.

(Res.C.1 4.3.1) Triage and treat patients.

(Res.C.1 4.3.1.3) Triage and treat patients at the incident site.



Resources

Materials and Preparation

Seating and work stations for up to 30 participants

Laptop computer, projector, and screen

Instructor Guide and CD with PowerPoint Presentation (1 for instructor)

Participant Guide (1 for each participant)

Resource List

Criminal and Terrorist Use of Chemical, Biological, and Radiological Agents

Technical Specialist-Hazardous Materials Reference: ICS Position Checklist

ICS Position Checklists for Multi-Casualty Incidents

START System for Triage

JumpSTART Pediatric Triage

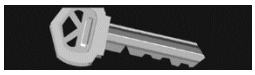
Pediatric Multicasualty Triage System

Reference List

See Reference List at the beginning of this guide.

Instructor/Participant Ratio

1/30



Practical Exercises (PE)

See Step 10 for exercise instructions.

6.1 Triage Pediatric Case Studies (Exercise Sheet)

6.1 Triage Pediatric Case Studies (Instructor Key)

Assessment Strategy

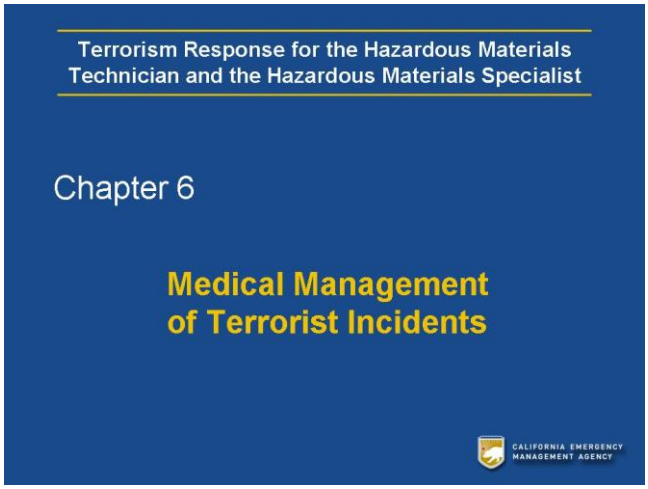
Pre/Post Test

Instructor Procedures

Step 1: Review the chapter's objectives.

Slides 6.1 through 6.3

Have participants turn to this section in their guides and follow along with the lecture.



Slide 6.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

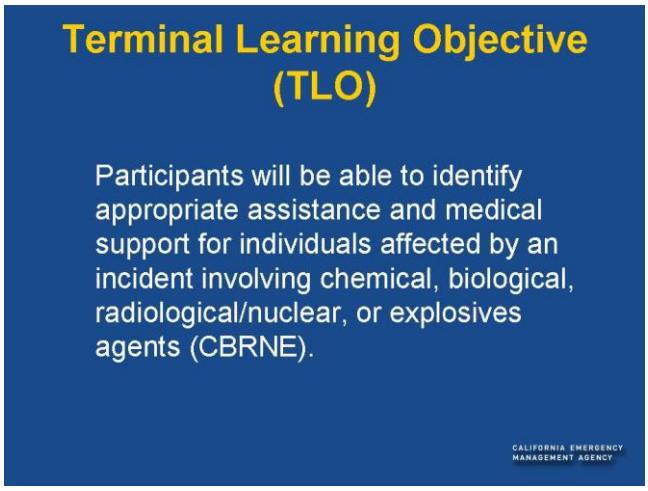
(Res.B.2 5.3.3) Extricate and rescue victims from within the hot zone.

(Res.B.2 5.4.2) Monitor all responders for exposure to hazardous materials.

(Res.C.1 4.3) Implement casualty management plan.

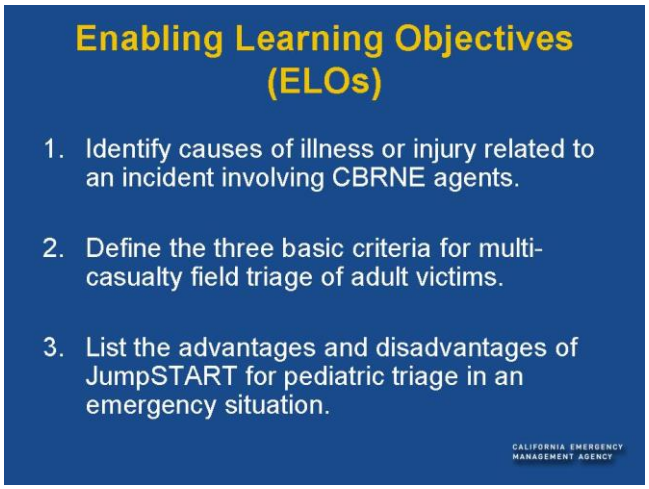
(Res.C.1 4.3.1) Triage and treat patients.

(Res.C.1 4.3.1.3) Triage and treat patients at the incident site.



Slide 6.2

The terminal learning objective (TLO) for this chapter is to ensure that participants will be able to identify appropriate assistance and medical support for individuals affected by an incident involving chemical, biological, or radiological/nuclear agents or explosives agents (CBRNE).



Slide 6.3

This chapter's enabling learning objectives (ELOs) are to ensure participants will be able to:

Identify causes of illness or injury related to an incident involving CBRNE agents.

Define the three basic criteria for multi-casualty field triage of adult victims.

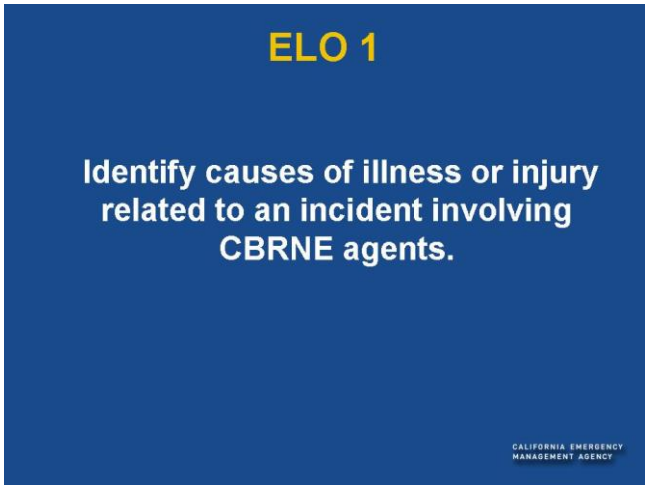
List the advantages and disadvantages of JumpSTART for pediatric triage in an emergency situation.

ELO 1: Identify causes of illness or injury related to an incident involving CBRNE agents.

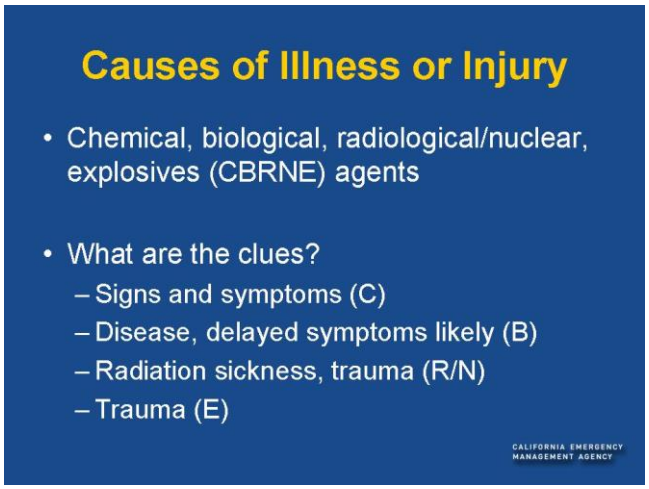
Step 2: Discuss the process of identifying causes of illness or injury that results from a CBRNE incident.

Slides 6.4 through 6.6

Have participants turn to this section in their guides and follow along with the lecture.



Slide 6.4



Slide 6.5

Victims of a CBRNE event may not be able to identify what caused their illness or injury. As a result, it is important for responders to be able to correlate the type of illness or injury with the probable CBRNE agent used.

If the cause of illness and injury in a multi-casualty terrorist incident is the release of a chemical agent, hazardous materials (hazmat) technicians and hazmat specialists should be able to determine the probable chemical family based upon easily observed signs (such as colored residue, dead foliage, pungent odor, dead insects and animals) and rapid onset of medical symptoms (such as skin irritation, respiratory distress, gastrointestinal upset). In addition, the hazmat technical specialist can use various detection devices to identify the specific agent.

If the cause of illness and injury in a multi-casualty terrorist incident is the release of a biological agent, symptoms of disease are usually delayed. Hazmat technicians and hazmat specialists can use field detection devices with protein tests and other equipment to rule out white powders. Hazmat technicians and hazmat specialists should be skilled at collecting field evidence for further testing and maintaining the chain of evidence.

If the cause of illness and injury in a multi-casualty terrorist incident is the release of a radiological/nuclear agent, the hazmat technical specialist can often determine alpha, beta, and gamma contamination and exposure, as well as identify the isotope. Hazmat technicians and hazmat specialists can calculate radiological doses based upon readings and stay times.

Traumatic injuries may be compounded if the explosive device contains chemical, radiological, or biological agents. The technical specialist-hazardous materials reference can help determine if a device is a simple explosive or if it contained additional agents and exposure to those agents has occurred.



Slide 6.6

Using various resources and methods of testing, the technical specialist-hazardous materials reference gathers valuable information—such as analysis of hazardous material released, physical properties, and hazard characteristics—that can be used to determine appropriate treatment modalities.

As a result, it is extremely important to ensure that medical personnel obtain this information and that it is passed on to receiving hospitals.

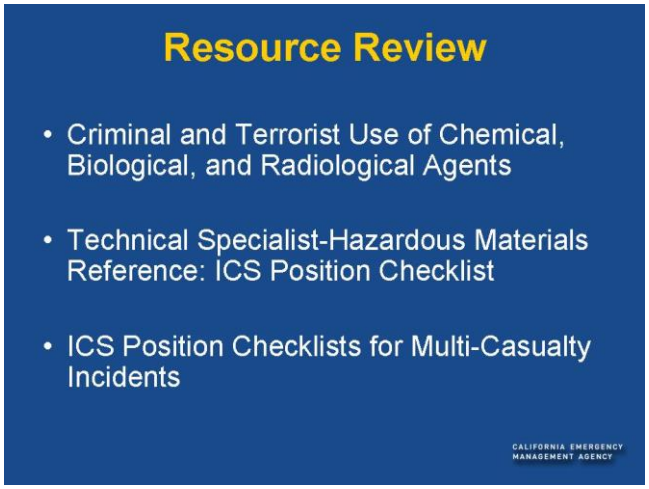
Step 3: Review and discuss resources.

Slide 6.7

Materials: Criminal and Terrorist Use of Chemical, Biological, and Radiological Agents; Technical Specialist-Hazardous Materials Reference: ICS Position Checklist; ICS Position Checklists for Multi-Casualty Incidents

Have participants turn to the Resources section in their guides.

Briefly review these materials with participants. For the ICS Checklists, have participants take note of the number of positions/people involved. Point out that entirely different groups, not just hazmat teams, will be working on-scene and emphasize the need to coordinate with other agencies and responders.



Slide 6.7

Review the listed resources in the participant guide.

The first fact sheet, adapted from a section of the *Emergency Response Guidebook*, includes a list of observable indicators of the use and/or presence of a chemical, biological agent, or radioactive material.

The ICS position checklist fact sheets provide more detail on the role and responsibilities of the Technical Specialist-Hazardous Materials Reference and other groups that will be involved in responding to an act of terrorism in which CBRN agents or explosive devices are used.

Step 4: Discuss the relationship between decontamination and medical care.

Slide 6.8

Have participants turn to this section in their guides and follow along with the lecture.



Slide 6.8

Generally, victims go through the decontamination process before receiving medical care. Decontamination is a high priority because it eliminates or reduces the chemical contamination that causes illness or injury. Decontamination also reduces the possibility of secondary contamination to responders and medical personnel.

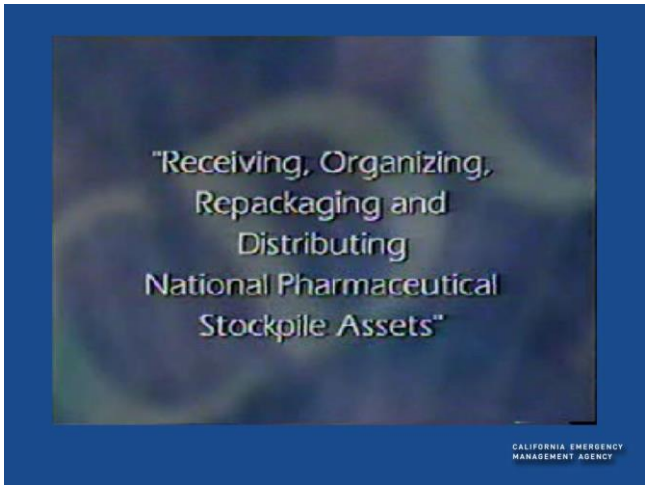
Sometimes, however, victims need critical medical care before going through decontamination, posing a unique challenge for emergency responders.

Hazmat technicians and hazmat specialists with emergency medical services training can help sort victims for decontamination.

Step 5: Discuss the process of amassing resources and support for the response to a mass casualty event.

Slide 6.9

Have participants turn to this section in their guides and follow along with the lecture.



Slide 6.9

In any terrorism event or those with a large number of casualties, the state's warning center ***must be called*.** This requirement will activate the process of amassing resources and support for the response. In addition, the Federal Bureau of Investigation should be notified.

The first line of support from the Strategic National Stockpile (SNS) are pallets of "Push Packages." These are caches of pharmaceuticals, antidotes, and medical supplies designed to provide rapid delivery of a broad spectrum of assets for a threat in the early hours of an event. Push Packages are positioned in strategically located, secure warehouses ready for immediate deployment to a designated site within twelve hours of the federal decision to deploy SNS assets.

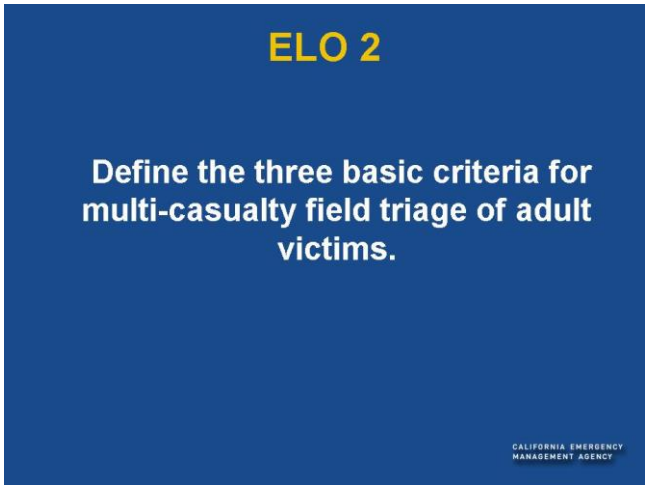
If the agent is well defined, VMI can be tailored to provide pharmaceuticals, supplies, and/or products specific to the suspected or confirmed agent(s). In this case, the VMI could act as the first option for immediate response from the SNS Program.

ELO 2: Define the three basic criteria for multi-casualty field triage of adult victims.

Step 6: Discuss multi-casualty triage.

Slides 6.10 through 6.12

Have participants turn to this section in their guides and follow along with the lecture.



Slide 6.10



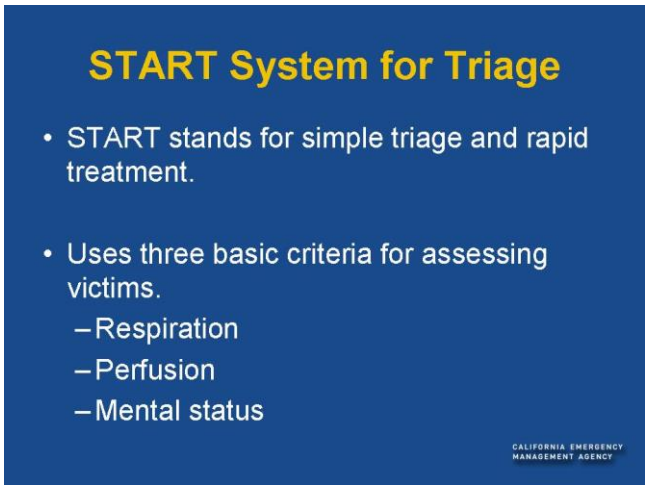
Slide 6.11

Multi-casualty triage is a process for sorting injured people into groups based on their need for or likely benefit from immediate medical treatment and transport. It is also a process for recognizing futility.

The goal of multi-casualty triage is to do the best that is possible under the circumstances for the most people, using the least of limited resources at hand.

The assumptions underlying multi-casualty triage are that needs outstrip immediately available resources and that more resources will become available with time.

Triage is a dynamic process. Once victims are triaged into a treatment category, it is important to continue monitoring them. For example, victims who are initially triaged as needing only minor care could develop further symptoms later and may need to be re-triaged into another treatment category.



Slide 6.12

START stands for simple triage and rapid treatment.

The START triage system relies on making a rapid assessment (taking less than a minute) of every victim, determining which of four categories (dead, immediate, delayed, or minor) victims should be in, and visibly identifying the categories for rescuers who will treat the patients.

START uses three basic criteria for assessing victims: respiration, perfusion, and mental status (RPM).

START is commonly used in the United States and many countries around the world.

Step 7: Review and discuss resource.

Slide 6.13

Materials: START System for Triage

Have participants turn to the Resources section in their guides.

Briefly review the fact sheet with participants.



Slide 6.13

Review the listed resource in the participant guide.

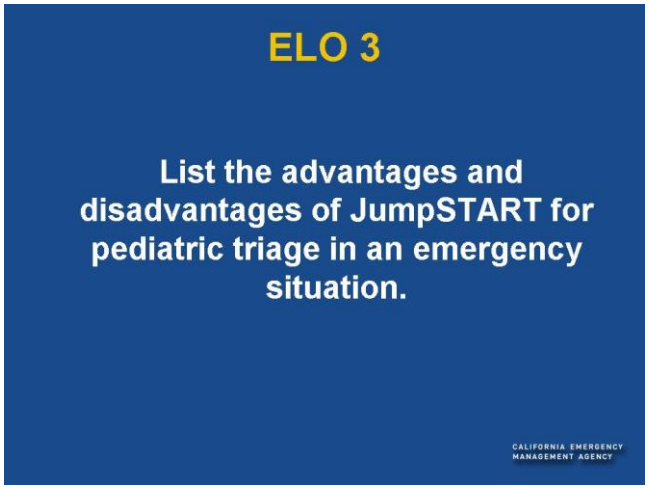
This fact sheet describes the criteria and the steps used in the START system for triaging injured adults.

ELO 3: List the advantages and disadvantages of JumpSTART for pediatric triage in an emergency situation.

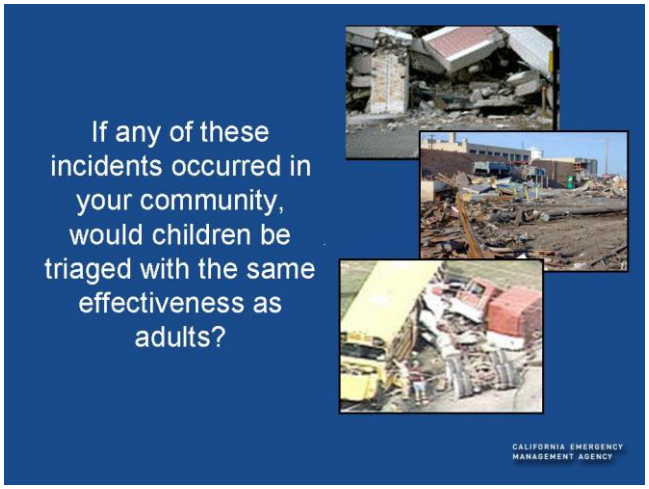
Step 8: Discuss the special considerations relating to triage of juvenile victims.

Slides 6.14 through 6.22

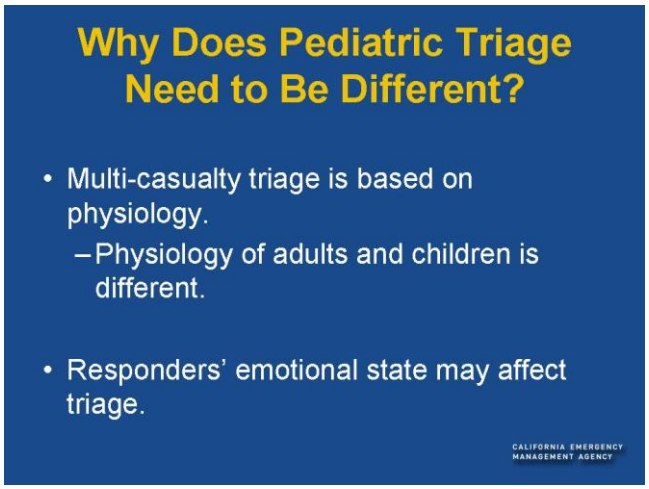
Have participants turn to this section in their guides and follow along with the lecture.



Slide 6.14



Slide 6.15



Slide 6.16

Pediatric triage needs to be different from the approach used for adults because multi-casualty triage is based on physiology and the physiology of adults and children is different.

The pertinent pediatric physiological difference, the airway, approaches that of adults by approximately eight years of age. Moreover, the ability to obey verbal commands may not be an appropriate gauge of mental status for younger children.

In addition, responders' emotional state—their compassion for children—may affect their ability to conduct triage efficiently. As a result, children may be over-triaged, which can redirect resources away from other patients who need them more.

Equally important, an objective guideline for triage of children provides emotional support for personnel who are forced to make life or death decisions regarding children in a mass-casualty setting.



Slide 6.17

Developed in 1995 by Lou Romig, MD, FAAP, FACEP, JumpSTART is a triage system specifically for children in a multi-casualty disaster setting.

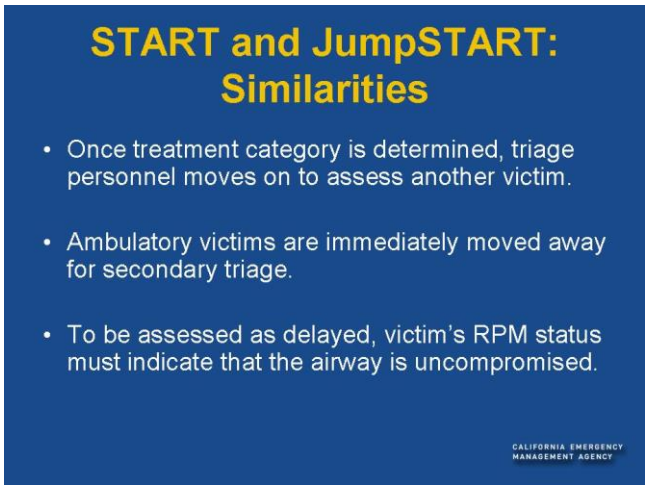
JumpSTART parallels the structure of the START system, the triage tool for adults in a multi-casualty incident (MCI). JumpSTART provides an objective framework that helps ensure responders perform triage on children efficiently and effectively.

JumpSTART's objectives are to:

Optimize the primary triage of injured children in the setting of the MCI setting.

Enhance the effectiveness of resource allocation for *all* MCI victims.

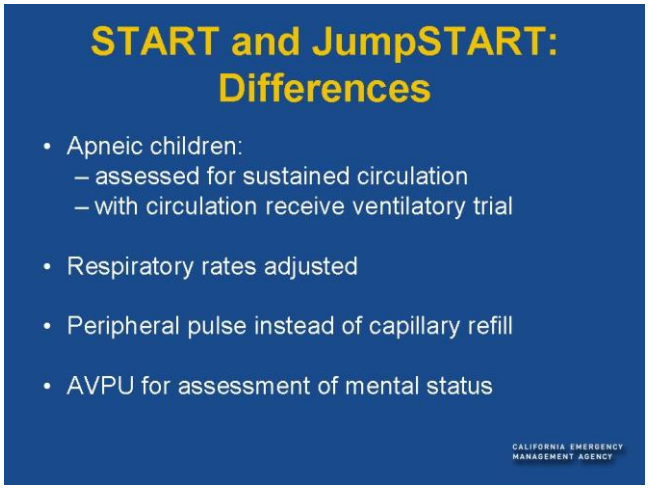
Reduce the emotional burden on triage personnel who may have to make rapid life-or-death decisions about injured children in chaotic circumstances.



Slide 6.18

START and JumpSTART share three basic approaches to triage.

1. As soon as a responder determines a victim's treatment category, the responder moves on to assess another victim. (Secondary triage may be conducted by medical personnel.)
2. Victims who are ambulatory are directed to move to another area for secondary triage.
3. To be assessed into the delayed category for treatment, victims' respirations, perfusion, and mental (RPM) status must be such that it is unlikely their airway is compromised.



Slide 6.19

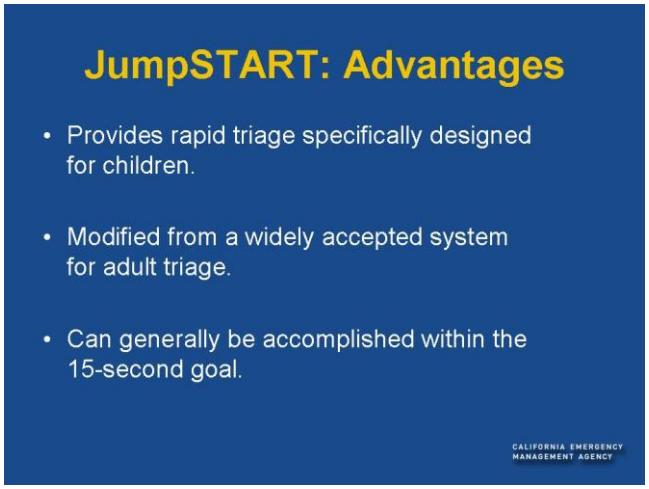
JumpSTART differs from START in the use of:

Ventilatory trial after airway opening when breathing does not resume

Parameters for respiratory rate

Peripheral pulse instead of capillary refill

AVPU (**alertness**, response to **voice**, appropriate reaction to **pain**, and **unresponsiveness**) to assess mental status



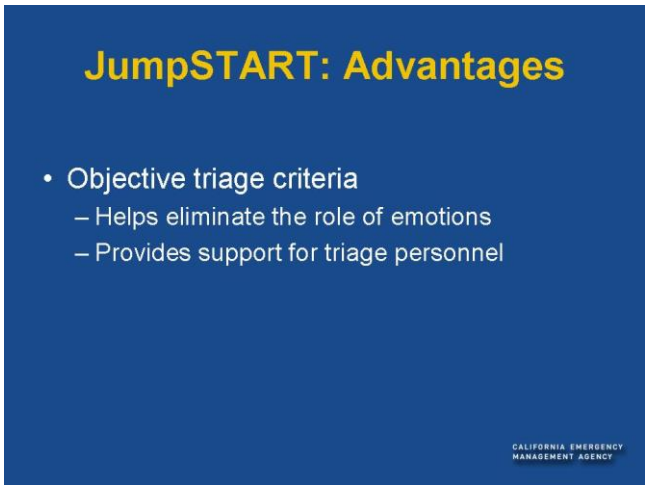
Slide 6.20

JumpSTART offers several advantages over START for triage of children.

It is a system of triage that was developed specifically for children between the ages of one year to eight years old, taking into account the physiological differences between children and adults.

It is a pediatric version of an already widely accepted system of triage for adults.

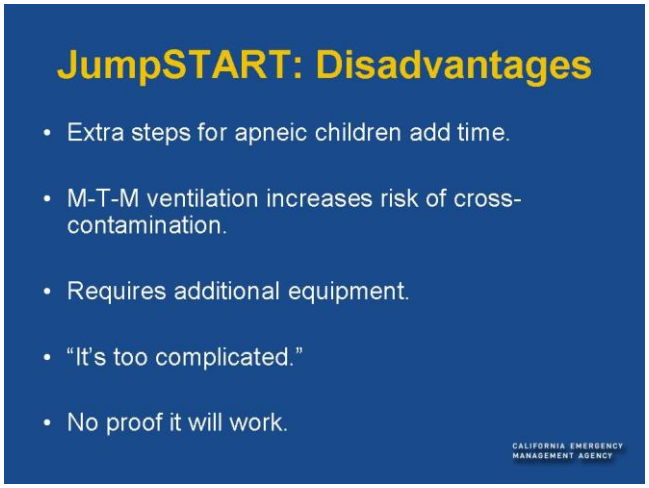
It can generally be accomplished within the goal of triaging each victim in fifteen seconds.



Slide 6.21

One of the most important advantages of JumpSTART is that its objective criteria help eliminate the role of emotions when triaging children. JumpSTART allows responders to triage "with the head, and not the heart."

JumpSTART also helps reduce the emotional burden on triage personnel who may have to make rapid life-or-death decisions about injured children in difficult, chaotic circumstances.



Slide 6.22

While JumpSTART clearly offers advantages over START for pediatric victims, it also has a few disadvantages.

Those disadvantages are

It adds time to triage to conduct the extra steps (ventilatory trial) for ensuring that children who are not breathing cannot be saved under the circumstances.

Mask-to-mouth ventilation increases the risk of cross-contamination.

Additional equipment, which first responders may not have on hand, is required.

The steps involved are perceived as "too complicated." No triage tool, including START and JumpSTART, has been clinically or scientifically validated using data from victims of mass-casualty incidents.

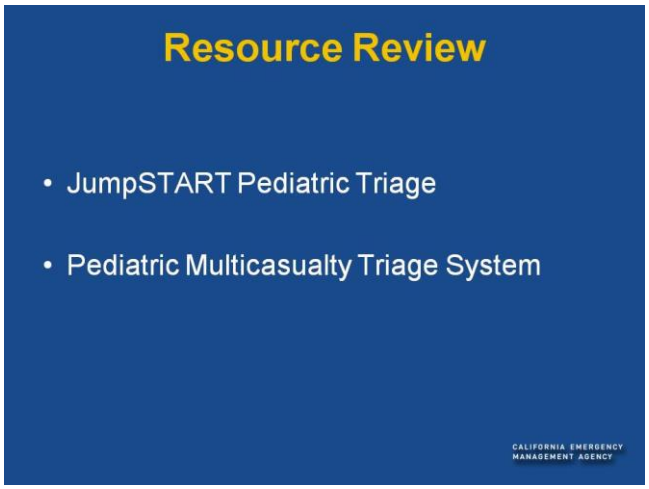
Step 9: Review and discuss resources.

Slide 6.23

Materials: JumpSTART Pediatric Triage, Pediatric Multicasualty Triage System

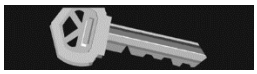
Have participants turn to the Resources section in their guides.

Briefly review the fact sheet and flow chart with participants.



Slide 6.23

Review the listed resources in the participant guide which provide more detail and an algorithm flow chart on the JumpSTART triage system for children.



Step 10: Conduct Practical Exercise 6.1—Triage Pediatric Case Studies.

Introduction: Participants work independently to develop skills in primary triage for children in a multi-casualty incident.

Action to Be Completed: Participants will read case studies and use the JumpSTART system to "triage" pediatric victims.

Rationale: This exercise is intended to provide participants with practice in triaging pediatric victims with their "heads, not their hearts." Triage of pediatric victims can be an emotionally difficult procedure for responders to conduct.

Time Necessary to Complete: 5 minutes for case studies, 10 minutes for class discussion

Resources: Triage Pediatric Case Studies: Exercise Sheet and Instructor Key

Findings: Use the Practical Exercise Key to review the correct answers with participants. Engage participants in a discussion on how useful the JumpSTART system of pediatric triage would be in a mass casualty incident.

Seat Time: 15 minutes

Step 11. Provide time to answer questions.

Slide 6.24

Use this opportunity to clarify any misconceptions or to answer any questions participants may have.

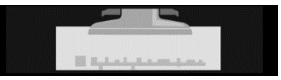


Slide 6.24

Keep in mind that numerous resources (such as the *Emergency Response Guidebook*, the CBRN Indicator Matrix, and, especially, the hazmat team's Technical Specialist-Hazardous Materials Reference) are available to help responders gauge whether chemical, biological, or radiological/nuclear materials have been released at an incident.

START and JumpSTART are two systems of primary disaster triage that will allow first responders to do the greatest good for the greatest number, and to maximize survival for those who need medical help first. Responders should be prepared for the presence of children in any multi-casualty event. JumpSTART will help responders conduct triage with their heads, not their hearts.

Chapter 6



Practical Exercise

Practical Exercise 6.1 Exercise Sheet Triage Pediatric Case Studies

Directions: As you read each case study for pediatric victims of a mass casualty incident, take no more than fifteen (15) seconds to decide which treatment area each victim should be assigned to. Use the Jump-START triage system to make your decisions, referring to the Jump-START flow chart as needed.

Victim 1

Seven-year-old female

Spontaneous respirations present: respiratory rate 24

Peripheral pulses present

Non-responsive to pain

Which treatment area would you assign this victim to?

Victim 2

Eight-year-old male

Awake, alert, crying

Crushing injury to left leg; unable to walk

Spontaneous respirations present: respiratory rate 32

Peripheral pulses present

Which treatment area would you assign this victim to?

Victim 3

Five-year-old male

Non-responsive

No spontaneous respirations

Open airway: no spontaneous respirations

Peripheral pulses present

Mouth-to-mask ventilation for 15 seconds: no spontaneous respirations

Which treatment area would you assign this victim to?

Victim 4

Six-year-old female

Awake and alert

Spontaneous respirations present: respiratory rate 20

Peripheral pulses present

Unable to walk

Which treatment area would you assign this victim to?

Victim 5

Eight-year-old male

Confused: Will follow commands

Walking and looking for his sister

Which treatment area would you assign this victim to?

Victim 6

Three-year-old male

Non-responsive

No spontaneous respirations

Open airway: no spontaneous respirations

Peripheral pulses present

Mouth-to-mask ventilation for 15 seconds: spontaneous respirations present

Which treatment area would you assign this victim to?

Victim 7

Seven-year-old female

Spontaneous respirations present: respiratory rate 48

Peripheral pulses present

Awake and alert

Which treatment area would you assign this victim to?

Victim 8

Eight-year-old male

Able to walk

Cut to forehead

Awake and alert

Which treatment area would you assign this victim to?

Victim 9

Three-year-old male

No spontaneous respirations

Open airway: no spontaneous respirations

No peripheral pulses

Which treatment area would you assign this victim to?

Participant Guide

Chapter 7
Field Tactics for Biological Agents

Developed by the California Department of Public Health



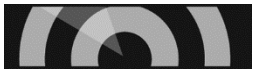
Scope

This chapter provides an overview of biological warfare agents and demonstrations on field sampling and testing of suspected biological agents.

Note: The instructor for the exercise should be well-versed in conducting field sampling and testing.

Only limited information regarding bioterrorism response is presented in this chapter. Contact your local public health department, bioterrorism response laboratory and FBI WMD Coordinator for information on additional bioterrorism response training available to your jurisdiction.

Additional bioterrorism response training, including advanced field sampling procedures, is available through the National Center for Biomedical Research and Training at Louisiana State University. See Appendix: Additional Training and Education Resources.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 7, participants will be able to recognize when hazardous materials teams should conduct field testing and sampling of suspected biological agents and how to do so without contaminating themselves, the sample, or the environment.



Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

Name the four main types of biological warfare agents.

List the common characteristics of biological agents.

Conduct field testing to rule out biological agents.

Conduct environmental sampling for suspected biological agents.

Linkages to Universal Task List

The information, objectives and activities in this chapter promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

(Res.B.2 2.1.1.2) Develop and implement training related to self-protection equipment.

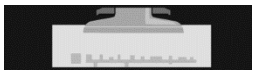
(Res.B.2 3.2.1) Coordinate and direct hazardous materials detection and assessment activities.

(Res.B.2 3.2.2) Coordinate, integrate, and manage efforts to prevent, or mitigate, or minimize threat of potential releases.

(Res.B.2 5.1.1) Identify hazardous materials and extent/scope of the incident.

(Res.B.2 5.1.1.1) Develop a monitoring and sampling plan, including laboratory support.

(Res.B.2 5.1.1.2) Require utilization of the laboratory response network (LRN) to test suspected biological threats.



Resources

Resource List

Biological Warfare Agents

Select Bioterrorism Agents

Clandestine Bio-Labs

Field Identification of Unknown Substances

Ruling Out Biological Agents

Using the BioCheck Kit

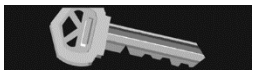
Environmental Sampling

Chain of Custody Form

Checklist for Environmental Sampling of FBI Credible Threats

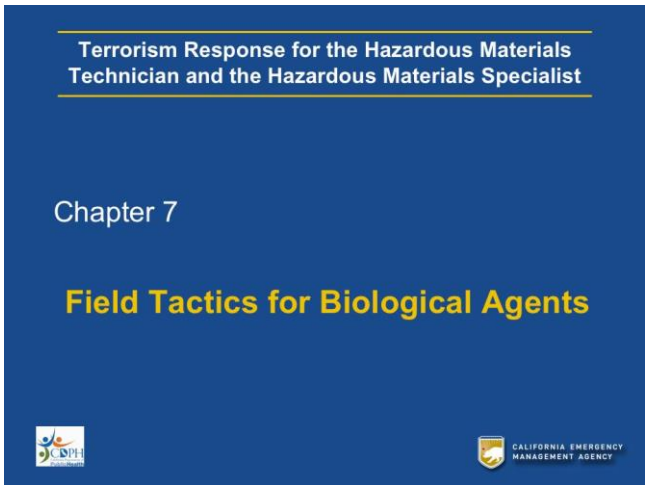
Reference List

See Reference List at the beginning of this guide.



Practical Demonstration (PD)

7.1 Field Testing and Aseptic Sampling for Suspected Biological Agents (Demonstration Sheet)



Slide 7.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

1. (Res.B.2 2.1.1.2) Develop and implement training related to self-protection equipment.
2. (Res.B.2 3.2.1) Coordinate and direct hazardous materials detection and assessment activities.
3. (Res.B.2 3.2.2) Coordinate, integrate, and manage efforts to prevent, or mitigate, or minimize threat of potential releases.
4. (Res.B.2 5.1.1) Identify hazardous materials and extent/scope of the incident.
5. (Res.B.2 5.1.1.1) Develop a monitoring and sampling plan, including laboratory support.
6. (Res.B.2 5.1.1.2) Require utilization of the laboratory response network (LRN) to test suspected biological threats.

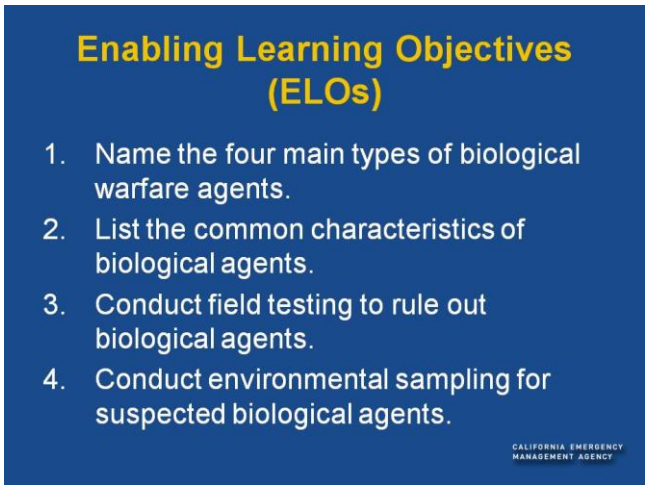
Note: This chapter presents only limited information regarding bioterrorism response. Contact your local public health department, bioterrorism response laboratory and FBI WMD Coordinator for information on additional bioterrorism response training available to your jurisdiction.

Additional bioterrorism response training, including advanced field sampling procedures, is available through the National Center for Biomedical Research and Training at Louisiana State University. See Appendix: Additional Training and Education Resources.



Slide 7.2

The terminal learning objective (TLO) for this chapter is to ensure that participants will be able to recognize when hazardous materials teams should conduct field testing and sampling of suspected biological agents and how to do so without contaminating themselves, the sample, or the environment.



Slide 7.3

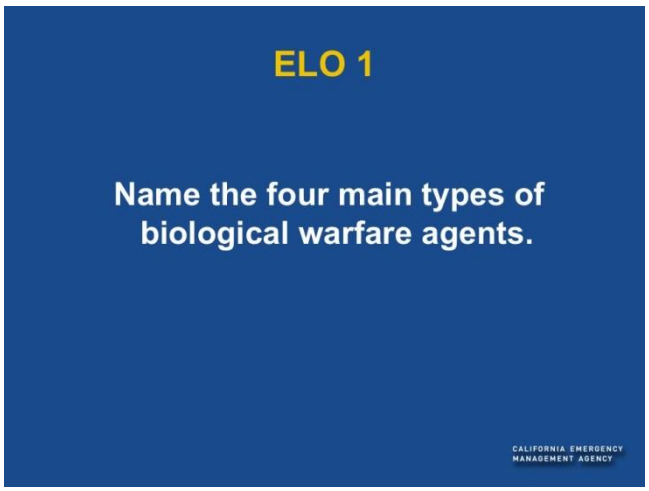
This chapter's enabling learning objectives (ELOs) are to ensure participants will be able to:

Name the four main types of biological warfare agents.

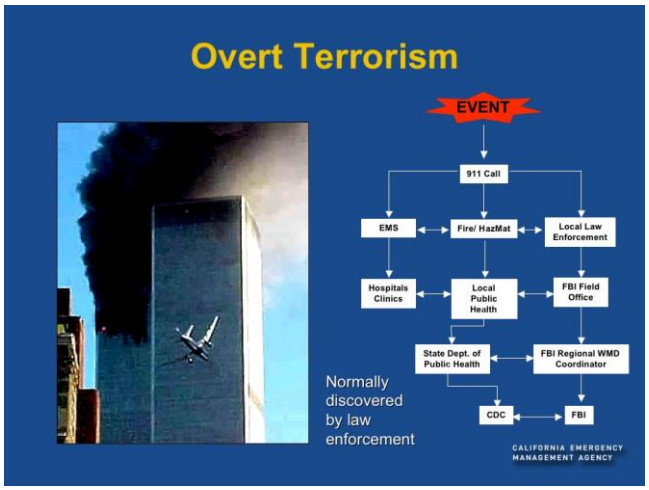
List the common characteristics of biological agents.

