STUDENT MANUAL

FEMA/USFA/NFA-ERT:TC-EMS-SM
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Emergency Response to Terrorism: Tactical Considerations: **Emergency Medical Services**

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNITED STATES FIRE ADMINISTRATION
NATIONAL FIRE ACADEMY

Federal Emergency Management Agency

United States Fire Administration

National Fire Academy

FOREWORD

The Federal Emergency Management Agency (FEMA) was established in 1979. FEMA's mission is to focus Federal effort on preparedness for, mitigation of, response to, and recovery from emergencies encompassing the full range of natural and manmade disasters.

FEMA's National Emergency Training Center (NETC) in Emmitsburg, Maryland, includes the United States Fire Administration (USFA), its National Fire Academy (NFA), and the Emergency Management Institute (EMI).

To achieve the USFA's legislated mandate (under Public Law 93-498, October 29, 1974), "to advance the professional development of fire service personnel and of other persons engaged in fire prevention and control activities," the U.S. Fire Administration has developed an effective program linkage with established fire training systems which exist at the State and local levels. It is the responsibility of the USFA to support and strengthen these delivery systems. The field courses of the USFA's National Fire Academy have been sponsored by the respective State fire training systems in every State.

In recent years the growing threat of terrorism has given greater visibility to the need for up-to-date training on tactical considerations when dealing with a possible terrorist situation. The major focus for the American fire service is to learn how to prepare for, identify, and respond to terrorist incidents, such as the Tokyo Sarin attack and the bombings at the World Trade Center and Oklahoma City. To this end, several training initiatives are underway at the National Fire Academy. This course shall focus on the emergency response to terrorism tactical considerations and options, especially dealing with issues of the emergency medical service responders.

The USFA's National Fire Academy is proud to join with State and local fire agencies in providing educational opportunities to the members of the Nation's emergency services.

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OVERVIEW

COURSE GOAL

The goals of the course are to:

1. Increase an emergency responder's chance of surviving a terrorist incident that:

    a. Is in violation of the criminal laws of the United States to intimidate or coerce a government or the civilian population in furtherance of political or social objectives.

    b. Consumes a significant portion, if not the majority, of the readily available law enforcement, fire, and EMS resources.

    c. Entails multi-agency, multi-disciplinary, multi-jurisdictional response to confront the problem.

    d. Places an EMS first responder in a position of making important decisions in sizing up hazards and risks.

2. Increase an EMS first responder's ability to anticipate potential terrorist incident targets.

3. Increase a department's ability to respond effectively to a terrorist incident through coordinated planning, training, and exercising.

4. Increase an EMS first responder's skills level to work in a team setting to address terrorist incidents.

The numerous activities included in the course account for less than one half of the class time.

SCOPE OF THE COURSE

You will be trained in security considerations, identifying signs of terrorism, anticipating unusual response circumstances, assessing information and taking corrective actions, and determining strategies for survival. You will also learn to apply your knowledge about response to B-NICE events, providing patient care, identifying and preserving evidence, managing site safety, documenting the event and debriefing personnel. It is recommended that you take the ERT:TC *Company Officer* course as well.

TARGET AUDIENCE

This course was designed for the first on-the-scene responding EMS personnel with the responsibility to render patient care to victims of terrorist incidents. Secondarily, this two-day course was designed to cover the needs of response personnel, who would be career and volunteer fire fighters, EMS industrial contractors, allied health personnel or members of the military or other government agencies.

It assumes exposure to FEMA's *Basic Concepts* course (ERT:BC) or self-study course (ERT:SS).

COURSE METHODOLOGY

PRESENTATIONS

Presentations are interactive lectures that, in some cases, include skill-based activities. Word slides have been used only for main points, and, where possible, are accompanied with illustrative photos and graphics. Students should read the Student Manual materials and limited Supplemental Readings the night before the lecture.

COURSE SCHEDULE

UNIT	TITLE
Unit 1	Introduction
Unit 2	Safety
Unit 3	Security
Unit 4	Patient Care
Unit 5	Conclusion

Unit 1: Introduction

Terminal Objective

- Given a terrorist event, the student will be able to recognize the event and determine possible response stages.

Enabling Objectives

The student will be able to:

- Distinguish between strategies and tactics.
- Identify strategic goals regarding terrorism response.
- Define terrorism and several categories of terrorist targets.
- List several cues for recognizing a terrorist event.
- Identify potential field medical resource needs.

WELCOME TO EMS TACTICAL CONSIDERATIONS

Welcome to the National Fire Academy's Emergency Response to Terrorism: Tactical Considerations for Emergency Medical Services. This program is one of three tactical-level training programs developed by the Academy for the training of the nation's first responders to potential terrorist events. This program, in combination with the components "Tactical Considerations: Company Officer" and "Tactical Considerations: Hazardous Materials," presents the response considerations for three of the major public safety disciplines involved in responding to terrorism. This program is intended to be taken separately from the other two components and will present the information necessary for you to effectively carry out your functions. However, both the Company Officer and Hazardous Materials programs have specific information that may be valuable to you during a response.

Program Goals and Objectives

The primary goal of this program is to provide the EMS responder with the tactical and field medical considerations necessary for a safe and effective response to terrorist events. To achieve that goal it will be necessary for you to:

- recognize potential targets and events, as well as the associated impact of the event and resource needs/requirements;
- develop a safety plan for EMS operations;
- understand the very important implications of incident security upon your personal safety and survival;
- understand the components of a patient care plan; and
- understand the importance of planning for the event.

Course Background

The first needs assessment for this course was conducted at a meeting hosted by the National Fire Academy in October 1996. Attendees represented a broad spectrum of the community including Federal agencies, State and local firefighting and/or emergency response organizations, US military organizations and professional trade groups. The group sought and received input from experienced emergency professionals in Israel, Northern Ireland and Tokyo.

A development team composed of a variety of fire and emergency professionals from across the country met in 1998 to create this particular course using guidance from the original needs assessment. They convened a law enforcement round table with Federal, State and local law enforcement officers to complement their knowledge of fire and HazMat response. Members of the team also spoke with representatives from a number of agencies and developed a bibliography.

This product was the result of a determined effort by a number of experienced professionals both on and off the development team. The common thread was a commitment to an effective and safe response by first responders to terrorist events. This course is but one of a series of interventions developed by the NFA with Bureau of Justice assistance funding.

COURSE OVERVIEW

This program is presented in five separate but interrelated units.

Unit 1--Introduction: If you possess a basic understanding of terrorists' motivation, what targets they might select and how to recognize a terrorist event, you will be one step closer to an effective and safe response. In this unit we will discuss some of those key issues as well as the interrelationship between strategies and tactics, and those unique resource needs that you might have at one of these incidents.

Unit 2--Safety: Your personal safety is the major focus of the program. History, experts in the antiterrorism field and simulated exercises have all demonstrated that emergency responders are at risk during terrorist events. Although the probability of emergency responder casualties exists in terrorist events, the number of casualties will be determined by the effectiveness of leadership. Whether it comes from the first person arriving at the scene, the paramedic in charge, the company officer or your organization's management, it is leadership that will control or eliminate losses. Effective safety strategies and tactics must be implemented, trained for and practiced by *everyone*. This requires management commitment and everyone's participation.

Unit 3--Security: Unfortunately, it is true that emergency responders are very likely to be directly targeted by terrorist activities. Emergency responders represent the system that many terrorists are attempting to change. In addition, the public relies heavily upon the fire, EMS and law enforcement agencies within their communities. Any event that can reduce the public's confidence in their ability to serve and protect will result in public demands for change and, therefore, the furtherance of the terrorist's agenda. Aggressive security for the incident scene is the next most important activity for ensuring a safe and successful response. This requires a unified command and extensive coordination with law enforcement and other protective forces (e.g., the National Guard). In this unit we will discuss the security tactics that should be employed to ensure that unnecessary personnel are not allowed on the scene.

Unit 4--Patient Care: In this unit we will discuss the mainstays of patient care, the clinical effects of various terrorist weapons and treatment. You will be provided with tools to use in the development of a patient care plan. The principles of mass casualty incident management will also be discussed.

Unit 5--Conclusion: This unit offers an opportunity to apply the strategies for a safe response, available job aids and patient care considerations to a hypothetical event.

STRATEGIES VERSUS TACTICS

During this program you will be presented with various strategies and tactics for the EMS response to terrorist events. It is important to understand both the differences between strategies and tactics and the role of EMS responders in the overall response plan.

Strategies are broad statements of overall desired outcomes. The incident commander develops the necessary strategies for the management of the event. During the early stages of the event, the incident commander may be the paramedic in charge or the first arriving fire company officer or law enforcement officer. As the event progresses, command of the incident is passed to higher levels of command and the strategies initiated by earlier commanders are reviewed and revised as deemed necessary. The earlier officer then acts within a role under the strategic direction of the new command officer.

The major strategies with regard to EMS response to terrorist events are:

- Response and arrival.
- Security.
- Protective measures.
- Establish command.
- Isolate.

- Sizeup.
- Notification.
- Evidence preservation.
- Product identification.
- Rescue.
- Medical care.
- Control (spill, leak, fire).
- Recovery and termination.

In contrast to strategies, tactics are specific actions. Tactical objectives are the necessary actions that must be taken to achieve the successful completion of a strategy. If we were to apply this concept to a routine multi-casualty incident, one strategy most likely would be "patient care"; others might include safety and extrication. The tactical objectives necessary to provide "patient care" at such an event would include actions such as "triage," "treatment" and "transport." As we progress through this program, you will see the interrelationship of EMS strategies and their associated tactics.

This program focuses on the tactical considerations of emergency response to terrorism. However, as a person who will be implementing these tactics, it is important that you, the student, understand that you are working within an incident command system that is identifying strategic goals that must be accomplished.

The incident commander will identify broad overall goals that must be accomplished to bring the event to a successful conclusion. At the incident commander's level, the attention to the actual tactics that are employed to achieve the strategic goal would be overwhelming. Therefore, the incident command structure is developed to manage the actual operations so that strategic goals can be completed in a timely, safe and efficient manner.

Strategic goals are broad statements of desirable outcomes and **tactical options** are a more refined definition of specific measurable actions that must be carried out to achieve the strategic goal.

The emergency services throughout the country currently operate under a variety of strategic goals systems. These systems are designed to provide organized direction to the management of a particular type of event. Whether in response to a mass-casualty event, structure fire event, hazardous materials event or technical rescue event, strategic goals systems are a part of our lives on a day-to-day basis. An attempt to redesign a strategic goal system for the management of a terrorist event in the midst of responding to it, or to create a totally new strategic goal system under those circumstances, would be impractical and confusing. This statement is made based upon the fact that a terrorist incident involves one or more of the following types of events in any combination:

- Hazardous materials.
- Mass casualty.
- Technical search and rescue.
- Warfare.
- Criminal investigation.

EMERGING RESPONSE DOCTRINE

The doctrine of emergency response to terrorist events in the United States is a young and constantly changing set of ideas and information. As these events occur both domestically and internationally, we are constantly learning new and improved ways of managing the events and their consequences from other response organizations and military agencies. Therefore, the information in this program must be understood to be dynamic in nature. The standard of care today may become outdated in weeks or months to follow. With this in mind, it is important that we constantly monitor changing information and the standard of care just as we would monitor the changes in the other medical procedures that we perform on a more routine basis. During this program your instructor and the appendices of this Student Manual will direct you to numerous sources of what the National Fire Academy believes to be authoritative information. Most of the resources are US government and military sources.

One of the first and foremost strategies is that of incident recognition. First-response units must be able to rapidly identify incidents that could potentially be terrorist activities. Remember, first responders are likely targets, and therefore we must respond to such incidents in a manner that prevents us from being placed at a tactical disadvantage. This recognition process begins even before the rescue. It involves the establishment of an ITAG within the community to identify potential targets, monitor changing situations and look for intelligence indicators of real threats. We will discuss the ITAG later in this unit, but first we need to introduce to you the basic indicators of terrorist activities for first responders.

TERRORISM DEFINED

The US Department of Justice defines terrorism as "an illegal act or act that is dangerous to human life and which is against the laws of the United States or any political subdivision with the intent to intimidate or coerce a government or civilian population in the furtherance of a political or social agenda."

This very broad definition essentially characterizes terrorism as an illegal act intended to cause a change in politics or social issues through the use of intimidation. To better understand terrorism, we must look at five commonly accepted variables:

1. *The violence need only be threatened*. Terrorist acts are designed to do one thing--instill fear. People will feel that they cannot protect themselves and that the government is unable, or unwilling, to provide adequate protection. Therefore, a terrorist act need only be threatened to instill that level of fear, provided that the threat is perceived to be genuine and valid. Consider the impact on the US airline and travel industries if a believable threat were made to bomb 20 US planes over the next six months. If the public believed the threat to be valid, the resulting reduction in travel could be financially devastating to the industries and would result in increased pressure on the government to respond to the terrorists' agenda. Consider, for example, the incident in the summer of 1986, when Middle Eastern terrorists threatened US tourists in Europe with a campaign of terror and bombings. This simple threat resulted in a reduction of US tourism to the area of almost 40% and placed a severe economic burden on the European tourism industry.