Conduct field testing to rule out biological agents.

Conduct environmental sampling for suspected biological agents.



Slide 7.4



Slide 7.5

The Federal Bureau of Investigation (FBI) divides possible acts of terrorism into two categories: overt and covert terrorism. Overt incidents are known in some way, either because they are announced or through obvious actions, such as:

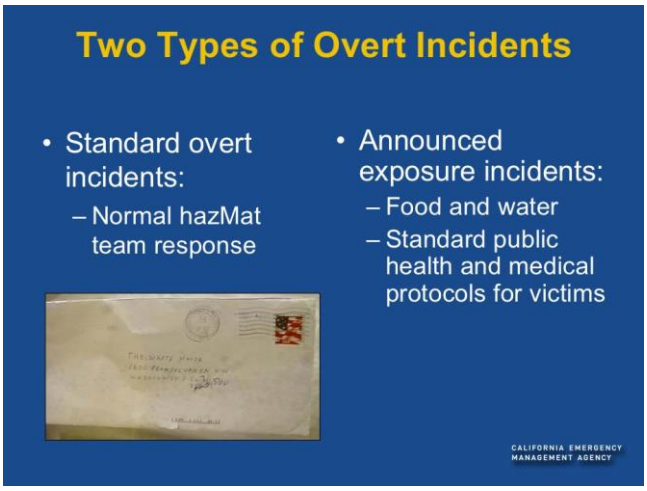
7. Discovery of suspicious letters and/or packages
8. Phoned, e-mailed, or other types of communication detailing a threat
9. Intelligence information that leads to discovery of planned terrorist acts
10. Discovery of clandestine laboratories (in this case biological ones)

With overt incidents, law enforcement usually is the first to respond, with fire, hazardous material (hazmat), and emergency medical services (EMS), as needed. If the situation may be hazardous, hazmat personnel will perform their normal safety screening.

If the likely cause of the incident is determined to be suspected or known terrorism emergency responders must contact their regional FBI Weapons of Mass Destruction (WMD) Coordinator.

The FBI will assess the incident for credibility. The FBI can make this determination either in person or via electronic or telephonic communications. Once the FBI becomes involved, it is the lead federal agency and will make the final determination of whether the incident is a credible threat.

If the FBI does decide the incident presents a credible biological threat, it may bring in a specialized Hazardous Materials Response Unit (HMRU) team to sample, or it may request that a Hazardous Materials (hazmat) Team Type I, which is trained in chemical, biological, radiological/nuclear, and explosive (CBRNE) agents, take samples. It is imperative that the regional FBI WMD Coordinator be contacted prior to sampling suspected or known creditable threats, and that sampling operations are conducted in close coordination with the FBI, local law enforcement and public health officials. The need to collect samples must be weighed against the importance of protecting personnel and public health, and preserving the potential crime scene and evidence.



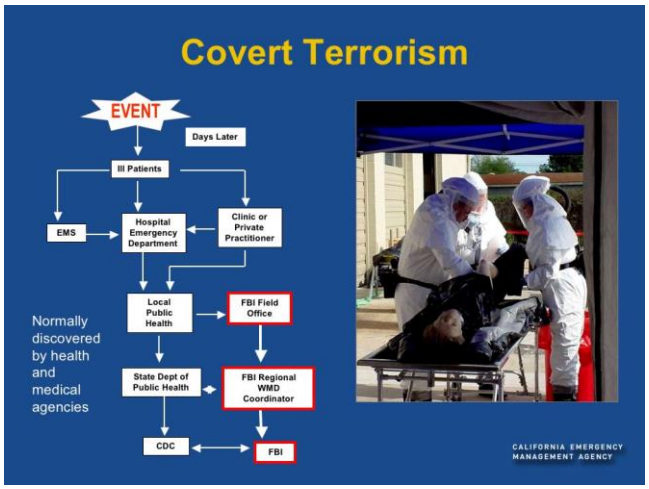
Slide 7.6

Overt incidents are further categorized as either standard overt incidents or announced exposure incidents. Standard overt incidents include reports or discoveries of suspicious powders, liquids, envelopes or packages, dispersal devices, or clandestine labs.

In addition to the routine sampling that a hazmat team may be asked to perform, the team may be asked to help in sampling by other agencies, such as health departments and water districts.

Announced exposure incidents involve food and water. In that case, the department of public health or environmental health will generally conduct sampling. In addition to routine regulatory compliance monitoring, many major water districts throughout the state possess water sampling kits to use for both chemical and biological sampling. Personnel within these facilities have been specifically trained on the protocols and use of these kits.

During outbreaks of food-borne illness, the departments of public health and/or environmental health will handle sampling. However, hazmat teams may be asked to help with sampling. Ill patients will be handled by hospitals, clinics, physicians' offices, and the public health department, according to well-established protocols. In any of these cases, the FBI will handle forensic issues; health departments will handle health issues.



Slide 7.7

Covert incidents are events that are unannounced and initially undetected. They will mimic a natural outbreak, and the preliminary response will follow long-standing and well-established public health protocols. As a result, medical staff will most likely identify covert incidents.

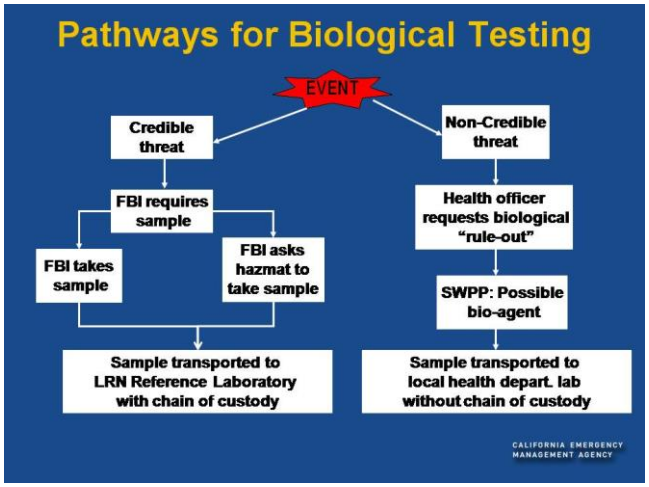
However, such attacks can be difficult to distinguish from naturally occurring disease outbreaks. For example, the 1984 salmonella attacks on restaurant salad bars in Oregon were not traced back to the responsible parties until several members of the Rajhneeshee Cult confessed. More than 700 people became ill as a result of salmonella poisoning. Similarly, the 2001 anthrax attacks were uncovered by astute laboratory personnel and an alert physician.

Covert terrorism may be discovered when epidemiologists and other medical staff identify odd or telltale signs of an unnatural outbreak by unexpected clusters of disease, unusual outbreaks of normal disease (such as flu outside its usual season), or unusual diseases and deaths.

The laboratory identification of select agents, especially outside their normal endemic (natural home) area, or detection of unusually high numbers may be *prima fascia* evidence of a bioterrorist attack.

If bioterrorism is suspected, the local public health officer or designee will contact the FBI for a threat assessment. In these cases, unless it's a situation noted in the previous slide, hazmat teams are not normally involved.

If animals or plants are involved, the incident will be handled by the agricultural department.



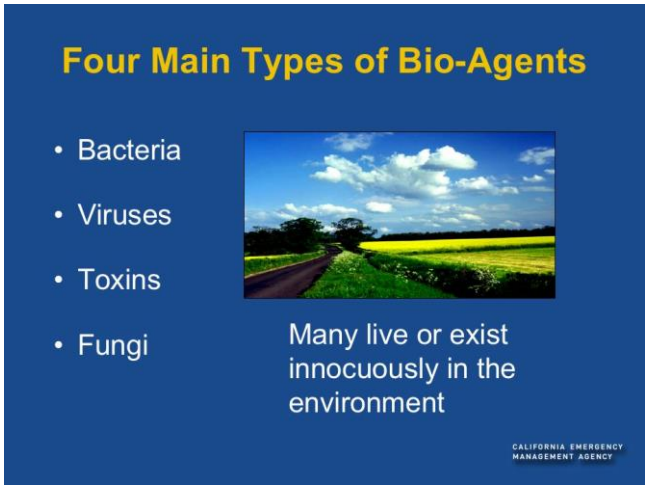
Slide 7.8

Once an overt incident has been reported, identifying the agent may take one of two pathways, depending on whether the threat is credible or not. When the FBI determines that an incident is a credible threat, the agency takes direct control of forensic activities.

When the FBI response team does not conduct sampling, it may rely on a Hazardous Materials Team Type I to obtain the samples. These samples will then be given to an FBI agent who will transport them to the closest Laboratory Response Network (LRN) reference laboratory. If an FBI agent is not present, other law enforcement officers may be requested to transport the sample(s) in order to maintain the chain of custody.

Even if the FBI deems an incident to be a non-credible threat, the incident may still present a health hazard. In this case, the incident may be referred to the local public health officer, either directly or through the environmental health department, according to local protocols.

The health officer may request that the hazmat team test for a powder's solubility in water, pH, and presence of protein (SWPP). These tests may be used to *rule out* biological agents.

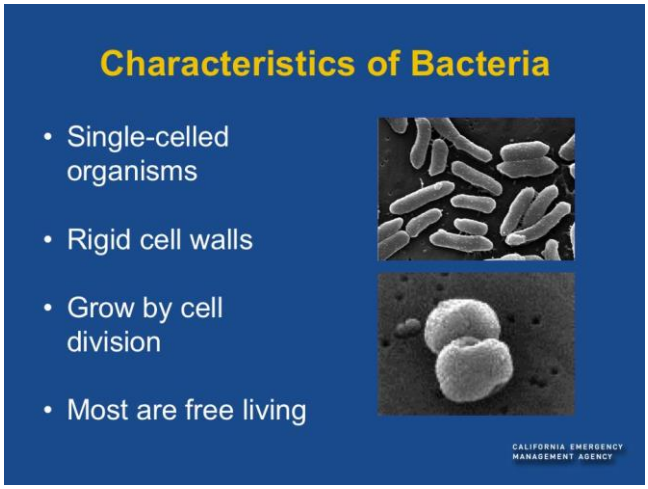


Slide 7.9

Four main types of biological agents exist: bacteria, viruses, toxins, and fungi. Hazmat teams may encounter any or all of them. This course discusses all of these biological agents but fungi. It's important to remember that most microorganisms occur naturally and do not normally cause disease.

Of the Category "A" select agents (those with the highest probability of being used in an attack) only one—smallpox—is restricted to humans. The other biological agents are also frequently found in animals and are called zoonotic diseases.

Responders need to know the similarities and differences of biological agents in order to understand how incidents that involve these agents are handled. This understanding may be compared to knowing the difference between an illegal burn pile and a raging wildland fire.



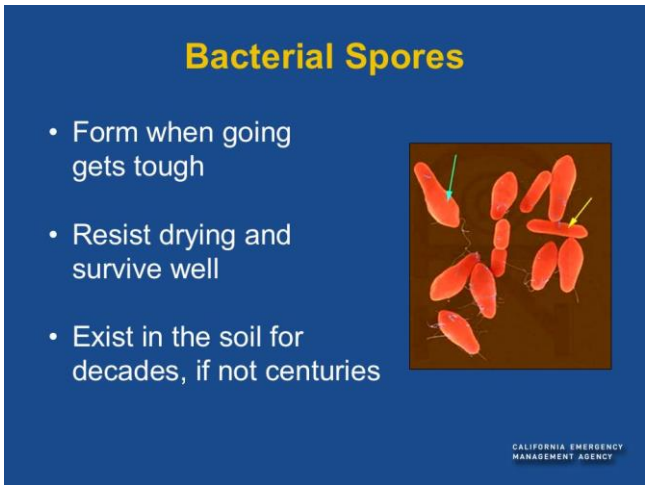
Slide 7.10

Most bacteria can grow on microbial media, although a few, most notably the *Rickettsia*, must invade living cells in order to reproduce.

Bacteria's inflexible cell walls are different from any other organism. In fact, bacteria themselves are divided into two general types based on their cell wall construction. They are distinguished by the Gram stain, leading to a split between Gram-negative and Gram-positive organisms. Anthrax, for example, is sometimes referred to as a Gram-positive rod.

Bacteria come in varying shapes: rods (bacilli) and spheres (cocci) are the most prevalent. Often bacterial names are based on their shape and conglomeration. Spherical bacteria that cluster like grapes are referred to as "Staphylococci", while the same shape bacteria that string together like pearls are "Streptococci". Understand these morphologies can facilitate assessment if field microscopy is conducted.

Bacteria reproduce by doubling in size and then splitting into two genetically identical cells, called daughter cells. In contrast, yeast multiply by budding, producing smaller daughter cells from a large mother cell.



Slide 7.11

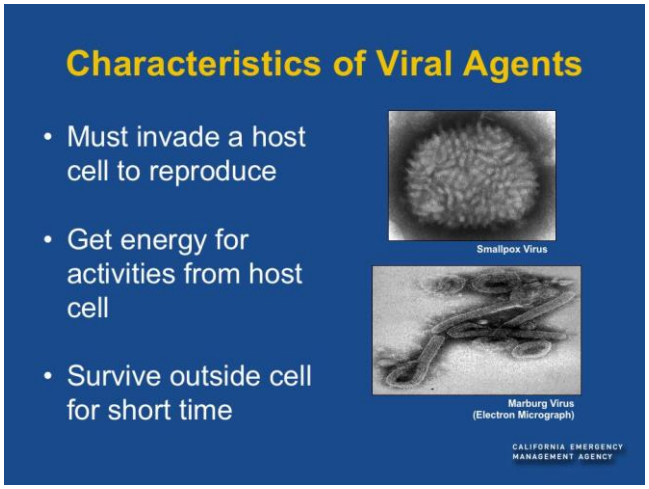
Bacterial spores are the microbial equivalent of seeds. They form when the going gets tough, such as when the supply of food is reduced or when exposed to air. Bacterial spores usually form within six to eight hours of harsh conditions.

They resist drying and survive well. In fact, bacterial spores, such as anthrax spores, can exist in the soil for decades, if not centuries. Most organisms that form spores are not pathogenic (disease causing). Spores are *not* found in living hosts, only in the environment.

Spore-formers, such as *Bacillus anthracis* (anthrax), make a good bio-weapon. Once spore-formers are loaded in a bomb, for example, they remain infectious for long periods.

In contrast, special efforts are needed to keep the bacterial cells of organisms that do not form spores, such as plague, alive. However, such bacteria may be "freeze-dried" (much like instant milk) and then reconstituted.

The yellow arrow in the slide indicates bacterial rods. The blue arrow indicates spore-forming bacteria.



Slide 7.12

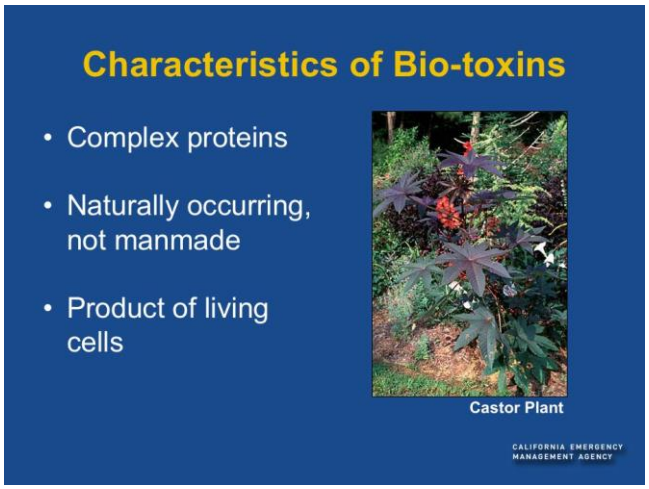
Viruses are fundamentally different from bacteria, *Rickettsia*, and fungi. They are an order of magnitude smaller and are made up of only nucleic acids (RNA or DNA) and a protein coat. Some also have an outer protective envelope.

Viruses are obligate intracellular parasites. That means they cannot reproduce without invading a living cell (host). Once inside the targeted cell, they hijack the cell's machinery to make more virions (virus particles). Nor do they leave quietly. Many viruses burst the cell when they exit. Others wiggle through the host cell wall, leaving holes that ultimately weaken the wall so that the host cell dies.

With the exception of smallpox, viruses can survive outside cells for only a limited time. Smallpox can survive for years, if protected in cold.

Because they have no cell walls and no active cell machinery for antibiotic targets, antibiotic treatment is useless against viruses.

The **Coronavirus Disease 2019** (COVID-19) worldwide pandemic of 2020 was the result of the novel coronavirus **SARS-CoV-2**, While there is no public evidence that the pandemic was caused by an intentional release of SARS-CoV-2, it is an example of the devastating effect that an infectious virus could have on a population and the associated socio-economic impact.



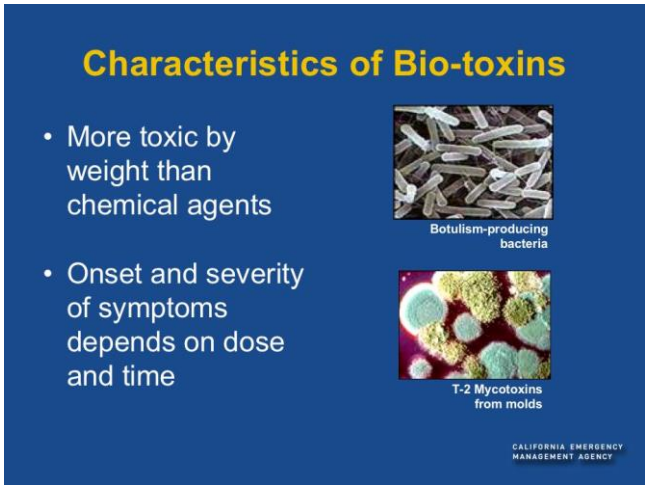
Slide 7.13

Bio-toxins are even smaller than viruses.

Bio-toxins are complex proteins produced by living organisms and easily separated from them. Although they are made by living bacteria, fungi, plants, and other living beings, bio-toxins themselves are not alive.

In fact, they act more like chemicals than biological agents. However, in contrast to toxic chemicals, bio-toxins tend to be slow-acting agents, usually taking hours to days for symptoms to appear.

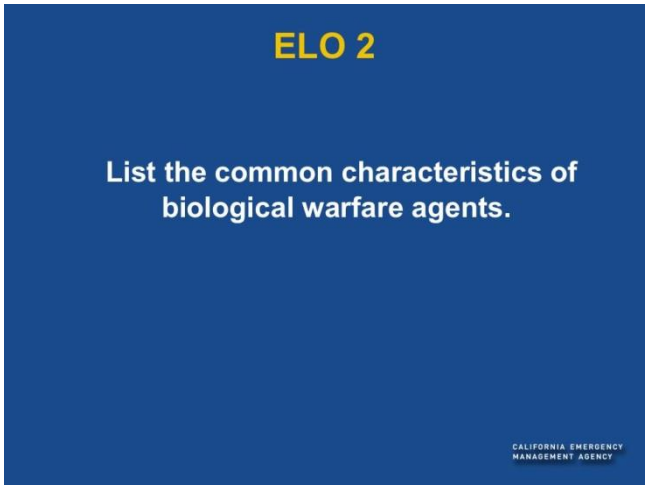
Of the biological toxins, the most well known, ricin, is derived from castor beans. The castor plant grows throughout California, especially in the southern part of the state. The manufacturing process of extracting castor oil produces a mash by-product that contains the ricin.



Slide 7.14

Biological toxins are much stronger per unit of weight than manmade chemical agents. For example, botulism toxin made from the bacterium *Clostridium botulinum* is one of the most powerful toxins known to humankind. This Gram-positive bacterium, a spore-former like anthrax, is also found naturally in the soil.

Unlike most chemical agents at hazmat incidents, biological toxins are not volatile. Only one, the T-2 mycotoxins formed by some molds, causes dermal activity.



Slide 7.15

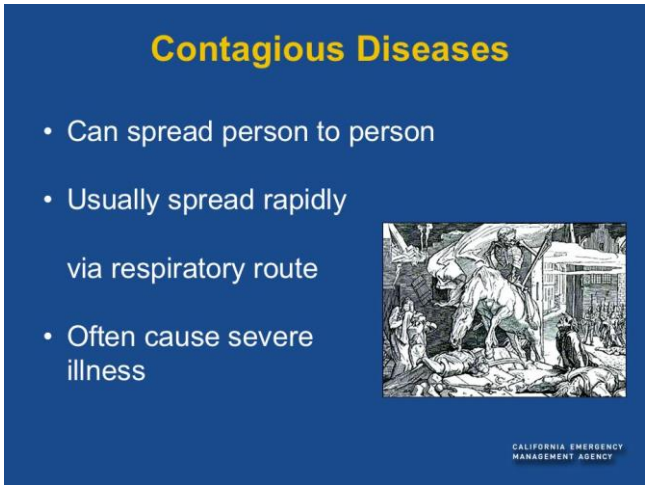


Slide 7.16

All pathogens (disease-causing agents) are infectious. That is, they can invade a host, gain a foothold, and then grow and produce disease. Organisms that are only infectious are not transmitted directly from host to host: They do not jump from animal to animal or human to human. The only way to contract the diseases they produce, such as anthrax, is to pick them up in the environment (for example, through contaminated water, food, soil, air, equipment, etc.).

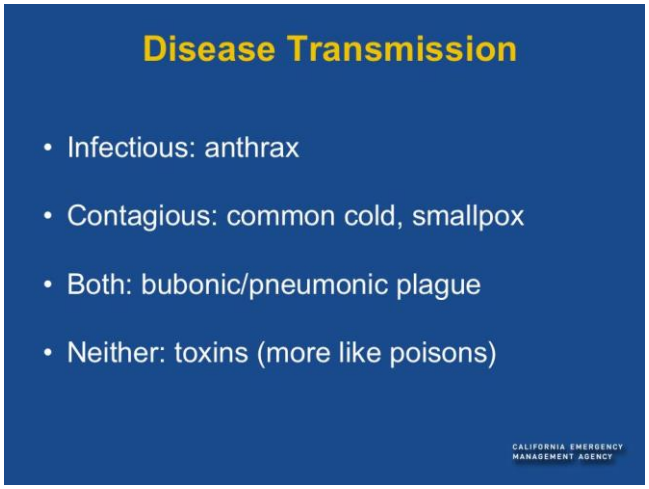
Communicable or contagious diseases are transmitted directly from host to host. The commonly accepted terms *infectious* and *contagious* generally are applied to specific diseases.

These categorizations hold true for the general modes of transmission for a given agent. For example, although it might be possible for a bleeding patient with anthrax to infect an improperly protected caregiver (it's never been documented), anthrax is considered an infectious disease, not a communicable one.



Slide 7.17

Contagious diseases are communicable diseases that spread rapidly, often through the respiratory route, and cause severe illness.



Slide 7.18

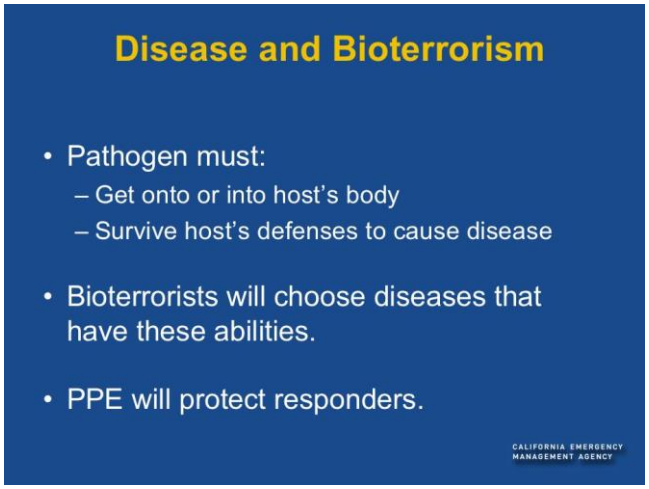
Anthrax is considered non-contagious, because it spreads from the spores through the environment to the victim.

Plague is interesting because it can manifest as either an infectious (bubonic) or contagious (pneumonic) disease. Bubonic plague is caused when an infected flea bites a host and injects the *Yersinia* bacterium. In contrast, pneumonic plague is contagious because it spreads from person to person through airborne droplets.

Smallpox can easily spread from person to person through:

11. Airborne aerosols (coughing)
12. Contaminated objects (fomites), such as handkerchiefs, sheets, and cooking and serving utensils
13. Sloughed scabs, which can remain infective for decades, if maintained in a dark, cool environment

Note: The human body can respond to insult in only so many ways. If an agent enters the body through the airway, it causes difficulty breathing, and ultimately it can cause pneumonia. The body also can respond with "flu-like" symptoms as it reacts to infection.



Slide 7.19

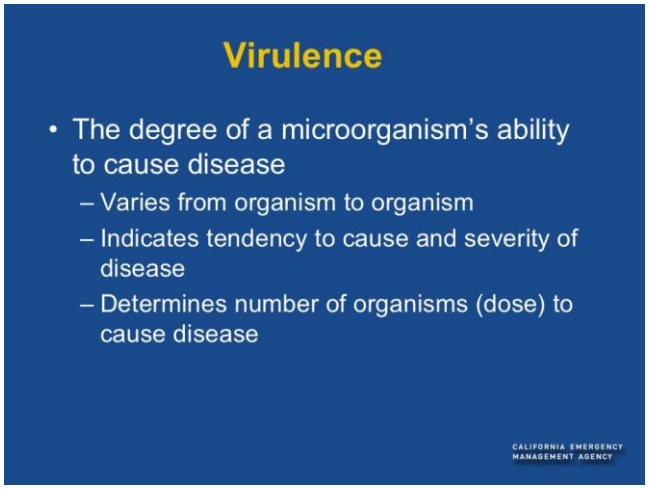
A pathogen can enter the body through five portals: dermal exposure (skin), exposed mucous membrane (nose, mouth, eyes), inhalation (lungs), ingestion (food or water), or injection (including bites and wounds).

When pathogens enter by different routes, they can cause different signs and symptoms. For example, if anthrax enters the body cutaneously, it causes skin lesions. If it enters the body through inhalation, it causes difficulty breathing.

Toxins can enter through the same five routes. Many bio-agents can enter the human body by any of several of routes, depending upon how the host is exposed.

To cause disease, a pathogen must meet at least two requirements. It must get onto or into a host's body through one of the five portals of entry. Then it must survive the host's defenses, such as the skin and immune system, to cause disease.

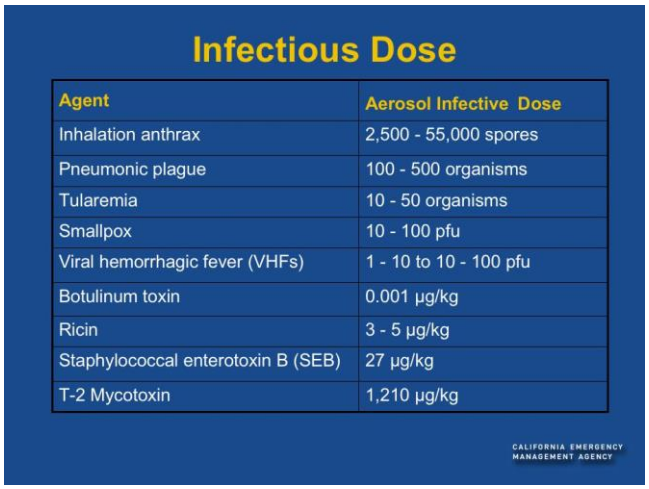
Bioterrorists will choose a disease that already has these abilities. It's important to keep in mind that standard personal protective equipment (PPE) closes the five routes of entry and, thus, will protect responders from infection.



Slide 7.20

Virulence is a measure of a specific organism's innate ability to invade a host and cause illness. For example, the *Ebola* virus's ability to kill 90 percent of the people it infects makes it extremely virulent.

In contrast, many people can be exposed to tuberculosis (TB), but won't become ill, because their natural defenses can control the organism.

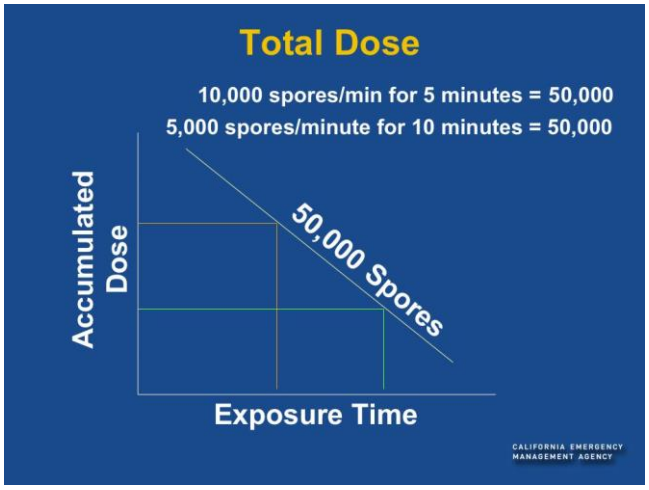


Slide 7.21

Infectious dose denotes the number of organisms required to cause disease. These numbers are related to virulence (strength) of the organism *and* to the route of infection. For example, the numbers noted on the slide provide the numbers of organisms required to cause disease through inhalation exposure.

Inhalation infectious doses for bacteria vary widely. For example, anthrax (2,500–55,000 spores) *vs*. tularemia (10–50 organisms). In general, viruses do not vary widely in infectious dose. Toxins, however, span four orders of magnitude. (Note: pfu stands for plaque forming units, a measure of number of virus particles.)

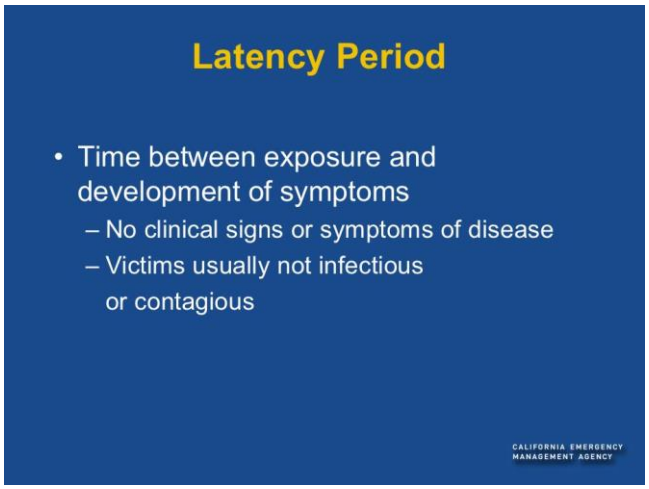
Infectious dose can be used to give an idea of the risk of contracting a disease. In the worst case, a few organisms can be infectious. Tularemia, for example, is a disease often found in hunters who skin and eat rabbits or other infected animals. Now, however, it is an occupational disease that most often infects laboratory workers who handle the highly concentrated cultures. Ten organisms of tularemia are enough to infect a microbiologist. Therefore, if tularemia is suspected, the laboratory should receive this information.



Slide 7.22

As with chemical exposures, total dose depends upon exposure and concentration.

What does this mean for responders? Keep exposure time as short as possible!

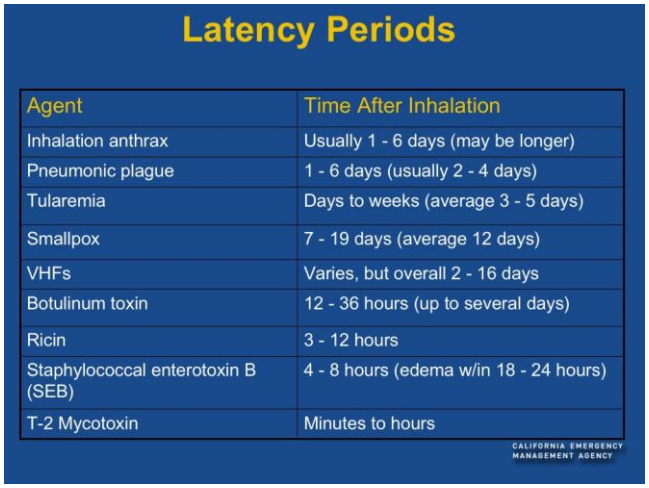


Slide 7.23

The latency period, or incubation, is the time between exposure to the agent and the development of symptoms.

To cause disease, pathogens must grow and (often) migrate through the body; this takes time.

During incubation the victim shows no clinical signs or symptoms of disease and, usually, is not infectious or contagious.



Slide 7.24

As with infectious doses, latency periods are listed through route of exposure.

These periods also vary from organism to organism and are dose dependent. For example, anthrax normally manifests within a week. In an accidental release in Russia, however, latency periods extended to as much as 42 days. The extended latency period was the result of smaller doses far downwind from the accident.



Slide 7.25

In biological cases, the terms *contamination* and *exposure* have slightly different meanings than they do in radiation exposures. In radiation, exposure means that you're "in the line of fire," and contamination means you carry radioactive substance away with you.

In biology, contamination denotes the organism's presence. For example, if smallpox virus is present on a patient's bedding, that bedding is said to be contaminated with smallpox virus. If an ill patient coughs droplets containing plague and the organisms stick to your clothes and skin, you and your clothing are contaminated with plague bacteria.

Contamination can lead to exposure. In a radiological incident, contamination is exposure. In a biological incident, you have been exposed only if the contamination results in an infection. This exposure may or may not result in obvious disease, but the organism has invaded your body and your body has responded to it by creating antibodies.



Slide 7.26

When it comes to biological agents, keep in mind that:

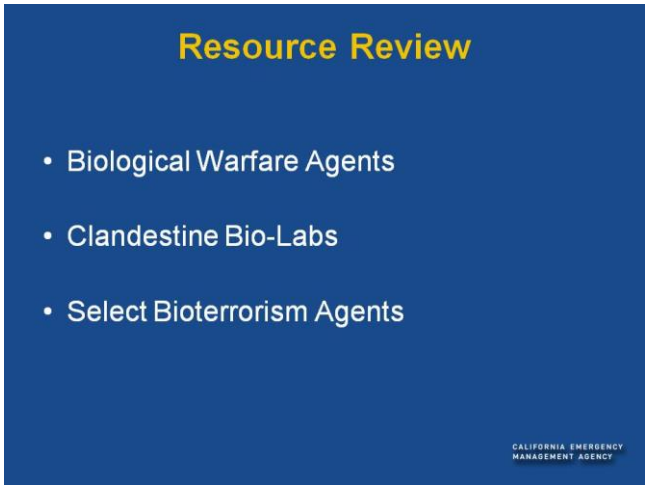
14. They are not volatile.
15. They are not normally a contact hazard.
16. Most occur naturally in the environment, but may be purified and concentrated for weapons.



Slide 7.27

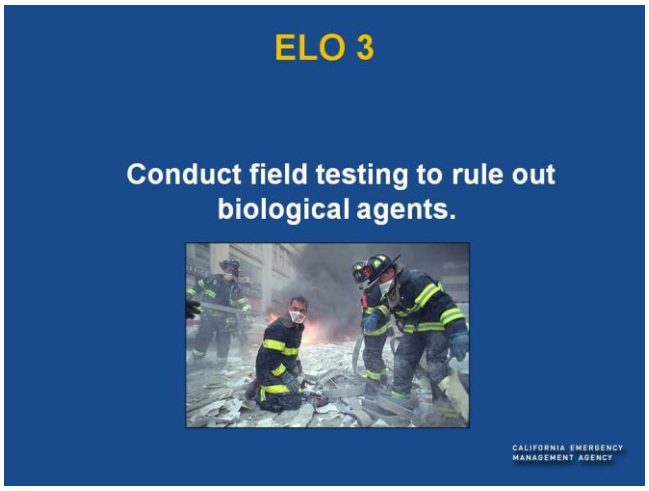
In addition, biological agents:

17. Are infectious (with the exception of toxins) and many can be contagious
18. Are fatal in very small volumes
19. Exhibit a lag-time between exposure and symptoms, the latency period, which may last anywhere from hours to days
20. Are invisible to our senses

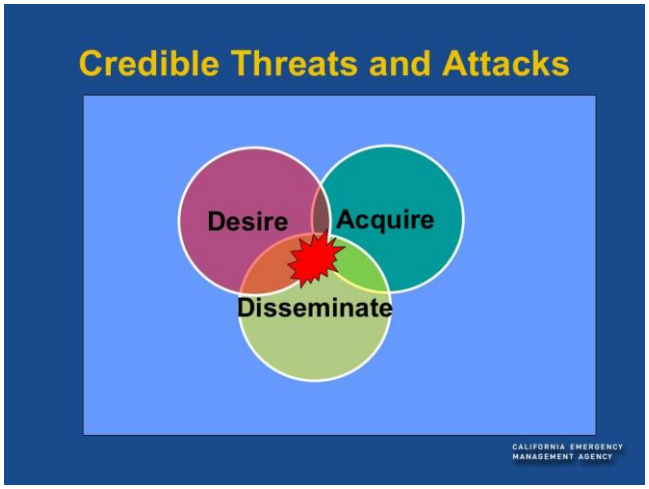


Slide 7.28

Review the listed fact sheet in the participant guide.



Slide 7.29



Slide 7.30

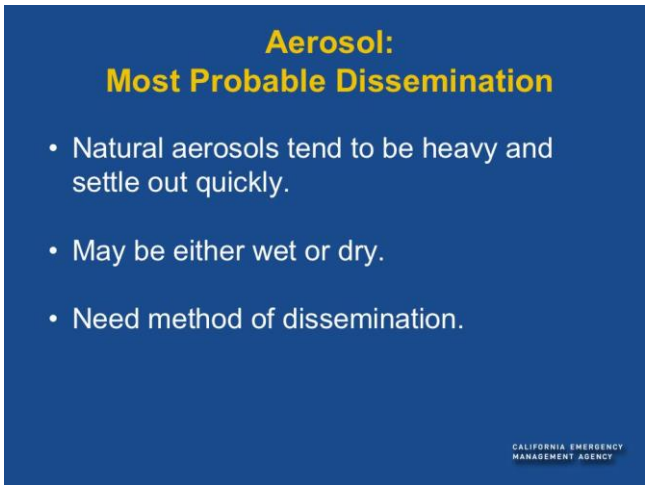
A credible threat depends upon the existence of a vulnerable target and the perpetrator's willingness to carry out the attack (desire), obtain and create weapons (acquire), and use effective delivery systems (disseminate).

Since the 11 September 2001 attacks, many measures have been put into place to thwart would-be terrorists at every turn. For example, those with the desire to be potential attackers can now be identified. Law enforcement intelligence can intercept planning documents and communications and respond to citizen reports of suspicious activity.

Acquiring materials to create weapons is more difficult now than before. With the passage of the “select agent rule” in 2005, laboratories and researchers are no longer given free rein to maintain and store select agents. Non-select agent laboratories must get rid of any confirmed select agents within seven days of identification. This requirement applies to both cultures and the original materials from which the isolations were made.

Laboratories wishing to handle select agents must now comply with strict requirements, including federal inspections; extensive security precautions; records of cultures in the laboratory, their location, and who has handled them; and FBI clearance of all staff who will be handling agents. American Type Culture Collection must now obtain proof that the recipient of select agents is approved to handle them.

Dissemination is usually the biggest problem for would-be bioterrorists. The Aum Shinrikyo cult tried at least twice to disseminate anthrax in Japan and failed both times. The distribution of anthrax through the U.S. Postal Service, however, was unexpectedly successful.



Slide 7.31

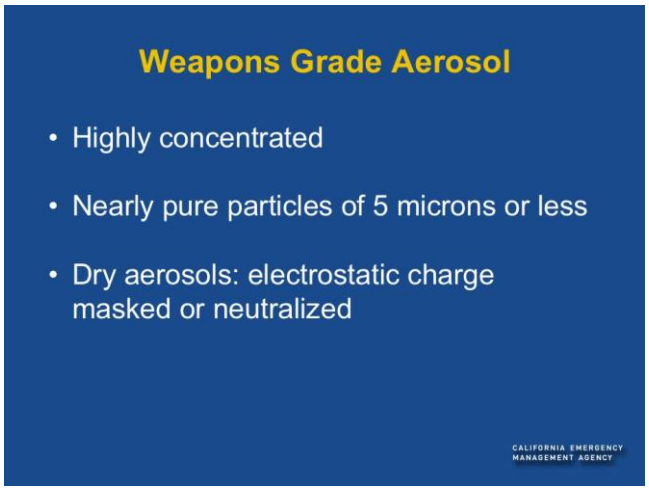
The most likely way a biological agent will be dispersed is as an aerosol composed of airborne particles. Aerosols enter the host through inhalation or the mucous membranes. Since aerosols can be widely disseminated, they have the potential to infect a large number of people.

However, conditions must be just right for them to work effectively. Natural aerosols, once settled, are difficult to re-aerosolize. Even so, studies have shown that weaponized agents do re-aerosolize easily with simple office activities, such as turning on and using fax machines and printers.

Dry aerosols are more difficult and dangerous to handle, but when distributed, they are more concentrated and more effective than wet aerosols.

Wet aerosols are easier to handle ("grow and blow"), but are diluted and not as effective as dry aerosols.

Although aerosols can be widely disseminated, they require a method of doing so, such as a hand-spray device or crop-dusting airplane. Investigators may locate or identify these obvious signs of dissemination.



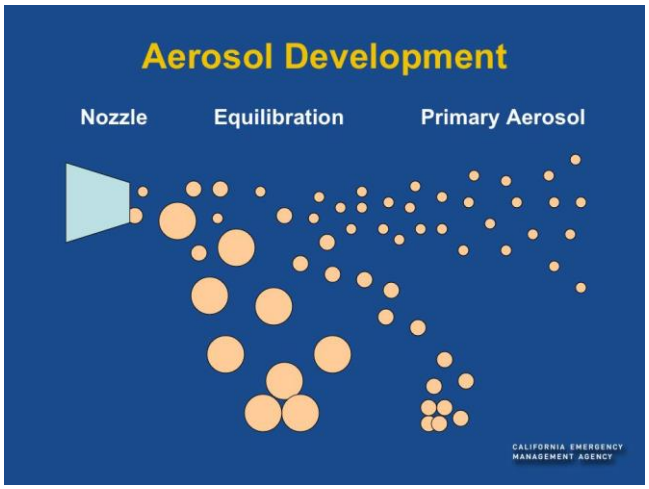
Slide 7.32

Some investigators consider any manipulation, such as extensive washing and purification, of natural cultures as weaponizing them, especially if the intent is to use them for an attack. Most effective bio-weapons are

21. Highly concentrated (much more so than one would find in nature). This high concentration makes any exposures much more dangerous than handling a non-weaponized sample.

22. Sized to about five microns. Five microns is small enough to avoid being swept out of the airway by the cilia, yet large enough to make the turn from the back of the mouth into the trachea virulent.

23. To be effective, dry aerosols must have their electrostatic charges either masked or neutralized.



Slide 7.33

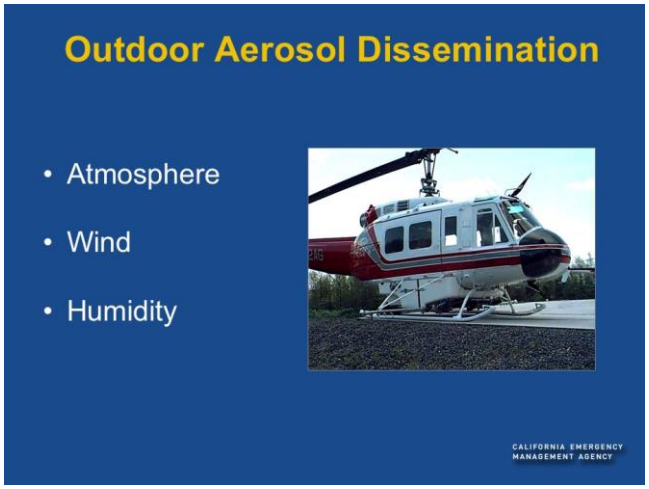
Aerosols, whether wet or dry, develop through equilibration to a primary aerosol.

Once delivered under pressure through a nozzle, the largest particles (ten microns or larger) settle out during the equilibration period.

Smaller particles (around five microns) continue to float on the air for long distances. This primary aerosol acts as a gas; individual particles pass around objects rather than sticking to them. Wipes, swabs, etc., can easily find the larger particles, especially close to the nozzle outlet.

Smaller particles will eventually settle in totally still air, but not in high concentrations. To capture the smaller particles of the primary aerosol, samplers must use impinger air flow devices.

Secondary aerosols: If organisms from the original aerosols, which have settled out of the air, get stirred up, the clumps will be larger and pose less of a danger than those from the primary aerosol.



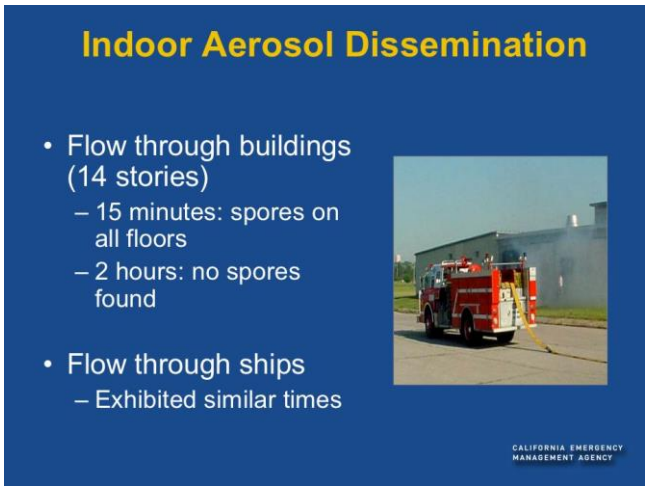
Slide 7.34

When dealing with a possible outdoor dissemination, consider how the weather will affect the aerosol's spread.

Sunlight causes an aerosol to rise directly up, removing it from the infectious zone. In addition, ultraviolet light can kill organisms such as plague and smallpox.

Light winds (less than 5 mph) can cause the aerosol to drift close to the ground for miles. At winds that are greater than 30 mph, the aerosol will disintegrate and lose integrity.

The best conditions for detecting hazardous aerosols are when the wind is light and during or near sunrise and sunset. If the aerosol is not released during this time, samplers may not find residual amounts of the agent. The only clue to such a bio-attack may be the presence of sick people.



Slide 7.35

Keep in mind that primary aerosol behaves as a gas.

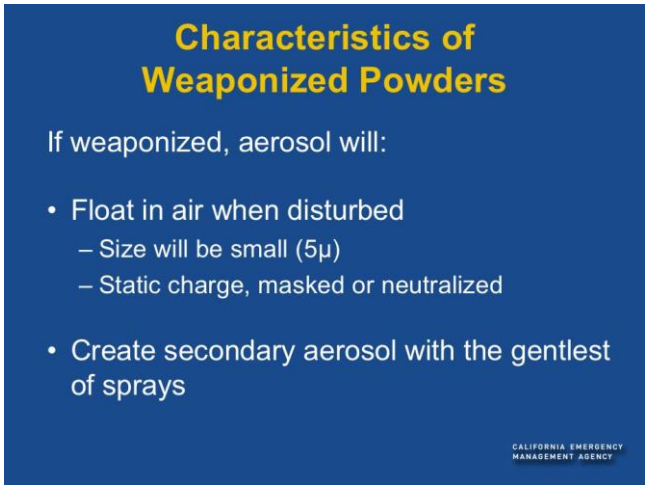
Investigators at Fort Detrick, an Army biomedical research and development installation, used impinger samplers to study the flow of 5 micron particles through a 14-story building.

The investigators found that, with the heating, ventilation, and air conditioning (HVAC) system running, the simulated agent spread throughout the building within 15 minutes. They also found that all traces of the segregate agent had disappeared within two hours when the HVAC system was allowed to continue running. The results from a study on aerosol flow through ships yielded similar findings.

In other words, responders do not need to shut down HVAC systems automatically. The choice to shut down an HVAC system should be made consciously and according to the time of the response and the size of the aerosol.

If the particles are light and float on air currents, exhibiting a gas-like behavior, responders may want to leave air-handling devices running in order to clear the building. If air-handling devices *are* left on, responders need to note where the particles will go. Where are the exhaust vents? Are the particles light enough to disperse?

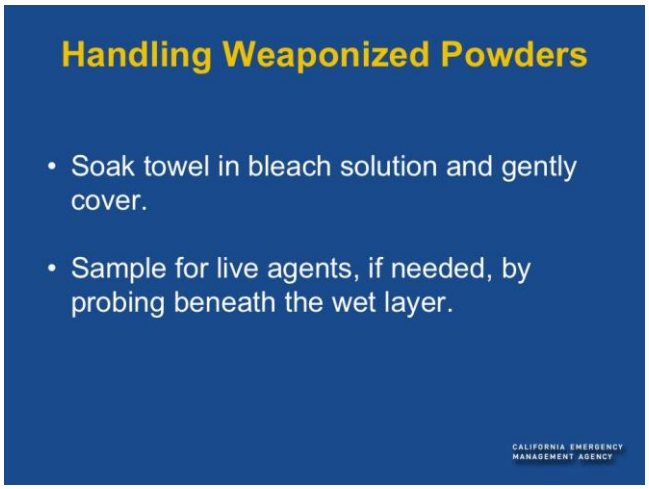
If the agent is believed to be dangerous and tends to sink to the ground, responders may want to turn off the HVAC system and fans.



Slide 7.36

Keep in mind that normal powders will stay in place, but weaponized ones will not. Weaponized aerosols will puff up with minimal air currents.

As a result, responders must take considerable care to control secondary aerosols. Even the finest spray should *not* be used to dampen down weaponized aerosols.



Slide 7.37

Instead of spraying, cover the pile with a bleach-soaked towel and sample for live agents, if needed, by probing beneath the wet layer.

Use a towel that is large enough to cover the pile of weaponized powder. A five-gallon bucket works well for soaking the towel in fresh bleach.

Roll up the bleach-soaked towel, place it on the edge of the pile that is closest to you, and, moving the towel away from your body, roll the towel out gently over the powder.

Responders should be aware that these methods may destroy evidentiary value of these products. In addition, there is no guarantee that these measures will destroy all of the biological agents, as powders may have been spread elsewhere. Ideally, response entities should work with the FBI WMD Coordinator, who will be in charge of a biological terrorism incident, and determine if these measures should be conducted, or if material should be left in place pending federal Hazardous Materials Evidence Response Teams.

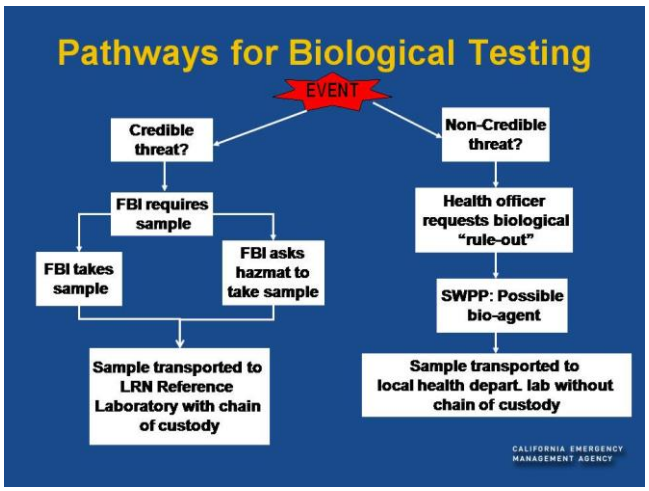


Slide 7.38

Upon arriving at a possible bio-terrorism event, hazmat technicians and hazmat specialists should perform normal field safety screening. Keep in mind that A–C level PPE provides protection against biological agents.

If material is forwarded to a laboratory, a written copy of the field safety screening must be included. The laboratory needs these results because microbiologists work in bio-safety cabinets, not fume hoods. Explosions or caustic materials can destroy the filters in these cabinets.

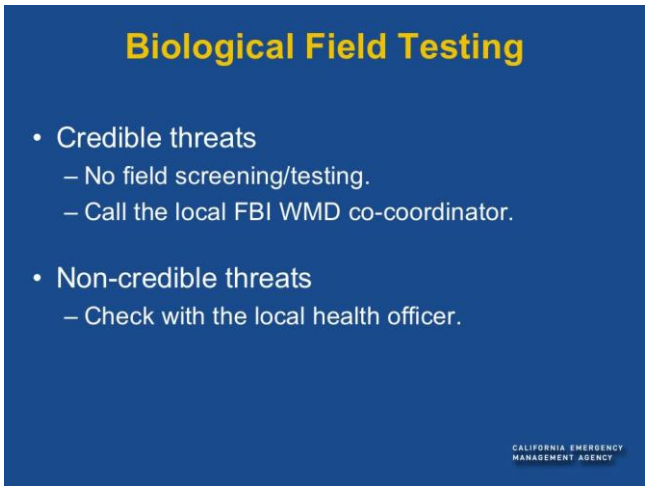
The laboratory does not care what format is used for these results.



Slide 7.39

The amount of biological field testing that is conducted for a possible bioterrorist incident will depend upon whether the threat is credible or non-credible.

To review: A credible threat is one in which there is a vulnerable target, the terrorist has the capacity to obtain and create weapons plus delivery systems, and the terrorist has the willingness to carry out the attack.

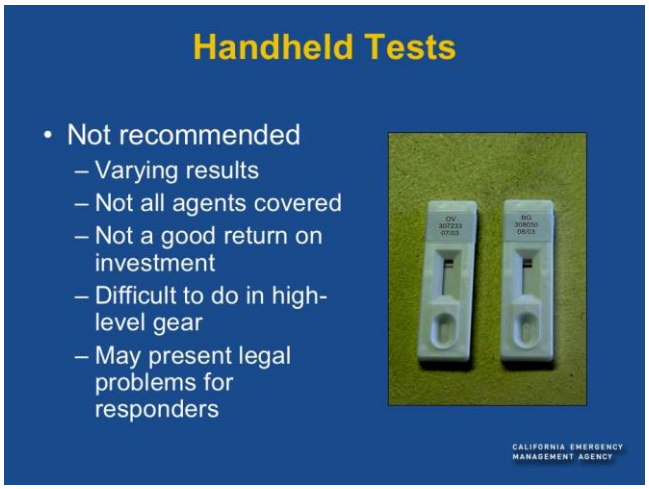


Slide 7.40

For credible threats, both the FBI and the Centers for Disease Control and Prevention (CDC) strongly recommend that no biological field screening take place. The FBI cites forensic reasons; CDC cites testing issues. If you have any doubts, contact your local FBI WMD coordinator.

If the FBI feels there is not enough evidence to construct a case, the incident may nevertheless pose health issues. In this case, contact the local (county) health officer and, if local protocols dictate, the local environmental health department.

The local health officer may request that the hazmat team perform various tests (such as those for solubility, pH, and protein) to rule out biological agents. If biological agents cannot be ruled out, hazmat teams may also be asked to conduct aseptic sampling of the material and to transport it to the local health department laboratory for biological testing.



Slide 7.41

Most handheld tests (HHTs) are based on immunoassay methodology. Although the tests are appealing because they are easy to conduct, the results may be inconsistent, yielding both false negatives and false positives. (These difficulties are not restricted to field testing; they also occur in the laboratory.) Few of these tests have been validated by an independent testing agency, nor have they been validated during field use.

In addition, each HHT tests only a single antigen, and most companies do not have HHTs for all possible agents. As a result, a number of possible dangers may be missed (such as the enteric agents, salmonella and shigella, that have been the most frequently used organisms in actual bioterrorism attacks).

A major drawback of testing for only one agent is that the HHTs quickly become outdated and are expensive. They do not provide a good return on investment.

Another problem is called the “pro-zone” or the “hook effect.” Immunoassay tests depend upon a specific ratio of antibody (on the ticket) and antigen (the bio-agent) for the reactions to be correct. If the concentration of antigen is too high, the test can yield a false negative. This problem is corrected by appropriately diluting the antigen. For example, negative ricin tests must be diluted and run again.

Hazmat teams should have protocols for using test results. If the incident could possibly be a threat, the sample still must be sent to the laboratory. Even if a powder or liquid does not *test* positive for a specific antigen, it may still be a health threat.

The probability of false results depends on the actual number of true positive and true negative results. In the case of bioterrorism agents, a hazmat team would expect to encounter a low number of true positive results. Actual calculations have shown that 82 percent of positive results would be false, regardless of the testing method. This figure is based on odds alone.

Results of hazmat team testing are legally discoverable. That means test results must be provided to defense attorneys. If the hazmat team’s results differ from the laboratory’s, the discrepancy presents difficulties for the prosecution. The FBI has several examples of the problems that differing test results can pose in legal cases.

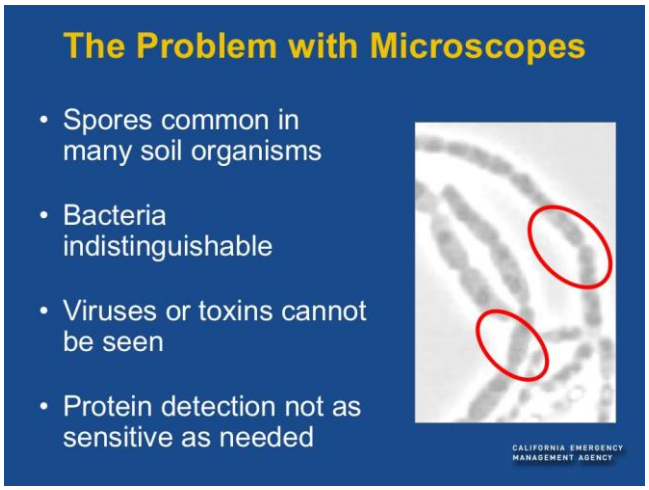
Extensive field testing uses up both sample and time. If the sample is sent directly to the appropriate lab instead of field testing, test results may be available within four to six hours.



Slide 7.42

After reviewing the position statement by the Association of Public Health Laboratories (APHL), engage in a discussion of handheld tests.

What kind of screening kits, if any, does your agency use to rule out biological agents?



Slide 7.43

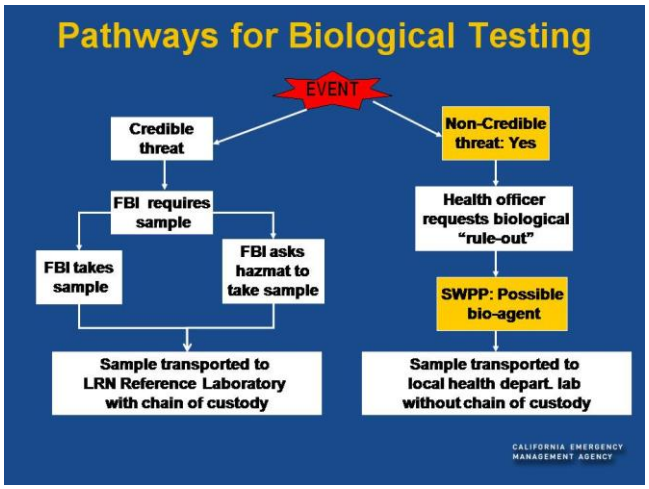
Microscopes are an option to be used in the field for incidents that may involve biological agents. However, they are not without their limitations, but present an additional tool for the responder's to consider.

Perhaps most importantly, microscopes require skill and time to be used properly. Personnel must receive considerable training—and practice—in how to focus the instrument and interpret the results. Often, emergency responders do not use microscopes often enough to remain proficient.

Emergency Responders must understand that the microscopes are great for the identification of the presence of bacteriological specimens. These can be easily seen under moderate magnification and measured to determine if there are in the 5-micron size frame of concern. Although microscopes cannot be used to identify any bacteria (even in a laboratory setting), they can determine three factors that aid in threat assessment of a biological agent: size, shape (morphology), and amplitude (quantity of bacteria).

Historically the images viewed in microscopy often are unclear, primarily due to the limitations of looking down the eyepieces of a microscope while wearing PPE. However, with evolving technology, capabilities have advanced that allows responders to use digital/wifi enabled cameras to view microscope images on tablets and laptop devices. This facilitates viewing images in PPE, and, may even allow the transfer of the captured images/video to a public health professional outside of the exclusion zone.

Lastly, one historical concern has been decontamination of microscopes. This process would be nearly impossible to thoroughly conduct as the intricate parts once exposed to fine powders may require disassembly. However, a thorough field screening in the exclusion that rules out the presence of biological pathogens then does not require that the microscope undergo the same level of decon (since the hazard is not present). On the contrary, if a biological threat is detected, emergency responders would likely just leave the microscope down range in the exclusion zone, as it would then be part of the processed scene for the FBI Hazardous Materials Evidence Response Team.

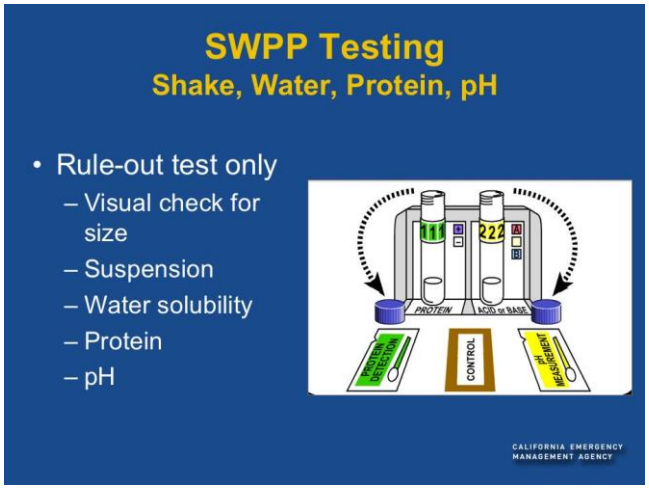


Slide 7.44

The FBI and the CDC recommend that no field testing be conducted for agents that fall into the first pathway (credible threat).

The second pathway, however, is a grayer area. Once the FBI has deemed an incident a non-credible threat, it must be evaluated by the health department.

The State of California Department of Public Health (CDPH) laboratories recommend little or no field testing to identify specific biological agents. If the local health officer and/or the environmental health department request more information, CDPH suggests the SWPP (shake, water solubility, protein, and pH) series of tests to rule out possible biological agents.



Slide 7.45

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Evidence Response Team. If particles rise with little motion, the agent may be a weaponized powder. If the agent doesn't move, shake the tube and see if it clings to the side. If so, the electrostatic charge has not been neutralized.

Water solubility: Once it is determined that the powder is not reactive in water, place a small amount (about the size of a pea) in the bottom of a screw cap tube and slowly add water. Cap the tube and shake it.

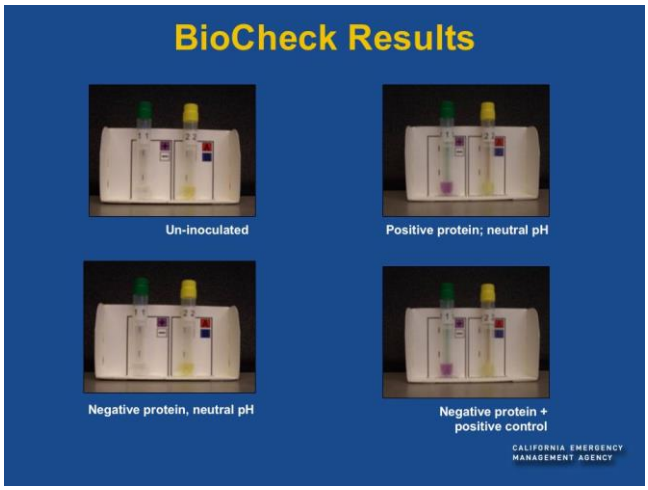
If the substance falls unchanged to the bottom, leaving the supernatant clear, it is not a biohazard. If the substance dissolves in the supernatant, it is not a biohazard. If the substance goes into suspension, making the supernatant cloudy or turbid, then it's a possible biohazard. The color can be white or tan.

Protein: CDPH uses the 20/20 BioResponse BioCheck™ kits because these kits have been validated by a third party and used extensively in classes with no errors. In addition, the kit comes with a control to check that the test is working correctly.

All bioterrorism threats contain protein. If the protein is negative and the control is positive, then the sample is not likely to be a bio-threat.

pH: This tube offers a check on the pH paper. Biological agents that threaten human life survive only in a neutral pH range.

Note: SWPP testing, as well as other field detection methods are for presumptive testing only and should not be used to "rule out" bioterrorism agents. Polymerase chain reaction (PRC) in a laboratory setting is still considered the "gold standard" to rule out bioterrorism threats.



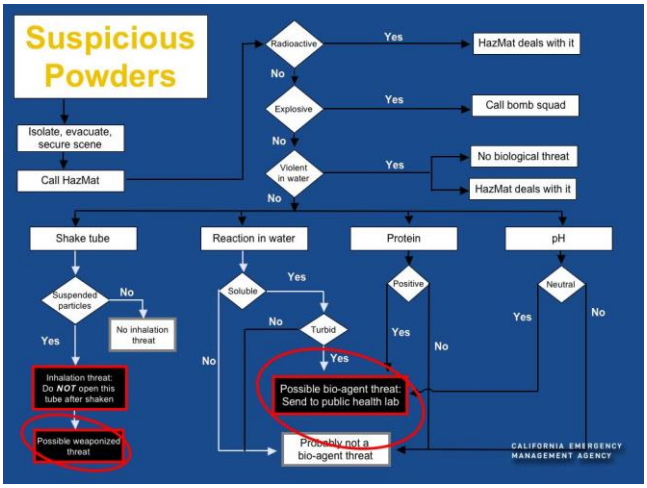
Slide 7.46

The photo in the upper left-hand corner of this slide shows an untouched kit, just taken from the box.

The photo in the upper right-hand corner shows test results for a sample. The protein reagent has turned purple, indicating positive presence for protein. In addition, the pH reagent indicates neutral pH. Together, these indicators mean the sample could be some sort of biological agent, and further testing is required.

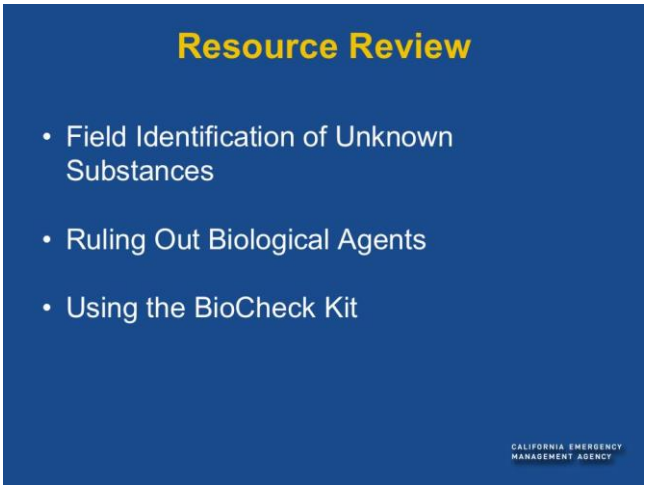
The photo in the lower left-hand corner shows negative results for protein and neutral pH, indicating that the presence of a biological agent can be ruled out.

Kits generally are good until their expiration date, even if stored on rigs. If stored in a cool, dry place, kits can remain viable for up to an additional year. (Always validate that the reagent in the protein tube is still viable, as shown in the lower right-hand photo. Checking a kit with a control swab will indicate whether the kit can still be used for testing.)



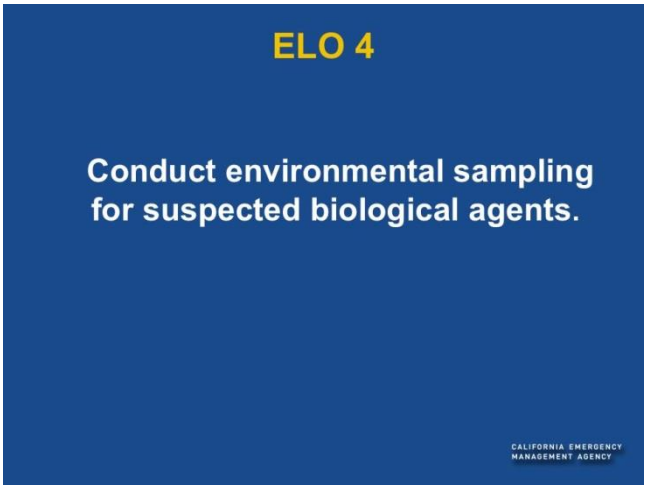
Slide 7.47

This flow chart explains how suspicious powders are handled for a possible bioterrorist event.

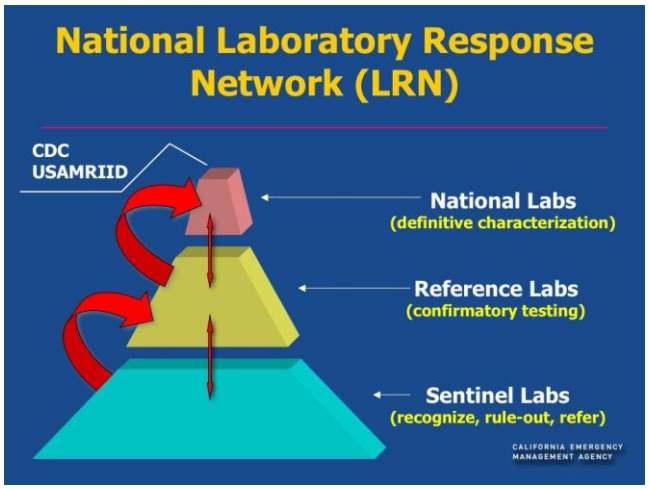


Slide 7.48

Turn to the listed resources in the participant guide.



Slide 7.49



Slide 7.50

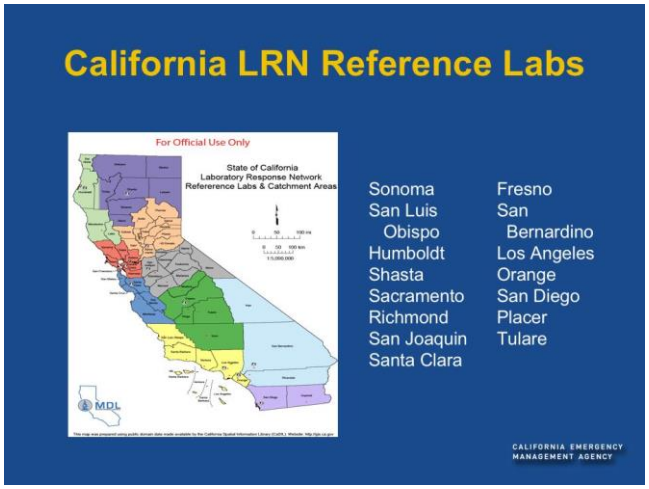
The National Laboratory Response Network (LRN) is a system of local, state, and national laboratories that specifically test for bioterrorism agents.

The sentinel laboratories are located at hospitals, clinics, and some public health agencies that are equipped to rule out biological select agents.

If they cannot rule out select agents, sentinel labs forward the cultures to a reference laboratory that can confirm the presence of select agents.

National laboratories, located at the CDC and the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID), can characterize such isolates.

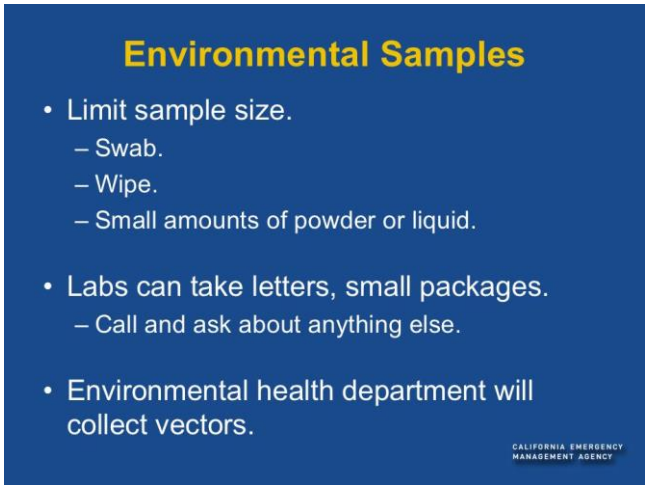
Certain suspected agents, such as smallpox and VHF, are sent directly to the national laboratories since they are the only labs equipped to handle such organisms.



Slide 7.51

Most states have a single reference laboratory, typically the state public health laboratory.

California, because of its large and geographically wide-spread population, has fourteen reference labs. California's reference labs are located at select public health laboratories, with each lab serving several counties.



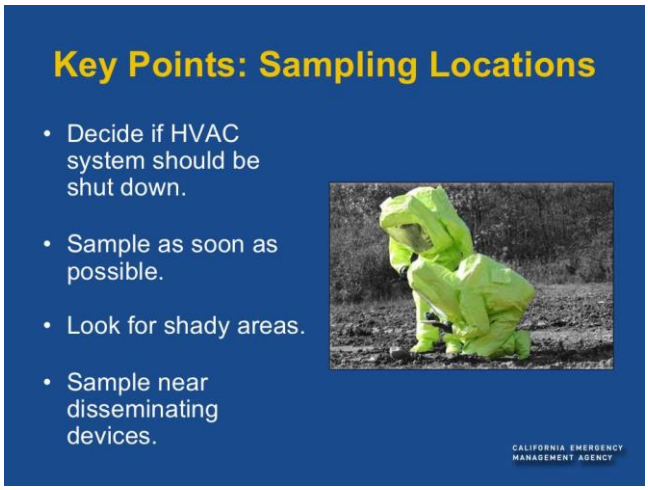
Slide 7.52

Keep in mind that all materials must be able to fit within the bio-safety cabinet, so laboratories cannot accommodate large boxes or equipment. Laboratories need small samples. As a result, simple swabs, wipes, and small amounts of liquids (up to 10 ml.) or powders (about the size of a sugar packet) will suffice.

Laboratories can take letters and small packages. However, they must be small enough to fit into a zip-lock bag or "hands-in bag." Call and check with your LRN reference laboratory regarding the size and types of packaging and equipment it can accommodate.

Vectors will be collected through the environmental

health department.



Slide 7.53

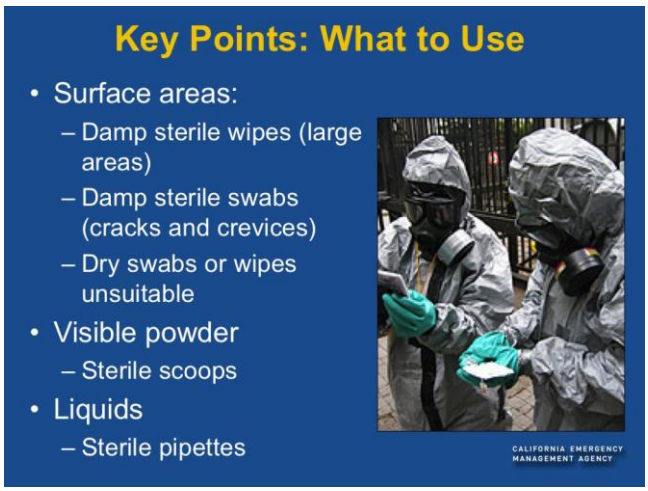
When selecting where and when to collect samples, keep these key points in mind.

24. Decide if the heating, ventilating, and air conditioning (HVAC) system should be shut down. Note any such actions. Sample filters and swipe from vents.

25. Collect samples as soon as possible from a known dissemination. (Exposure to the environment can kill agents.)

26. Look for shady areas. (Ultraviolet light can sterilize agents.)

27. Collect samples near disseminating devices. (Heavier particles will fall out; others will be dispersed by the wind.)



Slide 7.54

Keep these points in mind when determining what to use in collecting samples.

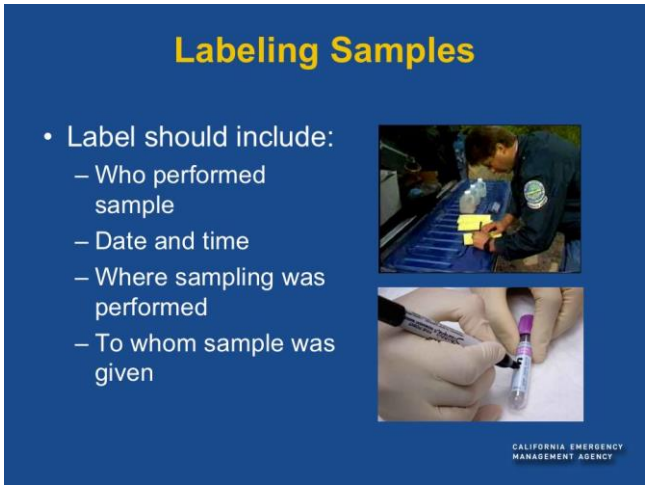
28. For surface areas, use damp sterile wipes or swabs (wipes for large areas, swabs for cracks and crevices). Dry swabs or wipes are unsuitable, because they will pick up only 33 percent of spores in comparison to damp swabs or wipes. This is especially important because little evidence may remain if the agent is weaponized.

29. For visible powder, use sterile scoops.

30. For liquids, use sterile pipettes.

Studies have shown that routine office activities re-aerosolized spores in the Hart building of the U.S. Senate.

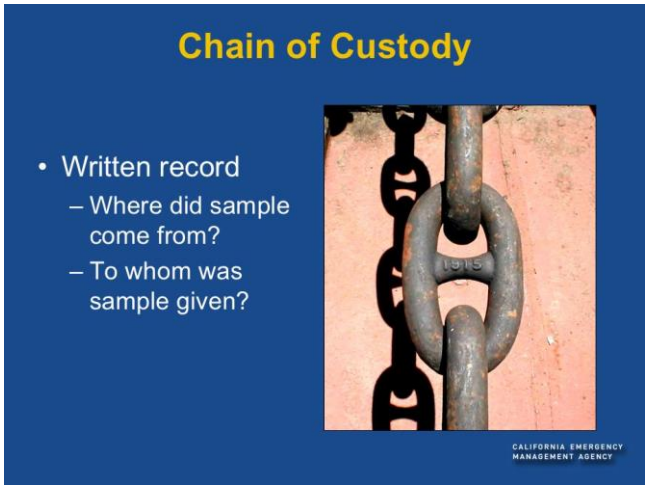
If the agent is weaponized and air-handlers are *not* turned off, concentrations of agent will be diminished from surfaces. Therefore, a negative laboratory result will not necessarily mean an agent wasn't dispersed.



Slide 7.55

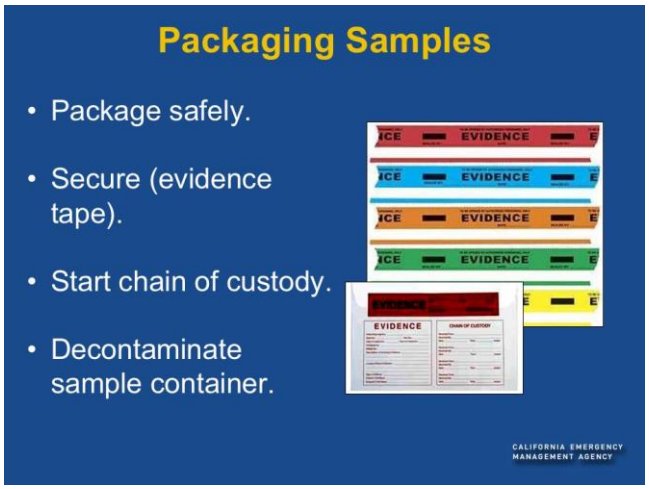
Samples must be labeled with the date, time, and the collection point. An agency sample number or other identification must be included for forensic sampling. The person taking the sample should use a waterproof pen to initial the primary container.

When using pre-labeled containers, samplers must double-check labels against the actual sample description (location, number, etc.). Similarly, when in the warm zone, responders must ensure that the label on the sample matches the paperwork.



Slide 7.56

The chain of custody is documentation that records the collection, transfer, receipt, safekeeping, and final disposition of evidence. It is the written record of who was in possession of the specimen at any given moment.



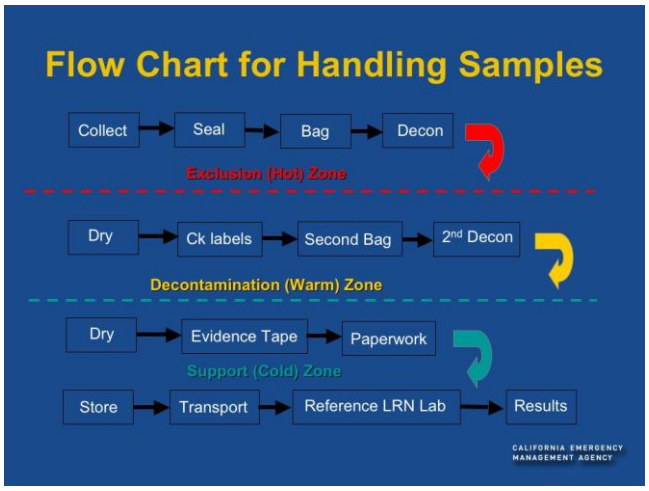
Slide 7.57

It is important to package samples safely.

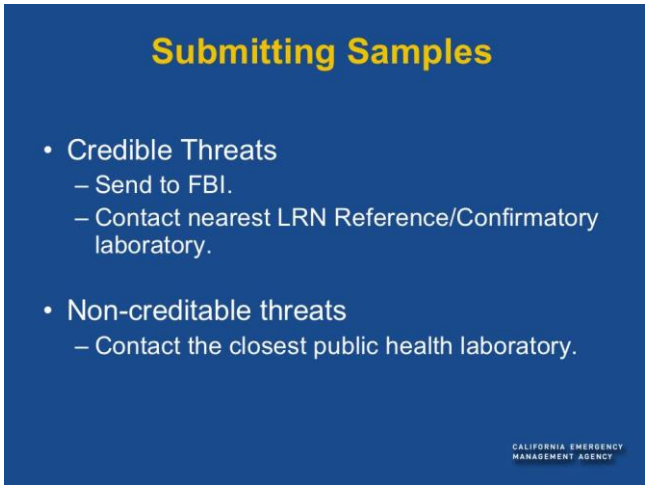
Use care when positioning the evidence tape. For example, sealing a sample bag vertically can allow the primary container to be removed.

Start the chain of custody. It is not necessary to adhere to common carrier shipping regulations, because specimen(s) will normally be transported by approved individuals (custodial transport).

Decontaminate the sample container by, at the very least, double-bagging and sealing, followed by a decon of the outer bag.