2. *Fear is the actual agent of change*. For the terrorist to be successful, fear must be instilled. It is the population's fear that results in the pressures for the change that the terrorist desires. As fear grows, distrust in a government's ability to protect the public increases. It is this distrust that will result either in a policy change or an overthrow of the government. With this in mind, what would happen if the terrorist instilled the fear of becoming targets in America's emergency first responders? If responders become overly fearful and reluctant to act, public levels of fear will increase dramatically. Sometimes, however, the terrorist plan to

instill fear will backfire. Sometimes the terrorist act is so reprehensible that it incites anger rather than fear. If terrorists cross this line from fear to anger, their agenda is unlikely to be furthered. Examples are fresh in our mind--the bombing of servicemen in a West German nightclub in the 1980s that resulted in a strong military response against Libya for supporting the operations and, more recently, the images burned into our minds of the deaths of 168 people in Oklahoma City that resulted in an effect opposite that desired by the perpetrator, Timothy McVeigh. The American public was not frightened but appalled by the act and rallied behind the victims and Oklahoma City as if in the common defense of the country during a war. These strong and unyielding responses and sense of community will do much to prevent terrorists from carrying out such acts.

3. *Terrorists' victims are not necessarily the ultimate targets*. Generally speaking, the actual victims (whether injuries or deaths) are not the specific targets of terrorist acts. Victims are only pawns in the terrorist's attempt to instill fear in those who witness the attack. Unfortunately, the victims many times just happen to be in the right place ("right" meaning somewhere they feel comfortable and secure) at the wrong time.

4. *Those who observe the act are the intended audience*. Add to the situations we discussed above the media coverage that such events generate. Extensive media coverage is a double-edged sword. On one hand, it helps to pull the country or community together while, on the other hand, it furthers the terrorist's agenda by allowing more people to witness, almost instantly, an event that is, by nature, designed to instill fear.

5. *The terrorist's desired outcome is a political or social change*. The terrorist is trying to create enough individual fear or distrust of the government to force changes in social or political situations. Whether that change is to stop abortions, change a public policy or get the public to relinquish a certain freedom or liberty, thus giving the government more power to protect them, the people who are fearful demand the change. The terrorist only sets the terms for the cessation of hostilities. If we buy into those terms, we must remember that we have allowed the terrorists to achieve their goal.

Types of Terrorists

There are numerous ways to categorize or define terrorists--domestic or international; left or right; ideological; special interests; anarchists; neo-fascists and so forth. We will discuss only a simple breakdown of the types of terrorists.

Domestic terrorists originate within the United States; more often than not, they hold extreme right-wing beliefs. This is not to say that domestic terrorists are never from the left wing politically (we will discuss left and right in just a moment), but that the right is by far the largest and most active group within the United States. Luckily, to this point, there is little organization among the groups and they do not currently operate in concert. However, recent meetings between some of the larger groups are raising concerns that they are becoming better organized.

The continuum developed by Vetter and Perlstein in 1991 and shown in figure 1.1 demonstrates how terrorist groups range from the radical far left to the reactionary far right. The major belief structure of the far left is that of the fair and equitable distribution of power, wealth, prestige and privilege. This belief structure is expressed by many as the Marxist left, in as much as members of the far left believe in the writings of Karl Marx and therefore socialist or communist agendas. These types of groups are more likely to engage in terrorist activities designed to prompt the public to allow the government greater power. This is accomplished by instilling sufficient fear that the public demands the government do more to protect them. This increased government involvement generally would result in the reduction of individual liberties or freedoms in the interest of protection. Alternatively, the agenda could be to institute more extensive social programs and the redistribution of wealth.

On the other end of the continuum is the reactionary far right, whose values are based on order and a binding and pervasive morality. The far right may include religious, separatist or racial supremacy groups. Essentially these groups believe in less government intervention in social issues or, in many cases, no government intervention at all.

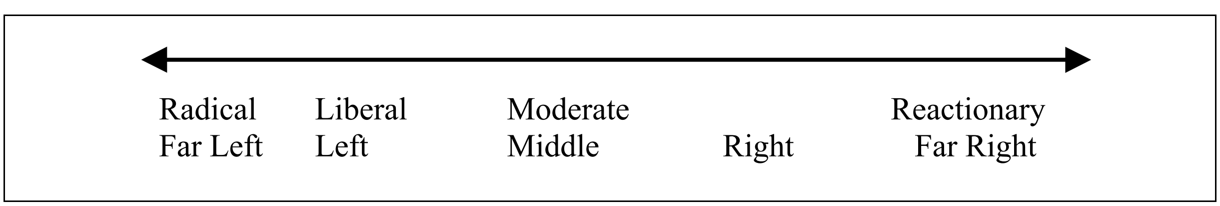


Figure 1-1

This is not to say that all left- or right-wing organizations are terrorist organizations. Other factors must be present before a group resorts to terrorist activities. In order for a group to be considered terrorist, it must meet three criteria:

First, it must hold an extremist viewpoint. Simply put, an extremist viewpoint is the belief in the "one truth." That is to say, the groups believes that there is only one answer to a particular issue, be it abortion, sexual orientation, or another religious, social or political issue. But holding an extremist viewpoint in itself by no means makes groups terrorists, any more than it does an individual. Many of us have one point of view on a specific topic--pro-life versus pro-choice is an excellent current example. Because the vast majority of people are tolerant of other points of view, however, we do not resort to terrorist activities provided others do not force their points of view on us. "Live and let live."

It is when the individual or group becomes intolerant of other points of view that we move closer to the terrorist belief structure and meet the second criterion, intolerance. At this point, the individual or group becomes unable to accept differences of opinion. This results in a belief that anyone who does not believe in the "one truth" is the enemy. Still, the individual or group isn't a terrorist; one can be intolerant and still be a law-abiding citizen. It is the third and final step that defines a terrorist.

In the third criterion, those persons, governments or countries with beliefs other than the terrorists' are not only considered an enemy, but are also vilified. The enemy now becomes a hindrance to accomplishing the belief or is seen as directly jeopardizing the "one truth." Once this shift occurs, the enemy loses all value. The enemy is thus worthless and a direct threat to the individual's or group's belief structure. Therefore, any means necessary to defeat or overcome the enemy becomes acceptable. In other words, the end justifies the means. This can even be taken one step further to create the most dangerous of situations. If the terrorist accepts the belief that anyone who is not fighting the "enemy" *becomes* the "enemy," then such people also become worthless and may themselves be attacked regardless of age, gender or relationship to the primary enemy.

TERRORIST TARGETS

Remember that terrorists want to instill fear in those who witness the attack. Therefore, they will look for a target that will give them as much media coverage as possible. The target may be a government facility if the terrorist is trying to portray the government as weak or inept (right-wing terrorist) or public facilities may be selected if the terrorist is trying to show the public that they need greater protection (left wing).

Targets can be people, places or infrastructure. People will be targeted to build the fear that no place is safe. Places could be of historical or ideological significance or of value/significance to the public. Infrastructure targets include those elements necessary for a community to function (e.g., roadways, bridges, and water treatment plants). The more critical the infrastructure and the harder it is to restore to service, the greater its potential for targeting.

RECOGNIZING TERRORIST EVENTS

We mentioned earlier that terrorists might specifically target emergency responders. Therefore, it is essential that responders understand how to recognize a terrorist event as early on as possible so changes can be immediately implemented to ensure that we maintain the tactical advantage. As soon as it is recognized that we are dealing with a terrorist event, we must change the way we do business. We want to avoid getting "blocked in," stay away from "choke points," use different response routes, implement security measures, be on the lookout for secondary devices and so forth. Therefore, we need some tools for recognition.

There are two stages of terrorist event recognition--pre-event recognition, which is, predominately, an awareness state of mind for conditions that might increase the likelihood of terrorism, and response phase recognition. We will discuss this in the planning section of the text but simply put, we watch out for people looking at the way we do business and we communicate closely with local law enforcement officials who should be monitoring trends with regard to groups that might carry out such acts (intelligence).

Event Phase Recognition

During the response phase we need to be alert for other indicators of terrorist incidents. These include:

Occupancy and Location

- Symbolic/Historic.
- Public assemblies.
- Controversial facilities.
- Infrastructure.

- Critical facilities.
- Vulnerable facilities.

Types of Events

- Bombings, incendiary fires.
- Events involving firearms.
- Non-traumatic mass casualty incidents.
- Epidemiological events.

Conditions

- Ideal attack weather conditions (unstable atmospheres with inversions and little air movement), which can be either natural or man-made, such as in a building or a subway.
- Situations that appear to deliberately place you at a tactical disadvantage (choke points, high grounds, unexpected traffic diversions).

Timing of the Event

- Timed for maximum casualties.
- Historic or significant dates. Example: April 19th raid on Branch Davidians, OKC Murrah Building, and Battle at Lexington and Concord.

Other Observations

- Unusual casualty patterns or symptoms.
- Odors.
- Out-of-place containers or dissemination devices.

Integrated Threat Analysis Group Concepts

An Integrated Threat Analysis Group (ITAG) is essential to a community's preparedness for a response to terrorist events. This group is composed of various officials from the local public safety professions who review intelligence and determine potential threats to the community. Most likely, a core ITAG would be comprised of representatives of local law enforcement, public health, fire, EMS, and emergency management agencies. The main role of this core ITAG is to identify potential targets within the community and to monitor for potential threats.

Once the potential targets have been identified, all potential first responders should be informed so that their level of awareness is heightened for any response to the location. Once the first responder is made aware of the potential targets, the other clues to the recognition of terrorist events (such as event type, time of day, visible observations and significant dates) can come into play to increase the likelihood of the identification of the terrorist event. And once that event has been identified, the local plans and policies for terrorism response are put into place immediately.

The roles of the core ITAG include:

- Determining the potential targets within the community.
- Coordinating the gathering of intelligence and reviews for potential threats.
- Coordinating the multi-agency gathering of intelligence.
- Ensuring intelligence security.
- Monitoring current threat levels.
- Monitoring for potential terrorist intelligence-gathering activities.
- Assisting and coordinating the development of agency response plans.
- Issuing appropriate advisories to member agencies as threat levels increase.

ITAG Issuance of Advisories

Based upon the perceived threat levels identified by the core ITAG, advisories to other organizations within can be issued. These advisories will assign a predetermined level of threat (awareness, warning, alert) based upon the current situations and may also contain additional information that is not considered by the ITAG to be too sensitive to release.

It is not necessary that the ITAG release detailed information. Too much information could jeopardize responder safety as well as ongoing criminal investigations. Therefore, the three levels--awareness, warning and alert--are issued to indicate the relative probability of an event.

Tactical Awareness--Although responders should be constantly aware of the potential for terrorist incidents, the issuance of a Tactical Awareness for Terrorist Activities should serve to enhance responder alertness to such events. If responders are then dispatched to a location which has been previously identified as a potential target, they should strongly consider the need for implementation of special tactical and strategic operations. A Tactical Awareness would be issued when public, social or political conditions exist that increase potential for terrorist action but no specific intelligence or threats have been received or identified--for example, a planned antiabortion or animal rights demonstration. During the awareness phase, routine activities are conducted normally but personnel alertness is heightened.

Tactical Warning--Specific threats or intelligence have been received. The contents of these threats may or may not be released, depending upon the sensitivity of the information. During Tactical Warnings, no nonessential operations should be carried out, and stations and resources within the area should be secured and hardened.

Tactical Alert--A terrorist event is either underway or has occurred. The alert can be issued by the ITAG or by the responding unit that recognizes the event. During the Tactical Alert, the community's emergency response plan is activated, and extensive security measures are implemented to ensure the safety of responders and the continuity of government. During the tactical alert phase of operation, local law enforcement and possibly National Guard units will play key roles in the security of the site and emergency response. In addition, FBI representatives will be notified and the Federal response will commence. It must be remembered, however, that Federal resources may be some distance away. Therefore, the community will be completely responsible for all operations during the initial stages.

POTENTIAL RESOURCE NEEDS

Remember that although extensive State and Federal resources may be dispatched to assist with the incident, their arrival may be delayed. Therefore, local EMS systems need to anticipate the potential resource needs and identify locations in their community from which those resources can be obtained.

Obviously, local mutual-aid agreements will play a key role in the response. However, bear in mind that mutual-aid agreements are based upon the premise that communities will share resources if they *can*. Therefore, an event that impacts more than one jurisdiction may adversely affect mutual-aid agreements.

EMS organizations need to consider expanding their resource-sharing agreements. Looking to regional response agreements that will bring resources from communities more distant than those immediately adjacent to their own community will greatly enhance capabilities. Additionally, the use of regional response resources will minimize the possibility of any one community being completely robbed of resources.

Fire service units will be key to EMS's effectiveness. The fire service carries personal protective equipment that can be very effective in such events. In fact, recent studies conducted by the US military suggest that firefighter protective clothing and the use of positive pressure breathing apparatus can provide protection equivalent to that provided by the MOPP-4 chemical/biological protective clothing used by the military. Although tests have not been completed at this time, organizations should monitor closely the information coming from the Chemical and Biological Defense Command (CBDCOM).

In addition to the obvious fire service resources, remember that fire departments will play a key role in the decontamination of patients, hazardous materials response, and light, medium and heavy rescue activities.

Local law enforcement must form a unified command with fire and EMS organizations. Law enforcement is key to security and evidentiary issues of the terrorist event.

Public works can assist in the establishment of necessary resources and aid in perimeter security with barricades and rescue with their heavy equipment. Public works is an absolutely essential resource to tap into during the planning stages.

Public health can provide extensive assistance in the areas of epidemiology and the coordination of public health issues with State and Federal government agencies. Your local public health official can provide a point of direct contact with the Centers for Disease Control and Prevention during both the pre-event and actual alert phases of operations.

Remember that a terrorist incident is very likely to overwhelm the local medical community, and additional State and Federal medical resources will not be in operation in your community for up to 12 hours after the event, depending upon your location. Therefore, tapping into every aspect of your local medical community may be necessary. Getting local professional medical organizations involved during the planning phase is essential. The vast number of nurses and physicians that can be drawn upon from outside the hospitals is a tremendous resource for any overwhelming mass casualty event. But if we do not get them involved early, their self-dispatch and freelance operations in dangerous areas can result in a disjointed approach as well as the injury or death of those medical professionals. To think that we can handle a major terrorist event by ourselves is insane. We can absolutely use their help, but we need to ensure that their response is integrated into the plan.

Local Emergency Operations Plan

The local emergency operations plan is generally managed by the community's emergency management official. This plan is approved by local elected officials and, many times, gives the emergency manager the ability to apply government resources to missions that are normally outside of their daily responsibilities.

Many local emergency response plans are designed in a fashion similar to that of the Federal Response Plan (FRP) which, when activated by Presidential declaration, enables the Federal Emergency Management Agency (FEMA) to provide virtually any Federal resource to a State that has been overwhelmed by a major emergency or natural disaster.

When the local emergency operations plan is activated, a local state of emergency is essentially declared and the assistance of all government agencies can be requested by the on-scene incident commander. The request for the resource is sent to the local emergency operations center by the IC and the resource need is filled from the local community's resources. Should the local community be overwhelmed, then a request is sent to the State emergency operations center and the resource is filled at the State level. The Federal Response Plan comes into play when the State needs additional resources to meet the needs of the local community.

Therefore, the resource request goes from local to State to Federal until the needed resource is obtained.

FEMA is named in the Federal Response Plan as the lead Federal agency for what is termed "consequence management" during a terrorist event. Therefore, any resources needed by the local community to respond to or recover from the event are coordinated by FEMA. The actual request for a resource is channeled through the local-State-Federal communication chain as previously discussed.

In addition to the consequence management role, FEMA plays a support role to the FBI during crisis management. Crisis management is essentially all other operations regarding terrorism that are not consequence management. This includes investigation and counterterrorism operations.

Local, State and Federal resources are generally coordinated under what are called emergency support functions or ESFs. The Federal Response Plan uses 12 such ESFs to organize all Federal resources. Each ESF has a specific mission(s) and is headed by a lead Federal agency. Therefore, when a State request for a Federal resource is forwarded to FEMA, the FEMA Emergency Support Team (EST) forwards that request to the appropriate ESF for action. Table 1-1 lists the various ESFs that are designated in the Federal Response Plan and that are commonly used by State and local emergency managers to organize their emergency operations plans.

Table 1-1
Emergency Support Functions at the Federal Level

ESF	LEAD AGENCY	MISSION
# 1--Transportation	U.S. Department of Transportation	Provide for the transportation of resources and assist with local transportation restoration.
# 2--Communications	U.S. Office of Science and Technology Policy	Ensure adequate communications within government and assist with restoration.
# 3--Public Works and Engineering	Department of Defense--Army Corps of Engineers	Assist with the restoration of essential utilities.
# 4--Firefighting	U.S. Department of Agriculture--U.S. Forest Service	Firefighting operations, predominately wildfire.
# 5--Information and Planning	Federal Emergency Management Agency	Collect, process and disseminate information.
# 6--Mass Care	American Red Cross	Shelter, feeding and basic first aid in the shelter operations.
# 7--Resource Support	U.S. General Services Administration	Logistical support for Federal operations.
# 8--Health and Medical Services	U.S. Department of Health and Human Services - Public Health Service	Source of extensive medical resources (Disaster Assistance Teams and Metropolitan Medical Response System funding and development).
# 9--Urban Search and Rescue	Federal Emergency Management Agency	Search and rescue operations for collapses of reinforced concrete structures.
#10--Hazardous Materials	U.S. Environmental Protection Agency	Support local and State hazardous materials response resulting from catastrophic disasters. Other incidents are handled under the National Contingency Plan.
# 11--Food	Department of Agriculture	Assess need for, secure and transport food to the affected area.
# 12--Energy	Department of Energy	Ensure continued energy needs are met (electrical and fuel).

ESF #8--HEALTH AND MEDICAL RESOURCES

The National Disaster Medical Service

The United States has never experienced a disaster comparable in magnitude to the 1988 Armenian earthquake, the 1984 Bhopal, India, toxic gas release, or the 1985 Mexico City earthquake, but the United States is still susceptible to the kinds of catastrophic accidents that occur elsewhere. For example, the 1857 earthquake (Richter magnitude of 8+) that destroyed Fort Tejon, California, approximately 100 miles northwest of the center of Los Angeles, caused negligible casualties. Because the area has since become densely populated, authorities estimate that a modern recurrence could cause from 3,000 to 14,000 deaths and 12,000 to 55,000 injured persons requiring hospital treatment. Such an event in Los Angeles could cause 20,000 deaths and close to 100,000 serious injuries.

No single city or State can be fully prepared for such naturally occurring or manmade catastrophic events, such as terrorism. Although many cities in the nation are well provided with health resources, those resources would be overwhelmed by a sudden surge of disaster injuries proportional to the population. The health resources of most States would be similarly overwhelmed. A system for dealing with disaster casualties must, therefore, provide for "mutual aid" among all areas of the nation and must be able to handle the large number of patients that might result from a catastrophic incident.

In addition, in the event of a conventional overseas war involving American forces, the military medical system could be overwhelmed by casualties returning to the U.S. for hospitalization. To meet the need, military casualties would be distributed among the Federal and private hospitals for treatment. This military system for dealing with warfare casualties can be implemented for use in the case of major disasters within the United States under the National Disaster Medical Service, which is managed by the U.S. Public Health Service Office of Emergency Preparedness.

The National Disaster Medical System (NDMS) is a single system designed to care for large numbers of casualties from either a domestic disaster or conventional overseas war.

Concept and Mission of the NDMS

The National Disaster Medical System is an organizational structure administered by the Federal government to provide emergency medical assistance to States following a catastrophic disaster or other major emergency. It is usually activated when the catastrophic disaster overwhelms both local and State resources. It is designed to supplement other resources and is oriented primarily to large-scale disasters in which local medical care capabilities are severely strained or overwhelmed. NDMS has two primary missions:

1. To supplement State and local medical resources during major domestic natural and manmade catastrophic disasters and emergencies; and

2. To provide backup medical support to the Department of Defense (DoD) and Department of Veterans Affairs (VA) medical systems in providing care for U.S. Armed Forces personnel who become casualties during overseas conventional conflicts.

Although NDMS is administered as a partnership, the Department of Health and Human Services is charged with overall direction of the program. This responsibility is delegated to the DHHS Office of Emergency Preparedness. This office maintains operational control of the program during periods when it is not activated and during peacetime activation. Control of the program is transferred to the Department of Defense in wartime support situations.

In a peacetime activation, generally in response to a domestic natural or manmade catastrophic disaster, NDMS has three objectives:

1. To provide health, medical, and related social service response to a disaster area in the form of medical response units or teams and medical supplies and equipment;

2. To evacuate patients who cannot be cared for in the affected area to designated locations elsewhere in the Nation; and

3. To provide hospitalization in Federal hospitals and a voluntary network of non-Federal acute care hospitals that have agreed to accept patients in the event of a national emergency.

To carry out these three objectives, NDMS has three sets of organizational resources:

Disaster Medical Assistance Teams and medical professionals from DHHS, VA and DoD–Disaster Medical Assistance Teams (DMATs) are voluntary medical manpower units organized and equipped to provide medical care in a disaster area or medical services at transfer points or reception sites associated with patient evacuation. Hospitals, volunteer agencies, or health and medical organizations sponsor DMATs and recruit interested medical and paramedical personnel to participate. DMATs are classified into four readiness levels, as follows:

Level One: DMATs that are fully deployable with standardized equipment and supply sets, are self-sustaining for up to 72 hours, and are capable of meeting and willing to meet the following mission assignments: pre-hospital care, ambulatory care, in-patient care, medical transportation, patient disposition and evacuation, patient administration and processing, and collateral health and medical duties as required. (Figure 1-2 shows the location of Level One DMATs in the United States.)

Level Two: DMATs that are deployable with personnel and person-carried personal equipment and supplies. Primary mission is to augment on-ground Level One teams.

Level Three: DMATs that have local response capability only.

Level Four: DMATs with memorandum of understanding executed that are in some stage of development but currently have no response capability.

An activated DMAT generally consists of 35 members, and a team roster may include more than 100 individuals to ensure sufficient personnel on activation. Two or three DMATs may be combined to form emergency medical response units with larger treatment capabilities. The following map shows the locations of Level One DMATs.

READINESS LEVEL-I DMATs

Figure 1-2

The Office of Emergency Preparedness administers the DMAT program by maintaining memoranda of agreement with sponsors for approved teams, rating readiness levels of teams, maintaining personnel files with the credentials of team members, monitoring and approving training, and supplying teams with certain articles of equipment. Upon activation of NDMS, the Office of Emergency Preparedness establishes an NDMS Operations Support Center, which calls up and deploys DMATs, Federalizes DMAT personnel for performance of medical tasks outside of their State of licensure, and maintains overall control of DMAT utilization. In the field, DMAT activities are supported and coordinated by Medical Support Units (MSUs). Besides general DMATs, specialized units have been formed for chemical/biological, pediatric care, burn care, mental health, disposition of the deceased (Disaster Mortuary Services Teams [DMORTs]), and assistance to Urban Search and Rescue units.

Casualty Evacuation System--Movement of patients from disaster sites to locations where definitive medical care can be provided is administered through the Department of Defense. Casualty tracking is conducted by the

Armed Services Medical Regulating Office (ASMRO) and the U.S. Air Force provides airlift through the Air Mobility Command, which can be supplemented by civilian resources through the Civil Reserve Air Fleet (CRAF). Other types of transportation, such as specially outfitted Amtrak trains, can be called into service through this system.

Definitive Medical Care Network--NDMS has enrolled over 110,000 reserve beds in 1,818 participating civilian hospitals to receive casualties from disaster areas. DoD and VA can provide additional beds, if required. These hospitals are located in 107 metropolitan areas. Maintaining this network is the responsibility of the Department of Defense and the Department of Veterans Affairs under the current concept of NDMS operations. This administration is performed through liaison offices, Federal Coordinating Centers (FCCs), in 72 DoD and VA facilities around the United States. Federal Coordinating Centers control patient distribution within their areas during catastrophic disaster casualty inception situations.

The entire National Disaster Medical System or selected components can be activated in a number of ways. The governor of a State can request assistance from the President who, in turn, can either declare a disaster or order activation of Federal assistance to that State. Currently, such activation is authorized under the Stafford Act of 1988 and administered through the Federal Response Plan which is coordinated by the Federal Emergency Management Agency (FEMA). The Public Health Service Act also authorizes the Secretary of the Department of Health and Human Services to provide emergency medical assistance on request of State or local authorities, and NDMS is an authorized vehicle for such assistance. The Secretary of Defense can also activate NDMS in situations of national emergency.

OTHER RESOURCES PROVIDED BY THE U.S. PUBLIC HEALTH SERVICE

There are numerous other resources available under the U.S. Public Health Services. In addition to being available under the activation of the Federal Response Plan, these resources are also available to your local public health officials during nondeclared emergencies.

Resources include the Centers for Disease Control and Prevention and the Agency for Toxic Substances and Disease Registry. In addition, the U.S. Public Health Service is currently funding the development and implementation of Metropolitan Medical Response System (MMRS) in major cities across the country to meet the medical decontamination and treatment needs caused by chemical/biological or nuclear weapons. The MMSTs were discussed earlier in this unit.

Intelligence Coordination

Another role of the core ITAG group is to coordinate the gathering of intelligence information that would suggest increased threat levels from throughout the community, State and Nation. The most knowledgeable intelligence organization within a community most likely will be the local law enforcement agencies. Their points of contact with other local, State and Federal agencies make them uniquely qualified to lead the intelligence-gathering efforts, and they *must* be included in any ITAG.

Law enforcement agencies regularly receive updates from other agencies including the FBI with regard to increased activities and threats. Not only are they capable of providing intelligence on terrorist issues but they can also be a valuable source of information concerning gang violence trends and civil disturbances. Within the core ITAG, the intelligence information is shared and carefully analyzed to determine if threat levels are increasing.