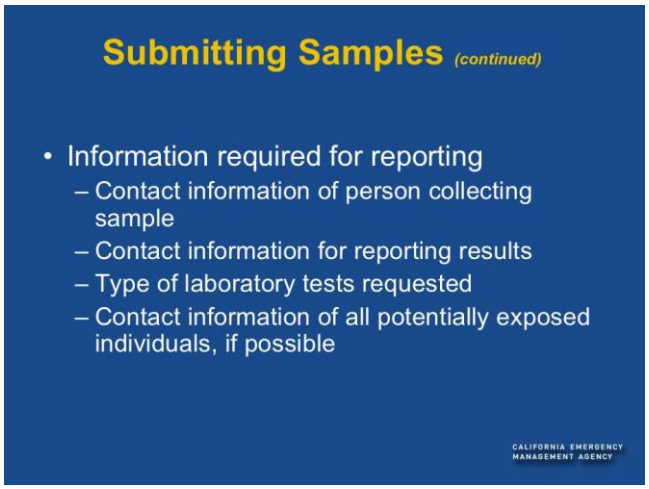
Slide 7.58



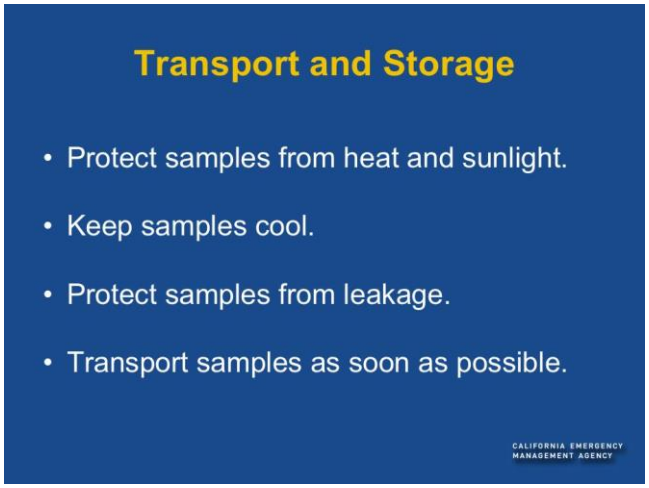
Slide 7.59

Credible threats: Go to the FBI or, at their request, contact the nearest LRN Reference/Confirmatory laboratory to inform them of the incident and arrange for sample receipt.

Non-creditable threats: When the health officer wants a sample tested, contact the closest public health laboratory.



Slide 7.60



Slide 7.61

During transport and storage:

31. Protect samples from heat and sunlight.

32. Keep samples as cool as possible. However, do not freeze the samples—unless directed to do so by the receiving lab.

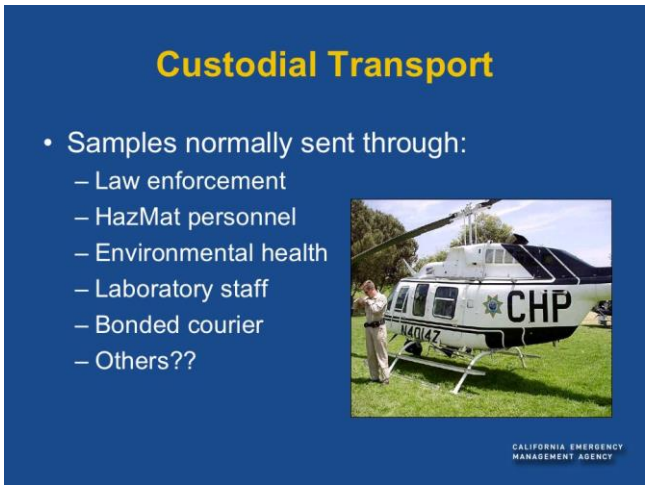
33. Protect the sample from leakage.

34. Transport the samples to the lab as soon as possible.



Slide 7.62

These simple lines will help you remember what temperature bio-agent samples should be kept at when they are being transported or stored.



Slide 7.63

The specimen samples are sent to the laboratory by custodial transport. Personnel with agencies such as law enforcement, hazmat response, environmental health, public health laboratories, or bonded courier services normally carry out custodial transport.



Slide 7.64

Review the listed resources in the participant guide.



Slide 7.65

Keep in mind that standard PPE closes the five routes of entry for pathogens and, thus, protects responders from infection.

Even when the FBI declares an incident to be a non-credible threat, the local health officer may ask for additional testing to either rule out or identify the presence of a health threat.

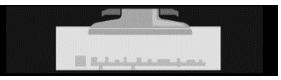
This task may fall on the shoulders of hazmat responders. The best way to screen for biological agents is to test for the presence of protein, a neutral pH, and turbidity in water (SWPP testing).

If SWPP testing indicates a protein for which a source is not readily apparent, then confer with the local environmental health staff and/or the public health officer.

When hazmat responders are asked to conduct environmental sampling for laboratories, they should:

35. Use aseptic sampling techniques with sterile wipes, swabs, scoops, or pipettes, as appropriate.
36. Use secondary containment.
37. Decontaminate the sample container.
38. Label the container correctly.
39. Complete all required forms.
40. Begin chain of custody documentation.

Chapter 7



Resources

Biological Warfare Agents

41. Biological warfare agents are living organisms or the materials derived from them that cause disease in or harm humans. They can be either disease-causing organisms (bacteria, rickettsia, or viruses) or toxins produced by living organisms. A viable biological agent typically has a latent period between infection and onset of disease.

42. Biological warfare agents are generally split into four groups. The first group includes ***bacteria, mold, and fungi.*** They are single-celled organisms that cause a variety of diseases in animals, plants, and humans. They may also produce extremely potent toxins inside the human body. The second group includes the ***rickettsias***. Although true cells, rickettsia are smaller than bacteria and live inside individual host cells. ***Viruses*** are much smaller than bacteria and use the host cell's reproductive mechanism to make additional viruses. The fourth group, ***toxins***, are potent poisons produced by a variety a living organisms, including bacteria, plants, and animals.

43. The medical response to the threat or use of biological weapons may differ depending on whether medical measures are employed before exposure or after exposure and/or symptoms are already present. If provided before exposure, active immunization or prophylaxis with antibiotics may prevent illness in those exposed. Active immunization may be effective against several potential biological warfare agents, and is probably the best modality for future protection of U.S. military forces against a wide variety of biological threats. After exposure, active or passive immunization as well as pre-treatment with therapeutic antibiotics or antiviral drugs may ameliorate the symptoms of disease. After the onset of illness, the only options left to medical care providers are diagnosis of the disease and general or specific treatment. The good news is that excellent vaccines and antitoxins exist for several of the most likely biological warfare agents and more are under development.

Potential Biological Warfare Agents

44. Among the numerous biological agents that could be used as bio-weapons, this section briefly describes those that might be used in a terrorist attack.

Bacteria

45. ***Anthrax*** is an acute bacteriological disease. Exposure may be through direct skin contact only, ingestion, or inhalation, which is its deadliest route. After the incubation period, the initial symptoms of anthrax inhalation include malaise, fever, fatigue, non-productive cough, and chest discomfort. The second phase develops suddenly with the onset of severe shortness of breath and cyanosis. Shortly after this phase, the terminal phase develops and typically lasts less than 24 hours, usually ending in death despite therapy.

46.

47.

48. ***Pneumonia plague*** is the airborne form of the so-called “black plague.” Symptoms include a cough with bloody sputum, fever, and pathogenic (dead) tissue in the lymph nodes. It is rapidly fatal and highly contagious.

49. Initial infections of plague are usually due to a bite from a flea carrying the disease. This leads to bubonic plague, which is recognized by swollen and tender lymph glands. Bubonic plague may progress to either the septicemic form, where the blood carries the infection throughout the body, and/or the pneumonic form, which involves the lungs. Untreated septicemic and pneumonic plagues are invariably fatal. The greatest public danger is from pneumonic plague because the victim produces an infectious aerosol which is highly contagious. This is the form that causes epidemics among the human population.

50. Tularemia

51. Also known as “Rabbit Fever”, Tularemia is a disease that can infect animals and people. Rabbits, hares, and rodents are especially susceptible and often die in large numbers during outbreaks.

52. Symptoms vary depending how the person was infected. Tularemia can be life-threatening, but most infections can be treated successfully with antibiotics.

53. Three to five days after exposure to ***tularemia***, an abrupt onset of fever, chills, headaches, muscular pain (myalgia), etc., with non-productive cough, occurs. It can be fatal, but is not considered contagious.

Rickettsia

54. ***Q fever*** is caused by a rickettsia-type organism and is rarely contagious. Symptoms include those commonly associated with the flu, acute hepatitis, and pneumonia. Other symptoms are inflammation of the brain and the three membranes, or meninges, surrounding the brain and spinal cord (meningoencephalitis); inflammation of the membranes surrounding the heart (pericarditis); and inflammation of the myocardium, or muscular middle layer of the heart (myocarditis). Normally, it is not fatal.

Viruses

55. Viruses are different from bacteria in that they grow and reproduce by hijacking the mechanism of individual cells and forcing those cells to produce additional viruses. As a result, viral infections may be more difficult to treat than those caused by bacteria.

56. ***Smallpox*** is infectious as an aerosol. It is highly contagious and has a high mortality rate. After a seven- to seventeen-day incubation, the pox-like rash starts and patients may present with fever, muscle rigidity and shivering, malaise, headaches, vomiting, and other symptoms. Scabs start forming eight to fourteen days after the onset of the disease and leave depressed pigmented scars.

57. ***Venezuelan equine encephalitis*** (VEE) is a mildly contagious disease with an incubation period that lasts from one to six days. Symptoms include fever, headaches, muscular pain (myalgia), and vomiting. Symptoms may also include drowsiness, chills, sore throat, and diarrhea. VEE can be fatal.

58.

59. ***Viral hemorrhagic fevers*** (VHF) include Ebola, yellow fever, dengue fever, Crimean-Congo hemorrhagic fever, the hanta viruses, and several others. Symptoms include fever, myalgia, headaches, prostration, hemorrhage, capillary leaks, hypotension, and shock. They are considered moderately contagious, but often fatal.

60. For more information, consult texts such as *Control of Communicable Diseases Manual* published by the American Public Health Association.

Toxins

61. Two examples of biologically derived toxins are ricin (from castor beans) and botulinus toxin (BTX) (from the common organism *Clostridium botulinum*). In these agents, the toxins are chemicals produced by living organisms. These agents typically are susceptible to storage, handling, and delivery problems, so their effectiveness as weapons is severely reduced. However, these problems can be overcome. Soviet agents, for example, have successfully used ricin as an assassination weapon.

62. Botulinus toxin is considered to be the most toxic substance on earth. It is 1,000 times more toxic by weight than the strongest nerve gas (LD_{50} is 1 picogram/kg). In theory, seven ounces of botulinum Type A toxin is sufficient to kill every human on the face of the planet. On a more localized basis, this toxin could be delivered in milk (.3 mg in 10 gallons would equal an LD_{50} per 8-ounce glass) where normal refrigeration and rapid consumption would ensure effectiveness.

63. It should be noted that in 1984, two Canadians were arrested for illegally obtaining cultures for botulism and tetanus. The individuals were arrested after they placed a second order for the cultures from a Maryland biological supply warehouse.

64. ***Staphylococcal enterotoxins*** commonly cause food poisoning after the toxin is produced in and ingested from improperly handled foods. Inhalation of aerosolized toxin can lead to septic shock and death.

65. ***Mycotoxins*** include more than 40 toxins produced by various fungi. Some of these toxins are extremely stable and easy to produce and spread as aerosols. Symptoms can include weight loss, vomiting, bloody diarrhea, diffuse hemorrhage, and skin inflammation. Some may cause death.

66.

Latency Periods of Biological Agents

• nthrax	• –45 days	• holera	• 2 hours to 6 days
• lague	• –3 days	• ularemia	• –10 days
• fever	• 4–16 days	• mallpox	• 0–12 days
• EE	• –6 days	• bola	• –16 days

• otulinum	• ours to days	• –2	• –4 hours
• taphylococcal	• ours	• icin	• ours to days

67.

Threat of Contagion from Biological Agents and Toxins

• **igh**	• **oderate**	• **ow**	• **one**
• lague	•	• holera	• nthrax
• bola	•	• fever	• ularemia
• mallpox	•	•	• EE
•	•	•	• otulinum
•	•	•	• –2
•	•	•	• icin

Select Bioterrorism Agents

Category A Agents
68. High-priority agents include organisms that pose a risk to national security because they:
Can be easily disseminated or transmitted person-to-person
Cause high mortality, with potential for major public health impact
Might cause public panic and social disruption
Require special action for public health preparedness
69. Category A agents include:
Bacillus anthracis (anthrax)
Clostridium botulinum toxin (botulism)
Francisella tularensis (tularaemia
Variola major (smallpox)
Yersinia pestis (plague)
Filoviruses:

Ebola virus (Ebola hemorrhagic fever)
Marburg virus (Marburg hemorrhagic fever)
Arena viruses
Junin virus (Argentinian hemorrhagic fever) and related viruses
Lassa virus (Lassa fever)
Category B Agents
70. Second highest priority of agents includes those that:
Are moderately easy to disseminate
Cause moderate morbidity and low mortality
Require specific enhancements of public health diagnostic capacity and enhanced disease surveillance
71. Category B agents include:
Alphaviruses:
Eastern and western equine encephalomyelitis viruses (EEE, WEE)
Venezuelan equine encephalomyelitis virus (VEE)
Brucella species (brucellosis)
Burkholderia mallei (glanders)
Coxiella burnetii (Q fever)
Epsilon toxin of *Clostridium perfringens*
Ricin toxin from *Ricinis communis*
Staphylococcal enterotoxin B
72. A subset of Category B agents includes pathogens that are food-borne or waterborne. These pathogens include, but are not limited to:
Cryptosporidium parvum
Escherichia coli O157:H7
Salmonella species
Shigella dysenteriae
Vibrio cholerae (cholera)
Category C Agents
73. Third highest priority of agents includes emerging pathogens that could be engineered for mass dissemination in the future because of:
Availability
Ease of production and dissemination
Potential for high morbidity and mortality and major health impact

Category C agents include:
Hantaviruses
Multidrug-resistant tuberculosis
Nipah virus
Tick-borne encephalitis viruses
Tick-borne hemorrhagic fever viruses
Yellow fever
74. Note: Preparedness for Category C agents requires ongoing research to improve disease detection, diagnosis, treatment, and prevention.
75. Source: Adapted from Sacramento County Bioterrorism Response Plan

Clandestine Bio-Labs

76. The discovery in an unexpected or unlikely place of a laboratory with equipment such as high-powered microscopes, incubators, freeze dryers, centrifuges, and growing mediums may indicate an intention to produce biological weapons. In general, would-be terrorists are more likely to set up clandestine laboratories to produce the relatively easy-to-handle pathogens, such as bacteria. Terrorists also may try to produce and stockpile toxins, such as *Clostridium botulinum*, T-2 molds, and ricin. The production of fungi is less likely. Terrorists are particularly unlikely to try producing viruses, which requires living cells, heightened personal protection, and sophisticated equipment.

Typical Layout of Clandestine Labs

77. Although the components of a clandestine lab for producing bio-agents will vary depending on the terrorists' financial resources and technical expertise, in general, such labs will consist of an anteroom, lab space, area for general supplies, production and harvest room, discard area, and bookkeeping area.

78. The anteroom or entryway is the space where items for operator safety generally will be found. For example, the anteroom is likely to have decontamination supplies and various items for personal protective equipment. The anteroom may provide the first clues that hazardous materials (hazmat) responders may be entering a clandestine bio-lab.

79. The lab space where bio-agents are manipulated may simply consist of a countertop. The general supplies areas may consist of cabinet space, a refrigerator, and storage boxes.

80. Common equipment that may be found in the harvesting or production area includes a glove box or bio-safety cabinet. Protective enclosures, such as fume hoods (may or may not be present), bio-safety cabinets, or sleeved plastic, all depend upon negative pressure and should be found in a negative pressure room. The discovery of such equipment indicates a highly sophisticated operation. If tubes with loose, slide-on caps are found, hazmat responders should not try to collect a sample of the agent. There is no way to seal this type of tube.

81. The discard area may be identified by items such as red bags or an autoclave or pressure cooker for sterilization. (The discard area may be offsite.)

82. In particular, the bookkeeping area may yield a trove of valuable information on the type of bio-agent being produced. For example, bookkeeping areas generally contain such information as background materials, standard operating procedures, lab logs and records, and result notes.

Growing the Agent

83. To produce bio-weapons, terrorists must first grow the agent. There are four main ways to grow these agents: through fermentation, fertilized eggs with a developing embryo (embryonated eggs), tissue cultures, and live animals. Fermentation is used mostly for bacteria and toxins. Fermentation equipment can range from large flasks to commercial units. Embryonated eggs are primarily used for viruses and some bacteria. Tissues cultures are highly technical and unlikely to be found in small laboratories. Live animals, on the other hand, may be found.

84. Traditional growth media include Petrie dishes, liquid tubes and bottles, solid tubes (slants or deeps), and solid media bottles. Other things, such as potatoes, broth cubes, and powdered milk, also may be used as media to grow bio-agents.

Controlling Temperature and the Atmosphere

85. The production of bio-agents as weapons requires controlled temperatures and atmospheres. The temperature for producing bio-agents needs to remain constant and to keep cultures warm (about 35 degrees C, which is close to body temperature). Incubators are a reliable means to keep cultures warm and control temperature. Other common practices that illicit labs use to keep cultures warm and to control temperature are to place them on top of the refrigerator, near the stove, or in areas with controlled sunlight (such as a greenhouse).

86. In addition to keeping cultures warm and at constant temperatures, incubators can be used to control the atmosphere. Atmosphere control can also be accomplished with a bag or candle jar. Jars may be found that contain Alka-Seltzer® (a couple of tabs in a separate jar of water).

87. Different bio-agents have different oxygen requirements. Some bio-agents do well in atmospheres that have normal oxygen levels. Some bio-agents, such as plague and anthrax, require atmospheres that have reduced oxygen levels. Others, such as botulism, are sensitive to oxygen. Anaerobic agents will be found at the bottom of liquid tubes; aerobic agents will be found at the top of tubes.

Harvesting, Refining, and Dispersing Bio-Agents

88. Spores from bio-agents need to be dried, and then dispersed in liquid or dried form. Liquid bio-agents are simple to prepare, but difficult to disperse in small-particle aerosols. Liquid bio-agents typically are the consistency of milk or slightly thicker. The color of liquid bio-agents will vary. Some culture products are amber to brown but opaque. If the culture is produced from eggs, the color may be yellow (if from the yoke) to pink or red (if from whole egg).

89. Dried bio-agents are complex to prepare, but easily dispersed by crude devices. The color variation in dried bio-agents typically is the same as that found in liquid bio-agents. Dried bio-agents should have the consistency of baby powder and be free-flowing (1-10µ). Rollers, blenders, micronizers, or kitchen milling machines may be used to mill spores. (Coffee grinders may not produce fine particles, but still may be used.)

90. Cutting agents may be used with dry bio-agents to reduce clumping caused by electrostatic charges. Uncommonly, pharmacological manufacturing equipment may be used to extrude constant-sized particles. Cruder (larger particles) are easier to make, but not as effective. These particles do not re-aerosolize easily.

91. Delivery systems for bio-agents can be almost any dispersal device that can produce an aerosol. Such devices include truck mounted sprayers, crop dusters, garden sprayers, fire extinguishers, and even cans of deodorant.

Actions to Be Taken

92. If a clandestine bio-lab is discovered, first responders should secure the scene, deny entry, make any necessary rescues, and call law enforcement. Once law enforcement officials arrive, they will secure the scene (if not already done) and notify the Federal Bureau of Investigation and the public health department.

93. Hazmat responders may be able to collect a sample of the bio-agents by gathering existing cultures. Bio-labs that have not been disrupted tend to be safe, because the materials typically are well contained. Even so, it is imperative to use caution and protection.

APHL Position Statement: Standardized Validation of Screening Kits and Devices for Use in the Field to Identify Hazardous Biological and Chemical Agents

A. Statement of Position

94. The Association of Public Health Laboratories (APHL) strongly opposes the use of biological and chemical agent detection kits and devices for field testing in the absence of performance standardization, field validation, and certified individuals trained in the application of these kits and devices. It is essential that a standardized validation, approval, and training process for these kits and devices be developed and implemented as soon as possible.

B. Background/Data Supporting Position

95. Industry has stepped forward to develop a variety of field screening kits and devices for use by first responders to determine quickly whether or not hazardous biological or chemical agents are present at the site of an incident.

96. While APHL recognizes the potential usefulness of such kits and devices, their use without proper field validation and appropriate training is problematic. At sites where hazardous biological or chemical agents may be present, field screening kits and devices are often used by first responders to make decisions regarding actions necessary to assure public safety. For chemical agents, while such field tests have been available for a number of years, minimum standards for performance have not been established. For biological agents, the kits and devices being developed commercially for this purpose have not been validated under field conditions. Validation is essential to assure that kits and devices used in the field are appropriately sensitive and specific to detect the agents for which they are designed. Analytical results obtained in the field without appropriate device validation and performance training can yield false positive or false negative results. Such data can be dangerously misleading. False positive results may cause unwarranted alarm, public panic, inappropriate action, and ultimately the loss of public trust. False negative results may lead to additional life-threatening exposures, inappropriate action, and again, loss of public trust.

97. Incorrect field test results may actually delay appropriate responses. Additionally, failure to conduct field testing correctly, using standardized protocols prescribed by the validation process, may result in depletion of available sample material with consequential loss of criminal evidence and the ability to conduct the appropriate confirmatory analytical testing essential for implementing effective public safety and public health measures. In the absence of standardized and validated field kits and devices, public health laboratories must be contacted for confirmatory testing or guidance for such testing.

98.

99.

100. To reduce the likelihood of erroneous field test results, it is essential that the screening kits and devices that are used on-site be standardized and validated to perform accurately and reliably under field conditions. While these kits and devices are not designed to give definitive results like medical devices, they do need to be reliable in terms of expected sensitivity and specificity. Concern regarding this lack of field standardization and validation has resulted in a statement by the U.S. Department of Health and Human Services (HHS) recommending against the use of field screening kits, such as hand-held assays, to evaluate and respond to incidents involving unknown powders suspected to contain *Bacillus anthracis* (anthrax) or other biological agents (1). This need to standardize and validate field screening kits and devices is supported by the HHS, CDC, FBI, APHL, and by state and local LRN laboratories. It is also supported by public safety officials (2) who must make decisions regarding purchase and use. This is a critical issue for public safety, public health, and homeland security.

References

Statement by the U.S. Department of Health and Human Services Regarding Hand-held Assays for the Identification of *B. anthracis* Spores, July 2002, available at http://www.gsa.gov/gsa/cm_attachments/GSA_DOCUMENT/Appendix 20E_R2M-y2-t_0Z5RDZ-i34K-pR.doc, accessed October 19, 2006.

Lipowicz, Alice and Starks, Tim. “Where Are Standards? Almost Nowhere, Say Rescue Units Struggling to Buy the Right Stuff.” CQ Homeland Security–Local Response, Oct. 7, 2003.

101.

102. Recommended by: The Emergency Preparedness and Response Committee

103. Date Submitted: November, 2006.

104. Date Approved by Board of Directors for Interim Use: December, 2006

105. Date Approved by Membership: February, 2007

106. Sunset Date: February, 2012

Field Identification of Unknown Substances

107. **Directions:** Fill out this form and submit it with the sample.

108.

Sample Name/# _____

109. **Tested by:**

_____

110.

111. 1. Radiological Screening:

112. **Meter used:**

_____

113. ☐ ☐ **negative** ☐ **positive**

_____

114. If positive, record readings and contact state radiological health agency for direction.

115.

116. 2. Flammability:

117. ☐ **positive** ☐ **negative**

118.

119. 3. Oxidizer:

120. ☐ **positive** ☐ **negative**

121.

122. 4. Water Reactivity:

123. ☐ **positive** ☐ **negative**

5. pH:

124. ☐ ☐ **<3 (Acid)** _____ ☐ **>12.5 (Base)** _____ ☐ **4-12 (Neutral)** _____

125. If neutral, proceed to protein test.

126.

127. 6. Protein Test:

128. ☐ **positive** ☐ **negative**

129. If positive, follow sampling protocol and transport to public health laboratory. Do not transport samples that test negative for protein to the public health laboratory.

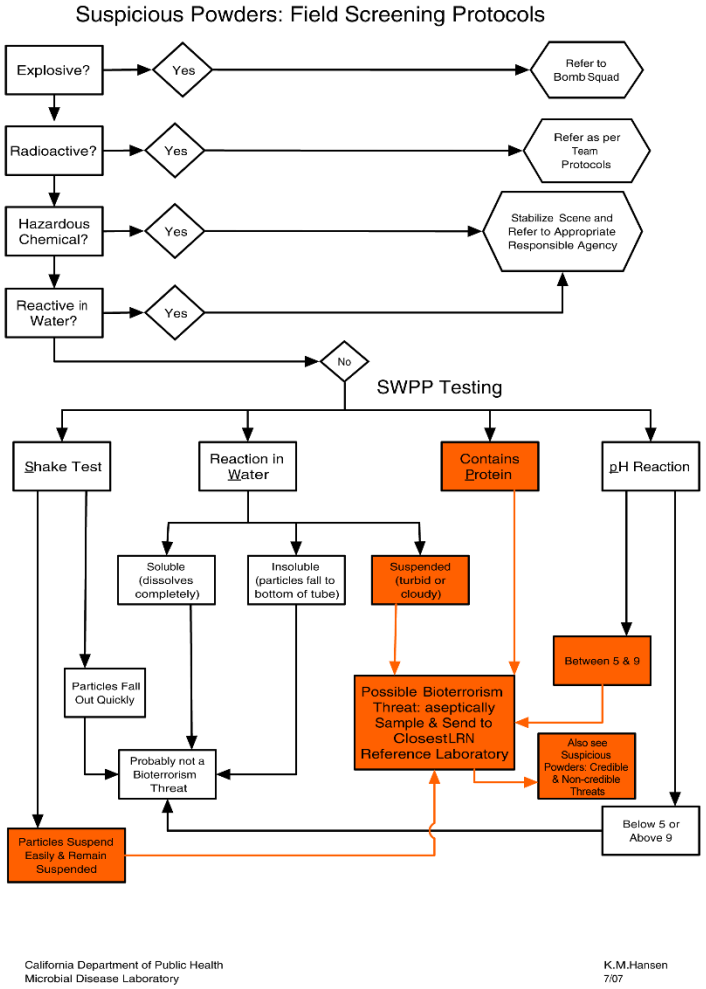
Chain of Custody and other checklists are available digitally.

Ruling Out Biological Agents

130. When responding to a suspected terrorist act, hazardous materials (HazMat) teams routinely perform field screening tests for weapons of mass destruction (WMDs). These tests include, but are not limited to, screening for chemical, radiological, caustic, and oxidizing agents. (See 29 CFR 1910.120, 40 CFR 311, and NFPA Guidance 471.) However, screening for bio-agents has remained problematic. Nevertheless, a set of four tests (shake, water solubility, protein, and pH) makes an effective addition to WMD protocols. Such screening helps with developing the sampling plan, directing efforts on protocols for laboratory sampling and testing on either chemical or biological agent, and getting the samples to the appropriate laboratory.

Overt Incidents

131. All overt incident materials will be pre-screened according to hazmat team protocols. If the incident meets the Federal Bureau of Investigation's (FBI) criteria for a credible threat, the material will be sampled and labeled according to its evidence-collecting protocols and transported to the closest National Laboratory Response Network (LRN) reference laboratory for definitive identification.



132.

Biological Field Testing

133. Although a number of field tests have been developed by commercial vendors, most focus on anthrax and/or plague. Such tests cannot indicate if another bio-agent is in the mix. These tests yield inconsistent results, are time consuming, difficult to do in high-level protective gear, and are specifically *not* recommended by either the Centers for Disease Control and Prevention (CDC) or FBI. If such testing is done, it may jeopardize the legal case in court, as the results of any such testing are considered exculpable evidence and must, by law, be made known to defense lawyers as it.

134. **Non-Credible Threats:** If the FBI has declared an incident a non-credible threat, the incident may still present a health threat. The hazmat team is not responsible for declaring a scene safe. That role lies with the local environmental health department and the health officer. The local health officer has jurisdiction, and may order additional testing based on the need to either rule out or identify the presence of a health threat.

135. **Biological Rule-Out Testing:** The best way to screen for biological agents is to test for the presence of protein, a neutral pH, and turbidity in water. Although many substances contain protein, more than 80 percent of hazmat spills do not. Any non-chemical, radiological, or explosive threat that comes from a location of high or medium threat, tests positive for a biological material, is of neutral pH, and turbid (cloudy) in water, needs to be brought to the health officer's attention and, if requested, sent to the nearest LRN reference laboratory. Once the laboratory receives the specimen, preliminary results take about four to six hours for such testing.

Shake, Water, Protein, and pH (SWPP) Tests

136. During the response to the anthrax letters of September 2001, emergency service providers (police officers, firefighters, hazmat teams, and emergency medical personnel) lacked standardized emergency guidelines for dealing with such incidents. As a result, the Center for Domestic Preparedness in Anniston, Alabama, hosted a working group to rectify this procedural gap. The working group included both scientists and emergency responders. The protocol in this course is adapted from their consensus paper. These tests are suitable for use with any visible powders.

137. **Purpose:** Emergency responders can rule out up to 80 percent of reported "hazardous" powders as being non-biological by using SWPP tests coupled with a threat assessment (identifying the source of the material and whether the location is a probable target). As noted in the biological field screening overview, this protocol can be used in the case of non-credible threats to rule out biological agents.

138. **Principle:** The bio-agents (bacteria, fungi, viruses, and toxins) all:

139. 1. Contain protein.

140. 2. Do not survive outside a neutral pH range (pH 5–9).

141. 3. Are turbid (cloudy, suspended) in water.

142. Thus, any powders that do not contain detectable protein, have a pH range of less than five or greater than nine, and are either soluble or insoluble in water most probably are *not* bio-agents. Unless other circumstances dictate, these samples should not be sent to the laboratory.

143. **Overview:** Four tests are collectively known as the shake, water solubility, protein, and pH (SWPP) protocol. This protocol assesses the particle size (and thus the respiratory threat), checks for substance in water, and tests for both protein and pH. If the health officer orders this testing and the results cannot rule out a bio-agent, a copy of these test results should accompany any sample to the laboratory. The field safety screening results, laboratory test requisition form, and chain of custody documentation also should accompany any sample to the laboratory.

144. Although the consensus paper cited above recommended using dip-sticks for the protein, the California Department of Public Health's Microbial Diseases Laboratory suggests using a validated system, such as 20/20 Gene System's BioCheck™ kits for both protein and pH.

145. **Samples:** The following protocol is suitable for powders. If liquids are tested, be aware that, due to the dilution factor, negative protein results may be unreliable.

146. Assess Particle Size.

147. Inhalation risk is directly related to aerosol particle size; particles that are about 5µ reach the lungs most effectively. The body's innate defenses normally clear larger and smaller ones. Particle size also can help determine if the powder could be a bio-agent, since effective bioterrorist preparations fall near this size.

Place about a gram (roughly the amount in a sugar packet) in a tube and securely cap it.

Gently swirl the powder; if it easily lifts into the air, it may be weaponized. If the particles remain suspended, a fine cloud or haze hanging above the sample for a few seconds; the powder presents an inhalation risk.

If the powder doesn't move much, it can be shaken harder. Various powders have different reactions. For example, talc tends to stick to the sides of a plastic tube, while some of it will suspend in the air. Pure Abasil (a dehydrating compound) moves almost like a liquid, because of its dehydrating prosperities.

148. If all the material falls to the bottom of the tube, like salt in a salt shaker, and the air above the material is clear; the powder does not present an inhalation risk.

149. Do not open this tube, under any circumstances, after it has been shaken.

Check Water Solubility.

150. Checking how the substance dissolves in water will indicate if it is a possible biological substance.

Place a small amount of the powder (about the size of a small pea or corn kernel) into a second tube. With the tube facing away from you, add a few drops of water. Take care to run the liquid down the inside of the tube rather than allow it to drop directly into the powder to avoid creating an aerosol.

If after the first drop or two, the sample bubbles, boils, or fizzes, discontinue testing. The sample is reactive in water and can explode or give off toxic gasses. It is unlikely to contain active biological agents.

If the sample appears stable, continue adding water slowly until about 2 ml have been added.

Cap the tube and shake vigorously for 15 seconds.

If the sample dissolves in water and becomes clear, with or without larger particles settling to the bottom; the sample is unlikely to be a biological threat.

If the sample appears to mix with water, but does not dissolve and leaves the liquid turbid or cloudy, the sample may represent a biological threat.

Test for Protein.

151. All living organisms, viruses, and toxins contain protein. A sample that does not contain protein will not present a biohazard.

Use the protein swab to sample material; rotate the swab in the powder until all sides are lightly coated. Do not use more sample than sticks easily to the supplied swab.

Insert swab into the tube supplied for the protein test and wait five minutes (time this reaction). Consider gently shaking or tapping the rack to be sure the powder falls off into the liquid.

If the liquid in the tube turns purple (a positive reaction), the sample contains protein.

If the sample does not turn purple within the time limit (5 minutes, a negative reaction), open the control swab and add it to the protein tube. If the kit is working properly, the fluid should turn purple.

If the control fails to turn the fluid purple, repeat the test using a different kit. If these results are inconclusive, consult with the environmental health department or the health officer regarding the next steps to take. (Also see Testing Limitations below.)

Test pH Level.

152. The pathogens that represent bio-threats can only survive in pH neutral environments (between pH 5 and pH 9). More acidic or alkaline environments denature these agents.

Using the appropriate (pH) swab, sample material as above.

After sampling, insert swab into the tube provided for the pH test and wait five minutes.

If the tube remains yellow, pH is neutral and the matrix is compatible with the existence of a biological agent.

If the tube turns red, the sample is acidic; if it turns blue, the sample is alkaline. In either case, the substance is not likely to be a biological threat.

Calculate Final Results.

153. All four tests must be considered in the interpretation of the results. Keep in mind that the primary purpose of this protocol is to ***rule out*** biological agents. Studies in the field have shown that, in up to 87 percent of hazardous material responses, this protocol can rule out biological agents.

Consider the sample a possible biohazard if it dissolves in water, leaves a cloudy or turbid suspension, ranges in pH between 5 and 9, and contains protein.

Consider the sample a definite aerosol threat to responders if the particles stay suspended in air, range around 5µ in size, and are a compound that may be weaponized.

A biohazard threat may be ruled out if the sample is soluble or insoluble in water, does not contain protein, or is decidedly acidic or alkaline.

Log the results on the appropriate test form and report the results to the incident commander and any other agencies according to your local protocols.

Testing Limitations

154. Not all powders that contain protein will be biohazards. Some substances (such as yeast, breadcrumbs, flour, nutmeg, cinnamon, chili powder, brown sugar, and cornmeal) can give positive results.

This protocol is only for preliminary testing for the purpose of ruling out possible biohazards.

Some materials are problematic because they give a false negative protein result. In these cases, the BioCheck™ positive control fails.

Some acidic materials containing protein (such as cream of tartar) will give negative protein results.

Reducing powders (such as zinc and aluminum). Baking powder, which contains aluminum, will give a negative protein test.

Chelating agents (such as EDTA and baking soda) will give a negative protein test.

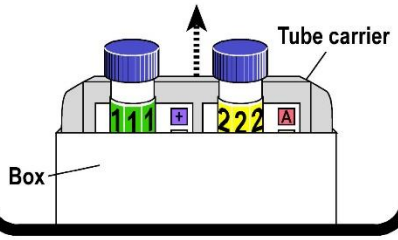
The BioCheck™ kit may be used for testing fluids.

If the result is positive for protein, this test is valid.

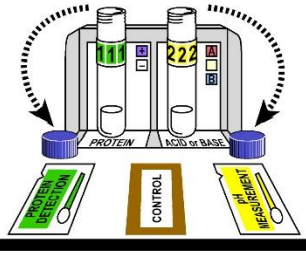
If the result is negative, any protein in the sample could have been diluted below the test's threshold.

Using the BioCheck™ Kit

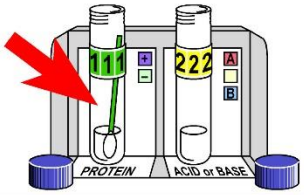
1 Remove tube carrier, remove swab pouches.



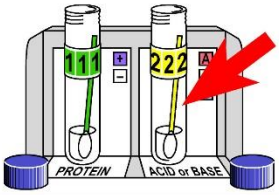
2 Place on level surface, take caps off (don't swap caps).



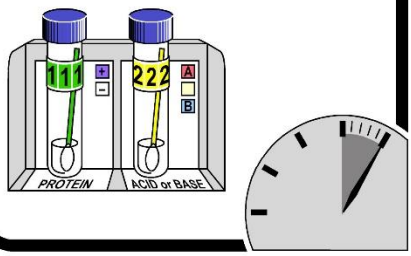
3 Open PROTEIN DETECTION pouch, rub swab in sample, place swab in PROTEIN tube (1).



4 Open pH MEASUREMENT pouch, rub swab in sample, place in ACID or BASE tube (2).



5 Put caps on tubes, wait 5 minutes.



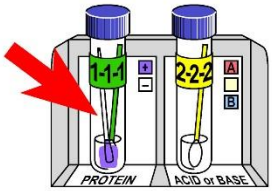
6 Evaluate liquid colors:

ACID or BASE test
- A Acidic sample
- Neutral sample
- B Basic sample

PROTEIN test
- \+ Likely to contain biological material
- – Not likely to contain biological material

Potential biohazard. Agent-specific testing required.

If PROTEIN test is negative (no color change), then perform confirmatory test:
a. Open CONTROL pouch, but *do not* rub in sample.
b. Place swab *directly* in PROTEIN tube (1) where it is visible.
c. Immerse swab in liquid (shake if needed).
d. Wait 5 minutes, then evaluate color in PROTEIN tube (1):



\+ Test valid.

– Test not valid: test again with new kit or proceed to agent-specific test.

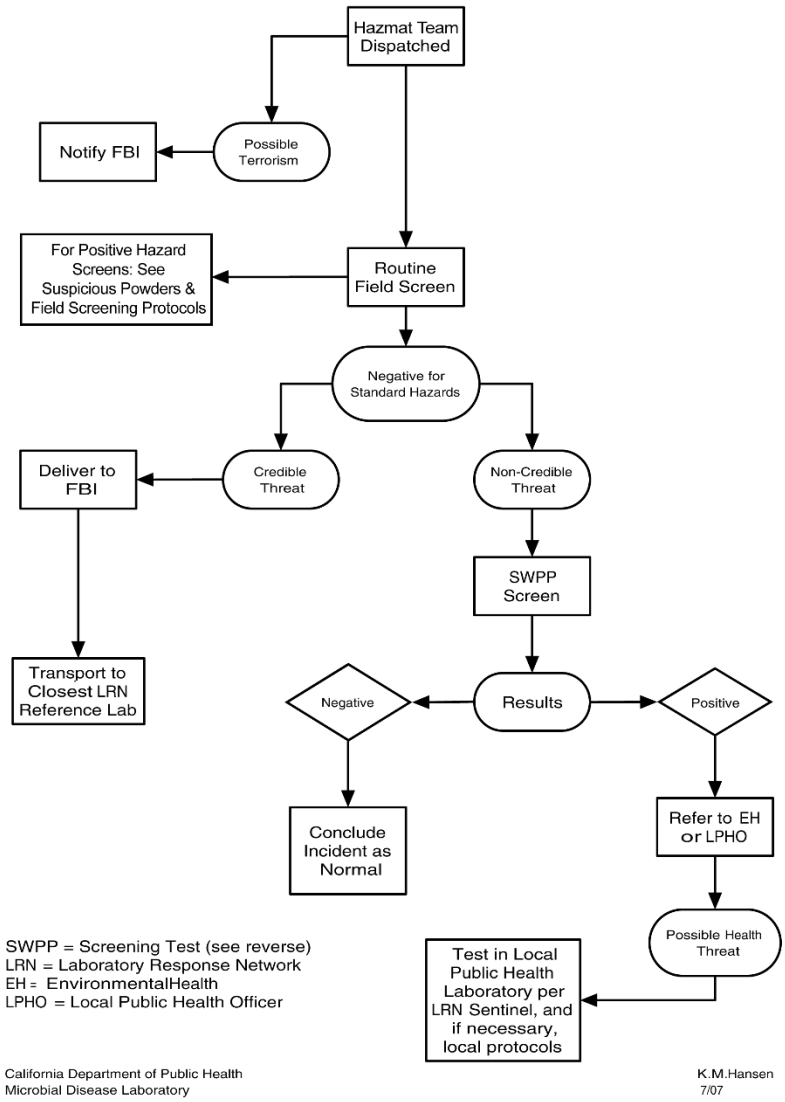
Environmental Sampling for Biological Agents

Overview

155. Screen samples for radiation, explosive, and chemical threats according to agency protocols. For threats the Federal Bureau of Investigation (FBI) has deemed credible, sample for biological agents only after field screening has ruled out the normal hazards. For non-credible threats, use the shake, water solubility, protein, and pH (SWPP) screening. If SWPP screening indicates a protein for which a source is not readily apparent, then confer with the local environmental health staff and/or the public health officer. The public health officer has the final responsibility for requesting additional testing and allowing re-occupation of areas that have been evacuated. The hazardous materials (hazmat) team is *not* responsible for declaring an area safe or for allowing people back into previously evacuated areas.

156.

Suspicious Powders: Credible & Non-credible Threats



General Comments

157. All material that goes into the contaminated (hot) zone must be appropriately discarded, decontaminated, or sealed until laboratory results indicate the type of risk. If laboratory results indicate a possible threat, the material must be either decontaminated or discarded as contaminated waste.

158. **PPE:** NFPA 1994 / Level C ensemble is appropriate PPE for biological sampling; N-95 masks are protective. Change gloves between samples. Always use at least two people to sample: one "dirty" and one "clean."

The "dirty" sampler handles only the item to be sampled and the sampling tool.

The "clean" sampler handles the containment packages, tubes, bags, etc., and opens sterile equipment and tubes for the "dirty" sampler to place the sample into the secondary container.

159. **Aseptic technique:** When sampling for laboratories, use aseptic techniques, which not only protect the samplers and the laboratory technicians, but also prevent contamination of the samples with unwanted organisms.

Use sterile implements and sample containers; sterile is *not* the same as certified clean.

Use *plastic* implements, *not* cotton, glass or metal (these substances interfere with testing).

Include equipment and reagent blanks when submitting the sample.

160. Sample plan:

The sampling plan should target those areas where agents have the best chance of surviving:

In the cool and shade

Near the dispersal device

When labeling sample containers, always label at least the body of the container, never just the lid.

Always decontaminate the sample markers at the end of the incident.