Several times we have mentioned the term "core ITAG." The reason for clarifying the description is the sensitivity of the intelligence that may be gathered by the group. In order to obtain good intelligence from law enforcement agencies, it is absolutely necessary to ensure the security and confidential nature of the information. Therefore, it is recommended that only a few key personnel be assigned to the core group. This group will then release information on a need-to-know basis to other ITAG members to allow for the development of plans and will issue "advisories" to agencies within the community based upon threats so that appropriate levels of response can be maintained

SUMMARY

It is important that we understand the terrorist's motivations and identify potential targets of terrorist attacks to recognize terrorist events quickly. If we fail to have pre-event or event phase recognition in place, we are likely to find ourselves in over our heads.

Know your community, the political and social conditions around you, likely targets and how to recognize terrorist acts. The number of casualties we take is up to you, our leadership.

Activity 1.1

Strategic Considerations at a Terrorist Event

Purpose

This activity should begin the team development process and tactical thinking approach taught throughout the course. It will provide an overview of the concept of strategy versus tactics. It will give the students an opportunity to identify the possible strategies and associated tactics that may be employed during a terrorist event.

Directions

1. Work in small groups.
2. Review the Blue Water County community information and maps.
3. Review the scenario and identify: (1) the strategies that you feel are important to your safe and effective response; and (2) the tactics you might use to achieve those strategies.
4. Respond to the issue assigned to your group.
5. Record your responses on the easel pad paper.
6. Report your group's findings to the class.

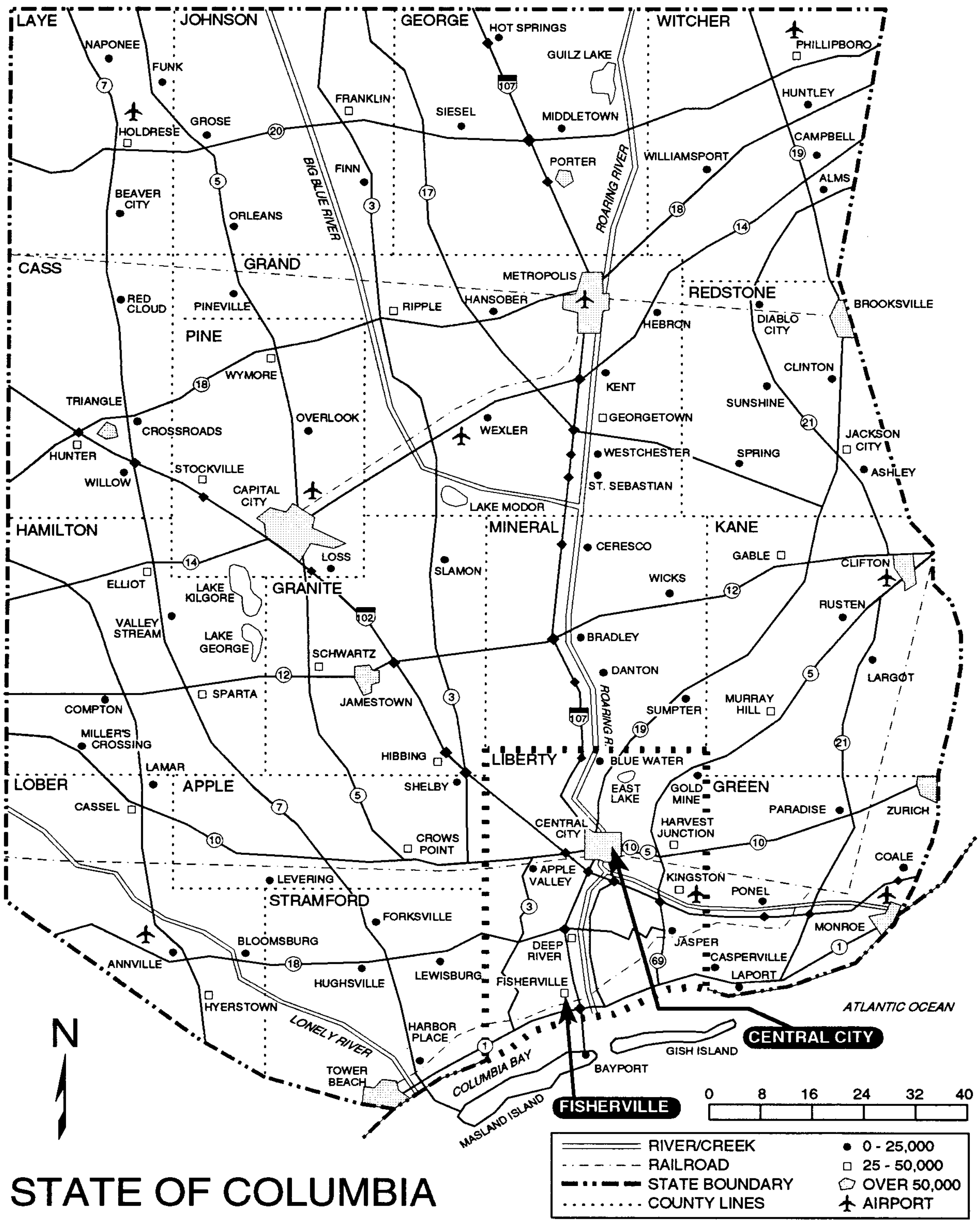
Masland Island Scenario

It is a sunny August day at 1:15 p.m. The public beaches on Masland Island are filled with thousands of sunbathers, families and weekend visitors from the city. You are the EMS Supervisor for Bayport Community Hospital EMS. Your system operates one BLS and two ALS units from the main hospital on Masland Island.

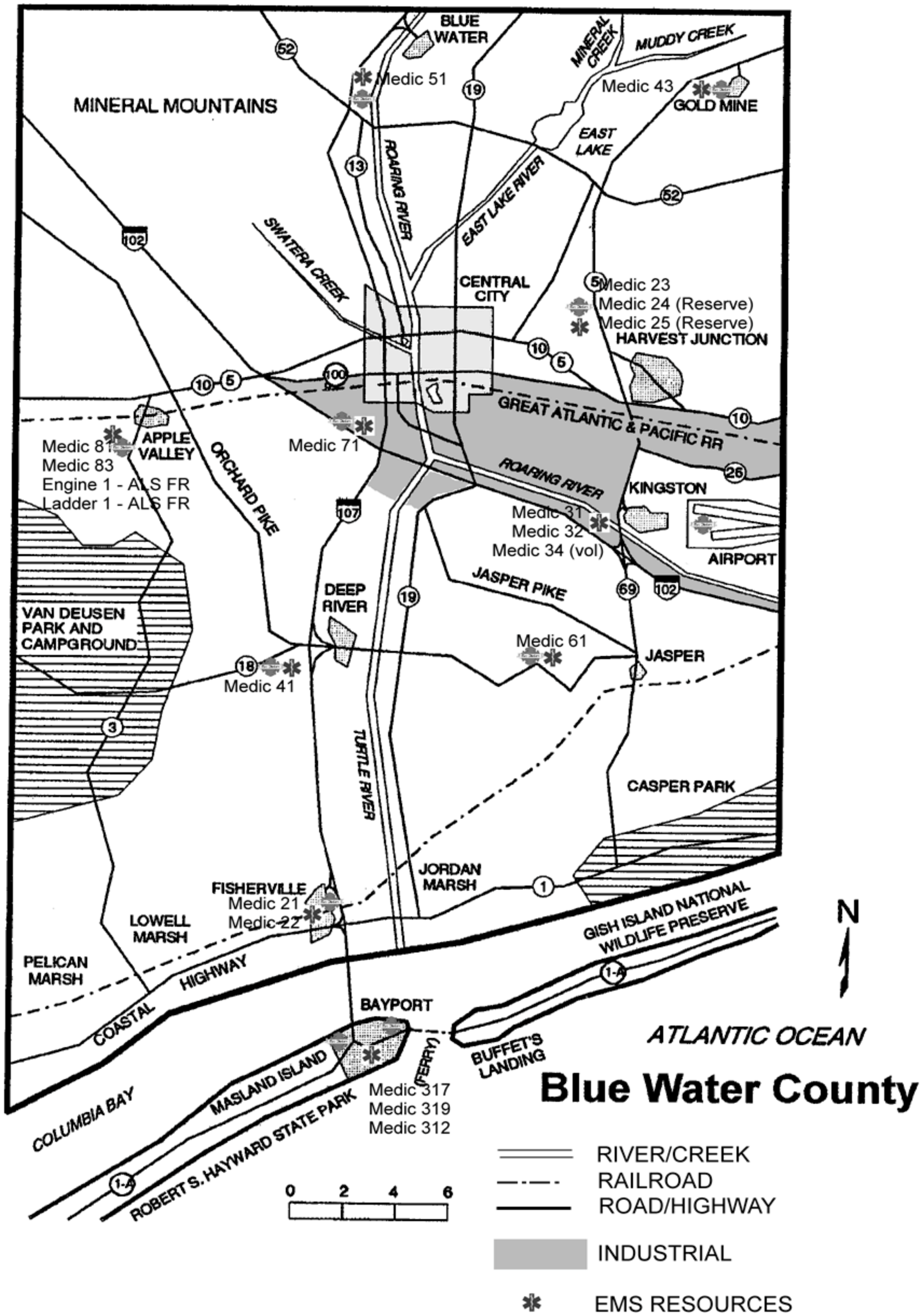
One of your ALS units has been dispatched to a reported ill person on the beach at Beach Blvd. and Eighth Street. Subsequent information indicates that numerous persons are calling in to report that they have been covered by a yellow liquid-like substance that apparently came from a low-flying private plane along the beach. Your ALS unit is on scene and reports that everything is covered with a yellow substance. Although no one is symptomatic, the anxiety of the people on the beach is high. The medic unit (317) reports that several hundred to a thousand people are affected.

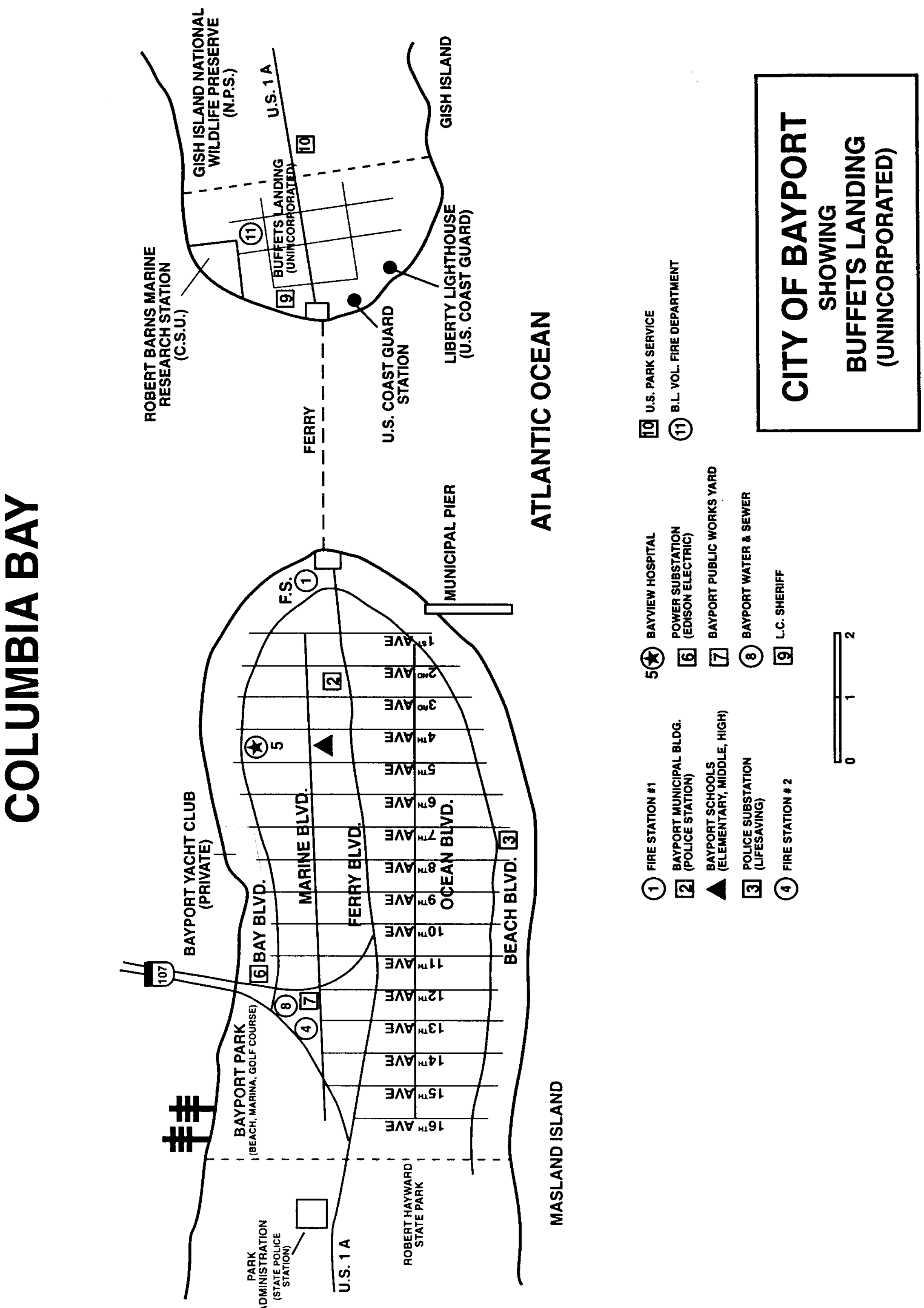
As you are responding to the beach call, your dispatch center (a county-wide 911 consolidated communications center) dispatches Medic 319 and a single engine from Bayport Fire Department to a reported explosion on the West Masland Bridge that links Masland Island to the mainland at Harbor Place.