Sampling

161. Following the sampling plan and using sterile equipment and containers, sample the product with appropriate tools. For example, use scoops for large amounts of material, swabs for cracks and crevices, and wipes for large smooth areas.

162. **Taking samples:** Sample using aseptic technique. Be sure to change gloves between samples.

Send only a small amount to the laboratory (for powder, no more that what is in a sugar packet; for liquids, about 5–10 ml).

For swabs and wipes, add a small amount of sterile saline (sterile water, or pbs) to the dry material to dampen it and aid in sample recovery.

For additional information, see the separate directions for each type of sampling.

For materials other that the above sampling tools, contact the laboratory.

163. **Secondary containment:** Once the material is in a primary container (tube, cup, etc.) this container must be inserted into a secondary container.

Be sure the primary container is appropriately labeled on at least the body of the container.

This container's lid should be sealed with Parafilm™ or its equivalent.

This container should then be placed in a self-sealing bag. Note: whirl-bags tend to create aerosols and can leak, so they are not recommended.

More than one sample, provided they were taken from the same spot and are appropriately labeled, may be packaged in the same secondary container. However, include a packing list with multiple samples so that the laboratory can inventory them on arrival.

In the case of letters or packages, the envelopes or boxes can be considered the primary containment, and they should be sealed in bags.

The bags may then be sealed and then decontaminated.

164. **Decontamination:** Use *freshly* made bleach solution for decontamination.

Use one part bleach (from the commercial bottle), one part vinegar, and eight parts water.

Either wipe the secondary container or immerse it for about 15 to 30 minutes.

Never use bleach on humans.

165. **Labeling:** At least the outer or secondary container must be marked as a biohazard including the biohazard symbol.

Either before or after the decontamination step, the secondary container must be sealed with evidence tape and appropriately signed or initialed, as per team protocols.

Following this step, the specimen(s) may be over-packed for custodial transport.

Submitting Samples

166. Submit all samples with the appropriately completed forms. These forms can vary from team to team and from laboratory to laboratory.

167. **Hazardous materials safety screening results:** The results from these routine screenings must be included with the submission. These results may be on a separate form or included with the laboratory request form. They may also be copies of the forms the team uses to record their own results. The only requirement is that the laboratory has these results for radiation, explosives, chemical hazards, etc., in writing.

168. **Laboratory request form:** This form must also accompany the samples. Again, this can vary by laboratory and may contain the necessary information for requesting testing, or include room for the screening results and/or the chain of custody.

169. This form must include:

Name of the laboratory to which the specimen is going

Date of sample collection

Contact information of person collecting sample

Laboratory tests requested (consult with the laboratory)

Contact information for reporting results

170. Chain of custody: This process tracks the sample and records the people who have had it in their custody and are responsible for the integrity of the sample. The chain of custody may appear as part of one of the forms mentioned above or it may stand alone. In any case, it must be available on the exterior of the sample packaging, so that all persons who handle the sample will be able to sign the form.

Packaging

171. All samples must be packaged for safe transport.

172. Paperwork for each sample must be placed in the outer pocket of the sample bag. ***Never include paperwork in the same compartment as the sample***.

173. Depending upon the size of the sample, it may be over-packed in another self-sealing bag, an unused paint can, or other type of protective container.

More than one sample, provided they come from the same incident, may be over-packed together. Include a listing of all samples within such a package so that the laboratory can inventory them upon their arrival.

Storage and Transportation

174. Samples must be protected from the elements prior to and during transport.

Protect samples from heat and sunlight.

Keep sample as cool as possible, but do not freeze the samples unless directed to do so by the receiving lab.

Storage rules of thumb:

If it's cold (the sample), keep it cold.

If it's warm, make it cold.

If it's frozen, keep it frozen.

If it's dry, leave it dry.

If it's wet, leave it wet.

Protect the sample from leakage, and transport to the lab ASAP.

Environmental Sampling Using Wipes

175. **Overview:** Use damp, sterile wipes for large areas, especially for those that show only traces or no evidence of contamination. To prevent the wipes from becoming contaminated, sterile forceps must be used to handle them.

Procedures

176. **Preparation** (clean assistant):

Lay out material.

Label cup, lid (if desired), and self-sealing bag.

Open sterile forceps and hold for sampler.

Open wipe package and hold for sampler.

Apply sterile water or PBS to the wipe to dampen it.

177. **Sampling** (sampler “dirty”):

With forceps, remove wipe and hold for assistant to dampen it.

Wipe about 1 square foot of surface

Cover top to bottom in “S” patterns

With same wipe, rotate “S” patterns 90 degrees and repeat

Insert wipe in plastic cup.

178. **Sealing** (clean assistant):

Cap specimen cup.

Check tube label against sampling location.

Apply Parafilm™ or other sealer around the top of the tube, winding clockwise (to the right) to keep the cap from loosening.

179. Secondary packaging:

Insert tube in self-sealing bag and seal it.

If the bag is labeled, be sure the tube matches the bag.

180. Primary decontamination:

Insert bag into decontamination solution for 15 to 30 minutes.

181. Final Packaging and Transporting:

See instructions to complete sampling protocol.

Environmental Sampling for Liquids Using Pipettes

182. **Overview:** Use sterile pipettes to sample liquids. Expel air from pipette before inserting in liquid to avoid creating bubbles and aerosols. Also, to avoid creating bubbles and aerosols, let the material slide gently down the side of the tube. In addition, to steady the pipette, place one finger underneath and midway up the barrel. Insert only the tip of the pipette into the container. To minimize mixing in biphasic liquids, sample the top layer first. When transferring the sample, hold the pipette upright to minimize leakage from the tip.

Procedures

183. **Preparation** (clean assistant):

Lay out material.

Label 15 ml tube and self-sealing bag.

Open pipette package and hold for sampler.

184. **Sampling** (sampler “dirty”):

Depress bulb to expel air from pipette. Do this ***before*** inserting pipette into the liquid so that a bubble aerosol will not be created.

Slowly release pipette bulb, drawing liquid into barrel.

Release bulb and hold pipette upright to avoid leakage.

Gently, along the inner side of the sample tube, discharge the contents.

185. **Sealing** (clean assistant):

Cap the tube and tighten securely.

Check the tube label against sampling location.

Apply Parafilm™ or other sealer around the top of the tube, winding clockwise (to the right) to keep the cap from loosening.

186. Secondary packaging:

Insert tube in self-sealing bag and seal it.

If the bag is labeled, be sure the tube matches the bag.

187. Primary decontamination:

Insert bag into decontamination solution for 15 to 30 minutes.

188. Final Packaging and Transporting:

See instructions to complete sampling protocol.

Environmental Sampling Using a Scoop

189. **Overview:** Use scoops when you can see the powdered agent or ample agent is available to sample. If possible, carefully sample from the interior of the pile. If the powder appears to waft with the slightest breeze, soak a towel in a five-gallon bucket of decon solution and carefully roll it over the pile. Let set for five to ten minutes, and then carefully sample from under the dampened layer. Use either 15 ml or 50 ml screw-top centrifuge tubes. One scoop (no more than the amount in a sugar packet) is adequate for the LRN reference laboratory.

Procedures

190. **Preparation** (clean assistant):

Lay out material.

Label tube and self-sealing bag.

Open scoop package and hold for sampler. Note: if the assistant opens the sterile package halfway, the sampler can choose which end to use.

191. **Sampling** (sampler “dirty”):

Using scoop, collect a small amount of material (about the size of a sugar packet).

Place sample in 15 ml or 50 ml tube.

192. **Sealing** (clean assistant):

Cap the tube and tightens securely.

Check the tube label against sampling location.

Apply Parafilm™ or other sealer around the top of the tube, winding clockwise (to the right) to keep the cap from loosening.

193. Secondary packaging:

Insert tube in self-sealing bag and seal it.

If the bag is labeled, be sure the tube matches the bag.

194. Primary decontamination:

Insert bag into decontamination solution for 15 to 30 minutes.

195. Final Packaging and Transporting:

See instructions to complete sampling protocol.

Environmental Sampling Using a Swab

196. **Overview:** Use damp, sterile swabs to collect samples of non-visible agents or for hard-to-reach places, such as cracks. If no wipes are available, use swabs for smooth contaminated areas; if no scoops are available, slip damp, sterile swabs under the top of the materials. In all cases, roll the swab 360º during the sampling.

Procedures

197. **Preparation** (clean assistant):

Lay out material.

Label tube and self-sealing bag.

Open swab package and hold for sampler.

Apply sterile water to the swab.

198. **Sampling** (sampler "dirty"):

Swab area.

For a crack, draw the swab along its length, for about a foot, rotating the swab as it's moved.

For a flat surface, use an "S" motion to cover about a square foot; repeat swabbing motion at right angles.

Insert swab in 15 ml tube.

Break off or clip tip of swab (to remove contamination).

199. **Sealing** (clean assistant):

Cap the tube and tighten securely.

Check the tube label against sampling location.

Apply Parafilm™ or other sealer around the top of the tube, winding clockwise (to the right) to keep the cap from loosening.

200. Secondary packaging:

Insert tube in self-sealing bag and seal it.

If the bag is labeled, be sure the tube matches the bag.

201. Primary decontamination:

Insert bag into decontamination solution for 15 to 30 minutes.

202. Final Packaging and Transporting:

See instructions to complete sampling protocol.

Final Packaging and Transporting

203. **Overview:** Final packaging may depend upon the type of sample. In all cases, the sample must be secured in at least two layers of protection and must be labeled with biohazard warnings. All paperwork must be completely filled out and must include field safety screening results, chain of custody, and a request for testing. Transport is custodial to the nearest LRN reference laboratory.

Procedures

204. Additional Decontamination:

Once the sample is removed from the decontamination bucket at the contaminated-decontaminated (hot-warm) zone, it may be either:

Wiped dry and prepared for transport

Inserted into a second decontamination bucket between the warm and cold zones

205. Paperwork:

Fill out all paperwork completely; do not leave any blank spaces. Indicate if a test is not run, so that the receiving laboratory will know that the information is unavailable and not that the space has been left blank through error.

Fill out field safety screening results form.

Fill out test request form for health department laboratory.

Create chain of custody for custodial transport.

Insert paperwork in the outside pocket of the sample bag.

Never place paperwork in the same compartment or self-sealing bag as the sample/tube/cup.

If dual-compartment bags are not available, seal the sample in one self-sealing bag and place it and the paperwork in another, larger self-sealing bag.

206. Final Steps:

Check tube or cup and bag labels against paperwork to ensure accuracy.

Ensure the samples are labeled.

Seal bag with evidence tape, if not previously done.

Record results on log sheet and/or sample list as necessary.

Over-pack, if desired.

207. Transport:

Turn the sample(s) over to law enforcement, laboratory representative, hazmat team member, or other qualified individual for transport to the closest LRN reference laboratory for definitive testing.

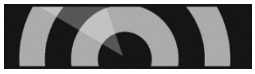
Participant Guide

Chapter 8
Emergency Response to Radiological Incidents



Scope

This chapter addresses types of radiation, the types of radiological weapons that might be used by terrorists, and ways for responders to protect themselves and assist the public in response to such incidents.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 8, participants will be able to recognize the appropriate means for monitoring radiation levels and protecting themselves during response to a radiological incident.



Enabling Learning Objectives (ELOs)

This chapter's enabling (performance) objectives are to ensure participants will be able to:

Name four kinds of radiological/nuclear weapons terrorists might use.

Identify the four types of ionizing radiation.

Name three critical means for protecting responders from contamination with radiation.

Identify two processes for radiological decontamination.

Linkages to Universal Task List

The information, objectives, and activities in this chapter promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

(Res.A.2 1.3.1) Monitor for primary and secondary threats.

(Res.A.2 1.3.2) Report current monitoring activities and results.

(Res.A.2 1.4.1) Coordinate with EOC/responders for situational awareness and public safety concerns.

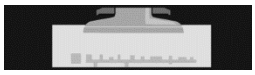
(Res.A.2 1.5) Classify incident scene areas.

(Res.B.1 16.3) Perform ambient and task specific worker exposure monitoring for hazardous substances and inform workers of relevant risks.

(Res.B.1 16.5) Monitor and perform activities related to worker health and safety issues.

(Res.B.2 1.2.2.2) Establish criteria for proper decontamination of health workers and for the population at large.

(Res.B.2 5.1.1.4) Conduct contamination surveys.



Resources

Resource List

Nuclear and Radiological Weapons

Measuring Radiation

Time, Distance, and Shielding

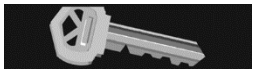
Attending to Victims of a Radiological Incident

G-M Detector's Job Aid

Measuring Instruments

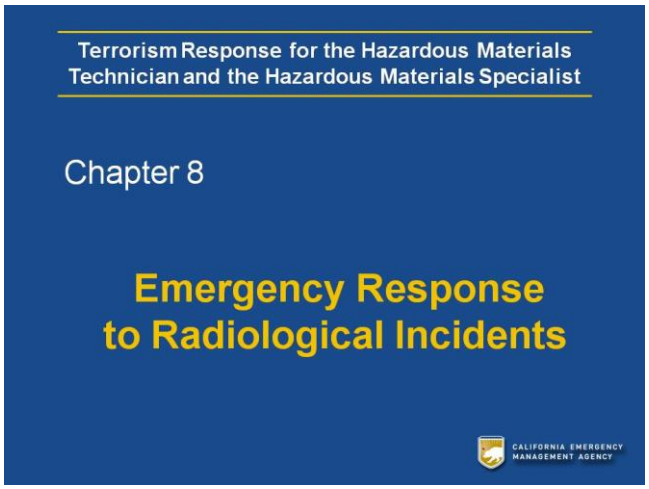
Reference List

See Reference List at the beginning of this guide.



Practical Exercise (PE)

8.1 Radiological Survey for Victim Contamination (Exercise Sheet)



Slide 8.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

208. (Res.A.2 1.3.1) Monitor for primary and secondary threats.

209. (Res.A.2 1.3.2) Report current monitoring activities and results.

210. (Res.A.2 1.4.1) Coordinate with EOC/responders for situational awareness and public safety concerns.

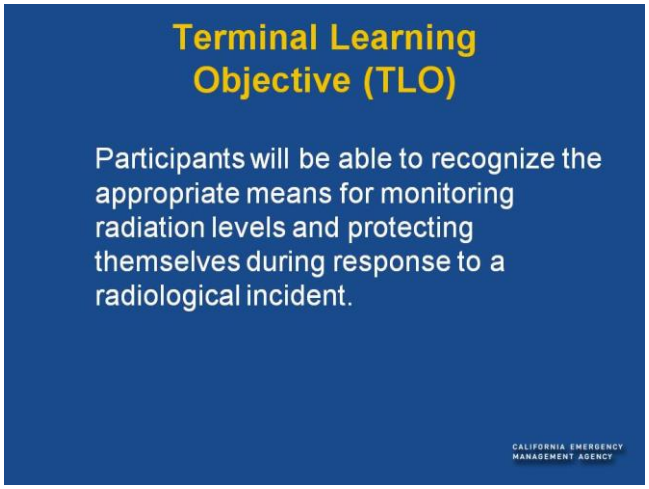
211. (Res.A.2 1.5) Classify incident scene areas.

212. (Res.B.116.3) Perform ambient and task specific worker exposure monitoring for hazardous substances and inform workers of relevant risks.

213. (Res.B.116.5) Monitor and perform activities related to worker health and safety issues.

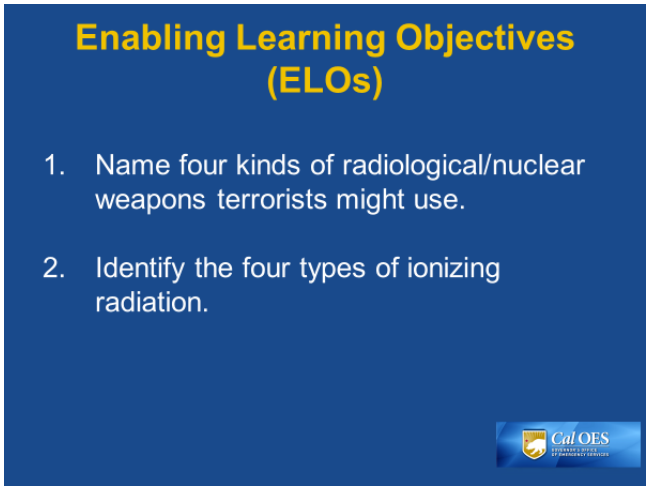
214. (Res.B.21.2.2.2) Establish criteria for proper decontamination of health workers and for the population at large.

215. (Res.B.25.1.1.4) Conduct contamination surveys.



Slide 8.2

The terminal learning objective (TLO) for this chapter is to ensure that participants will be able to recognize the appropriate means for monitoring radiation levels and protecting themselves during response to a radiological incident.

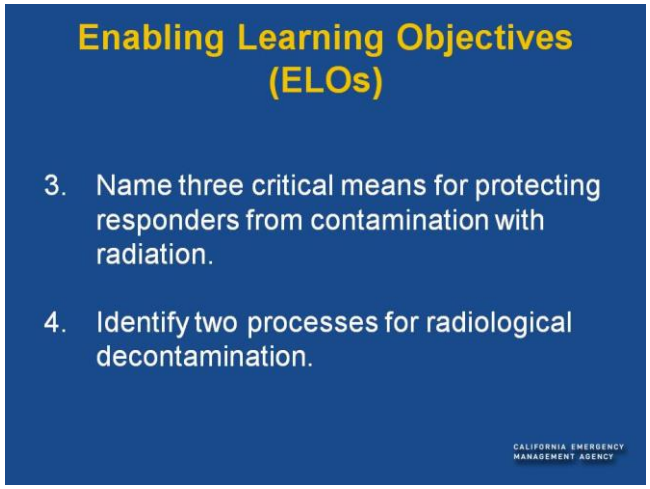


Slide 8.3

This chapter's enabling learning objectives (ELOs) are to ensure participants will be able to:

Name four kinds of radiological/nuclear weapons terrorists might use.

Identify the four types of ionizing radiation.

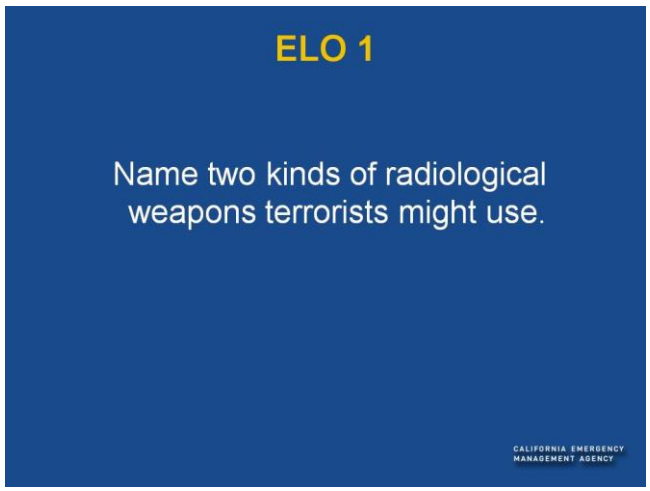


Slide 8.4

The ELOs in this chapter will also ensure that participants will be able to:

Name three critical means for protecting responders from contamination with radiation.

Identify two processes for radiological decontamination.



Slide 8.5



Slide 8.6

The accessibility of radioactive material for use in terrorist weapons is a global concern. For example, the safekeeping of radioactive materials that can be found in common locations, such as industrial sites, research laboratories, or hospitals, is an area of increased interest. Similarly, the many cases of smuggling and black market trafficking of nuclear materials have caused alarm among security officials.

But the good news is that, of all the potential CBRNE (chemical, biological, radiological/nuclear, explosives) threats, radiation is the easiest to detect and locate with properly trained personnel and appropriate equipment.



Slide 8.7

Radiological/nuclear terrorism is the intentional or threatened use of radiation to seriously injure, incapacitate, or kill.

The potential radiological/nuclear threats terrorism might take include:

216. Detonation of a fission device ("Nuclear Device")

217. Release and dispersal of radiological materials by either explosive or non-explosive means ("Radiological Dispersal Device")

218. Exposing people to harmful levels of radiation from a sealed source or radiation generating device ("Radiation Exposure Device")

219. A large-scale conventional explosive device detonated in proximity to a target containing large amounts of nuclear materials (such as a nuclear power plant or similar facility)



Slide 8.8

The U.S. Department of Defense defines improvised nuclear device (IND) as: a device incorporating radioactive materials designed to result in the dispersal of radioactive material and designed to result in the formation of a nuclear-yield. Such devices may be fabricated in a completely improvised manner or may be an improvised modification to a U.S. or foreign nuclear weapon.

In other words, terrorists might try to seize an intact nuclear weapon residing in a state's nuclear weapons arsenal. Or, more likely, they might try to acquire fissile material for the purpose of making a crude nuclear bomb, an IND, on their own.

In the case of a low-yield weapon, responders could expect damage similar to traditional high explosives, plus the spread of radiological fallout. This type of weapon could potentially present emergency responders with substantial radiation exposure.



Slide 8.9

A Radiological Dispersal Device (RDD) can be defined as a device that disperses radioactive materials, either through non-explosive or explosive means. Non-explosive RDDs may be mechanical or non-mechanical such as the use of spraying devices, introduction or the material to building's HVAC system or by hand. Explosive RDDs function by combining radioactive material with explosives without creating a nuclear detonation. Explosive RDDs are often referred to as a "dirty bomb." These devices can range in size, with the smallest fitting into a suitcase or backpack. The explosives used may be commercially available or homemade. The range of the explosion and the extent of the radiation dispersal will vary based on many factors.

The greatest risk of injury or death from the use of an RDD would come from the explosive blast. The blast itself could kill and injure many people, and the dispersal of the radioactive material might cause severe biological injury to those who were exposed. Immediate dangers include radiation burns and acute radiation poisoning.

In addition to the deaths and injuries that could occur, two additional major concerns of an RDD are the fear it would create in those who possibly had been exposed and the environmental contamination resulting in the potential loss of use of the affected area for an extended period of time.

Several factors determine the effectiveness of an RDD, including the type of radioactive material used, the means of dispersal, the type and quantity of explosive(s) used, the location of the dispersal, and the prevailing weather conditions.

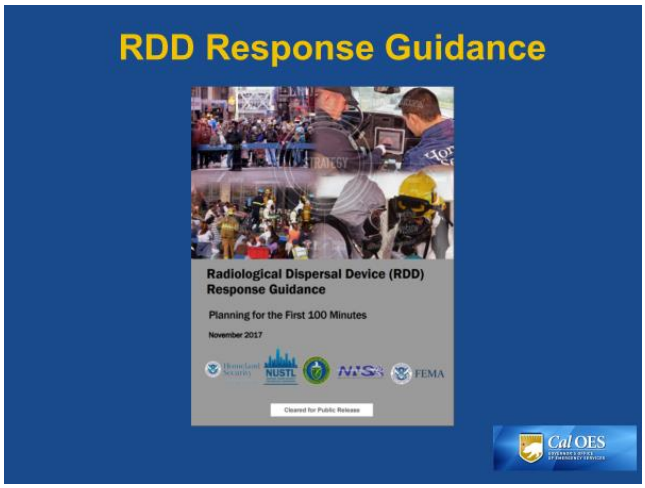


Slide 8.10

When the explosive in an RDD detonates, it disperses the radioactive material over a large area.

The arrow in this slide shows where the RDD detonated.

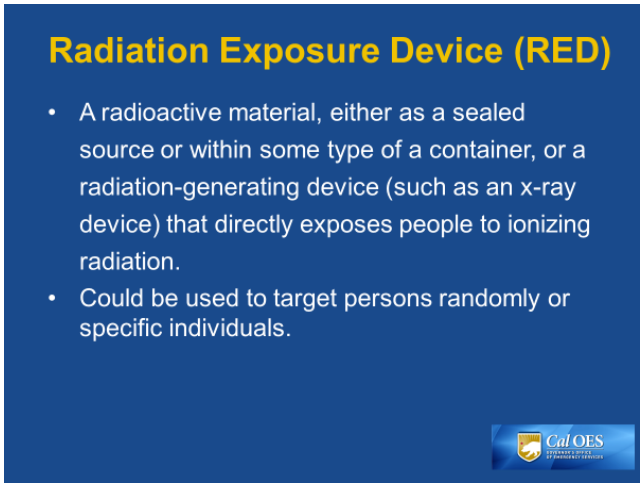
The red circle indicates the potential widespread area of contamination. Levels of radiation would be highest closest to the detonation site and diminish as you move away toward the outer edges of the circle.



Slide 8.11

In November 2017 FEMA/DHS issued federal guidance for RDD incidents response. Titled, *Radiological Dispersal Device (RDD) Response Guidance – Planning for the First 100 Minutes.*

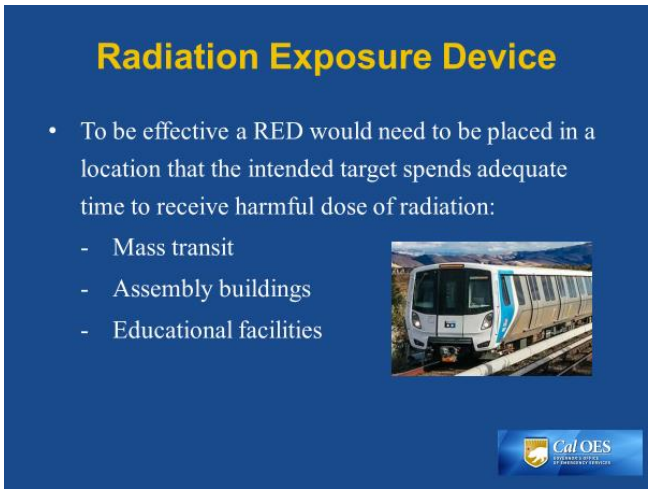
This science-based guidance is intended to equip first responders and emergency managers with the necessary knowledge to properly plan for, and respond to, an RDD incident. This guidance is availble for free download at https://www.dhs.gov/publication/st-frg-rdd-response-guidance-planning-first-100-minutes



Slide 8.12

A Radiation Exposure Device (RED) is a radioactive material, either as a sealed source or within some type of a container, or a radiation-generating device (such as an x-ray machine) that directly exposes people to ionizing radiation.

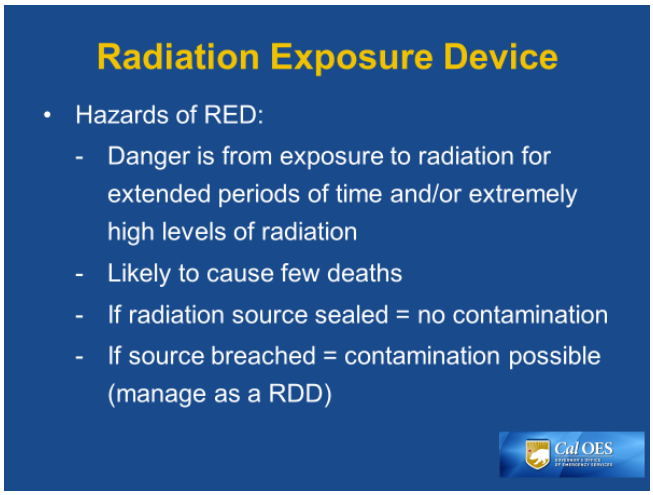
A well placed RED could be used to target persons randomly or specific individuals.



Slide 8.13

To be effective a RED would need to be placed in a location that the intended target spends adequate time to receive harmful levels of radiation exposure:

- Mass transit
- Assembly buildings and areas
- Educational facilities



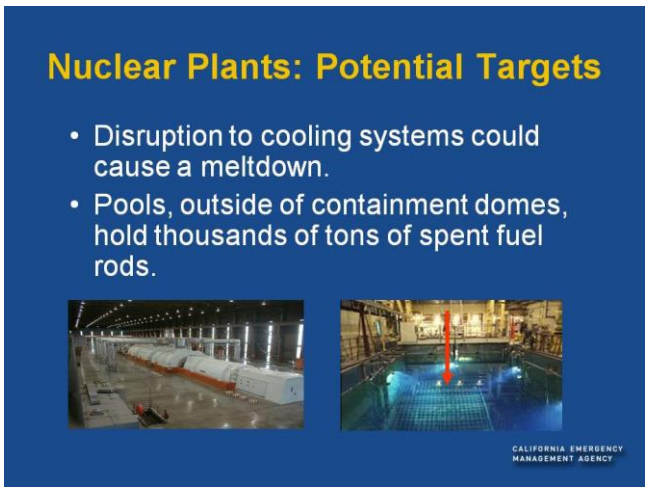
Slide 8.14

Hazards of a RED:

The danger from a RED is from exposure to high levels of radiation for extended periods of time.

REDs may result in injury and illness, but will likely cause few deaths

If a RED's radiation source or container remains intact the device should pose minimal contamination risk. However, if the seal source or container is breached, contamination is likely and the incident should be managed as a Radiological Dispersal Device.



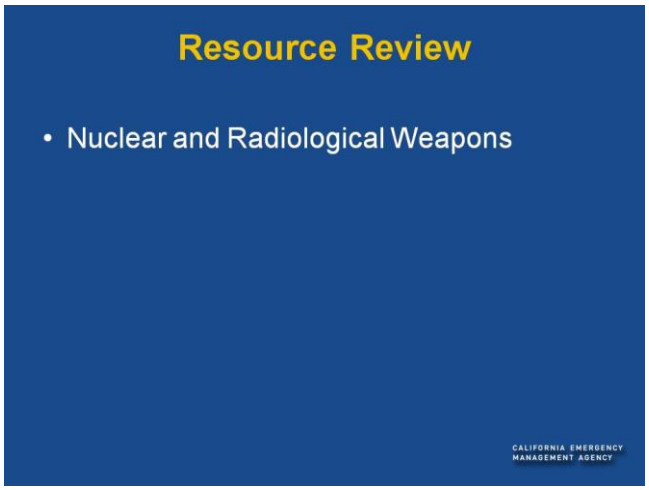
Slide 8.15

Nuclear power plants have long been recognized as potential targets of terrorist attacks. Operating nuclear reactors contain large amounts of radioactive fission products which, if dispersed, could pose a direct radiation hazard, contaminate soil and vegetation, and be ingested by humans and animals. Human exposure at high enough levels can cause both short-term illness and death, or longer-term deaths by cancer and other diseases.

To prevent dispersal of radioactive material, nuclear fuel and its fission products are encased in metal cladding within a steel reactor vessel, which is inside a concrete "containment" structure. Residual heat from the radioactive fission products could melt the fuel-rod cladding, even if the reactor were shut down. Disrupting the cooling systems or emergency power generators could cause a meltdown and release radioactive materials.

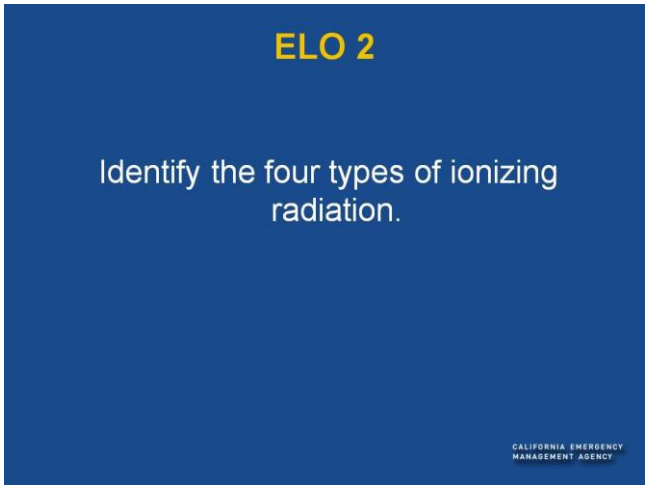
Radioactive "spent" nuclear fuel—which is removed from the reactor core after it can no longer efficiently sustain a nuclear chain reaction—is stored in pools of water near the reactor building or in dry casks elsewhere on the

plant's grounds. Because both types of storage are located outside the reactor containment structure, particular concern has been raised about the vulnerability of spent fuel to attack by aircraft or other means. The primary concern is whether terrorists could breach the walls of a spent fuel pool and drain the cooling water, which could cause the spent fuel to overheat and catch fire.

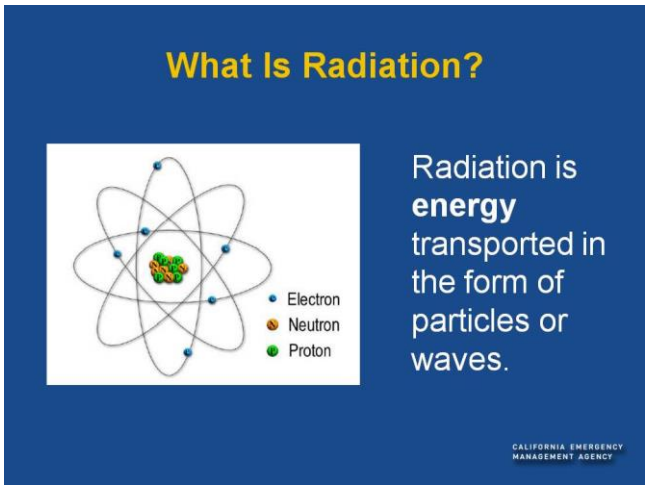


Slide 8.16

This resource provides more information on the three potential forms of nuclear terrorism.



Slide 8.17



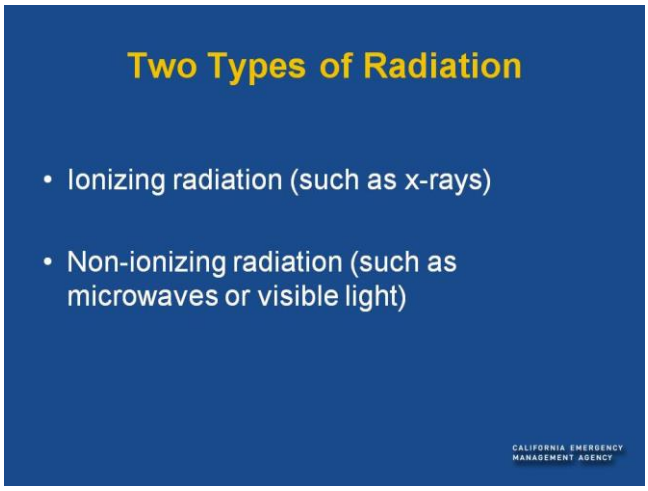
Slide 8.18

The atom is the basic building block for all matter. At the atom's core is the nucleus. The nucleus consists of protons and neutrons, and is surrounded by orbiting electrons. The protons carry a positive charge and the neutrons are neutral, carrying no charge.

The ratio of neutrons to protons in an atom determines whether it is stable or unstable. An atom is stable when the forces among the protons and neutrons within the nucleus are balanced. An atom is unstable if the forces are unbalanced. These unbalanced forces result in an excess of energy, mass, or both.

An unstable atom will attempt to become more stable by emitting the excess energy or mass. Thus, an unstable atom is considered to be radioactive and the emissions in the form of particles or waves are called radiation.

People are actually exposed to radiation all of the time. Scientists estimate that 80 percent of the exposure comes from natural sources, such as radon, rocks, and soil, while the remaining 20 percent derives from man-made sources, such as medical X-rays, consumer products, and fallout from nuclear weapons tests.



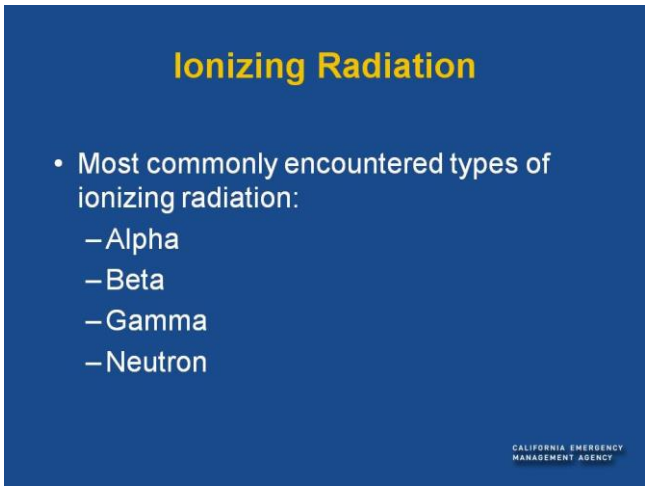
Slide 8.19

The radiation emitted from unstable atoms is referred to as nuclear or "ionizing" radiation. This is the type of radiation that most people usually think of as "radiation."

Ionizing radiation has enough energy to displace or remove tightly bound electrons from atoms. The loss (or gain) of an electron is called ionization and a charged atom (or molecule) is called an ion.

Ionizing radiation can cause damage to living cells, and is the focus of this presentation.

Non-ionizing radiation refers to electromagnetic radiation that has only enough energy to excite electrons (that is, to move an electron to a higher energy state). Examples of this kind of radiation are sound waves, visible light, and microwaves.



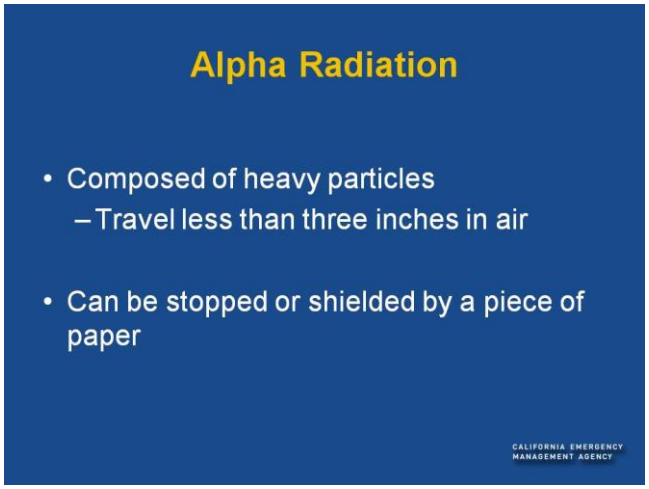
Slide 8.20

The three most commonly encountered types of ionizing radiation are alpha, beta, and gamma. Neutron radiation, which responders are less likely to encounter, is another type of ionizing radiation.

Each type of ionizing radiation can potentially cause damage to the body, yet the manner in which they penetrate the body and cause biological damage differ.

For example, alpha and beta particles do not easily penetrate the body. In fact, a sheet of paper can stop alpha particles, and beta particles do not readily penetrate clothing or the outer layers of skin. However, if alpha and beta particles enter the body through inhalation, ingestion, or open wounds, they can cause damage to cells.

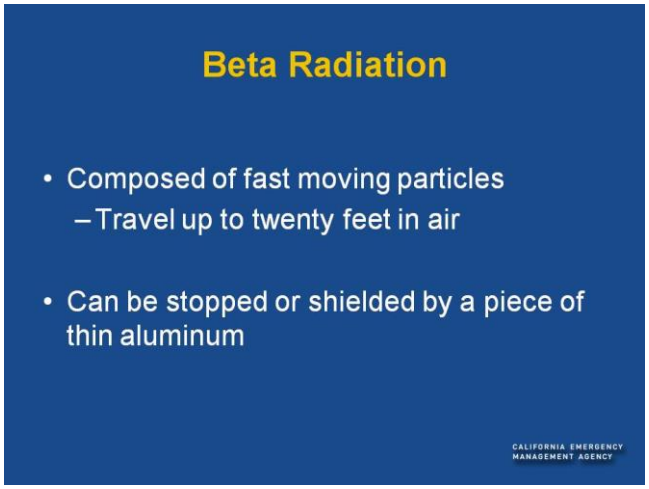
Gamma rays and neutrons, on the other hand, can easily penetrate the body and damage tissue deep within the body. This is the reason gamma and neutron radiation are referred to as “penetrating radiation”.



Slide 8.21

Alpha radiation consists of heavy particles that travel approximately three inches in the air and can be stopped with a sheet of paper.

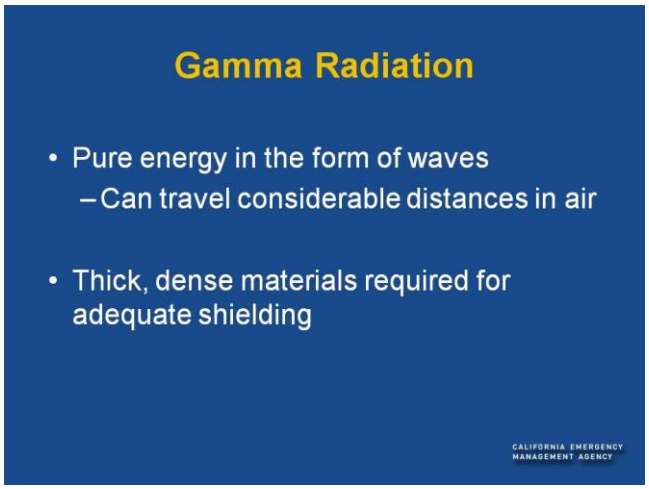
Alpha radiation is a greater concern for internal contamination than for external contamination.



Slide 8.22

Beta radiation is composed of fast moving particles that can travel up to about twenty feet in the air.

Beta presents both an internal and external hazard.

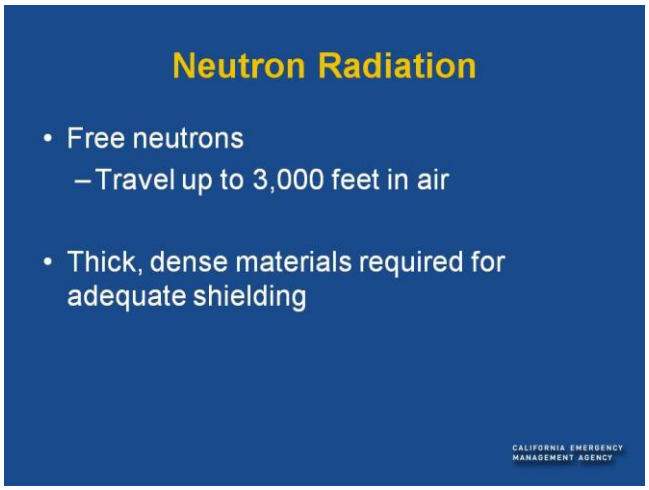


Slide 8.23

Gamma radiation is pure energy in the form of waves and can travel hundreds of feet in the air, depending on the source material.

Alpha and beta particles and gamma rays interact with matter by transferring (giving) energy to the electrons of atoms. The ions formed are easy to measure, using devices such as Geiger counters.

Thick, dense materials are required for shielding against gamma radiation.

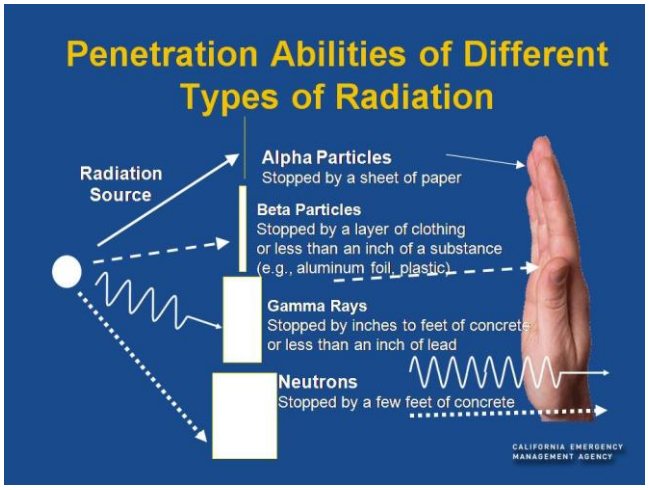


Slide 8.24

Neutron radiation consists of free neutrons, the particles in the nucleus of an atom that do not have a charge. These particles can travel thousands of feet in the air.

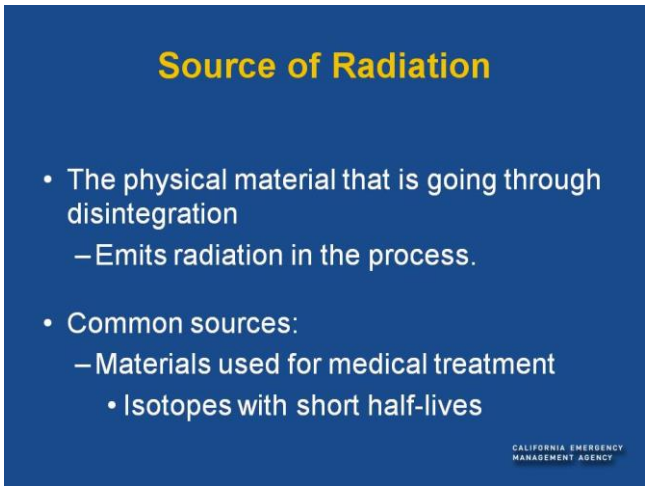
Neutron radiation also has the tendency to be absorbed or “captured” by the nuclei of its target material, making the target radioactive.

Thick hydrogenous materials, such a plastics and other hydrocarbons are the best source of shielding for neutrons.



Slide 8.25

This graphic illustrates the penetration abilities of different types of ionizing radiation.



Slide 8.26

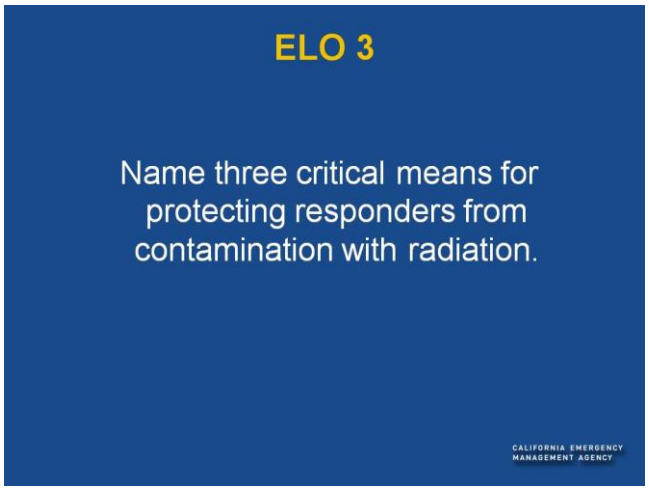
The source of radiation is the physical material that is going through disintegration and, in the process, emitting radiation.

The types of radioactive materials that most people are likely to encounter are those used for medical treatment. The isotopes in these radioactive materials have a relatively short half-life, between several hours to several days, and do not usually produce a significant amount of radiation.

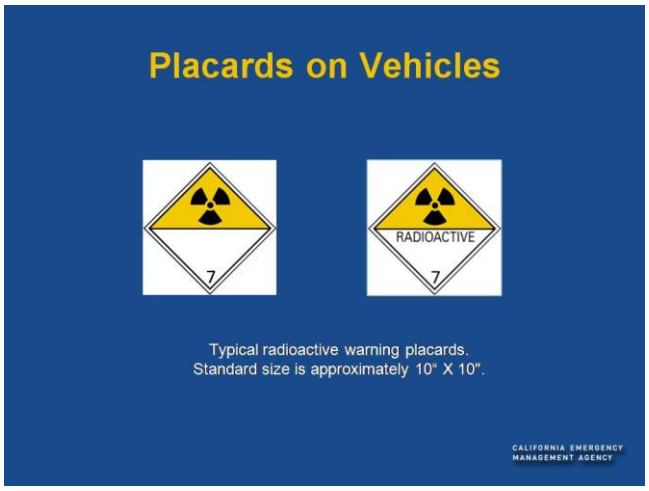
Atoms of the same element can have different numbers of neutrons; the different possible versions of each element are called *isotopes*.

Half-life refers to the time after which the radiation intensity in a radioactive source is reduced by half. Half-lives differ from one radioactive material to another and range from a fraction of a second to millions of years.

Do you know of any facilities or areas within your jurisdiction that contain sources of radiation?



Slide 8.27



Slide 8.28

It is important for responders to be familiar with and pay attention to the various placards, labels, and warning signs that indicate the presence of radioactive materials.

Motor vehicles, rail cars, and freight containers are required to display specific warning placards when transporting certain types and quantities of radioactive materials. As a guideline, the presence of such placards indicates that radiological safety controls are necessary during emergency response activities. Placards are required on all vehicles that transport packages labeled Radioactive Yellow—III and on exclusive-use vehicles, which may have packages without labels.



Slide 8.29

The label to the left, Radioactive White—I, indicates that almost no radiation (0.5 mrem/hr maximum on the surface) is associated with an intact package.

The middle label, Radioactive Yellow—II, indicates that low radiation levels (50 mrem/hr maximum on the surface and 1 mrem/hr at 3 feet) are associated with an intact package.

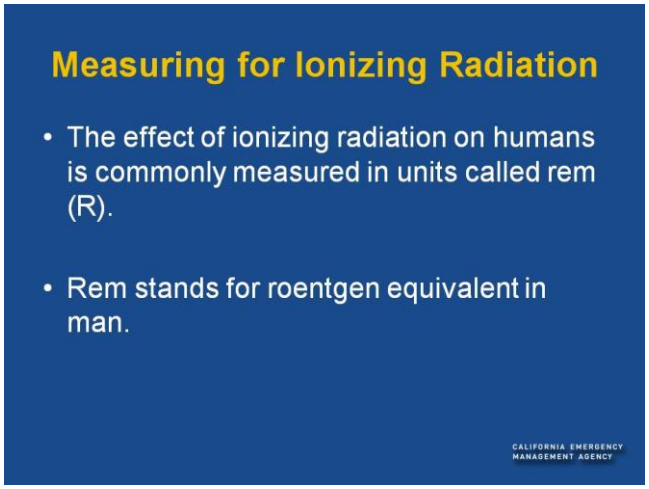
The label to the right, Radioactive Yellow—III, indicates that higher levels of radiation (200 mrem/hr maximum on the surface and 10 mrem/hr at 3 feet) are associated with an intact package. This label also is required for fissile class III materials or shipments containing large quantities of radioactive materials, regardless of radiation level.



Slide 8.30

Radiation hazards can exist at facilities such as hospitals, universities, biomedical laboratories, or industrial sites.

The presence of radioactive materials or devices that generate radiation, such as X-ray machines and nuclear accelerators, is usually indicated by signs or labels. These signs and labels are typically posted on entry doors, storage vaults, cabinets, or containers.



Slide 8.31

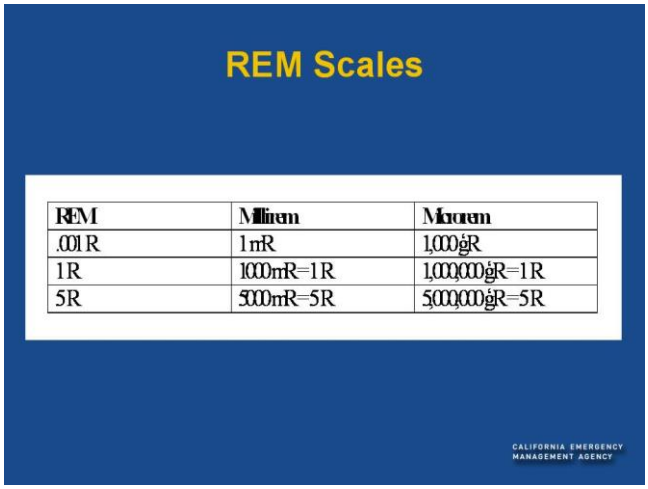
Different terms are used to measure radiation. The conventional unit of measure commonly used in the U.S. for the measurement of radiation in the air is the Roentgen, represented by the abbreviation “R”. The amount of radiation absorbed by a person (the amount of energy deposited in human tissue by radiation) is measured using the conventional unit, “radiation absorbed dose”, represented by the abbreviation “rad”.

The radiation risk that a person will suffer health effects (biological risk) from exposure to radiation is measured using the conventional unit, “roentgen equivalent in man”, or “rem”.

A rem is a dose of ionizing radiation that will produce a biological effect approximately equal to that produced by one roentgen of X-ray or gamma-ray radiation.

The radiation that comes from different radioactive sources will vary. The “activity”, or rate of decay of radioactive material is measured in the conventional unit “curie”, or “Ci”.

(Note: Most scientists in the international community and U.S. military assets measure radiation using the System Internationale [SI], a uniform system of weights and measures that evolved from the metric system. In the United States, however, the conventional system of measurement [curie, rad, rem, etc.] is still widely used.)

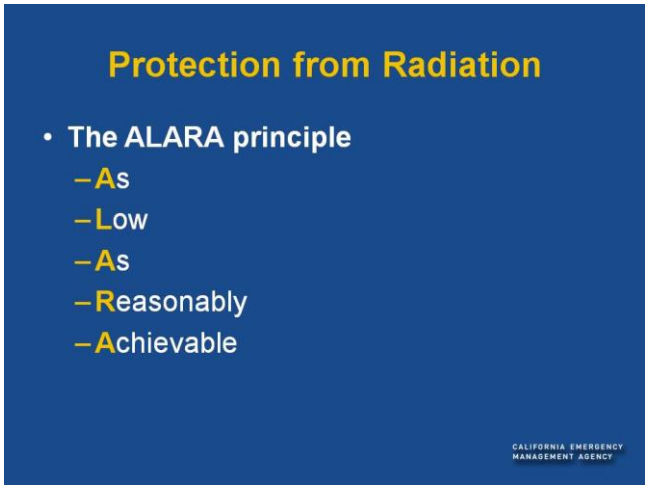


Slide 8.32

Ionizing radiation is also measured in sub-units of the previously discussed units of measure. For example, millirems (mR). Millirems are used more frequently than rems because low levels of radiation are encountered more often. One millirem (mR) equals 1/1,000 of a rem.

When measurements are taken in an uncontaminated area, normal readings are taken in microrems (µR) and referred to as *background radiation*. Background radiation readings vary, but normally fall between the range of 5 to 30 microrem (µR/hr).

One microrem (µR) equals 1/1,000,000 REM or 1/1,000 mR.

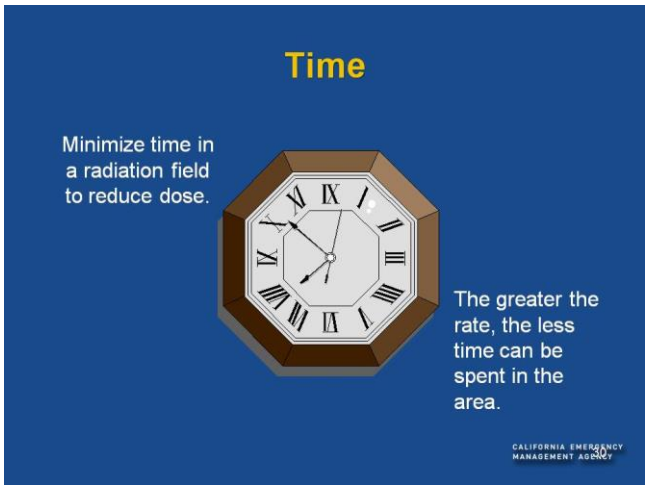


Slide 8.33

Following the ALARA principle reduces exposure to a minimum level of radiation. ALARA stands for *as low as reasonably achievable*.

The chief tools for following the ALARA principle are time (T), distance (D), and shielding (S).

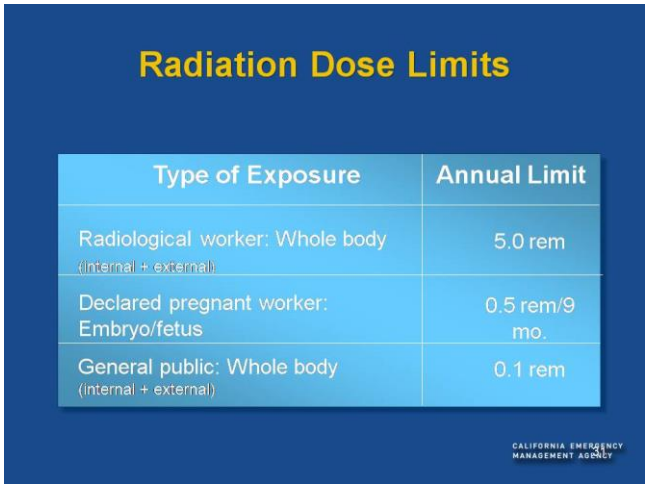
Reducing the time in the vicinity of a source, increasing the distance between personnel and the source, and using shielding material between personnel and the source whenever possible are the three critical means for protecting responders from contamination with radiation.



Slide 8.34

Given the exposure rate per hour, the time that personnel can stay in various radiation fields before dose limits are reached can be calculated.

At higher exposure rates, it will take less time to reach a given exposure dose.

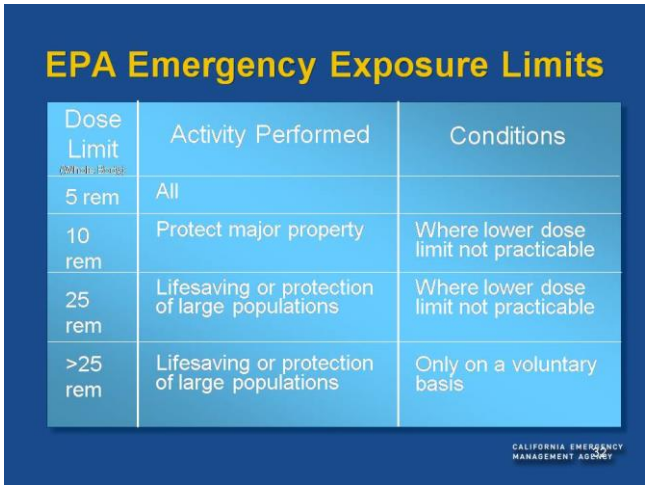


Slide 8.35

The biological effects of radiation depend on how much of the energy from the radiation is absorbed by the body and which tissues or organs within the body have absorbed the radiation. (For example, blood forming organs are more sensitive to radiation than the nervous system.)

The radiation dose is a calculation that divides the amount of energy absorbed by the tissue mass exposed.

This concept is roughly comparable to that of a drug dose, which may be expressed in units of milligrams of the delivered drug per kilogram of body weight.



Slide 8.36

Environmental Protection Agency (EPA) guidelines allow first responders to acquire a dose of up to 5 rem on an annual basis. However, it is unlikely for first responders to acquire 5 rem of radiation in one year during the normal course of emergency response operations.

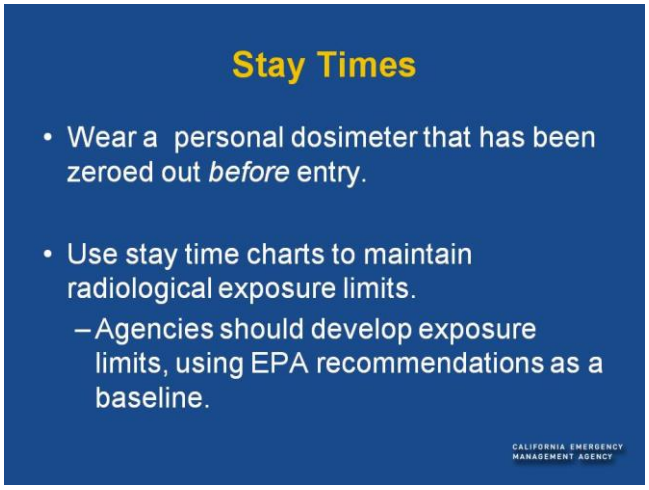
The EPA also takes into account emergency exposures in situations where the lower dose limit is not practicable. Doses of radiation above the 5 rem level are special-event exposures (for example, up to 10 rem to protect major property and up to 25 rem to save lives or protect large populations).

Moreover, a responder who has acquired an exposure of 25 rem may not be exposed again to ionizing radiation as a result of work activities in his or her lifetime.

The effects of radiation usually cannot be detected until an acute dose of 25 rem has been received. No long-term adverse health effects have been seen in single exposures below 50 rem. The short-term effects that have been seen in single exposures below 50 rem are reversible changes in white blood cell counts.

In effect, the EPA's guidelines for limiting exposure to a dose of 25 rem during a lifesaving emergency provide a 50 percent safety margin for responders.

If viable victims were in need of rescue, but rescuing them would mean you would receive an exposure of 25 rem, would you go in?



Slide 8.37

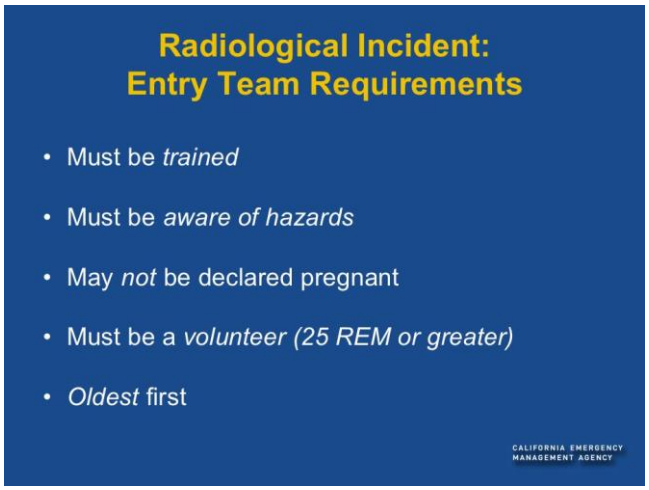
Stay time is the amount of time that a person can safely remain in a radiation field. Specifically, it is the time in minutes that, multiplied by the current dose rate, would reach the set-point for a high-dose alarm on a personal dosimeter.

A stay time chart is a valuable tool for calculating rates and doses.

Whenever rescuers enter a radiological field, they should wear a personal dosimeter that has been zeroed out *before* entry operations.

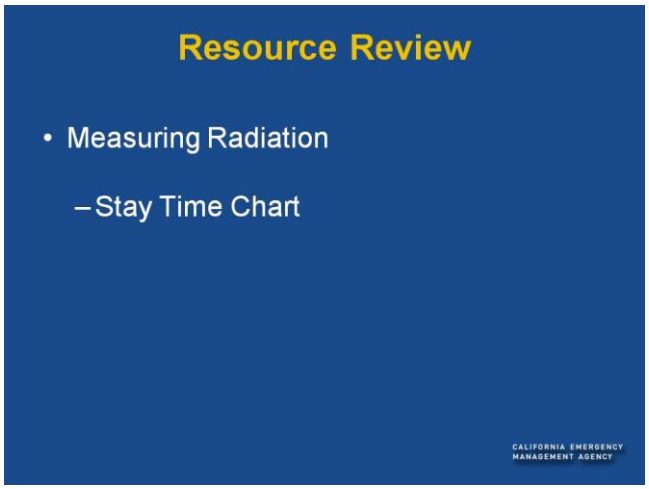
However, the lack of available personal dosimetry should not solely prohibit emergency personnel from conducting rapid rescue operations during RDD incidents. In the absence of personal dosimetry incident command personnel should implement appropriate dose management actions (e.g., personnel rotation, work area radiation surveys, dose and stay time calculations, representative dosimetry).

A dedicated member of the team should use stay time charts to maintain radiological exposure limits. Agencies should develop these exposure limits, using EPA recommendations as a baseline.



Slide 8.38

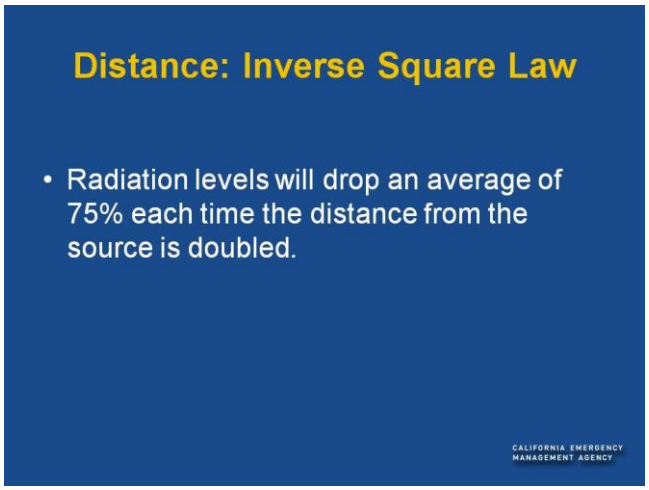
Members of the entry team for radiological incident should be properly trained (e.g., to NFPA 472 Annex D mission-specific competencies, technician/specialist level), be fully aware of the hazards and may not be declared pregnant. For lifesaving purposes members of the entry team for incidents 25 REM or greater, must be fully aware of risk and must volunteer. Consideration should be given to using the older team members first.



Slide 8.39

Among other information, the fact sheet on measuring radiation explains the terms used to describe characteristics of radioactive materials, which fall into two groups: those that describe the intensity of the radiation and those that describe the biological effects of the radiation.

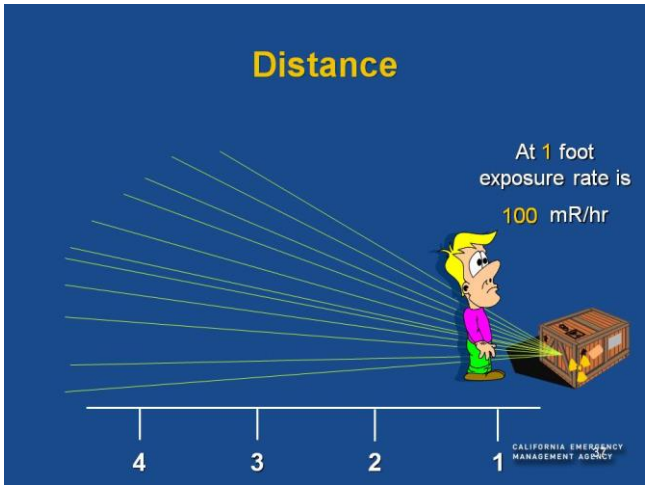
The Stay Time Chart in this section is a useful tool for calculating acceptable exposure times. Use this table to calculate how long it would take to reach 5R if the rate was 100mR/hr.



Slide 8.40

The Inverse Square Law provides a strategy for minimizing exposure.

For example, if a radiological source emitted 100R/hour at a distance of 10 feet, doubling the distance from the source to 20 feet would reduce radiation levels to 25R/hour.

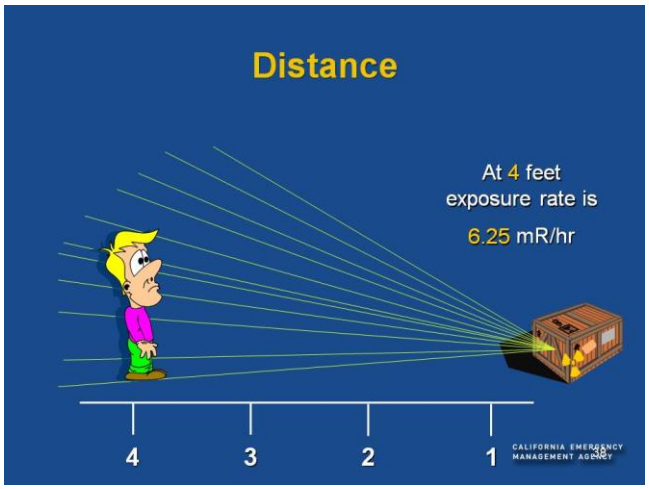


Slide 8.41

The intensity of the radiation field increases as responders approach the source. Conversely, increasing the distance between responder and source of radiation will reduce the amount of exposure received.

Alpha, beta, and gamma radiation travel different distances, but one rule remains the same: the farther away the source, the less the radiation effect.

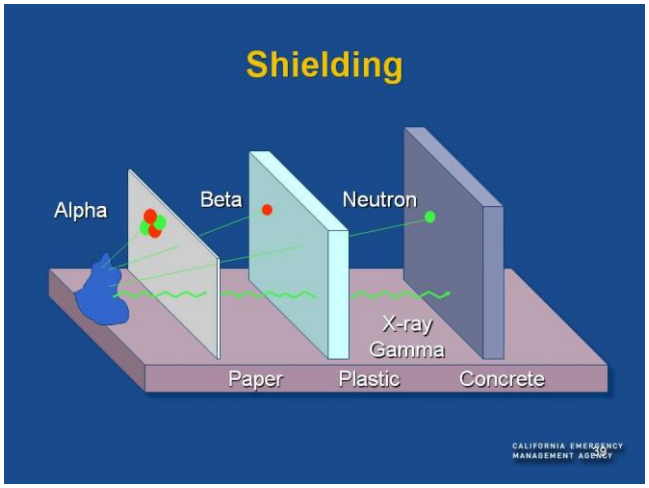
If the character in this slide were to move a total of four feet away from the source, using the Inverse Square Law, what would his exposure rate be?



Slide 8.42

If your answer to the question in the previous slide was 6.25 mR/hour, you are correct.

If you didn't get that answer, take a moment to recalculate, using the Inverse Square Law.



Slide 8.43

Shielding is the third method for protecting responders against exposure to radiation. A shield placed between the source of radiation and the responder will absorb some of the radiation.

This slide illustrates various materials for shielding against the four types of ionizing radiation:

220. Alpha particles can generally be shielded by a piece of paper.

221. Beta particles are more penetrating than alpha particles. A thin sheet of aluminum can generally stop beta particles.

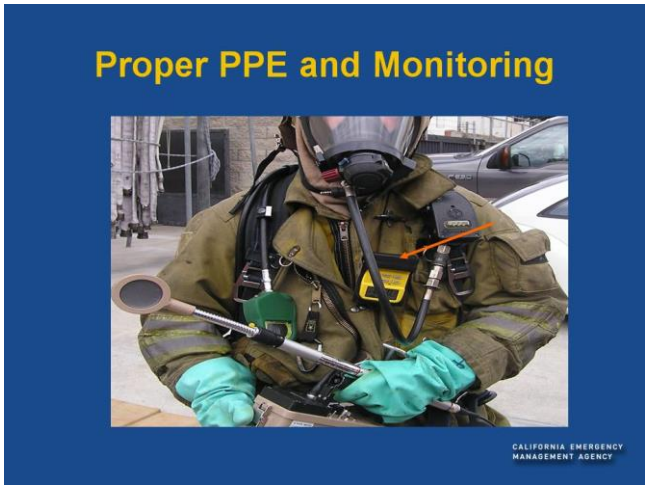
222. Gamma radiation is the most difficult to shield against. The penetrating power of gamma energy is due, in part, to the fact that it has neither charge nor mass. It does not interact as readily as the other types of radiation. Very dense materials such as lead, steel, and concrete are needed to provide shielding from gamma radiation.

223. Neutrons can pass through lead and require concrete to provide shielding from this form of ionizing radiation.



Slide 8.44

In this video, the basic principles of time, distance, and shielding are discussed as a critical means for protecting responders against dangerous exposures to radiation.



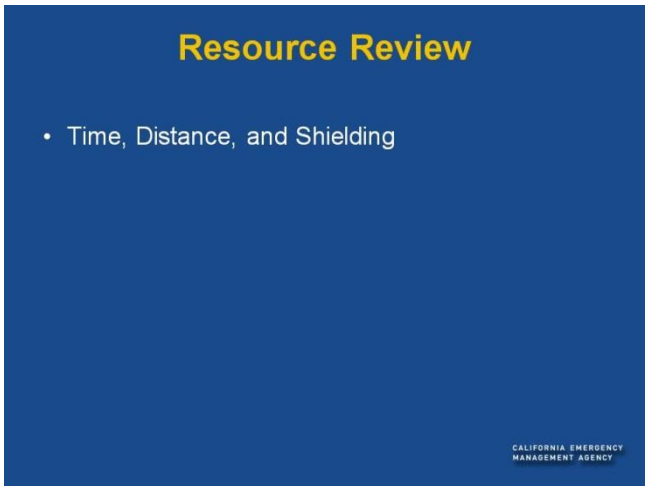
Slide 8.45

This slide illustrates a firefighter using self-contained breathing apparatus (SCBA), turnouts, nitrile gloves, and a personal dosimeter (indicated by the red arrow).

Donning structural personal protective equipment (PPE) and SCBA and monitoring a personal dosimeter provide the primary means of protection from most forms of radiation. Alpha radiation represents a risk only if inhaled or ingested, and donning an SCBA eliminates this route of exposure.

Using the proper PPE, in combination with survey meters, is the best means of preventing injury from radiation sources.

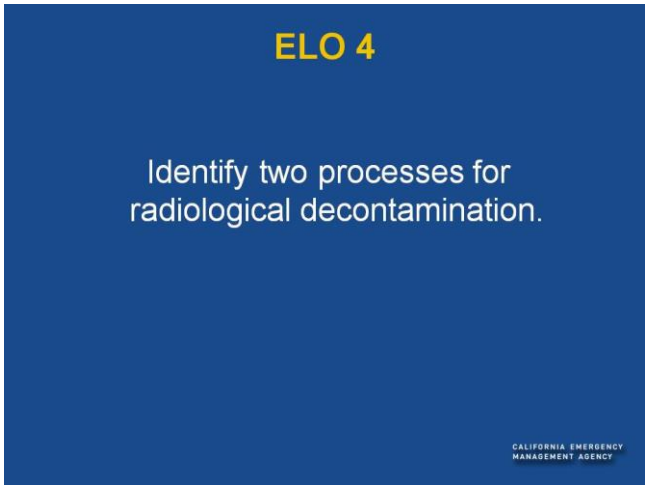
When donning an electronic personal dosimeter, remember the “three R’s”, Record, Report, and eRase (“zero out”) the accumulated dose reading upon dispatch or prior to entry operations. Recording and/or reporting the existing dose on electronic dosimeters ensures the previous dose is recorded (especially important for incidents involving shared dosimetry and multiple entry operations). Zeroing out the accumulated dose reading will ensure an accurate dose reading. “Personal issued” (non-shared) electronic dosimetry does not need to be “zeroed out” prior to repeated entry operations if measurement of the incident’s total accumulated dose is indicated or desired.



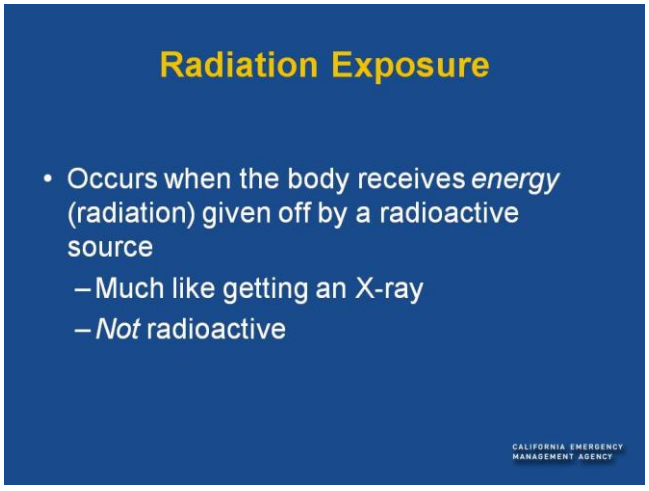
Slide 8.46

This fact sheet emphasizes the basic principles of time, distance, and shielding as simple—yet essential—ways to protect responders' health and safety.

Basically, this resource exhorts responders, when in the field, to reduce time, increase distance, and use shielding as protective measures.



Slide 8.47

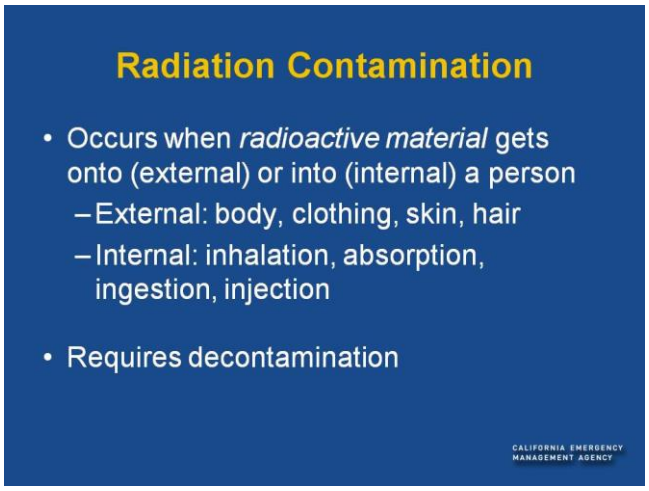


Slide 8.48

Exposure occurs when all or part of the body receives the energy (radiation) from a radioactive source, whether outside the body (external exposure) or within the body (internal exposure).

A person who has been exposed to radiation has had radioactive waves or particles penetrate the body, like having an X-ray.

The source of radiation, the radioactive material, has not come directly into contact with the person. As a result, the person is not radioactive. The person has only been exposed to the energy from the alpha, beta, or gamma radiation and received a dose of radiation exposure to the body.



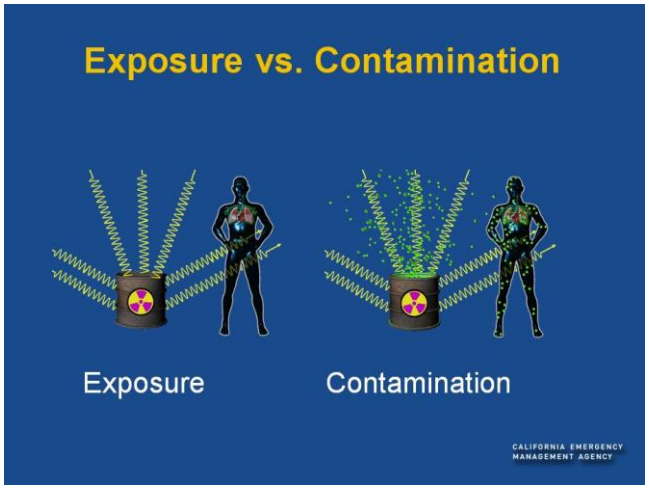
Slide 8.49

Contamination occurs when the radioactive material is actually on or in a person. Radioactive contamination may occur when a radioactive material (gas, liquid, or solid) is released into the environment and contaminates people either externally or internally, or both.

A person may have **external** contamination, which is found on the body. Clothing, skin, and hair are the most common examples of external contamination.

Internal contamination can occur when the product enters the body through inhalation, ingestion, absorption, or injection. Internal contamination may occur from inhalation of gaseous or airborne particles through the respiratory tract. Another route of entry for internal contamination is through ingestion. Radioactive contamination enters the body through the gastro-intestinal tract.

Some radioactive materials may be absorbed through the skin or mucous membranes in the eyes, nose, or mouth. Radioactive material can also penetrate into the body through cuts, wounds, or punctures in the skin.



Slide 8.50

This slide illustrates the difference between radiation exposure and contamination.



Slide 8.51

The purpose of decontamination procedures in a radiological incident is to:

224. Control the spread of contamination on or by people beyond the initially contaminated area

225. Prevent inhalation, ingestion, or absorption of radioactive material through the skin

There are two types of procedures for decontamination in a radiological incident: dry decon and wet decon.



Slide 8.52

Radiological decontamination usually starts with dry decontamination procedures.

Dry decon excludes the use of water and relies on the physical removal of the most heavily contaminated areas.

**SHOULD THIS BE INCLUDED IN THE DECON BLOCK TOO?



Slide 8.53

The first step in dry decon is to identify contaminated areas with the use of radiological survey equipment.

The second step is to remove the contaminated material:

226. If contamination is found on clothing, the clothing must be removed.

227. If contamination is found on bare skin, removing the contaminated material can be accomplished by either brushing the skin with a soft brush; using the sticky surface of masking tape, blue painter's tape, or medical tape; or vacuuming the skin with a specialized vacuum, such as those manufactured by Nilfisk.

(Inclusion of this manufacturer does not imply endorsement by the California Office of Emergency Services or any official entity of the State of California.)



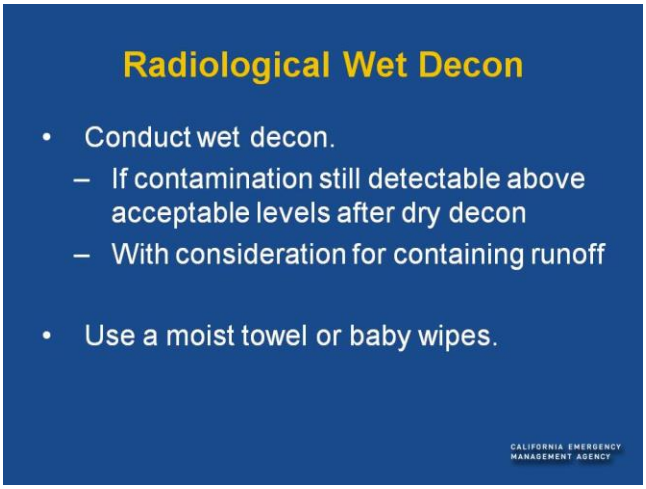
Slide 8.54

This slide illustrates the use of a soft brush.



Slide 8.55

This slide illustrates the use of tape wrapped upon a soft brush.



Slide 856

Wet decon should be conducted only when dry decon has already been completed, but contamination remains above acceptable levels.

Use a wet object, such as a moist towel or baby wipes, to minimize the use of water when conducting wet decontamination procedures for small, sensitive areas.

However, the use of more traditional wet decontamination methods (technical decon using showers or hoses) are likely be appropriate for a mass casualty incident.



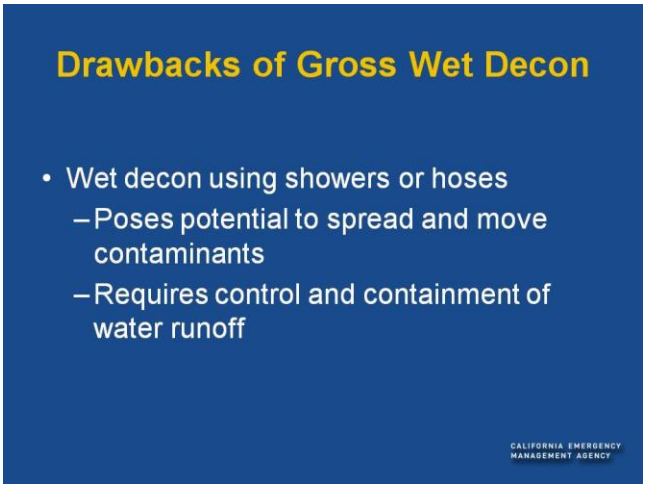
Slide 8.57

This slide illustrates the use of a wet towel.



Slide 8.58

This slide illustrates the use of a wet sponge.

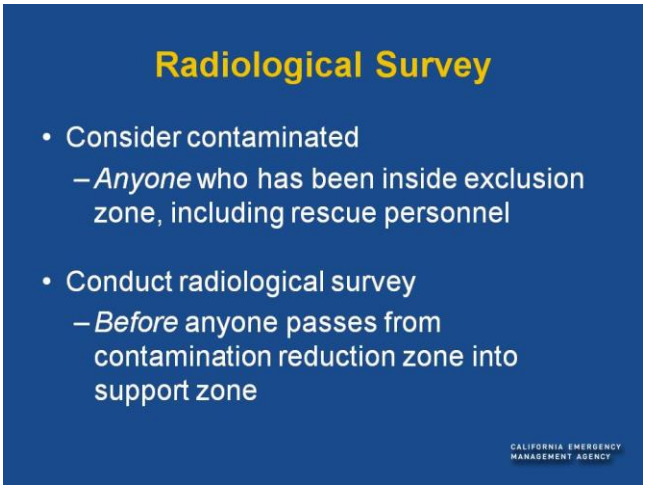


Slide 8.59

Traditional methods of decontamination include the use of water. The water may be in a bucket, spray device, firefighting hose, or shower system. Water is very effective for decontaminating victims.

However, with traditional wet decon, the contaminated waste water becomes another issue to address. Water runoff poses the potential to spread and move the contaminants to uncontrollable areas, and the water runoff must be controlled and contained.

Traditional wet decontamination is not always the best course of action at a radiological incident.



Slide 8.60

Anyone who has been inside the exclusion zone of a radiological incident should be considered contaminated. This includes rescue personnel and victims.