Identify the strategies that your group feels are important to the management of this event. Remember to focus on strategies rather than tactics.



STATE OF COLUMBIA


BLUE WATER
MINERAL CREEK
MUDDY CREEK
Medic 51
Medic 43
GOLD MINE
MINERAL MOUNTAINS
EAST LAKE
ROARING RIVER
EAST LAKE RIVER
SWATERA CREEK
CENTRAL CITY
Medic 23
Medic 24 (Reserve)
Medic 25 (Reserve)
HARVEST JUNCTION
GREAT ATLANTIC & PACIFIC RR
Medic 81
Medic 83
Engine 1 - ALS FR
Ladder 1 - ALS FR
APPLE VALLEY
ORCHARD PIKE
Medic 71
ROARING RIVER
KINGSTON
Medic 31
Medic 32
Medic 34 (vol)
AIRPORT
JASPER PIKE
DEEP RIVER
VAN DEUSEN PARK AND CAMPGROUND
Medic 61
JASPER
Medic 41
TURTLE RIVER
CASPER PARK
JORDAN MARSH
FISHERVILLE
Medic 21
Medic 22
LOWELL MARSH
PELICAN MARSH
COASTAL HIGHWAY
GISH ISLAND NATIONAL WILDLIFE PRESERVE
N
BAYPORT
ATLANTIC OCEAN
BUFFET'S LANDING
(FERRY)
MASLAND ISLAND
COLUMBIA BAY
ROBERT S. HAYWARD STATE PARK
Medic 317
Medic 319
Medic 312
Blue Water County
0 2 4 6
RIVER/CREEK
RAILROAD
ROAD/HIGHWAY
INDUSTRIAL
EMS RESOURCES


COLUMBIA BAY
ATLANTIC OCEAN
CITY OF BAYPORT
SHOWING
BUFFETS LANDING
(UNINCORPORATED)
GISH ISLAND NATIONAL
WILDLIFE PRESERVE
(N.P.S.)
U.S. 1 A
GISH ISLAND
BUFFETS LANDING
(UNINCORPORATED)
ROBERT BARNS MARINE
RESEARCH STATION
(C.S.U.)
LIBERTY LIGHTHOUSE
(U.S. COAST GUARD)
U.S. COAST GUARD
STATION
FERRY
MUNICIPAL PIER
F.S.
BAYPORT YACHT CLUB
(PRIVATE)
BAY BLVD.
MARINE BLVD.
FERRY BLVD.
OCEAN BLVD.
BEACH BLVD.
1ST AVE
2ND AVE
3RD AVE
4TH AVE
5TH AVE
6TH AVE
7TH AVE
8TH AVE
9TH AVE
10TH AVE
11TH AVE
12TH AVE
13TH AVE
14TH AVE
15TH AVE
16TH AVE
107
BAYPORT PARK
(BEACH, MARINA, GOLF COURSE)
PARK
ADMINISTRATION
(STATE POLICE
STATION)
U.S. 1 A
ROBERT HAYWARD
STATE PARK
MASLAND ISLAND
1 FIRE STATION #1
2 BAYPORT MUNICIPAL BLDG.
(POLICE STATION)
BAYPORT SCHOOLS
(ELEMENTARY, MIDDLE, HIGH)
3 POLICE SUBSTATION
(LIFESAVING)
4 FIRE STATION # 2
5 BAYVIEW HOSPITAL
6 POWER SUBSTATION
(EDISON ELECTRIC)
7 BAYPORT PUBLIC WORKS YARD
8 BAYPORT WATER & SEWER
9 L.C. SHERIFF
10 U.S. PARK SERVICE
11 B.L. VOL. FIRE DEPARTMENT
0
1
2

Unit 2: Safety

Terminal Objective

- Given a simulated potential target hazard for a B-NICE incident, the student will be able to develop a safety plan that addresses the potential for secondary contamination, personal protective equipment, decontamination and monitoring considerations for personnel operating in the multi-casualty branch.

Enabling Objectives

The student will be able to:

- Identify factors that would contribute to the potential for secondary contamination.
- Identify the precautions necessary for body fluid exposures.
- Identify the resource needs and procedures for the decontamination of EMS personnel.
- Identify the level of personal protection needed by EMS personnel based upon their location and job function.
- Identify the role of the Safety Officer and the Incident Safety Plan.

SECONDARY CONTAMINATION

In the event of a terrorist incident involving the dissemination of a biological or chemical agent, the potential for secondary contamination is a primary issue in emergency responders' safety. Secondary contamination is the contamination of responders or others by victims contaminated by the agents. The initial victims touch or brush against unprotected responders or other civilians. The contamination of the secondary victims therefore comes not from the dissemination device, but from the initial contaminated victims.

Secondary contamination is not limited to people. There is always the potential for secondary contamination of the environment, equipment and other facilities.

In the prehospital setting, the key factors in determining the potential for secondary contamination are the route of exposure to the agent and extent of exposure. Victims whose skin, hair or clothing is grossly contaminated with solid or liquid chemical (including condensed vapor) may contaminate personnel by direct contact or off-gassing vapor. Victims who have ingested a toxic chemical may expose others through toxic vomitus or by vapor off-gassing from toxic vomitus.

BODY FLUID PRECAUTIONS

One area frequently overlooked during a normal multiple casualty incident that would almost certainly be overlooked at a multiple casualty incident caused by a weapon of mass destruction is proper infection control procedures. An incident with a point source dissemination of a product will more than likely initiate a full response, complete with decontamination and HazMat team response. It is easy to overlook the need for infection control at such incidents. Those responders who are operating in chemical protective clothing will probably not be performing any invasive procedures; however, the responders who will be transporting the patients to the hospital will.

Despite the often critical condition of the patients victimized by a terrorist incident, there will be an even greater need for infection control than at the scene of a non-terrorist incident. For example, one of the leading symptoms of nerve agent exposure is the oversecretion of all body fluids. It is easy to forget that the patient may have an underlying disease process that is communicable through body fluids. On any normal call, responders reflexively don proper protective equipment, but at a mass casualty incident, especially one caused by a terrorist act, many responders forget to follow even the most basic rules of self-protection. When there are potentially hundreds of patients affected with oversecretion, effective infection control is critical.

In the case of biological weapons, there will most likely not be a point source response, but rather a response to multiple patients in the form of a very high call volume. In this case, body substance isolation (BSI) is crucial. A weapon such as pneumonic plague is very contagious, and without proper protection, responders will be at risk for contracting the disease.

In the short time frame and general confusion common to multiple casualty incidents, there is no way to predict which infectious diseases might be present. Therefore, responders should use body substance isolation against potential infection. BSI goes beyond universal precautions and applies to all body fluids. Wearing gloves, mask, gown, and eye protection as appropriate is intended to prevent eye, mouth, other mucous membrane, non-intact skin and parenteral contact with blood, other body fluids, or other potentially infectious material. Gloves should be donned prior to patient contact; this is particularly important for responders with chapped, cut, or non-intact skin on their hands.

Proper containment of sharps is also required. In the event of a nerve agent attack where there is liberal use of atropine and pralidoxime chloride, either in multidose form or as part of an antidote kit, the used needles must be managed appropriately. Although chemical protective clothing provides good protection against a variety of chemicals, needles will easily pass through it.

SUPERVISORY AND RESPONDER BRIEFINGS

EMS supervisory personnel who are responsible for the EMS aspects of the multiple casualty incident should participate in an on-site briefing with the Incident Commander, Hazardous Materials Branch Supervisor, and any other technical assistance available. This briefing should cover:

- Materials involved or suspected agents.
- Number of contaminated civilians and responders.
- Estimated time the agent was released.
- Physical and chemical properties of the material (e.g., vapor, aerosol, liquid, solid).
- Actions taken to this point.

- Zones established and their boundaries.
- Establishment of dedicated water supply for decontamination.
- Response of technical assistance and the estimated time of arrival.
- Dedicated radio channel for responders operating in chemical protective clothing.
- Appropriate level of personal protective equipment (PPE) for each zone.

All responders should be briefed upon arrival at the incident with at least the following information:

- Location of zone boundaries.
- Location of decontamination lines.
- Proper radio frequency.
- Proper PPE and equipment needed.
- Incident assignment.

DECONTAMINATION

This section on decontamination is meant as a brief review for those responders who are already trained in decontamination and as an introduction for those responders without decontamination training. It is not meant to take the place of competency-based training in this subject matter.

Hazardous material or terrorist incidents may involve civilians and/or first responders. Prompt, safe and effective decontamination procedures are essential to protect against, or reduce the effects of, exposure to both victims and first responders. Decontamination is performed to protect citizens, personnel, equipment, and the environment from the harmful effects of the contaminants.

The National Fire Protection Association (NFPA) defines decontamination as a chemical and/or physical process that reduces or prevents the spread of contamination from persons or equipment. According to the Occupational Safety and Health Administration (OSHA), decontamination is the removal of hazardous substances from employees and their equipment to the extent necessary to preclude foreseeable health effects.

From these two definitions, we can come up with a working definition of decontamination. It is a chemical and/or physical process used to remove and prevent the spread of a contaminant from an emergency scene because of the contaminant's ability to cause harm to living beings and/or the environment.

Phases of Decontamination

The two major phases of decontamination are gross and secondary. (There is usually a third or tertiary decontamination phase, but it generally occurs at a medical facility and may involve such processes as sterilization or debridement.)

Gross decontamination is the removal or chemical alteration of the majority of the contaminant. It must be assumed that some residual contaminant will always remain on the host after gross decontamination. This residual contamination can cause cross-contamination.

Secondary decontamination is the alteration or removal of most of the residual product contamination. It provides a more thorough decontamination than the gross effort. However, some contaminant may still remain attached to the host.

There are seven common mechanisms for performing decontamination. They are:

1. Emulsification--the production of a suspension of ordinarily immiscible/insoluble materials using an emulsifying agent such as a surfactant, soap or detergent. Emulsification is most often used for nonpolar liquids and insoluble solids.

2. Chemical reaction--a process that neutralizes, degrades, or otherwise chemically alters the contaminant. Normally, a chemical reaction does not assure that all hazards have been eliminated, and reactions can be both difficult and dangerous to perform. Chemical reaction is therefore not recommended for use on living tissue.

3. Disinfection--a process that removes the biological (etiological) contamination hazards as the disinfectant destroys microorganisms and their toxins.

4. Dilution--a process that simply reduces the concentration of the contaminant. It is most commonly used for those substances that are miscible/soluble. Huge quantities of solvent may be required to dilute even small volumes of some solute contaminants.

5. Absorption and Adsorption--the penetration of a liquid or gas into another substance. The classic example is water into a sponge.

6. Removal--the physical process of removing contaminants by pressure or vacuum. Most efforts involve the use of water, though solids can be removed with brushes and wipes; even air can be used.

7. Disposal--the aseptic removal of a contaminated object from a host, after which the object is disposed of.

Decontamination is performed when any of the following occur:

- Obvious contamination with a known substance.
- Suspected contamination by a known substance.
- Any likelihood of exposure to a hazardous substance in the hot zone.

Decontamination is also performed:

- To prevent the spread of a contaminant.
- To protect the environment.

Decontamination for responders in proper protective equipment will differ from the decontamination of responders who were not wearing proper protective clothing. Responders in PPE should not get any contaminant on their skin or work clothes worn under their PPE. For this reason, personal showers may not be required. If for any reason the responder becomes symptomatic for exposure or experiences a breach of the PPE, then the responder will undergo a full decontamination. A basic list of equipment required for decontamination is:

- Buckets.
- Brushes.
- Decontamination solution.
- Decontamination tubs.
- Dedicated water supply.
- Tarps or plastic sheeting.
- Containment vessel for water runoff.
- Pump to transfer wastewater from decontamination tubs to containment vessel.
- A-frame ladder (to reach the top of the responder's suit).
- Appropriate-level PPE for responders performing decontamination.

The objectives of the responders assigned to decontamination are:

- Determine appropriate level of protective equipment based on materials and associated hazards.
- Properly wear and operate in PPE.
- Establish operating time log.
- Set up and operate the decontamination line.
- Prioritize the decontamination of victims according to a triage system.
- Perform triage in PPE.
- Be able to communicate while in PPE.

The decontamination of responders in PPE should proceed as follows:

- Rinse, starting at the head and working down.
- Scrub the suit with a brush, starting at the head and working down.

- Pay special attention to heavily contaminated areas (e.g., hands, feet, front of suit).

- Rinse again, starting at the head and working down.

- Assist responder in removing PPE.

- Contain the runoff of hazardous wastewater.

The decontamination of victims contaminated by a weapon of mass destruction who are not wearing PPE would proceed differently. The first and foremost consideration is for the safety of all responders; if the first responders become incapacitated, they will be unable to help others. The proper use of personal protective clothing and SCBA, along with the selection of a pre-established decontamination site, will greatly reduce the hazards associated with cross-contamination.

Structural firefighting clothing is not designed or recommended for working in hazardous material environments and should be avoided. If personnel in firefighting gear encounter a hazardous chemical environment, they should take precautions to minimize the chance of contamination. A team in bunker gear can stand back and apply a fog stream to contaminated persons.

A public address system should be used to direct ambulatory victims to a decontamination line. This provides a rapid form of triage. Victims should be instructed to begin decontamination by removing their clothing. Shoes, socks, jewelry, watches and other items that may trap materials against the skin should be removed. Contact lenses should be removed as soon as possible. All clothing should be double bagged for disposal or decontamination later. Valuables and identification should be bagged and may (based on chemical and physical properties) be carried by the victims.

Next, the victims should receive a two- to five-minute water rinse. Solid or particulate contaminants should be lightly brushed off (dry decontamination) as completely as possible prior to washing (wet decontamination). Viscous liquid contaminants (including vesicants) should be blotted off prior to washing. If the material is water reactive, it should also be brushed off prior to the application of water. Rinsing should be done as needed afterwards to flush any remaining chemical that may be reacting with the moisture of the skin and eyes. An appropriate decontamination solution should also be used.

Washing and rinsing should start at the head to reduce contamination on or near the nose, mouth, ears and eyes. If contact lenses have been removed, the eyes should be irrigated. Open wounds should be irrigated starting from the area nearest the body core and working outward. Plastic wrap may be used to isolate the wound once it has been cleaned. A low-water-pressure system should be used to avoid aggravating soft tissue injuries and to avoid overspray and splashing. A low-pressure system will also help prevent the creation of an aerosol out of dry product.

After decontamination, victims should be given some type of cover to attend to modesty and provide protection from the elements.

Medical Decontamination Officer

The medical decontamination officer is responsible for the final walkthrough of the contamination reduction corridor before the first contaminated person enters it. This is to insure that all necessary supplies are present and there is adequate containment of the runoff, if conditions dictate containment. Once actual decontamination is begun, the officer, along with any other personnel not in proper PPE, should stay out of the decontamination corridor. The medical decontamination officer will remain in radio contact with the decontamination team and the command post.

Medical decontamination operations require supervision. Because full PPE limits one's field of vision, thereby limiting a supervisor's ability to observe operations, the medical decontamination officer should not wear PPE. The medical decontamination officer will supervise the decontamination procedure from outside the decontamination line, remaining in a position to observe all persons leaving the hot zone. This is to ensure their exit through the decontamination line.

Need for Decontamination

The establishment of a decontamination line will depend upon the needs of the incident. If, upon the responders' arrival, no victims are in need of decontamination, the need for a decontamination line will be limited to the entry teams. On the other hand, if the first arriving responders are confronted with a large number of contaminated, critically injured victims, then the need for the quick setup of a medical decontamination line becomes acute.

Location of Contamination Reduction Corridor

The contamination reduction corridor should be located upwind and upgrade from the exclusion area. The decontamination line should initially be established in a location that is safe to work in without SCBA or specialized chemical protective clothing. However, once the decontamination line is in place and before the decontamination line is put to use, personnel who will be performing tasks in the decontamination line must don proper protective clothing. All other personnel should leave the decontamination line. The boundaries of the decontamination line should be marked off with specific entry and exit points. Barricade tape, delineators, cones or natural barriers can be used. The size of the decontamination area depends largely on the size and scope of the incident.

CONSIDERATIONS IN DECONTAMINATION

Some considerations that must be addressed prior to any decontamination occurring are:

- Area.
- Runoff containment.
- Equipment.
- Personal effects.
- Delayed effects.

Area

Prepare an area that allows for full decontamination while permitting, if possible, modesty measures. Contamination reduction takes precedence over modesty, depending on the toxicity of the contaminant. For example, allowing a patient to change into a Tyvek™ suit while awaiting a decontamination shower will remove a large quantity of product while allowing the patient some modesty. Depending on the toxicity of the contaminant, this may not be an option.

Runoff Containment

During a life-threatening emergency, retention of wastewater runoff may be a secondary consideration. The final authority on the proper disposal of runoff is your local environmental protection agency. The duration of exposure and toxicity of the contaminant will determine the urgency of wastewater runoff containment. All decontamination plans should account for the start of both emergency decontamination with subsequent recovery of the contaminated wastewater and a non-emergency decontamination when there is time to prevent the release of contaminated wastewater. In an attack involving a weapon of mass destruction where there may be a need to decontaminate several hundred victims with critical levels of contamination, the setup of a wastewater containment system may occur simultaneously with the start of decontamination by the first arriving units. Plan for the runoff of liquids by setting up a collection pool. Prevent victims from standing in any pooling of contaminated runoff.

Personal Effects

All jewelry and clothing must be removed and vouchered by the appropriate authorities in PPE. If local law enforcement personnel are not capable of operating in PPE, consider the need for decontamination team members to be trained in vouchering personal effects.

If you must voucher personal effects such as jewelry, describe the articles in plain English based on what you see, not how the patient describes it. For example:

> Victim description--1.5 ct. diamond set on a 24 ct. gold ring.
>
> Responder vouchering--1 yellow metal band with a clear stone.

Consult with technical assistance personnel to determine whether personal effects, like jewelry, may be carried through the contamination reduction corridor and decontaminated as the victims are decontaminated.

Delayed Effects

Even after being decontaminated, the victim may still be a source of contamination. If internal contamination or dermal absorption of the contaminant occurs, any body fluids such as urine, sweat, feces, etc., may be contaminated. These body substances might redeposit the contaminant on the skin or might contaminate responders. For this reason, medical personnel rendering care to decontaminated patients must still be protected from any secondary contamination.

FACTORS AFFECTING DECONTAMINATION

Factors that will affect the decontamination line are:

- Chemical and physical properties of the contaminant.
- Amount and location of contamination.
- Contact time.
- Temperature.
- Level of protection used.
- Work function of responders.
- Effectiveness of decontamination.

Chemical and Physical Properties

The very properties that make a material more hazardous, thus more likely to be used by a terrorist, also make it more difficult to decontaminate.

- Gases are more likely to permeate clothing and skin.
- Liquids are harder to see and remove than powders and other solid materials.
- Low-viscosity liquids may permeate more rapidly than high-viscosity liquids.
- Soluble materials are easier to decontaminate than non-soluble materials.
- Multi-hazardous chemicals (such as those that are flammable, toxic, corrosive and/or reactive) involve a more complex decontamination process, are difficult to manage and present greater hazards to the decontamination team.

Amount and Location of Contamination

The greater the amount of body surface exposed, the more involved the decontamination process will be. If contaminants are located on or near the face, there is more likelihood of harm due to ingestion or inhalation. Product located in other body cavities, folds in skin, nails or hair has a greater likelihood of absorption or permeation into the body. For this reason it is normally recommended that decontamination start at the head and work down. Eyes, ears, nose, mouth, hair, etc. need to be thoroughly decontaminated. Open wounds need to be completely irrigated using a gentle water spray.

Contact Time

The longer a material is in contact with an object, the greater the probability and extent of contamination. Decreasing contact time is therefore one of the most important objectives of contamination reduction.

Temperature

Temperature increases vapor production, which increases permeation rates.

Level of Protection Used

Contamination reduction requirements vary according to the level of chemical protective clothing being used. The level of protection (A, B, C), the type of suit material, whether the suit is disposable, and the number of components of the suit are all important factors to be considered when performing contamination reduction and developing a standard operating procedure (SOP).

Specific Work Function

The likelihood of contamination is related to the specific work function. A person taking samples or mitigating a high-flow leak in the exclusion zone is far more likely to become contaminated than a person conducting a site survey.

Effectiveness of Decontamination

Determining the effectiveness of contamination reduction is not always easy. This is particularly true when people have been contaminated. Some symptoms of exposure do not become apparent for weeks, months or years. Some chemicals accumulate in the body and tend to weaken over time. Some combine with other substances in the body and become more toxic (synergistic effect). Immediate and follow-up medical monitoring should be conducted for contaminated persons.

Effectiveness of decontamination on PPE is not an issue if you are using disposable PPE. If you are using reusable PPE, then you will need to consult with technical assistance and the manufacturer to determine proper decontamination of the equipment.

All materials used for contamination reduction must also be decontaminated or disposed of properly. Items such as clothing and tools, which are not completely decontaminated on site, should be secured in drums with liners or double bagged and labeled prior to being removed from the site. Wash and rinse solutions used for decontamination should be tested for possible contaminants. If unacceptable levels of contaminants are found in the runoff water, the runoff water should be treated or held for proper disposal.

Victims must be evaluated for potentially life-threatening injuries. As soon as it is safely possible, measures should be taken to support the airways, breathing and circulation of the victims. Oxygen may be administered while decontamination is being performed. Suction equipment should be kept nearby and spinal precautions should be taken if needed. All possible attempts should be made to provide modesty measures when removing victims' clothing. A blanket, salvage covers, tents, and vehicles on scene may be used to provide privacy. Disposable paper garments should be provided if appropriate.

Sawhorses, buckets or other supporting structures will be required in the decontamination line to support backboards, body bags or Stokes stretchers during the contamination reduction process.

Nonambulatory victims must be disrobed and physically rolled over during the process to ensure adequate decontamination. Strict attention must be paid to protecting the airway, particularly for patients whose airway has been compromised by exposure to the hazardous material. Decontamination must be conducted carefully to ensure the victim does not aspirate the water used. Placing a board on an incline and giving the patient oxygen via a mask is recommended. Suction equipment should be on hand. Backboards and stretchers are allowed in the decontamination line only for the transfer of fully decontaminated patients. Additional equipment should be provided at the access control point to ensure safe handoff.

This entire decontamination process should be practiced repeatedly and often. Proper decontamination of victims and responders is a demanding art. Personnel must be familiar with the associated difficulties before the incident occurs. Decontamination prevents victims and response personnel from spreading the contaminant beyond the exclusion area.

The contamination reduction corridor and decontamination equipment must be set up prior to any entry by response personnel (with the exception of basic/gross decontamination done to save a life).

PPE FOR EMS RESPONDERS

In a B-NICE incident proper protective equipment must be worn by any responder who may come in contact with a contaminated patient. In this case, the proper protective equipment will include chemical protective clothing. This protective ensemble is made to protect skin and eyes from chemical exposure. There are different levels of protection and requirements for wearing it. Depending on the type of incident, there may be different levels of protection that can be worn in different areas. There is no all-hazard type ensemble that can be worn.

EMS responders who are going to perform pre-decontamination triage, treatment or decontamination itself must be trained in the wearing and use of personal protective equipment that is specific to the incident. This training needs to include both practical and didactic sessions and must be competency based.

There are two types of chemical protective clothing, encapsulating and non-encapsulating. The encapsulating suit is a complete, vapor-proof unit, whereas a non-encapsulating suit is not complete and most often does not have gloves attached. You must remember that unlike a "routine" hazardous materials incident, a weapon of mass destruction was designed for one purpose, to kill as many humans as possible, most effectively. This is why all responders must pay strict attention to the use of zones and proper protective clothing.

Three areas in which the suits are tested in order to develop a manufacturer's compatibility chart are permeation, penetration and degradation. Permeation is a chemical's ability to work its way through a fabric on a molecular level, much like water passing through a T-shirt. If you are wearing the shirt, the water will soak through but not damage the shirt. Penetration is a chemical's ability to perforate or leak through existing openings, such as zippers or seams. Degradation is a chemical's ability to break down or destroy fabric, thus creating its own route through the suit.

Levels of Protection

There are four levels of protection available to responders through chemical protective clothing--Levels A, B, C and D.

Level A suits are totally encapsulating and vapor proof and have flash protection. These suits must be worn with either an SCBA or a supplied breathing airline attached to a pass-through valve attached to the suit. They are used for maximum skin, lung and eye protection.

Level B suits are similar to Level A but are not encapsulated and will not provide vapor protection. These suits can be considered splash suits with a high level of respiratory protection.

Level C suits are similar to Level B, but instead of either the SCBA or supplied breathing airline, they have air purifying respirators (APRs). The drawback to the respirators is that the identity of the chemical involved must be known so that the correct cartridge can be placed on the respirator. Another limitation is that the respirators cannot be used in oxygen-deficient atmospheres.

Level D suits are normal workstation uniforms. They do not supply any splash or respiratory protection.

A vapor protective suit is defined by NFPA Standard 1991 as one designed to provide the highest level of protection available against vapors, gases, and liquids. The intent is that the suit be worn any time a chemical is present at or above the Immediately Dangerous to Life and Health (IDLH) concentration.

The suit must pass a stringent set of chemical permeation tests involving 17 specific chemicals plus anhydrous ammonia and chlorine gas, and any additional chemicals or specific chemical mixtures for which the manufacturer is certifying the suit. All parts of the suit, including the gloves, visor, boots and seams, are subjected to all 17 chemicals. The suit must undergo a pressurization test to check for airtight integrity as well as water penetration to ensure the suit provides protection against liquid splashes. Material testing for burst strength, abrasion resistance, flammability resistance, cold-temperature performance and flexural fatigue is required. These test results are documented in a "technical data package" for each suit.