Individuals leaving the Exclusion Zone should be surveyed to identify if they have been contaminated, or just exposed. If contaminated, then focused decon should be conducted to remove radiological material. Then, before these individuals are allowed to pass from the contamination reduction zone (CRZ) into the support zone, they should be surveyed again with radiological equipment to prevent the spread of contamination and to protect emergency responders from exposure to radioactive materials.



Slide 8.61

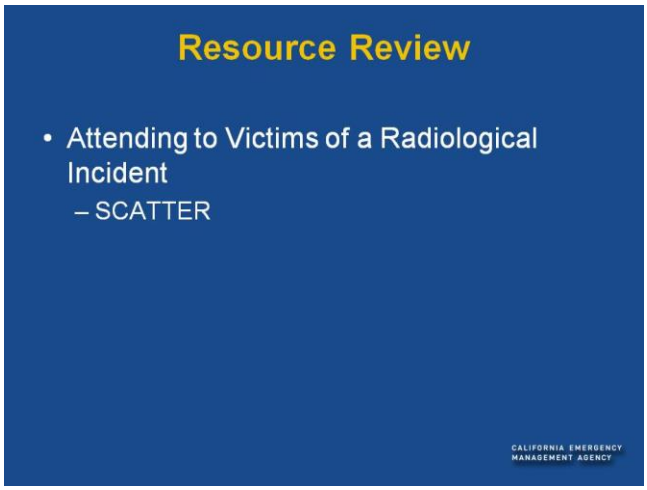
When victims have life-threatening traumatic injuries, medical care and transportation to facilities should not be delayed to complete decontamination procedures.

Under these circumstances, steps should be taken to confine the contamination as much as possible (such as removing the victim's clothing or wrapping the victim in a sheet).

It is essential to notify the receiving hospitals that contaminated victims are on the way and will be arriving soon.

What should the policies be for transporting a victim who has traumatic injuries, yet may still be contaminated?

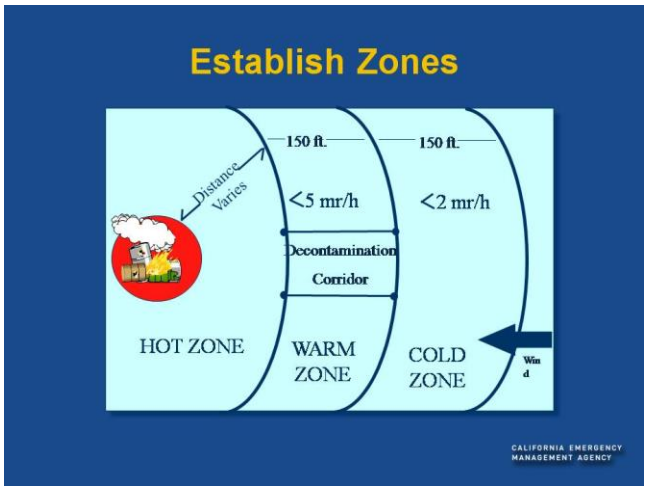
Keep in mind the "golden hour." The golden hour is the first 60 minutes after the occurrence of a major multisystem trauma. It is widely believed that the victim's chances of survival are greatest if he or she receives definitive care within the first hour.



Slide 8.62

This section provides important information on preparing victims of a radiological incident for transport and transfer of care. In particular, "SCATTER" offers a simple, seven-step approach to help rescuers quickly and safely rescue victims involved in a radiological incident.

SCATTER is discussed in greater detail later in this module.



Slide 8.63

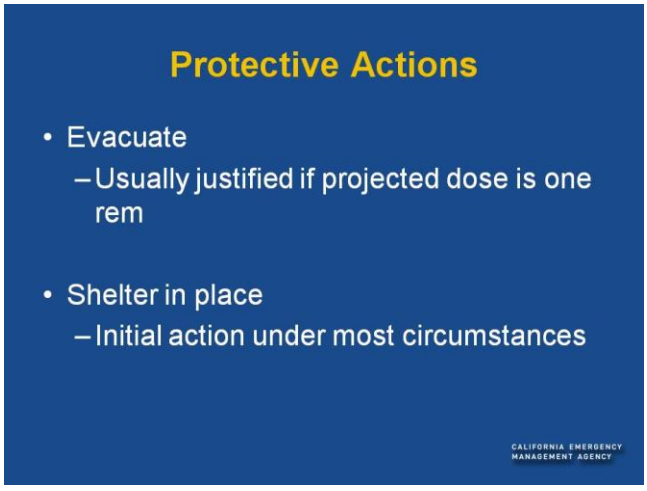
One of the first things that should be done during a radiological incident is to establish a clearly marked decontamination area upwind of the exclusion (hot) zone. What are the radiological readings for the exclusion zone line?

Barricades and identifying features of the decontamination system should be obvious to responders and civilians. Barricade tape or traffic cones can be used to identify the decontamination area. The warm zone is the contamination reduction zone.

Responders should anticipate having to provide decontamination for civilians, because receiving hospitals will be limited in their ability to cope with contaminated victims. Under normal circumstances, enough time should be available to provide complete decontamination to victims.

Direct victims to enter the decon area. Have decon personnel meet the victims and use radiological survey instruments to locate contamination. At the first indication of contamination, they should be directed to the dry decon area. Individuals who are completely surveyed, and for whom no contamination has been found, should be directed to a treatment area.

The perimeter control line (which separates the support zone, an area within the cold zone, from the contamination reduction zone) should be established where readings are less than twice background and not less than 100 feet from the exclusion zone perimeter. Use natural barriers or yellow fire line tape to mark the perimeter control line.



Slide 8.64

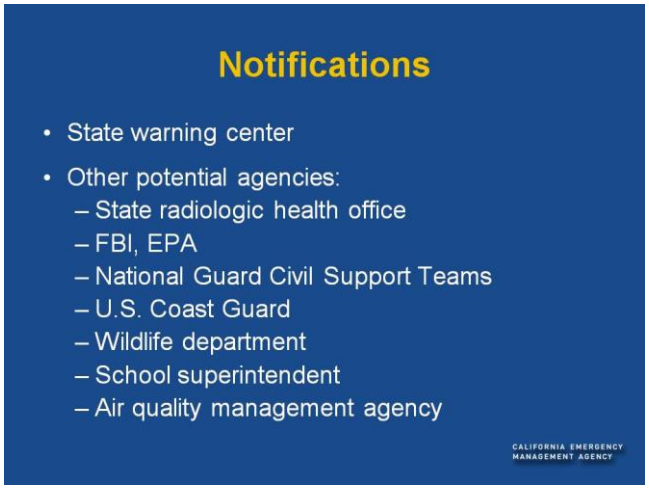
Like other hazardous material incidents, an incident involving radioactive materials may require the difficult decision to evacuate the exposed population or recommend that populations shelter in place.

The EPA guidance on this issue states that “evacuation of the public will usually be justified when the projected dose to an individual is one rem.” (EPA 400/R-17/001, *PAG Manual: Protective Action Guides and Planning Guidance for Radiological Incidents,* January 2017)

If evacuation is more likely to produce injury than staying sheltered, sheltering in place should be considered—even when the projected dose is one rem. Under most anticipated conditions, the initial protective action may be to shelter the public in place.

In all but the most severe conditions, there should be sufficient time to consult subject matter experts (SMEs) to identify the stay time within the impacted area. Most SMEs agree that an RDD event is unlikely to distribute radioactive material with a dose level above one rem over large areas.

If the decision is to evacuate, a carefully crafted plan should be developed to accomplish the mission before carrying out the evacuation. Most localities with facilities that contain radioactive material have such evacuation plans.



Slide 8.65

A number of valuable resources, such as the state warning center, are available during a radiological incident. California's state warning center for radiological incidents is part of the California Office of Emergency Service (CalOES). These agencies provide SMEs and specialized resources.

In California, notifying the Radiologic Health Branch, which is under the California Department of Public Health, can initiate the request for federal resources. In addition, notifying the Radiologic Health Branch can yield technical resources, such as experts in radiation, to assist the incident commander.

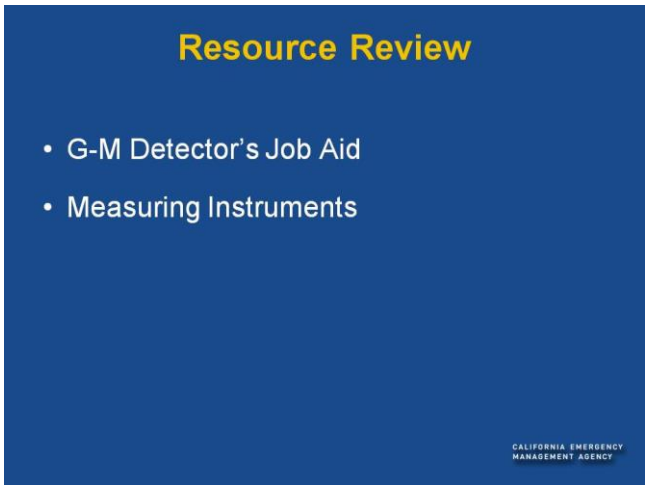
Even the least serious release of a radioactive isotope will require appropriate notifications and assistance. In addition to hazardous materials resources, several agencies may need to be notified as a result of a radiological incident.

A notification list is an effective tool and should be updated periodically. What are some other agencies and assets that might be added to this partial list?



Slide 8.66

This video demonstrates how to properly conduct an inspection, battery check, source check, background reading, and radiological survey using a Geiger-Mueller detector.



Slide 8.67

The G-M Detector's Job Aid is a concise description and visual aid for conducting a radiological survey.

The section on measuring instruments provides descriptions of various types of radiation detection equipment and includes a list of suppliers.



Slide 8.68

Since its discovery at the close of the 19th century, radiation has been used in both constructive and destructive ways.

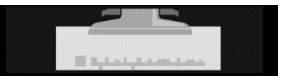
Hazardous materials responders must be prepared to handle incidents, whether intentional or not, that involve radiological substances.

In a terrorist attack, additional challenges arise. Responders must first determine if radiation is involved. If radiation is involved, responders must then identify the type of radiation used. In addition, the potential radiation doses to which responders and the public may be exposed must be determined.

To protect themselves in the field, responders should always use time, distance, shielding, and proper PPE. The use of a personal dosimeter also is an essential tool during a radiological incident.

Radiological meters should be used to establish and confirm zones boundaries. When rescuing victims during a radiological incident, responders should employ the SCATTER method. SCATTER stands for size up the scene, control zone, access and assess victim for life-threatening injuries, treat victim for life-threatening injuries, take the victim away from the hazard, expose the victim, and radiation precautions.

Chapter 8



Resources

Nuclear and Radiological Weapons

228. Beginning with the dawn of the nuclear age in the late 1940s, the hazards of nuclear materials and technology have been a serious concern. As access to nuclear technology has proliferated throughout the world, the danger has continued to grow. In recent years, the many cases of smuggling and black market trafficking of nuclear materials have caused alarm among security officials. The prospect of a nuclear weapon in the wrong hands is a chilling reminder of modern society's vulnerability to weapons of mass destruction.

Potential Forms of Radiological/Nuclear Terrorism

229. Terrorists are likely to use four approaches to radiological/nuclear terrorism. They include detonation of a fission device ("atomic bomb"), the release and dispersal of radiological materials by non-explosive or explosive means, exposing people to harmful level of radiation from radiological material or a radiation generating device, and a large-scale conventional explosive device detonated in proximity to a target containing large amounts of nuclear materials (such as a power plant or similar facility).

Detonation of a Fission Device

230. Fortunately, the difficulty in obtaining the fissile materials (also known as special nuclear materials), which are the foundation of nuclear explosives, has largely kept the proliferation of these weapons in check. However, since the breakup of the former Soviet Union, where both inventory control and security of nuclear materials remain problematic, the potential for proliferation of nuclear weapons through smuggled materials has increased dramatically.

231. The naturally occurring fissile material used in the construction of nuclear weapons is a particular isotope of uranium, uranium-235 (U-235). U-235 is found in low concentrations with its more abundant sister isotope, U-238, in many places throughout the world. U-235 is obtained by enrichment, using one of several technically challenging processes. Another fissile material used for the production of nuclear weapons is an isotope of plutonium, plutonium-239 (Pu-239). Pu-239 is synthesized by irradiating U-238 with neutrons in a nuclear reactor. Plutonium-239 has a half-life of 24,100 years.

232. Theft of an operational nuclear device would be even more difficult than acquiring the materials to build one. Strict national and international security measures make it very unlikely that an entire bomb could be acquired. Even if a nuclear weapon were stolen, activating it would require knowing a multi-digit code. (All Western and former Soviet nuclear devices incorporate the Permissible Action Links [PAL] security system, which will render the weapon safe, unless the correct multi-digit code is entered.)

Use of a Radiological Dispersal Device

233. The use of a Radiological Dispersal Device, or RDD, is far more likely than an actual nuclear detonation. An RDD functions by intentionally releasing (dispersing) the radiological material contained in or on the device. An RDD can function by non-explosive or explosive means. A non-explosive RDD utilizes mechanical or non-mechanical means to release its radiological material. Examples include using spraying devices, introduction of the material in to building heating, ventilation and air conditioning (HVAC) systems, from a moving vehicle, or simply by hand. A particular concern of a non-explosive RDD is that there may be no other readily identifying incident (e.g., an explosion) to signal that a dispersal has taken place. Recognition that the dispersal has taken place could be delayed until victims begin to demonstrate signs and symptoms associated with radiation exposure and contamination.

234. An alternate mean of dispersal is an explosive RDD. In this scenario, radioactive materials are combined with (packed around) conventional explosives.. When the explosive detonates, it disperses the radioactive material over a wide area. Depending on the material, both long-term and short-term hazards can be generated with such a device. Immediate dangers include radiation burns and acute poisoning. Long-term hazards include forms of cancer and contamination of ground water. This could lead to increased public fear, social and economic disruption, the loss of use of large areas for potentially extended periods of time and significant environmental concerns.

235. **Use of a Radiation Exposure Device**

236. While likely not as significant of an impact as an RDD, and Radiation Exposure Device, or RED, still poses significant concern. By design, a RED is intended to expose persons to harmful levels of radiation without releasing radiological material. A RED may consist of a sealed source, radiological material in a sealed container, or a radiation generating device, such as an X-ray device. A RED could be used to target people randomly or specific individuals. In either case, victims would need to remain in the affected area for the amount of time necessary to receive a harmful dose. A RED will like result in few deaths. However, public fear of radiation could have significant impact to the incident area. Because of the lack of contamination, the response and recovery associated with a RED incident may be less challenging. However, if the sealed source is breach resulting in contamination the incident should be managed similarly to a RDD.

Targeting a Facility

237. The fourth possible form of nuclear terrorism is to target a facility containing nuclear materials. This could be done by attacking the facility with conventional explosives, perhaps by aircraft. The expectation would be the widespread contamination of radioactive materials. Terrorists might also try to sabotage a nuclear reactor facility by disabling its cooling system, resulting in a large scale release.

Measuring Radiation

238. The terms used to describe characteristics of radioactive materials fall into two groups: those that describe the intensity of the radiation and those that describe the biological effects of the radiation. The intensity of a radioactive material is based upon how fast it is disintegrating, giving off particles or waves of energy. This is referred to as the activity.

239. The terms that address the activity of a radioactive material do not provide information about its biological effects. It is important to remember that the **terms for activity and the terms for exposure on a response level do not have any correlation**. In other words, even if a product has a low number of curies, this does not necessarily mean it represents a low exposure hazard.

240. Most scientists in the international community measure radiation using the System Internationale (SI), a uniform system of weights and measures that evolved from the metric system. In the United States, however, the conventional system of measurement (curie, rad, and rem) is still widely used.

Terms for Activity

241. **Becquerel (Bq):** The SI unit used to express the number of disintegrations of radioactive atoms in a radioactive material over a period of time. The Bq is equal to one (1) disintegration (release of a wave or particle) per second.

242. **Curie (Ci):** One Ci is equal to 37 billion (37×10^9) disintegrations per second. The Ci is being replaced by the Bq. Since one Bq is equal to one disintegration per second, one Ci is equal to 37 billion (37×10^9) Bq.

243. **Half-life:** The amount of time it takes for half the number of atoms of a source to disintegrate into another form. *(Note:* A source of radioactive material that has gone through one half-life may still be radioactive.)

Terms for Biological Effect

244. **Dose:** The accumulated radiation impact at a measuring point.

245. **Rate:** The calculated potential of the dose received in one hour at a specific location.

246. **Roentgen (R):** A unit of exposure used in measuring ionizing radiation, as X-rays or gamma rays, equal to the quantity of radiation that will produce, in 0.001293 grams (1 cubic centimeter) of dry air at NTP, ions carrying one electrostatic unit of electricity of either sign.

247. **MilliRoentgen (mR):** 1/1000 of a Roentgen

248. **MicroRoentgen (µR):** 1/1,000 of a milliRoentgen or 1/1,000,000 of a Roentgen

249. Rad: When a person is exposed to radiation, energy is deposited in the tissues of the body. The amount of energy deposited per unit of weight of human tissue is called the absorbed dose. Absorbed dose is measured using the conventional rad or the SI Gy.

250. **Roentgen Equivalent in Man (rem):** A dosage of any ionizing radiation that will produce a biological effect approximately equal to that produced by one roentgen of X-ray or gamma-ray radiation.

251. Millirem (mREM): 1/1000 of a rem

252. **Sievert (Sv):** A person's biological risk (that is, the risk that a person will suffer health effects from an exposure to radiation) is measured using the conventional unit **rem** or the SI unit **Sv**. One (1) Sv is equal to 100 rem.

253. To determine a person's biological risk, scientists have assigned a number to each type of ionizing radiation (alpha and beta particles, gamma rays, and X-rays) depending on that type's ability to transfer energy to the cells of the body. This number is known as the Quality Factor (Q).

254. When a person is exposed to radiation, scientists can multiply the dose in rad by the quality factor for the type of radiation present and estimate a person's biological risk in rems. Thus, risk in rem = rad XQ.

Exposure Limits and Protocols

255. In incidents where radiation has been released, a primary goal is to keep responders' exposure "as low as reasonably achievable," also known as ALARA. Any radiation dose of 5,000 millirem (5 REM) or less per year is generally considered low-level. To put that in perspective, each person receives approximately 360 mR per year over the course of his or her life through exposure to everyday encounters with radiation from natural sources (such as radon, rocks, and soil) and man-made sources (such as medical X-rays, consumer products, and fallout from nuclear weapons tests).

256. Very little is known about the health effects of long-term exposure to low-levels of radiation. However, we do know a lot about acute exposure to high levels of radiation. This body of knowledge results from research on survivors of the atomic bombings in Nagasaki and Hiroshima and the nuclear reactor disaster in Chernobyl. We have also learned a great deal from studies on victims who have been exposed to accidental doses while conducting research.

257. An acute dose is considered to be 200 rem or more received in a 24-hour period. The effects of radiation generally cannot be detected until a person has received an acute dose of 25,000 mR. At a dose of 50,000 mR, the adverse effects typically consist of temporary changes to the white blood cell count. At a dose of 100,000 mR (100 rem) and within a couple of days from exposure, the average person begins to experience the symptoms of radiation sickness (such as nausea, vomiting, and headache). But that person will recover. The LD_{Lo} for radiation is a dose of 200,000 mR (200 rem). The LD_{50} is a dose of 450,000 mR (450 rem).

It is highly unlikely that a responder will encounter fields capable of delivering such an acute dose.

When talking about doses and biological effects, we are referring to whole body doses. That means that the entire body was exposed to the field of radiation. A person could receive an exposure many times the LD_{50} on only one part of his or her body, such as a hand or leg.

258. Under Title 10 of the Code of Federal Regulations (10 CFR), the U.S. Department of Energy has set guidelines for dose limits during emergency response situations and in control zones. In addition, Title 10 CFR, Part 20, addresses emergency limits set by the Environmental Protection Agency (EPA).

259. The following table provides exposure limits for doses received over the duration of an incident, not the rate of radiation encountered in the field.

Exposure Limits

260. Dose Limit (whole body)	261. Activity Performed	262. Condition
263. 5 rem	264. All	265.
266. 10 rem	267. Protect major property	268. Where lower dose not practical
269. 25 rem	270. Lifesaving or protection of large populations	271. Where lower dose limit not practical
272. >25 rem	273. Lifesaving or protection of large populations	274. Only in a voluntary basis to personnel fully aware of the risks involved

275. The table below provides a guide to acceptable exposure times based on the radiation levels present and the desired maximum dose. As an example, with a reading of 100 R/hr (rem per hour), a responder would be able to stay in the control zone for a maximum of 15 minutes without exceeding the exposure limits allowed to save a life. If the reading was 50 R/hr, the responder could stay for 30 minutes. If the reading was only 2 mR/hr, the responder could stay for as long as 12,500 hours.

276.

Incident Stay Time Table (Time to Receive Dose)

277. Time to Receive Maximum Dose			
Dose Rate	**500 mrem (.5 rem)**	**5 rem**	**25 rem**
2 mR/hr	250 hours	2500 hours	12500 hours
5 mR/hr	100 hours	1000 hours	5000 hours
10 mR/hr	50 hours	500 hours	2500 hours
25 mR/hr	20 hours	200 hours	1000 hours
50 mR/hr	10 hours	100 hours	500 hours
R/hr	1 hour	10 hours	50 hours
R/hr	30 minutes	5 hours	25 hours
20 R/hr	108 seconds	15 minutes	75 minutes

Time, Distance, and Shielding

278. It's important to understand that the term "exposure" means radiation striking the living human cells of the body. This can happen even if the radioactive material giving off the radiation does not come in contact with the body. The closer a person approaches the material, the greater the exposure he or she will receive.

Time

279. The amount of radiation absorbed by a responder is in direct relation to the amount of time spent in a radiation field. For instance, if a responder stands in a 120 millirem per hour (mR/h) field for one hour, his or her total exposure will be 120 millirem. If, however, the responder works in the 120 mR/h field for only one minute, the total exposure will only be 2 mR (120 mR/h divided by 60 minutes = 2 mR/h). As a result, plans and operations should be based upon spending minimum amounts of time in radiation fields.

In the Field: Reduce it!

280. Before committing to the scene, take a minute to pre-plan or choreograph your mission or task as a team. Fire, rescue, hazmat, and medical personnel should all participate in a "tailboard session" to make sure that everyone fully understands their specific tasks and responsibilities. Proper planning also ensures that the appropriate medical and rescue equipment go in, thus minimizing the need for extended rescue operations or multiple trips.

281. When prolonged rescue and/or care of victims will be required near the source, consider alternating teams in and out to reduce individual exposure time. When possible, move victims out of the radiation field. Use a Site Access Control Leader to monitor time in the control zone and to communicate with the reserve (or backup) team leader.

Distance

282. Alpha, beta, and gamma radiation travel different distances. However, one rule applies to all three: the farther away from the source, the less the effect of radiation. Radiation levels drop an average of 75 percent each time you double your distance from the source. For example, if a survey instrument reads of 4 R/hour at 50 feet from the source, by doubling the distance, exposure is cut to 1 R/hour (or one-fourth the exposure at 50 feet). This is known as the Inverse Square Law.

In the Field: Increase it!

283. All equipment and personnel should be positioned at a distance from the source that is adequate to ensure protection. Until their services are actually required, all standby and support personnel who are not required for either fire suppression or rescue and medical functions should be kept out of the control zone.

284. As soon as adequate emergency medical care is given to the victim, move the victim and rescuers away from the hazard for additional medical care.

Shielding

285. Shielding can be approached two ways: Shield the source or shield the responder. The type of shield and its effectiveness is based upon the kind and quantity of material used. Basically, the denser the material, the more effective the shield will be.

In the Field: Use it!

286. Use some form of shielding whenever possible. How much shielding is needed will depend on the type of radiation involved. (Figure 2) Alpha particles are large enough that they can be stopped by something as thin as a piece of paper. Beta particles are small enough to pass through the paper, but are easily stopped by a sheet of aluminum. Gamma radiation, on the other hand, will require something much thicker, such as lead shielding. However, even if lead shielding is unavailable, responders can still protect themselves by staying behind some kind of “mass” whenever possible. Objects, such as fire engines, buildings, natural terrain, or wreckage, should be kept between the responder and the source. Remember, using anything that is denser than air provides more shielding than using nothing at all.

Quantity

287. In terms of quantity, the greater the amount of radioactive material, the higher the potential for exposure. The quantity of radioactive material that can be stored in one place at a time is regulated for industry and transportation. Quantity can also be a consideration at an emergency scene when items or clothing are being bagged for disposal.

Attending to Victims of a Radiological Incident

288. Before transferring victims to the hospital, all efforts should be made to ensure that victims have undergone decontamination procedures.

Medical Considerations and Field Reporting

Until the victim is taken away from the immediate area of the radiological hazard, only basic life support (BLS) care should be administered, unless a prolonged time of extrication is involved and advanced life support (ALS) care is essential to the victim's survival.

Unless imperative (such as decreasing vitals while attempting to extricate the victim, etc.) provide ALS care at the boundary of the control zone.

Prophylactic intravenous (IV) therapy should not be established on a victim involved in a radiological incident.

When an IV is indicated, use regular and aseptic techniques. Attempt to pick an uncontaminated site.

Under most circumstances, during the time that emergency responders interface with a victim, irradiation should not be a cause of unresponsiveness or decompensation. Investigate for another cause for these conditions.

If wiping or cleaning a wound, dispose of the used 4 x 4s, etc. These waste items are potentially contaminated with radiation.

If not vital to the **victim's *immediate* medical needs**, **do not irrigate** and/or **clean wounds**. Such procedures increase the possibility of creating internal contamination. This is especially true for any injuries about the **face** and **ears**, which provide openings to the body.

If cleaning a victim's wounds in the field is imperative, **clean gently**. Do not rub hard and break the integrity of the skin.

Note and **record** both the **distance** the victim was away from the source of radiation and the estimated amount of time the victim was exposed.

Preparing Victims for Transport

289. Emergency decontamination is seldom required for radiation exposure. Generally, there is ample time to consult a medical technical specialist. This checklist provides an overview of the steps involved in preparing a victim for transport to a medical facility.

290. Establish the decontamination area just inside of the control line.

Prepare the decontamination area by laying down a ground cover and staging the required medical equipment.

Cover and prepare an ambulance gurney (stage on clean side of the control line).

Prepare backboard with two disposable sheets.

Don the appropriate level of PPE for decontamination personnel. (At a minimum, this includes double gloves, eye protection, and surgical mask.)

Remove victim to the decontamination area.

Cut off (do not rip) all clothing.

Envelop removed clothing within top disposable sheet.

Package victim with second disposable sheet.

Consider wet decontamination if a liquid product was involved or upon the recommendation of a medical technical specialist.

Survey the victim with a radiation meter, if the victim's condition and time allows, before handing off the victim to "clean crew."

Transfer of Care

291. The two main goals in the transfer of care are to care for the victim and to limit the spread of contamination. It is critical to ensure that transport vehicles and emergency rooms remain uncontaminated, so that they can remain in service. Whenever possible, transfer decontaminated, packaged victims from the control zone to a clean ambulance crew who will then transport the victim to the hospital. If a clean crew is not available when ready to transport the victim, the attending crew should continue on through transportation to the hospital.

292. As soon as possible, alert the hospital to give staff ample time to set up their facility for receiving a potentially contaminated victim. Advise the hospital of the following:

293. Accurate visual description of the incident.

Number of victims involved.

Number of victims who are suspected of being contaminated.

If known, information regarding the type of nuclide involved, its chemical form, the dose rate per hour, the victim's estimated time of exposure, and the victim's proximity to the source.

Radiological status of each victim, if known (for example, radiological survey results, areas of greatest contamination, evidence of internal contamination, etc.).

Normal medical status information and updates routinely given to the hospital.

SCATTER: A Systematic Approach to a Radiological EMS Incident

294. The "SCATTER" seven-step method provides a simple approach to help rescuers quickly and safely rescue victims involved in a radiological incident.

295. Size-Up the Scene **(S)**

Control Zone **(C)**

Assess the Victim for Life-Threatening Injuries **(A)**

Treat the Victim for Life-Threatening Injuries **(T)**

Take the Victim Away from the Hazard **(T)**

Expose the Victim **(E)**

Radiation Precautions **(R)**

296.

Step 1: Size-Up the Scene (S)

297. As with any emergency incident, a complete size-up should be performed immediately upon arrival at the scene. Safety is the top priority during any emergency response. The responder's own safety ranks at the top of this list. A good scene size-up of a radiological incident will help assure both responder and victim safety.

298. Approach the scene from an upwind and uphill direction whenever possible. Maintain a distance of at least 150 feet from the incident in a non-fire situation and at least 500 feet for an incident involving fire. Double the distance on the downwind side when any fire, products of combustion, or any other airborne situation (contaminated dust, debris, etc.) exist.

299. Use binoculars to get a good view of the incident before committing personnel and resources. Note any radiological clues, such as placards, labels on packages or containers, specific type of vehicle (pharmaceutical company, welder, etc.), and the container shape and size (Type–B package, lead pigs, etc.). Make a quick visual assessment of the number of victims, severity of injuries, and their location in relationship to the possible radiological source. In addition, other hazards should always be looked for (such as leaking fuel tanks, downed power lines, and other hazmat threats).

300. Give a report on conditions to the dispatcher. Request any additional resources that may be needed. Describe the safest approach or route to the incident and identify a staging location for all incoming personnel and equipment. Inform dispatch of what you are doing and what you plan to do. Request that the appropriate authorities be notified, including the state radiological officer, the state radiological health department, the state office of emergency services, the local hospital, the local emergency manager/radiological officer, and the chemical transportation emergency center (CHEMTREC).

Step 2: Control Zone (C)

301. As with any hazmat incident, it is necessary to isolate the area immediately and to deny entry. As opposed to a full-scale, three-zone system that would be used to mitigate the hazard, a simple one-zone system can be used during an initial response to rescue a victim from a radiological incident. This zone is simply referred to as the "control zone." This control zone boundary will usually be set at the location where 2 mR/hr above background can be detected, if a radiological meter is available, and a minimum of 150 feet (non-fire) and 500 feet (fire) without a meter.

302. Use barricade tape, if available, to identify the control zone boundary. If barrier tape is unavailable, vehicles, natural boundaries, and landmarks can work. A designated Site Access Control Leader, if available, can be of great value in regulating passage of personnel and equipment past the control zone. People, rather than inanimate objects, generally are more effective in stopping and regulating people passing through the control zone. Entry and exit into the control zone should be made upwind and on the uphill side whenever possible.

303. No one should be allowed inside the control zone unless they are wearing structural fire turnouts (including nomex hood) and self-contained breathing apparatus (SCBA). Medical personnel working in the treatment area located just inside the control zone boundary should wear, **at a minimum**, eye protection, rubber gloves, and a surgical face mask. If available, it is recommended that medical personnel also wear a hair cover (bouffant caps, etc.), disposable paper suits/gowns, and shoe covers or booties. This same standard applies to "baggers" and any other support personnel who are working just inside the control zone, as well as the "clean" medical crew that receives victims.

304. In order to prevent the spread of contamination, all protective clothing and rescue equipment should remain in the control zone until surveyed out with a radiation meter. Any removed protective clothing should be bagged and tagged in plastic bags. All personnel and equipment exiting the control zone should be "frisked" with a radiation meter, as long as this process does not delay needed medical care.

Step 3: Access and Assess Victim for Life-Threatening Injuries (A)

305. With a radiation meter in hand, if available, make a primary survey of the victim for any life-threatening injuries.

Step 4: Treat Victim for Life-Threatening Injuries (T)

306. Quickly support the airway, breathing, and circulation. Control severe bleeding and take appropriate cervical-spine (C-spine) precautions. Do not deny the victim airway control, oxygen, C–spine protection, etc., unless the situation is extremely hazardous. It is highly unlikely responders would have to grab a victim and drag him or her out of a vehicle during a response involving highway shipment of radioactive commodities. Responders are much more likely to have to do this during the course of operations for "normal" hazards, such as fire.

Step 5: Take the Victim Away from the Hazard (T)

Moving as rapidly as possible, while at the same time providing appropriate medical care to the victim, place the victim onto a backboard covered with an unfolded plastic disposable sheet. Once on the backboard, wrap the victim in the sheet, secure the victim to the backboard with straps and other immobilizing devices, move to the treatment area located just inside the control zone boundary, and transfer care of the victim to the awaiting medical treatment team. If designated medical treatment personnel are not yet available on-scene, rescuers should begin needed medical treatment at the treatment area.

307. Minimize the spread of contamination beyond the control zone. Create a designated "clean zone" for placing tools, medical equipment, and victims. To do so, lay a plastic disposable sheet or salvage cover near the incident's working area. (Do not throw the plastic sheet onto the ground; doing so may spread contamination.) If at all possible, do not wheel a gurney to the work area. Instead, bring the victim to the gurney via a backboard or stoke litter, etc. This will prevent the gurney wheels from picking up any contamination and spreading it outside of the control zone. Normally, the gurney will be staged with the awaiting "clean" crew located just outside of the control zone.

Step 6: Expose the Victim (E)

308. Expose the victim by cutting off all exterior clothing down to underclothing. (Do not rip material.) This process will accomplish two goals: It will remove up to 90 percent of any potential contamination and it will allow for a thorough head-to-toe secondary exam of the victim. Unlike typical trauma situations, cover ***all*** open wounds to reduce the chance of internal contamination. Bag and tag all removed clothing. For safety, consider all victims contaminated when responding to a radiological incident.

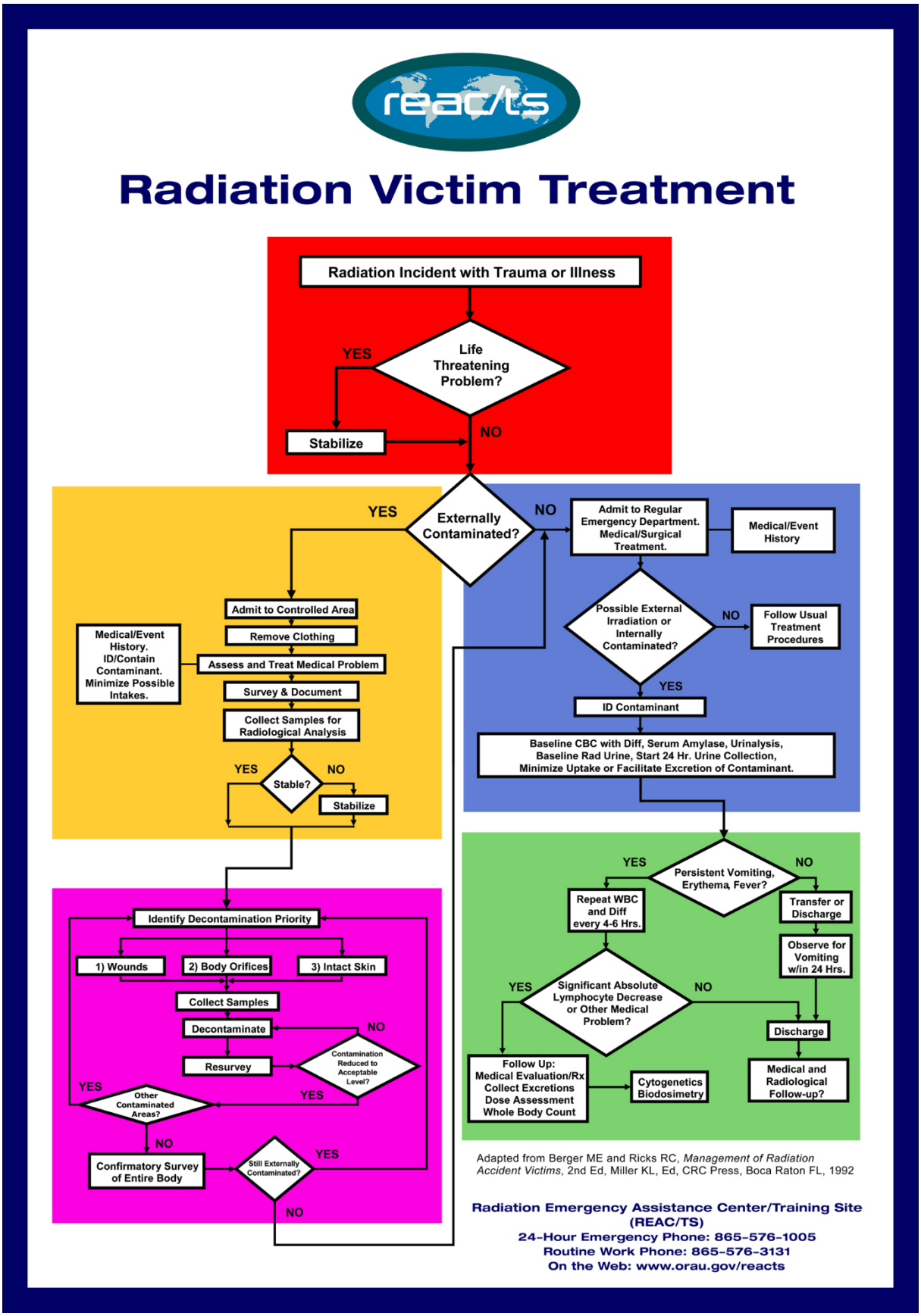
Step 7: Radiation Precautions (R)

309. Once at the control zone boundary line and before exiting the control zone, radiation precautions must be carried out for the victim, rescue personnel, and any equipment involved in response operations. If a radiation meter is not immediately available and obtaining one would jeopardize victim care, **do not delay treatment and moving of the victim, rescuers, and required medical equipment**. Consider all victims, rescue personnel, and medical equipment as potentially contaminated.

310. If available and time allows, conduct a radiological survey of the victim, essential medical personnel, and outgoing medical equipment before crossing the control zone. **Do not delay removing a seriously injured victim or essential medical personnel and life-saving equipment to conduct a time-consuming radiation survey.**

311. All remaining rescue personnel inside the control zone should doff protective clothing and equipment before exiting the control zone. Bag and tag all doffed protective clothing and equipment. **All remaining personnel and equipment need to be surveyed and cleared before exiting the control zone.**

312. After victims have been rescued and the incident's treatment phase has ended, have trained personnel and the appropriate authorities decontaminate and survey all remaining rescue and support personnel and equipment. Properly dispose of all contaminated personal protective equipment and medical waste used during the rescue.


Radiation Victim Treatment
Radiation Incident with Trauma or Illness
Life Threatening Problem?
YES
NO
Stabilize
Externally Contaminated?
YES
NO
Admit to Controlled Area
Remove Clothing
Assess and Treat Medical Problem
Survey & Document
Collect Samples for Radiological Analysis
Stable?
YES
NO
Stabilize
Medical/Event History. ID/Contain Contaminant. Minimize Possible Intakes.
Admit to Regular Emergency Department. Medical/Surgical Treatment.
Medical/Event History
Possible External Irradiation or Internally Contaminated?
NO
Follow Usual Treatment Procedures
YES
ID Contaminant
Baseline CBC with Diff, Serum Amylase, Urinalysis, Baseline Rad Urine, Start 24 Hr. Urine Collection, Minimize Uptake or Facilitate Excretion of Contaminant.
Identify Decontamination Priority
1) Wounds
2) Body Orifices
3) Intact Skin
Collect Samples
Decontaminate
Resurvey
Contamination Reduced to Acceptable Level?
NO
YES
Other Contaminated Areas?
YES
NO
Confirmatory Survey of Entire Body
Still Externally Contaminated?
YES
NO
Persistent Vomiting, Erythema, Fever?
YES
NO
Repeat WBC and Diff every 4-6 Hrs.
Transfer or Discharge
Observe for Vomiting w/in 24 Hrs.
Significant Absolute Lymphocyte Decrease or Other Medical Problem?
YES
NO
Discharge
Follow Up: Medical Evaluation/Rx Collect Excretions Dose Assessment Whole Body Count
Cytogenetics Biodosimetry
Medical and Radiological Follow-up?
Adapted from Berger ME and Ricks RC, Management of Radiation Accident Victims, 2nd Ed, Miller KL, Ed, CRC Press, Boca Raton FL, 1992
Radiation Emergency Assistance Center/Training Site (REAC/TS)
24-Hour Emergency Phone: 865-576-1005
Routine Work Phone: 865-576-3131
On the Web: www.orau.gov/reacts

G-M Detector's Job Aid

313.

G–M DETECTORS JOB AID:

- **Check batteries**
- **Take background reading in an uncontaminated area**
- **Scan slowly and close to the object**
- **Record your survey readings**

Figure: Conducting the Survey

SAFETY NOTE:
Do not disconnect or connect the connectors for the coaxial cable on the survey meter when the meter is turned on. You could receive an electrical shock.

G–M DETECTORS JOB AID:

Inspect the equipment.

a. Attach the meter to the probe with the cable.
b. Inspect the cable that connects the G-M detector to the survey meter. With the meter on, wiggle the cable near the connectors to see if this causes erratic behavior of sound or display; if so, the cable is defective.
c. Inspect the meter for obvious signs of damage (e.g., broken detector window; broken glass on meter face).

Perform a battery check.

a. Check the batteries, using the "range" switch or "bat" button; the method depends on the type of instrument. The meter needle should move to an area on scale marked "Bat" indicating the batteries are good. Replace if necessary.

Conduct a source/ operational check.

a. Place detector close to a check source (e.g., Thorium containing gas lantern mantle in a plastic bag; plastic button "check source").
b. Select appropriate range (e.g., x10).
c. Verify meter response.
d. If no source is available, assume the meter is working if the response to background is about 30 to 200 counts per minute (cpm).

Conduct a background reading.

a. Expect a reading of 30 to 200 counts per minute.

Conduct the survey (see figure).

a. Move the probe slowly (1 inch per second).
b. Do not let the probe touch anything.
c. Pay particular attention to face, feet, and hands.
d. Locate the points that produce the most clicks and document the reading. Generally, areas more than twice the pre-determined back ground are considered contaminated.

If large numbers of people require screening, to avoid delays, it may be necessary to perform only a "quick look" spot survey of the head, face, shoulders and hands, the most likely locations for contamination.

Measuring Instruments

314. Radiation can only be sensed or measured by specialized detection instruments. Radiation cannot be smelled, touched, tasted, or felt. Only its aftereffects can be experienced. Yet, with the proper equipment, radiation is easily detected. Such instruments work by detecting charged atoms, atom fragments, or particles (ions). They measure the quantity, intensity, and accumulation of radiation.

315.

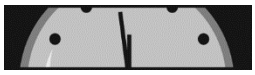
Types of Radiation Detection Equipment

Type	Description
Survey Meter	A portable device used to establish whether radioactive material is present and to measure the amount of that radiation.
Fixed Area Detector	A fixed instrument that measures energy (in counts per minute), and is used to monitor an area to establish whether or not a radioactive material is present.
Self-Reading Dosimeter	A device that measures accumulated radiation exposure over a period of time and can be read by the user at any time.
Film Badge	A light-tight package of photographic film used to measure radiation exposure over a period of time. The dose is calculated by the degree of darkness of the film after it is developed.

Instructor Guide

Chapter 9

Explosives, Bombs, and Improvised Explosive Devices

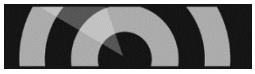


Duration	Method of Instruction
2 hours	
1 hour and 30 minutes for course instruction	Facilitated seminar
20 minutes for Wrap-up	Full group
10 minutes for Post Test	Individual work



Scope

This chapter provides an overview of the hazards that bombs, booby traps, and improvised explosive devices present to responders. This chapter also emphasizes that only specially-trained personnel should try to disarm an explosive.



Terminal Learning Objective (TLO)

At the end of instruction for Chapter 9, participants will be able to take appropriate precautions when explosive devices are suspected or known.



Enabling Learning Objectives (ELOs)

This chapter's ELOs are to ensure participants will be able to:

List weapons of choice for terrorists.

Define booby trap.

List three signs that indicate a booby trap may be present.

Linkages to Universal Task List

The information, objectives, and activities in this chapter promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

(Res.A.2 1) Establish procedures for the immediate incident scene.

(Res.A.2 1.3.1) Monitor for primary and secondary threats.

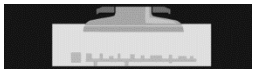
(Res.B.2 5.1.4) Develop site-specific plans.

(Res.B.2 5.3.2) Identify and establish perimeter and hazardous materials zones (hot, warm, cold).

(Res.B.2 5.4) Ensure the safety of all on-scene responders.

(Res.B.2 5.4.4) Coordinate rescue efforts with law enforcement to ensure safety of rescuers while law enforcement secures incident site.

(Res.B.2 6.2) Detect, Identify, Render Safe, and Dispose of IED.



Resources

Materials and Preparation

Seating and work stations for up to 30 participants

Laptop computer, projector, and screen

Instructor Guide and CD with PowerPoint Presentation (1 for instructor)

Participant Guide (1 for each participant)

Consult with your local bomb squad to arrange for a subject matter expert to conduct this block of instruction, if possible, and/or to provide deactivated improvised explosive devices (IEDs) to illustrate the types of hazards responders may encounter in the field.

Resource List

Tips for Searching Areas with Hidden Explosives

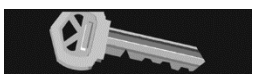
Search Systems

Reference List

See Reference List at the beginning of this guide.

Instructor/Participant Ratio

1/30

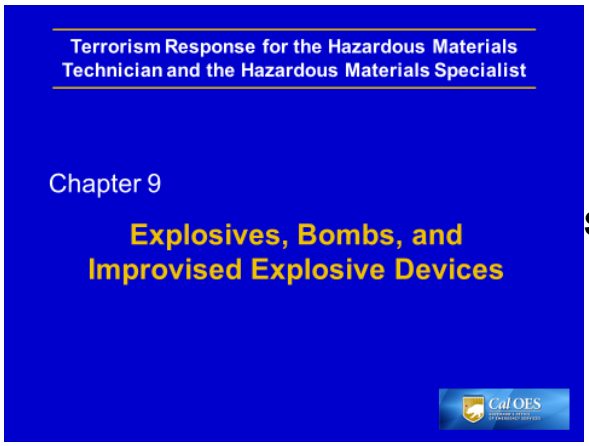


Practical Exercises (PE)

Note: No exercises have been assigned for this chapter.

Assessment Strategy

Pre/Post Test



Slide 9.1

The information and objectives in this presentation promote the acquisition of knowledge and skills in support of the target capabilities identified in Universal Task List:

316. (Res.A.2 1) Establish procedures for the immediate incident scene.

317. (Res.A.2 1.3.1) Monitor for primary and secondary threats.

318. (Res.B.2 5.1.4) Develop site specific plans.

319. (Res.B.2 5.3.2) Identify and establish perimeter and hazardous materials zones.

320. (Res.B.2 5.4) Ensure the safety of all on-scene responders.

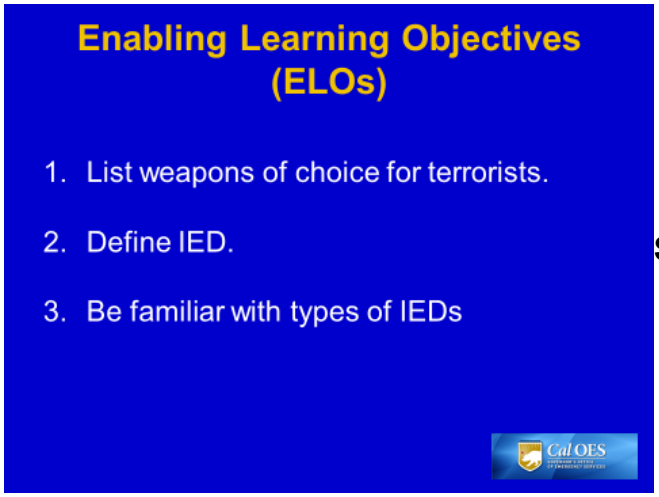
321. (Res.B.2 5.4.4) Coordinate rescue efforts with law enforcement to ensure safety of rescuers while law enforcement secures incident site.

322. (Res.B.2 6.2) Detect, identify, render safe, and dispose of IED.



Slide 9.2

The terminal learning objective (TLO) for this chapter is to ensure that participants will be able to take appropriate precautions when explosive devices are suspected or known to be present.



Slide 9.3

This chapter's enabling learning objectives (ELOs) are to ensure participants will be able to:

List weapons of choice for terrorists.

Define IED.

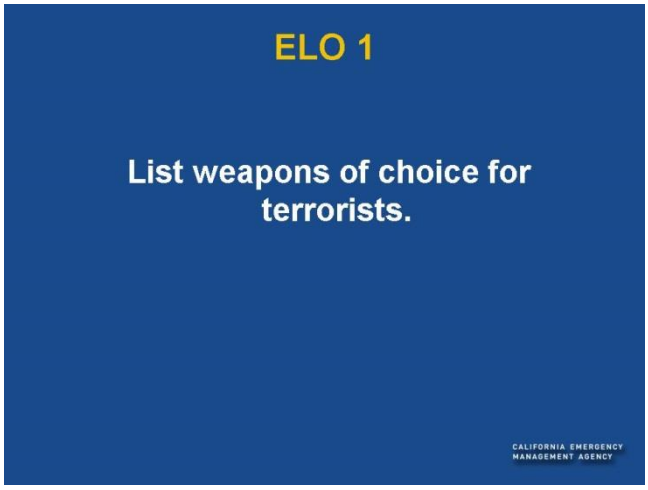
Be familiar with the types of IEDs likely to be encountered**.**

ELO 1: List weapons of choice for terrorists.

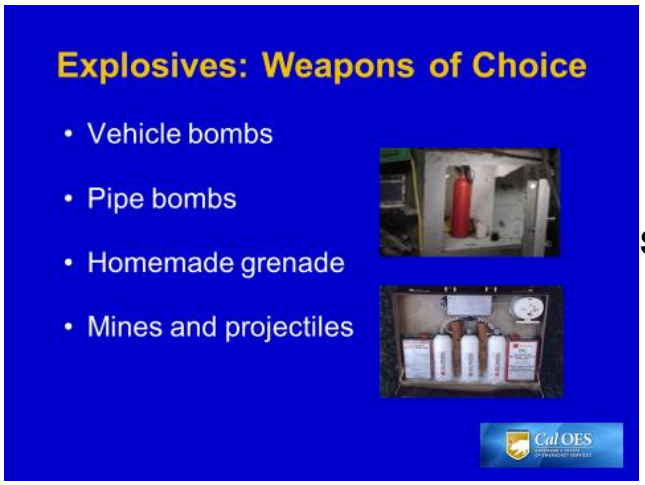
Step 2: Discuss the use of explosives as terrorists' weapons of choice.

Slides 9.4 through 9.6

Have participants turn to this section in their guides and follow along with the lecture.



Slide 9.4

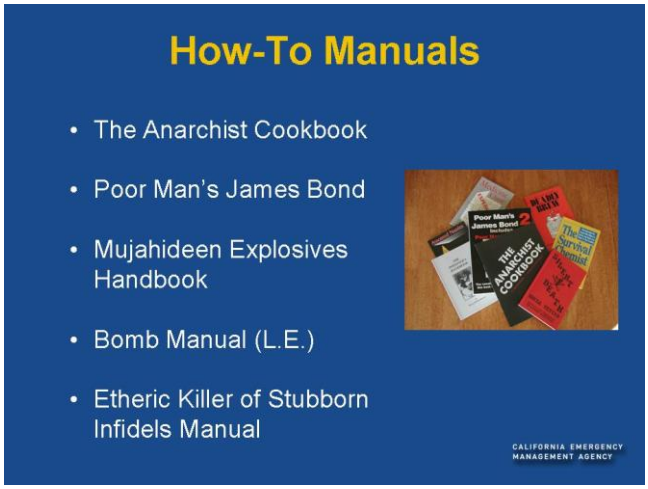


Slide 9.5

Explosives remain terrorists' weapons of choice. Seventy percent of all terrorist attacks involve explosives. This is, in part, because many of the materials needed to make explosive devices are relatively easy to obtain.

Terrorists have a number of devices at their disposal for setting off explosions, such as vehicle bombs, pipe bombs, and more sophisticated mines and projectiles, to name a few. Explosives can also be used to disperse other chemical, biological, or radiological/nuclear materials.

Responders should be alert to the possibility of an ambush. In such a scenario, the terrorist lures first responders to a scene by detonating a small device to create an emergency incident. When the incoming police, fire, and EMS units arrive on scene, they become victims of an additional device intended for a larger crowd.



Slide 9.6

In addition to the fact that bulk bomb-making materials, such as ammonium nitrate, have been available for many years in this country, underground books and Websites easily provide terrorists with directions for making bombs that can cause tremendous damage.

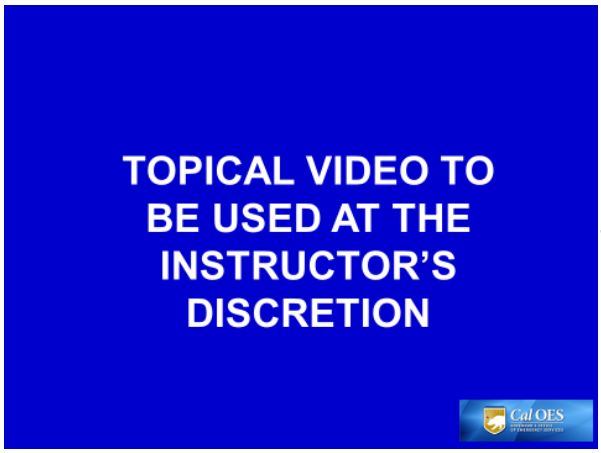
Books such as *The Anarchist Cookbook* and the *Poor Man's James Bond*, for example, have consistently caused problems for first responders over the years.

However, because some of the instructions in these how-to resources are wrong, many of these devices inadvertently explode.

Step 3: Video—Explosives.

Slides 9.7

Show a video, which illustrates the potential for destruction of even the most mundane items.



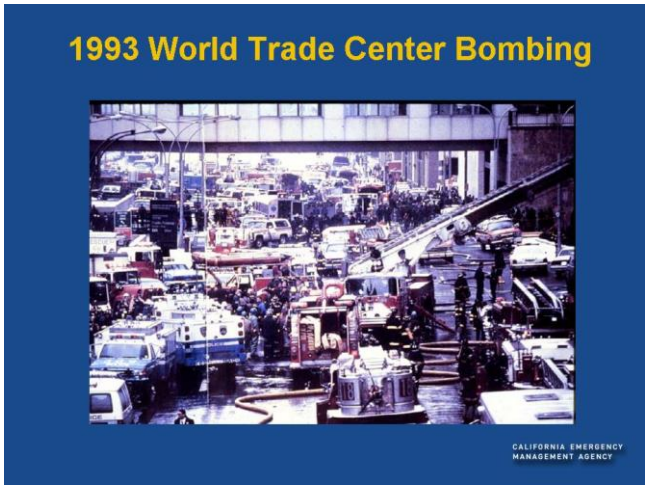
Slide 9.7

Since 2017, there have been multiple explosive devices used in terrorist and non-terrorist settings throughout the United States. A "Mini Case Study" from Austin, Texas, in March of 2018 is upcoming later in this module.

Step 4: Resume discussion on explosives.

Slides 9.8 through 9.10

Have participants turn to this section in their guides and follow along with the lecture.



Slide 9.8

In 1993, terrorists used fertilizer-based high explosives to create a car bomb that was intended to knock one of the World Trade Center towers into the other tower and kill thousands of people.

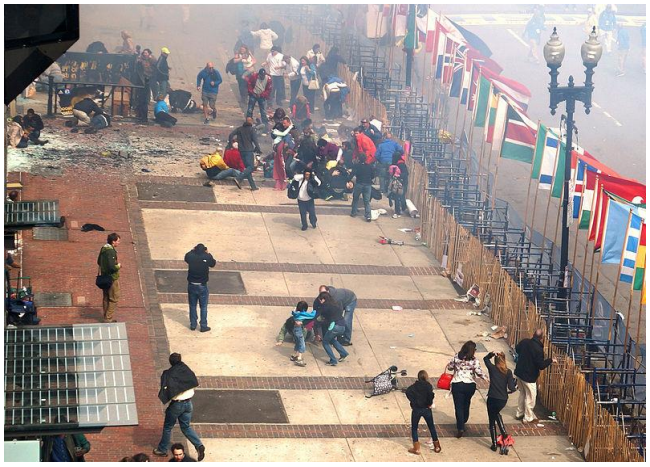
Although their scheme failed in terms of scope (six people died and more than a thousand were injured), the bombing was a wakeup call for the United States.



Slide 9.9

Similarly, American militia sympathizers Timothy McVeigh and Terry Nichols used ammonium nitrate fertilizer in a truck bomb to destroy the Alfred P. Murrah Federal Building in Oklahoma City.

McVeigh and Nichols were motivated by the federal government's handling of the Ruby Ridge incident (1992) and the Waco Siege (1993). The attack, which occurred on April 19, 1995, was timed to coincide with the second anniversary of the Waco Siege.



Slide 9.10

April 15, 2013, Dzhokhar and Tamerlan Tsarnaev deployed a 6-Liter pressure cooker, loaded with low explosive agents and metallic objects (Shrapnel) which detonated on Boylston Street during the Boston Marathon.

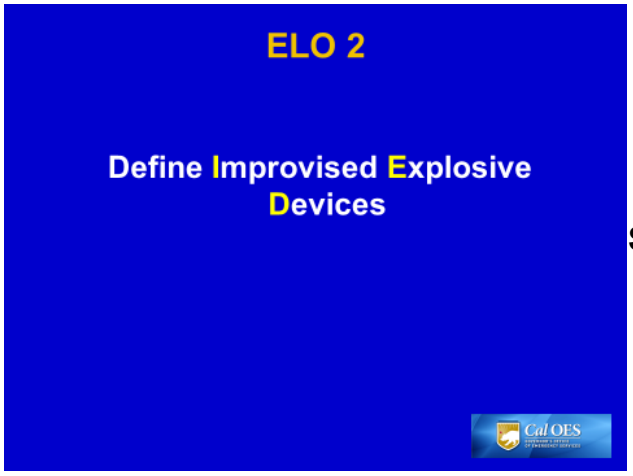
The ensuing blast caused dozens of casualties and 4 deaths of people along the route. A Police Officer was subsequently killed by Tamerlan Tsarnaev while he fled the scene.

ELO 2: Define booby trap.

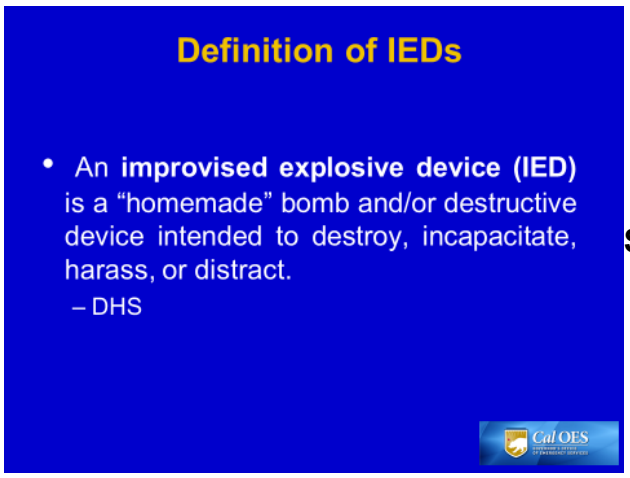
Step 5: Define and discuss booby traps.

Slides 9.11 through 9.25

Have participants turn to this section in their guides and follow along with the lecture.



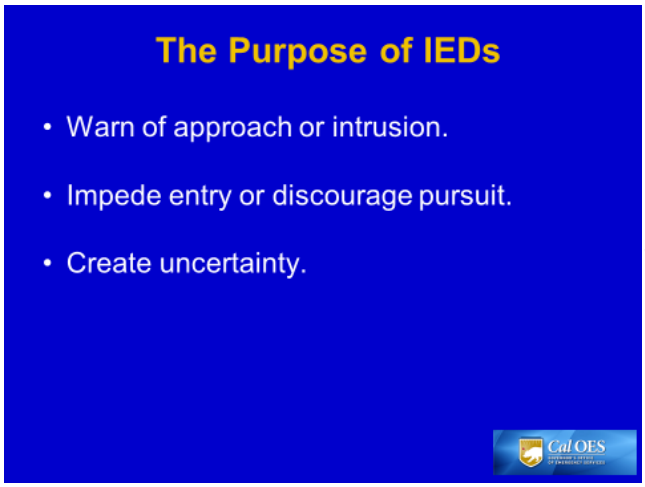
Slide 9.11



Slide 9.12

The Department of Homeland Security defines an **improvised explosive device (IED)** as a "homemade" bomb and/or destructive device intended to destroy, incapacitate, harass, or distract..

Terrorists have used a number of manually operated IEDs as "booby traps". These devices may be detonated in a number of ways.



Slide 9.13

In addition to being used to cause incapacitating injury or death, IEDs often are used as warning devices, as a means to impede an intruder or discourage pursuit, and as an effective way to create uncertainty.

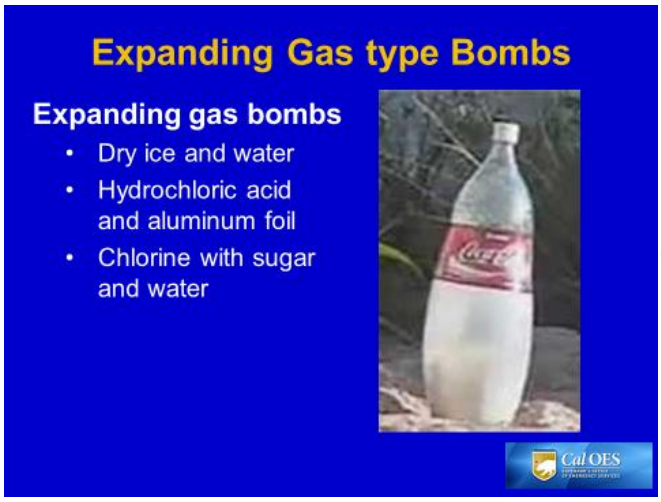


Slide 9.14

IEDs are detonated in (generally) three mechanisms: 1) Through a **timing device** (Mechanical, digital, a motion sensor, etc.) In the late 1800's, the term "Infernal machine" was applied to these types of weapons.

2) By **Command Detonation**, generally utilizing a trigger mechanism such as "Deadman's devices" which relies on pressure being applied to a hand-held trigger. A 'suicide bomber' will depress such a device in their hand and then threaten to detonate the device, or warn responders that attempts to apprehend them will result in a detonation when the pressure is released. Deadman's devices date back to the birth of the Railroads when Engineers had to depress a pedal, press a handle, or some other mechanism that would cause the Locomotive to shut down power if the Engineer became unconscious and stopped applying pressure (To prevent a runaway train).

3) By **Victim Activation.** These are the true "Booby traps" which operate via a tripwire, pressure plate, trembler, or other device that causes a detonation if disturbed by someone manipulating the device after it is set.



Slide 9.15

An explosion is a sudden, uncontrolled release of gas. It does not require a spark or a flame. When gas is put under pressure and suddenly released, it creates an explosion.

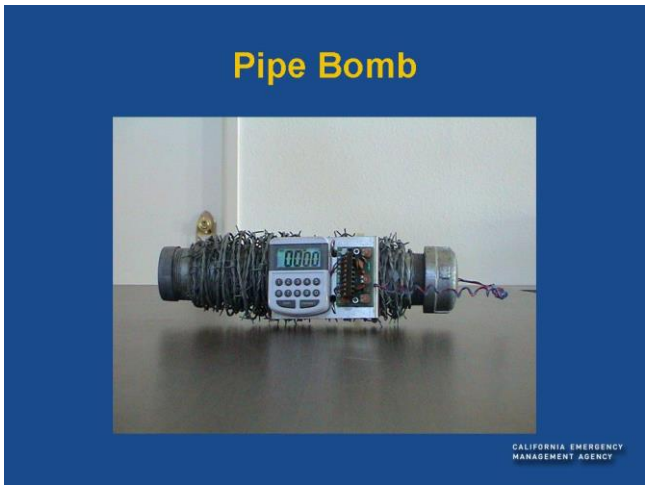
The reason certain materials make good bombs is because they produce a lot of gas very quickly. The expanding gas is what makes up the explosion. In other words, the more gas that is created by a reaction, and the faster it expands, the bigger the bang.

Improvised expanding gas bombs (also known as homemade chemical bombs) are explosive devices created by mixing volatile household chemicals in any container that allows pressure to build up. Toilet bowl cleaner or drain cleaner and tin foil mixed in a capped soda pop bottle is among the most common, and perhaps the most toxic, combination of materials.

Other examples of easily obtainable materials include water and dry ice (the water melts the dry ice, creating carbon dioxide gas), and hydrochloric acid and aluminum foil (the two react chemically to create hydrogen).

Common containers are plastic soda pop bottles, sports drink bottles, and water bottles of all sizes. These containers have a screw-on cap and expand to allow for containment of greater pressure before detonation. Regardless of the type of material, the liquid may be producing fumes as the chemical reaction takes place. As the reaction progresses, the container will begin to bulge or expand.

Due to the variable amount of chemicals, improvised expanding gas bombs should be considered unpredictable. Containers that are bulging should be considered volatile and may detonate at any time. Any movement of a container in this condition may cause it to detonate.



Slide 9.16

This IED is a pipe bomb with a timer.

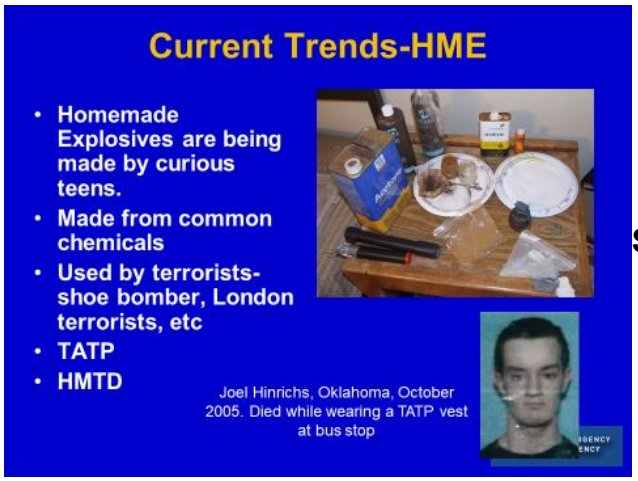
They can also be made with fuses, or attached to cellular phones or other electronic sources of detonation.

Thus, pipe bombs can be any of the detonation mechanisms discussed previously.



Slide 9.17

This is an example of victim activated “Booby trap” that utilizes a trip mechanism within a common sporting tackle box. Once set, if the lid is opened incorrectly it can cause severe injury or death to anyone within its lethal area of impact.



Slide 9.18

As of 2019, there is an increasingly violent movement within the USA, coupled with a growing technology. When combined, especially with curious youngsters, lacking proper training and experience, Responders must exercise more caution and vigilance in their on-scene size-up and investigations before commencing offensive operations. Use of chemicals such as HMTD (Hexamethylene Triperoxide Diamine), TATP (Triacetone Triperoxide), peroxides, chlorates, and nitrates is becoming more common. Homemade Explosives Labs (HME) are also becoming more common and equally and unpredictably dangerous to responders.



Slide 9.19

MINI CASE STUDY involving Mark Conditt, a 23-year-old resident of Austin, Texas.

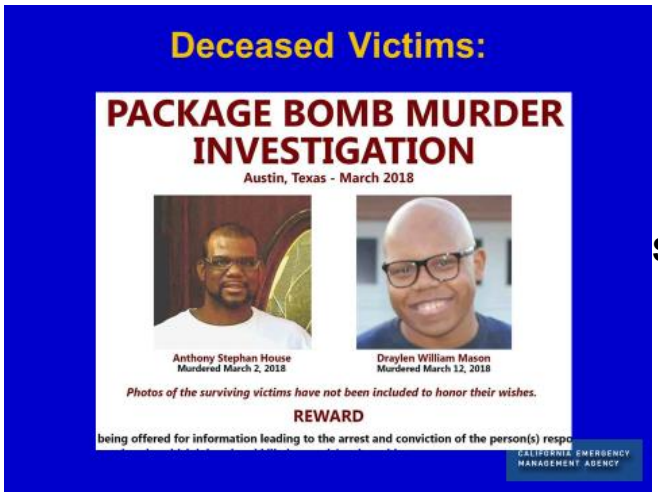
Conditt, an Emotionally Disturbed Person was responsible for the death and injury of over half a dozen people during a ten-day period in March, 2018. Conditt was tracked down, stopped in his vehicle by Police, and detonated an IED in his possession, killing himself, instead of submitting to apprehension.

There is a document discussing this event from an after-action report as well as a news perspective in the Instructor digital resource folder for this program. Instructors are encouraged to read the material, and, if so disposed, obtain video footage from any number of free use forums on the Internet.

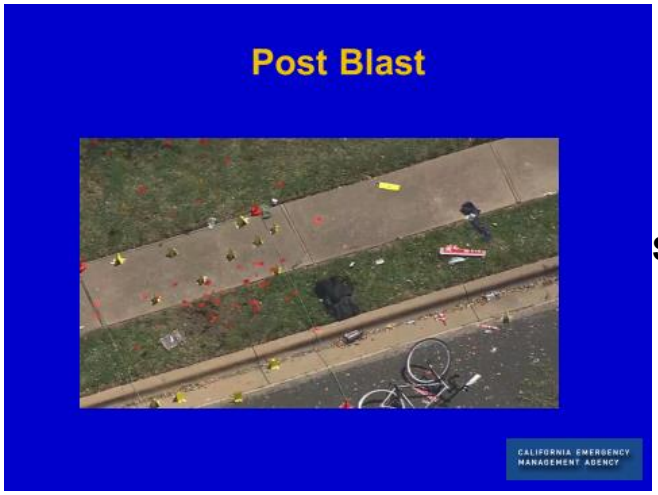
Because his video confession (Found on his cellular telephone following his death) never discussed his reasons or rationale, it is unknown how he chose his victims, or why.



Slide 9.20



Slide 9.21

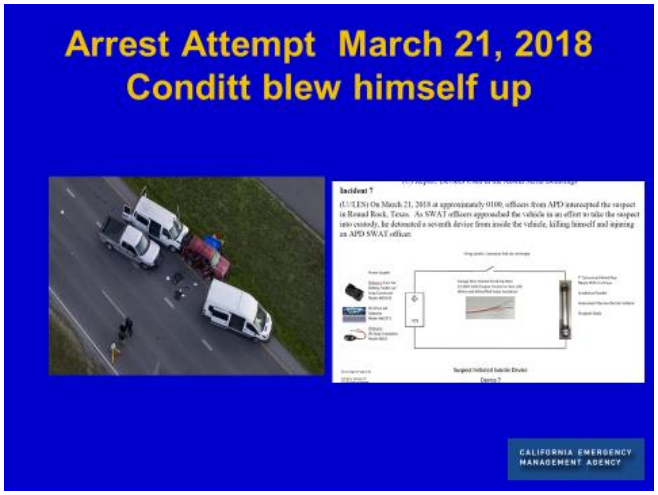


Slide 9.22



Slide 9.23

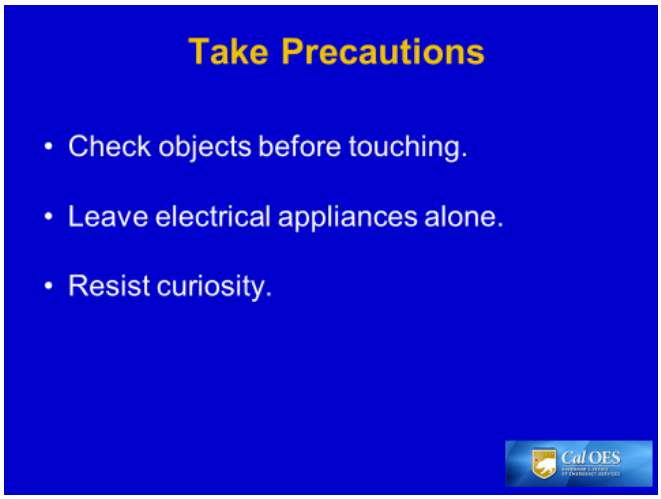
Resources mobilized by the Local, State, Regional, and Federal agencies included the Texas Rangers and the ATF, FBI, and US Postal Inspectors. Thousands of man-hours were dedicated to viewing thousands of hours of surveillance video, tracking the packages sent by US Mail and Federal Express, and interviewing hundreds of people.



Slide 9.24



Slide 9.25



Slide 9.26

Some IEDs are extremely difficult to detect while others are simple to detect.

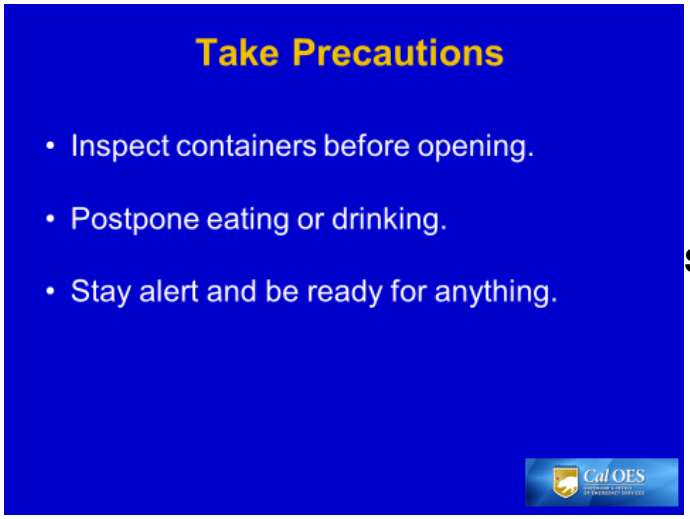
Responders can take precautions to make incidents somewhat safer.

323. Check all around any object before touching it. If in doubt, don't move it.

324. Check all furniture before using it. If there is any indication of tampering, such as locked drawers or areas, do not try to open them.

325. Leave electrical appliances alone. Do not use light switches or interior lighting facilities while inside a structure. Do not open refrigerators or other electrically charged appliances.

326. Be wary of anything meant to attract attention. Even pornographic materials have been used as lures in booby traps.



Slide 9.27

Additional precautions that responders can take to increase safety in a potentially booby-trapped area include:

327. Inspect the exterior of any container without touching it and before opening it.

328. Postpone consuming any beverages or food while in a building that is part of an incident site. Chemical contamination may occur through particulate matter in the air or contact with the food.

329. Stay alert and be ready for anything. Use the eyes, nose, and ears when inside a booby-trapped

area.



Slide 9.28

This slide shows an Israeli bomb expert dismantling an IED.

Inexperienced personnel should ***never*** attempt to disarm a booby trap. Do not attempt to cut any trip wires. Cutting the trip wires may initiate the device. Generally, these devices can be rendered safe or destroyed in place by a trained technician, such as a member of a bomb squad or explosive ordnance disposal team, or a manufacturer's representative.

By far, the best course of action to follow when encountering an area with known or suspected booby traps is to think SIN. That is, ***S***afely mark the area and stay away; ***I***solate it, if possible; and ***N***otify a qualified technician.

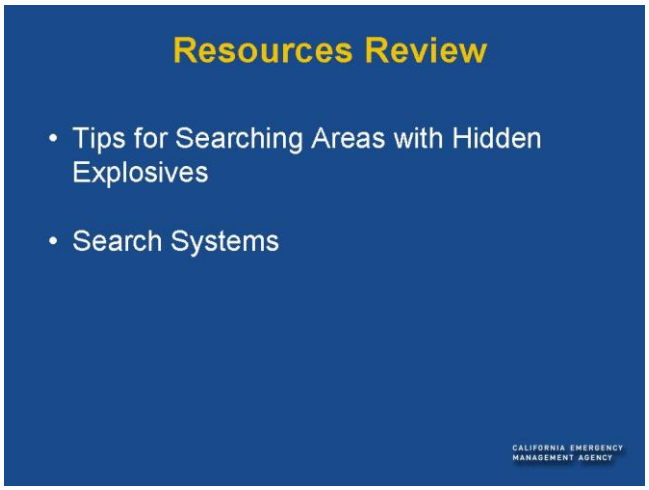
If a booby trap or IED must be removed before a bomb expert can arrive, the responder should do so only from a protected location and with a remote device.

Step 7: Review resources.

Slide 9.29

Have participants turn to the Resources section in their guides. Briefly review the materials with participants and answer any questions that may arise.

Emphasize that hazmat responders generally will not conduct a search for IEDs, etc.; that's left to the experts. Explain that, even so, it's useful for hazmat responders to have this information.



Slide 9.29

Review the listed resources in the participant guide.

Step 8: Video—Bombs, Booby Traps, and IEDs.

Slide 9.30

Show the video as a review of important points in this chapter.



Slide 9.30

The purpose of this video is to provide a visual demonstration of why Technicians and Specialists must be especially vigilant during their field operations.

Step 9: Provide time to answer questions and administer the post test.

Slide 9.31

Use this opportunity to clarify any misconceptions or to answer questions participants may have about this chapter or the entire course. Emphasize that the danger from incidents involving energetic materials, or explosives, varies widely. Some incidents may pose only a minor hazard to responders, while others may require a full evacuation of the affected area, including responders and the public.

Point out that the intent of this chapter was not to tell responders how to handle an incident involving explosives, IEDs, and booby traps. Instead, this chapter's intent is to help make responders aware of the hazards from these devices and to highlight the importance of using all available intelligence—such as information from initial size-up, the dispatcher, law enforcement personnel, eyewitnesses, etc.—to manage the incident efficiently, effectively, and safely.

Also reinforce the concept that inexperienced personnel should ***never*** attempt to disarm a booby trap. By far, the best course of action to follow when encountering an area with known or suspected booby traps is to think SIN: **S**afely mark the area and stay away. **I**solate it, if possible. **N**otify a qualified technician.

Administer the post test, which is a closed-book test. Remind participants that they must score a minimum of 70 percent to pass the exam.

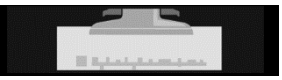


Slide 9.31

The intent of this chapter was not to tell responders how to handle an incident involving explosives. Rather, the intent of this chapter was to help make responders aware of the hazards involved with explosives and the importance of using all available information to manage such incidents.

All incidents differ and may involve more than one hazard. The hazards in explosives incidents vary from presenting minor threats to responders to requiring full evacuation of the area, including responders and the public.

Perhaps most importantly, responders should recognize that disarming a booby trap or IED should be left to a trained technician. When the presence of a booby trap or IED is suspected, responders should think SIN: Safely mark the area and stay away; Isolate it, if possible; and Notify a qualified technician.



Resources

Tips for Searching Areas with Hidden Explosives

General Tips

- When a suspected bomb is located:
- Do not touch it!
- Secure the area.
- Notify the bomb squad.
- Use appropriate evacuation and search techniques.
- When one bomb or suspicious object has been located:
- Do not stop the search.
- Take into account that bombers commonly hide more than one explosive device.
- If a person had been targeted, use commonsense logic:
- Search the target area first, then go through the basic search techniques.
- Never rely on random or spot checking (unless there is reason to think an imminent threat does not allow for a more thorough search).
- When the search is complete:
- Avoid stating that the area is clear or safe.
- Consider that a bomb may be extremely well-hidden.
- Recognize that it is unlikely anyone can be 100 percent sure a building is bomb-free, even when it has been searched by trained personnel.

Searching Buildings

Formulate general guidelines that will apply to nearly all incidents.

- Search operations should follow two basic maxims:
- Start on the outside and work inside.
- Start from the lowest level and work up, once inside the building.
- These principles have evolved from:
- Years of experience
- Application of common sense
- Properly applied, these principles reduce the risk of injury to searchers and occupants.
- Search teams should:
- Consist of at least two people
- Give each other mental support
- Searchers are more likely to do a thorough search if another person is present.

Exterior Search

The area most accessible to a terrorist is the outside of a building.

- Search operations should begin at ground level, with close attention given to:
- Piles of leaves
- Piles of refuse
- Trash cans
- Shrubbery
- Manholes
- Recently disturbed dirt
- Window wells
- Crawl spaces
- Parked vehicles
- Entrances
- Extend the search outward from the building, at least:
- 25 to 60 feet
- Or a natural division line
- Once the ground level is searched, investigate heights a bomber could reach, such as:
- Window ledges

- Air conditioning units
- Signs
- Building ornaments
- Fire escapes
- Accessible roof areas

Interior Area Search

The next level of accessibility is public access areas that have little or no security.

- The most common targets in public access areas are utility and service areas.
- Public access areas also include:
- Reception rooms
- Lobbies
- Elevators
- Stairs
- Restrooms
- Move systematically from the ground floor up through the building.
- Mark searched areas in the same manner to eliminate duplication or omission.

Detailed Room Search

After searching public access areas, search the interior of the building.

- Start at the lowest floor, including the basement.
- Complete one floor before moving up to the next.
- Pay special attention to utility and service areas, such as:
- Furnace rooms
- Electrical control centers
- Telephone control boxes
- Auxiliary power plants
- Central air-conditioning
- Elevator shafts
- Storage and maintenance areas
- Destruction of utilities can:
- Place a building out of use

- Create small risk of injury for occupants
- Detailed search of utility areas includes:
- Nooks
- Ledges
- Storage rooms
- False panels
- Walkways
- Empty bottles
- Detailed search of single rooms includes a series of distinct steps to ensure thoroughness and to minimize confusion and duplication:
- Do not touch anything or change the environment (e.g., switches, lights, air-conditioning controls)
- Conduct audio check

  Enter room, split up, and listen to/establish background noise

  Investigate unusual sounds immediately
- Organize the search by dividing the room into equal parts.
- Conduct first sweep, which usually is the most time consuming:

  Normally search from floor to waist height

  Move in opposite directions from the same starting point

  Look under rugs and in back of chairs
- Conduct second sweep:

  Search from waist height to ceiling
- Consider the detailed room search complete only when the individual in charge believes an adequate search has been made
- Mark each room in the same manner to indicate the room has been searched:

  Tape on door

  Paper on door handle

  Mark on door leading to room

Searching Vehicles

Vehicle searches are similar to building searches in that they should be conducted from the outside to the inside and from the floor to the top of the roof.

- Vehicle bombs are most often directed at harming an individual rather than property:
- Be especially alert for concealed triggering devices
- Vehicle bombs are generally:
- Electrical in nature
- Wired to the electrical system
- Vehicle bombs can be rigged to detonate in response to any number of normal actions, such as:
- Opening a door
- Starting the vehicle
- Turning on headlights
- Releasing the parking brake
- Use tools that allow the vehicle to be examined without having to touch it or to lie on the ground
- Flashlight
- Convex mirror

Search Systems

Search Systems

Search By	Advantages	Disadvantages	Thoroughness
Supervisors **Best** for covert search **Poor** for thoroughness **Poor** for morale, if detected	1. Covert 2. Fairly rapid 3. Lost working time for supervisor only	1. Unfamiliar with many areas 2. Will not look in dirty places 3. Covert search is difficult to maintain 4. Generally results in search of obvious areas—not those that are hard to reach 5. Problems with violation of privacy 6. Danger to workers who have not been evacuated	50–65%
Occupants **Best** for speed of search **Good** for thoroughness **Good** for morale (with confidence in training given beforehand)	1. Rapid 2. No problems with violation of privacy 3. Loss of work time shorter than for evacuation 4. Personal concern for one's own safety leads to good search 5. Personnel who conduct search are familiar with area	1. Requires training of entire work force 2. Requires several practical training exercises 3. Danger to workers who have not been evacuated	80–90%
Trained Team **Best** for safety **Best** for thoroughness **Best** for morale **Poor** for lost work time	1. Thorough 2. No danger to workers who have been evacuated 3. Workers feel agency cares for their safety	1. Loss of production time 2. Very slow operation 3. Requires comprehensive training and practice 4. Problems with violation of privacy	90–100%