Wearing chemical protective clothing affects the wearer in a variety of ways. It induces thermal stress, restricts user movements, restricts user vision, impairs user hearing, impairs communication, causes claustrophobia, and offers no thermal protection.

The following list of conditions has been established as a guideline for selecting the appropriate level of chemical protective clothing for various situations:

Level A

- Confined space entry.
- High potential for repeated splash or total immersion.
- Skin absorption or dermal absorption threat.
- IDLH dermal.
- High concentrations of vapors, gases, or particulate.
- Vapor-proof suit.

Level B

- High respiratory threat.
- O_2 less than 19.5%.
- Minimum level for assessment of unknown spill.
- Moderate splash threat.
- Non-IDLH dermal.

Level C

- No IDLH dermal or respiratory threat.
- All contaminants known.
- APR requirements met.

Level D

- No known hazards.
- Work functions preclude chemical exposure.
- Provides basic safety at an incident.
- Allows for quick upgrade to higher level.

MEDICAL MONITORING

Heat stress is the most common injury induced by the wearing of chemical protective clothing. Responders' agencies must adequately communicate the health threats to all members in chemical protective clothing and implement the proper safeguards to ensure their well-being. Responders in chemical protective clothing are more limited by their own physical condition than by the limits of the protective equipment. Within seven minutes of donning chemical protective clothing, wearers are subjected to 100% relative humidity and elevated temperatures 25% higher than ambient temperature. This in addition to psychological, mechanical and physiological stressors can lead to heat-related injuries.

One of the four major heat-related problems that can occur is heat rash. This is a minor irritation with chafed skin, resulting in discomfort. The potential for injury occurs because the chafed skin is no longer intact and provides less protection than intact skin. Also there is the problem of mental distraction. The responder in chemical protective clothing will lose some concentration as the discomfort level increases.

Increasing in level of severity, the next heat-related problem is heat cramps. Heat cramps are caused by electrolyte loss. In chemical protective clothing, this is an emergency because the cramping may cause the wearer to lose balance and fall into the product.

Heat exhaustion is caused by the rise in the body's core temperature. Profuse sweating and hypovolemia accompany it. This is a medical emergency that will require hospital evaluation. In a chemical protective suit, the accompanying lightheadedness, confusion, and potential loss of consciousness could be fatal to the wearer if he or she remains in the toxic atmosphere.

The most severe form of heat emergency is heat stroke. This is a complete breakdown of temperature regulation and a life-threatening emergency. It is characterized by red-hot dry skin, a core temperature of 106-110ºF, a fast, bounding pulse, and dilated pupils, followed by seizures and coma.

Pre- and post-entry medical evaluation should be performed on those wearing chemical protective clothing. Local medical protocols should dictate action levels to determine whether a responder is medically able to wear chemical protective clothing. Guidelines for responders would include a blood pressure less than 150/90 and a resting pulse that does not exceed 100. Also a responder's weight loss after entry should be no more than 1.5% of his or her total body weight. Weight loss of more than 3% of body weight requires removal from all duties pending assessment by a qualified medical authority. A 5% weight loss after entry requires immediate advanced life support evaluation and transport to a medical facility for assessment.

Proper hydration of responders is a primary concern for all EMS providers. Many responders have probably heard the warning, "No eating, drinking, or smoking at a hazardous materials assignment." This is directed at preventing an external contaminant from becoming an internal contaminant. Although responders should practice proper hydration, anyone who is contaminated should avoid any action that would cause internal contamination.

Although it is not within the scope of this document to address the smoking issue, there is sufficient documentation in medical literature that indicates that smoking by response personnel is not appropriate or healthy in general.

Eating at the scene of an assignment may be required, depending on the length of time responders are operating in the field. Good caloric intake is required to maintain proper health and well-being but is not usually an emergent concern, like proper hydration.

Drinking fluids is necessary to fend off heat-related emergencies. Any responder should start the hydration process by drinking fluids prior to the start of his or her tour. The hydration process then continues throughout the tour. Beverages containing caffeine or alcohol should be avoided. Both caffeine and alcohol are natural diuretics and will dehydrate a person. In addition, alcohol is a judgement-altering substance and should be avoided while on duty.

Responders usually underestimate the amount of body fluid lost from dehydration. A person loses fluid when breathing through an SCBA or APR since that air is low in water content and the body must compensate to keep the mucous membranes moist. Also, the wearing of CPC will increase the amount of fluid loss. The very properties that protect the wearer from hazards keep heat within the suit and cause greater fluid loss via perspiration.

Regarding the proper fluid to drink, water is the best fluid to maintain proper hydration. Overindulgence in prepackaged sports drinks has caused transient diarrhea in responders in the past. Responders should check with their local medical authorities to determine what fluids are best in a particular situation.

MECHANISMS OF HARM

B-NICE materials are capable of causing great damage to people, the environment, and property. All mechanisms of harm can be classified as arising from one of seven types of causes. These can be remembered with a simple mnemonic--TEAM CPR:

Thermal.
Etiological.
Asphyxiant.
Mechanical.
Chemical.
Psychological.
Radioactive.

Thermal refers to those events related to temperature extremes. High temperature is common with the use of incendiaries, but we often forget or ignore the potential for injury from extreme cold.

Etiological refers to uncontrolled exposure to living, disease-causing microorganisms. Diseases commonly associated with etiological hazards are classified in the biological weapons category.

Asphyxiates are those chemicals that can kill by either displacing the oxygen in an enclosed environment or interfering with the respiratory process.

Mechanical injuries include those injuries caused by shock waves, impact forces, or the scattering of debris such as shrapnel in an explosion or blast. This also includes projectile-type injuries that are common in a shooting victim. This avenue of harm must be considered in light of possible contamination as well as injury. The body may become internally contaminated either by the object depositing the contaminant as it passes through the body, or by opening up the skin to allow for a faster absorption through the no-longer-intact skin.

Chemicals obviously affect the body. Exposure to vesicants will cause painful burnlike blisters and also affect the eyes. Other chemical weapons can enter the body and cause harm in other ways. Nerve agents will interfere with the body's nervous system, and cyanides will interfere with the cells' ability to use oxygen.

Psychological harm is harder to quantify and can be used against either the responders or the victims. The terrorist does not have to actually release a chemical or biological agent to promote panic in the general populace. If terrorists issued a statement that anthrax or the plague had been released in a major commuter hub, panic would ensue, and a segment of the population would seek medical attention even if no agent had been released. On the other hand, the psychological weapon will be used against the responders due to the stress and anxiety of responding to a B-NICE incident. Sometimes this stems from a lack of sufficient knowledge about how to operate; at other times, it stems from the inability to operate. One cause, surely a high stress inducer, is the deliberate choice that must sometimes be made not to act to save a victim's life when the lives of the responders are at equal or greater risk.

Radioactive agents are the last agents of harm. Energy released from radioactive sources, such as alpha, beta, or gamma radiation, can do serious harm to the body. Often, these harmful results can be long lasting and can lead to death.

In summary, the mechanisms of harm are the standard ways the body gets hurt or suffers injuries. Whatever negatively affects the body and threatens its well-being has reached the body through one of the mechanisms of harm.

ROUTES OF EXPOSURE

The routes of exposure are the pathways the agent touches or uses to enter the body. They have a direct relationship to the severity and types of effects the agent produces. Sometimes a person may be exposed to a toxin by a single route, such as ingestion. There are other instances where exposure or poisoning may occur through multiple routes. If a nerve agent comes into contact with a person's skin, common sense would indicate that an inhalation injury would also occur from the vapors. We need to keep in mind that most liquids (depending on their evaporation point) and some solids are constantly producing fumes. Almost all liquids that are potential terrorist agents present some level of vapor hazard.

Inhalation

The lungs are the only internal organs that have vital functional components in constant contact with the external environment. The lungs have the largest exposed surface area of any organ. There are about 70 to 100 square meters of surface area within the respiratory system, compared to about 2 square meters for the skin and 10 for the gastrointestinal tract.

The respiratory tract is divided into three regions--the nasopharyngeal, the tracheobronchial, and the pulmonary acinus. The pulmonary acinus contains the respiratory bronchioles (terminal bronchioles) and about 100 million alveoli.

When particles are inhaled into the lungs, they tend to settle according to their diameter. Particles of 5 to 30 microns usually settle in the nasopharyngeal region; particles of one to five microns will end up in the tracheobronchial tree; and particles under one micron will make it all the way to the alveoli.

Agents that harm the respiratory system or interfere with its function are generally classified according to the type of harm they cause. Asphyxiants can prevent oxygen from reaching the pulmonary tree or the cells themselves; these would include blood agents. Irritants can cause hypersecretion and damage to respiratory structures; two examples are choking agents and incapacitating agents. Some materials that enter the lungs cause no harm to the respiratory tract, but use the lungs as a pathway into the bloodstream to reach the target organ.

Ingestion

Ingestion injuries at a B-NICE incident should not be a major problem when the source of the contamination is present and has been recognized. In the majority of incidents involving biological weapons, however, since the incubation period can be several days, ingestion could occur. There should be no hand-to-mouth contact among responders to terrorist incidents until proper decontamination has been completed.

ROLE OF INCIDENT SAFETY OFFICER AND INCIDENT SAFETY PLAN

It is imperative that an Safety Officer be present at any multiple casualty incident. Unless there is a serious situation at a routine response, a Safety Officer will not be needed at the majority of calls an agency handles. When there is a major incident, however, the presence of a Safety Officer is crucial. The Safety Officer must have the full authority of the Command Officer to watch for a life-threatening problem and to take immediate corrective action. If emergency action is needed, the Safety Officer must not hesitate and must either stop the hazardous activity or correct the actions of the members so that the hazard is eliminated. Once such emergency action has been taken, the Command Officer must be notified immediately.

This command authority should be used only in true emergencies. If there is no hazard present, but there is a safer way to perform a task or evolution, the Safety Officer should formulate a plan of action and bring it to the Command Officer for implementation. Additionally, it is the responsibility of the Safety Officer to investigate any member injuries or accidents that occur on the incident ground.

The primary role of the Incident Safety Officer (ISO) is to ensure the safety of the responders. The ISO should ensure that responders follow safe work practices. The ISO can do this in a number of ways, some of which are:

- Ensuring responders wear PPE.
- Ensuring responders work in teams in hazardous areas.
- Having backup personnel available to react to an unexpected event quickly.
- Using an accountability system to track responders.
- Following agency and recognized safety practices.
- Following safe practices during training exercises.

Part of the ISO's role in the incident is to assist in the formulation of the Incident Safety Plan. This plan should encompass all aspects of the operation. Some of the areas that need to be addressed are:

- Location and size of the zones.
- Proper level of PPE in each zone.
- Location and proper setup of the decontamination line.
- Establishment of a rapid intervention team, with chemical protective clothing.
- Medical monitoring of responders operating in chemical protective clothing.
- Emergency evacuation signals.
- Responder accountability.
- Establishment of a responder medical treatment team.

WEATHER CONDITIONS

Weather is a critical consideration when choosing response strategies. Weather has more influence than any other single element at the emergency scene. The strategies and tactics of chemical warfare were first devised in the early 1900s. During World War I, the biggest problem with chemical agent delivery was controlling it. Weather forecasting capability was primitive at that time, which made forecasting unreliable. In many cases, weather caused the agent to render "friendly" casualties.

With today's technologies, weather forecasting is more accurate than ever before. Any hazardous material, because it is a chemical, will follow the laws of physics. Following those laws means reacting to weather conditions. If commanders understand how an agent will react to each element of weather, they can anticipate what is happening or what is going to happen. The better commanders understand which weather conditions promote survival, the better they can plan, select, and implement strategic and tactical decisions.

Present and Forecasted Temperature

The law of kinetic energy states that the higher the temperature, the higher the vapor pressure will be in a hazardous chemical, which equates to more parts per million (ppm) released. The odds that a few ppm will affect a particular individual increase with the amount of ppm released.

Humidity

Humidity will affect the water available to hydroscopic agents. Humidity will also add weight to the atmosphere, which may displace a static product or agent and cause it to move. Humidity may cover or depress an agent so that it produces less ppm and can cause it to lie dormant until a change takes place. Humidity, when in such states as fog, rain, or even dew, may act as a camouflage, actually deceiving the investigator and keeping the agent from being discovered.

Inversion Temperature Gradient (Stable)

Normally, the higher one goes in the atmosphere, the cooler the temperature. In an inversion, the normal action is reversed--the higher the altitude, the warmer the temperature. At whatever altitude the inversion ends, the temperature will return to what would normally be expected at that altitude.

In an inversion, as an agent rises, it will warm (law of kinetic energy) and expand, then open, until it reaches the edge of the inversion. The sudden change in temperature it encounters there will create condensation and has the potential of returning the agent to ground. This is both good and bad news. The good news is that the higher the end of the inversion, the further the product is away from the ground and people. The bad news is that the higher the end of the inversion, the more dramatic the condensing and the further down range the product may travel.

Inversions at lower levels will act in reverse and the product will have a greater possibility of staying in contact with the ground and people. Such lower-level inversions usually occur on a clear or partly clear night when mid- and low-level clouds cover less than 30 percent of the sky. They may also exist early in the morning until about one hour after sunrise when the wind is less than 5 mph. This is the most favorable condition for delivering an agent/product and the hardest time to defend against a release.

Neutral Temperature Gradient (Neutral)

A neutral temperature gradient usually exists on heavily overcast days or nights when mid- and low-level clouds cover more than 30 percent of the sky. Independent of cloud cover and time of day, a neutral condition may exist when the wind speed is greater than 5 mph. Periods of precipitation are normally accompanied by a neutral condition. A neutral temperature gradient is the most favorable for the use of biological agents.

Lapse Temperature Gradient (Unstable)

A lapse temperature gradient normally exists on a clear day when the mid- and low-level clouds cover less than 30 percent of the sky and when the wind speed is less than 5 mph. This condition is the most favorable temperature gradient for survival in a situation involving hazardous chemicals; it is not good for delivering chemical or biological agents/products. When this unfavorable condition is present, only a steady low wind of 3-7 mph could help with area coverage. Diffusion will result with higher wind speeds.

Cloud Cover

Cloud cover affects agents in more ways than the obvious one--the presence of humidity. Clouds have an effect on explosions because they reflect the resulting shock waves and, in many cases, cause more damage. Clouds also prevent sunlight from getting to the ground. Some agents, such as halogens, break down in ultraviolet light. Chlorine, for example, being diatomically bonded, breaks down rapidly in sunlight. On a cloudy day, such an agent can continue to cause damage, because it will not disappear as quickly as it might on a cloudless day.

Forecasted Weather

Forecasted weather at a working incident should be studied and constantly monitored. It is important to be able to anticipate agent/product movement in the future. Present and forecasted weather should be compared to anticipate potential changes in the site. The weather, both present and forecasted, has a physical effect on the responders and site characteristics, causing physical hazards and/or obstacles.

Controlled Weather (Artificial)

Controlled weather or environment involves the manipulation of weather conditions. Manipulation of the environment to achieve objectives is easiest to perform indoors and especially underground. Consider any of the mustard-type agents, which work better in a humid environment. If the body is perspiring, the mustard is more effective and in some cases even lethal.

When possible, responders should change the environmental conditions to best suit survival. For example, if an incident occurs indoors and the agent/product works best at 70 degrees in dry conditions, make the inside as cold as possible and increase the humidity. These weather conditions will contribute to the survival of the recipients.

In the event that the incident occurs outside, where climate controls are not feasible, other actions will need to be considered. These could include applying water with several master streams to elevate the humidity, or producing artificial rain, which could, in many cases, protect persons and property and wash many agents/products away.

ADDITIONAL MONITORING NEEDS

Each geographic area of the incident will need to be monitored for the spread of contaminant. This monitoring will start with the need for real-time weather information. With the knowledge of the prevailing weather, including temperature, humidity, cloud cover, and wind direction and speed, the technical specialists on site can give good estimates of plume disbursement. Once you know where the plume is going, evacuation can be accomplished in advance of the spread of the contaminant.

Knowledge of the chemical and physical properties of the agent and information on current and forecasted weather conditions can yield useful data on evaporation rates and size of the zones. Zone sizes should be based on air monitoring. Airborne spread of the contaminant will affect a larger area than actual physical spread by a dissemination device. By performing air monitoring and setting alarm-type instruments, the boundaries of the zones can be set safely.

Each patient coming out of the decontamination line must also be monitored. This is to ensure that the patient has been successfully decontaminated. If a responder in PPE checks each patient and returns patients that test positive for the agent to the decontamination line, the likelihood of cross-contamination is significantly decreased.

SUMMARY

Creating a safe environment for you to work in while operating at a release of a weapon of mass destruction will be a trying experience. Following the concepts and ideas outlined in this chapter can go a long way toward making the incident site a safer place.

The primary way you can prevent injury from exposure to the hazardous material is to take steps to limit your exposure. This includes providing decontamination, practicing body substance isolation, and properly managing sharps. These steps, along with proper management of treatment and transportation issues, will greatly reduce or eliminate the potential for secondary contamination.

The Safety Officer and the Incident Safety Plan will be crucial to effective scene management. As we discussed, the plan will address such things as monitoring needs and proper protective equipment. Along with decontamination, the Incident Safety Plan should be the equivalent of a road map, directing you around the potential problems at the incident.

Lastly, knowing what chemical protective clothing is required to work in the different zones and being trained and equipped to wear that clothing will help prevent your becoming contaminated. Remember that weapons of mass destruction are designed to kill people. You cannot exceed the limitations of your training and equipment; otherwise you will become a victim.

Activity 2.1

Emergency Response Plan Development

Purpose

To develop an emergency response plan that addresses the potential for secondary contamination, personal protective equipment, decontamination and monitoring considerations for personnel operating in the multi-casualty branch.

Directions

1. Work in small groups.
2. Read the memorandum from the Chief.
3. Review the Blue Water County and Central City background material in Appendix D.
4. Respond to the issue(s) assigned to your group.
5. Record your responses on the easel pad paper.
6. Report your group's findings to the class.

Central City: Emergency Medical Service

TO: Hazardous Materials Committee

FROM: David Fenton
Chief of Department

THROUGH: John Mann
Chief of Special Operations

SUBJECT: Emergency Response Plan Revision

As you are aware, construction is nearing completion on the Alston Arena. This state-of-the-art multiple-purpose venue will have a capacity of 26,000 spectators. In reviewing our Emergency Response Plan, it is obvious that revisions need to be made to take this new venue into account. In addition, the Blue Water County Office of Emergency Management has informed us that the arena is to be considered a potential terrorist target.

I am requesting that you address the following issues in the plan. Your reply does not have to be formatted as a procedure, but rather as issues that we need to address as a group. Please include any solutions or proposals in your reply.

1. Identify factors that contribute to secondary contamination, and the steps to take to limit the exposure.
2. Identify precautions and methods our personnel can use to practice body substance isolation.
3. Determine what HazMat equipment we need to carry on the ambulances, and what procedures we need to follow to decontaminate responders in PPE, if needed, and who will decontaminate seriously injured patients, while providing patient care.
4. Identify what levels of protection our personnel need, in terms of chemical protective clothing, based on their incident job function and location of operation.
5. Determine how the role of the Safety Officer and the Incident Safety Plan need to be changed in the face of a terrorist incident.

Thank you for your attention to this matter. I look forward to hearing your responses.

Unit 3: Security

Terminal Objective

- Given a simulated terrorist event, the student will be able to identify security concerns regarding responses and on-site operations.

Enabling Objectives

The student will be able to:

- Identify the difference between known and unknown terrorist incidents.
- Identify aspects of vulnerability.
- Identify primary security actions to take when a terrorist event occurs.
- Identify how topography will impact security.
- Identify different strategies and tactics to be utilized for self-preservation.

PRE-RESPONSE CONDITIONS

Known Terrorist Incident

Responding to known acts of terrorism will afford the responder an opportunity to initiate preplanned security-related response actions that should include law enforcement participation in all response phases of operations. Moving into a known hostile environment will allow responders to operate at a much higher state of situational awareness which will significantly enhance responder survivability and minimize potential losses.

Unknown Terrorist Incident

Responding to what was first reported to be a "standard" emergency call, then is recognized by incident site outward warning signs/indicators or by updated dispatch information en route to be an actual terrorist act, will require the initiation of preplanned actions to maximize responder safety and survivability. Preplanning and an effective training program will prove to be the best tools in preparing for "no notice" terrorist-related incidents and safe movement to the actual incident site.

VULNERABILITY ASSESSMENT

The purpose of conducting terrorist-response vulnerability assessments is to determine organizational and individual responder shortfalls or weaknesses when responding to acts of terrorism. A number of different perspectives or approaches can be adopted in conducting this assessment. The assessment should encompass all terrorism response issues, including security, personnel, equipment, organizational structure, command and control, interagency relationships, and training-related capabilities and vulnerabilities in effectively and safely responding to acts of terrorism. The assistance of law enforcement will be necessary to properly conduct the vulnerability assessment as it pertains to security-related issues, particularly in the following areas:

- Incident site operations.
- Pre-planned response routes (primary and secondary).
- Command and control sites.
- Improvised explosive device awareness training.

- Secondary explosive devices/booby trap awareness training.
- Multiple-incident site operations considerations.
- Pre-planned and proposed staging areas.
- Communications plans (primary and secondary).
- Medical operations.
- Medical receiving facilities.
- Casualty collection points.
- Mortuary facilities (fixed and temporary).
- Evacuation sites.
- Shelter-in-place considerations.
- Personnel and equipment resources.
- Re-supply resources.
- Security resources.
- Mass casualty response resources (transportation, medical, command and control).
- Responder knowledge of B-NICE threat outward warning signs.
- Evidence-preservation training.
- Responder self-protection measures training.
- Rescue operations.

PRIMARY ACTIONS

Primary actions are the actions that must be taken immediately: actions in the first 30 to 60 minutes that only the first-in company officer or supervisor can take. Many of these actions will be taken to preserve the life of you and your crew. Their major intent is to enable you to make sense of the chaos of the incident site, control your crew and preserve them. Some of these actions are ensuring the security of your crew and making a fast hazard/risk assessment to understand the vulnerability of your position. Will you need to direct your crew to hard shelter or should you find a secure egress route? Primary actions must be instinctive. Those that are successful come from the immediate leadership ability of the officer in charge. There is no reason to discuss strategy or tactics if the crew isn't going to be around to use them.

Hazard and Risk

Before general considerations are discussed, hazard and risk assessment should be studied in detail. Assessing hazards and risks is effective, however, only if a protection measure is found. A hazard is a known or perceived danger. Risk is being exposed to a known or perceived danger. Calculating risk means understanding the risk--will a danger occur or not? The risk is either acceptable or unacceptable. This may sound easy, but to understand the risk, your vulnerability must be known. Vulnerability is being in an exposed position or being at a disadvantage. You can be in danger and not know it, as in an ambush. But if site awareness is in the front of your mind, the conditions will indicate any potential vulnerability.

Responding to acts of terrorism brings with it a level of acceptable risk like no other type of response any first responder will encounter. In the case of the fire service, when a roof is determined to be too weak or a wall too unstable, we back out and go defensive. As emergency responders, we assess a hazard and compute what risk is present: Is it an acceptable risk or is it unacceptable? We use protection methods like PPE such as bunker gear, bulletproof vests and the like to minimize the risk and bring an unacceptable level of risk within an acceptable range. As emergency responders we accept risk at every call by going to work and getting on our particular unit of response. But we are trained to respond in a fashion that minimizes the risk for the designated type of calls. The type of units we ride on, the type of clothing we use, even the type of training we practice all illustrate this.

What level of risk is acceptable and what is unacceptable? As firefighters we will accept the level of risk involved in running into a burning building for the mission of suppressing the fire. We will accept an even greater risk for the mission of rescue. This is true with law enforcement also. Officers will take certain risks to stop a bank robber; another level of risk is accepted for rescue in the line of fire. The military uses the term "acceptable loss" when planning an objective, to equate what a particular objective will cost in terms of lives. Past a certain point, an objective will be judged to cost too much, and the potential losses are or may become unacceptable. Thus a retreat is called for. As civilian emergency responders, we don't equate lives in such a manner before the fact. We are more in control, but when the risk of an area becomes unacceptable we also retreat whether we call it "going defensive," or "surround and drown."

Everyone assesses risk as acceptable or unacceptable. Few will come up with the same results when given a particular set of circumstances. A bulletproof vest may be all that is needed to move the level of risk from unacceptable to acceptable for one person, whereas, another may not be willing to risk the loss of a limb or taking a head shot and may choose a piece of protection that covers the entire body, not just the torso. We all evaluate risk in different manners, because we use different criteria. One of the basic facts of the equation is who is at risk. If we are risking ourselves we are counting on our own personnel experiences and training. But risking others involves another risk assessment process entirely. We have to ask ourselves in making these assessments: Are we working from our head or our heart?

Being a first responder at a terrorist attack and being vulnerable equates to casualties. The faster the officer recognizes that the crew is unacceptably at risk, the faster the officer will be able to avert or minimize losses, which is really the name of the game. The fire service will take some casualties when this event occurs, but just how many will be left up to the leadership. When do we stop and minimize our losses? The easiest decision to make will be the toughest to live through. To run to the aid of other responders may result in disaster or it may be the right thing to do. It is one thing to respond to an act of terrorism and do what you are told; it is quite another to respond and have to make decisions on what and whom to risk.

It is easy to sit down before or after the fact and assess what could or should have been done to balance risk and service in a given situation. It is an entirely different matter to be in the decision-making position in real time and have to make the decisions now, see them through, and live with them. Often in tabletop HazMat scenarios, the person making decisions says about a person or group of people, "We're writing them off," or says, "Evacuate all of these people," while pointing at a mile or more of people. These things are easy to say in a tabletop exercise: They keep the activity moving and prevent it from getting bogged down. But what are we really saying when we say these phrases, and what are we accepting when we say them? We may operate one way, in theory, when we are engaging in tabletop practice exercises; but will we act another way, in the field, in real time? It would be great if there were absolute right and wrong answers for these problems of risk assessment but there aren't. You'll have to arm yourself with information so you can recognize the opportunity to succeed.

Security

To effectively and safely respond to acts of terrorism, fire service standard operating procedures (SOPs) will need to be revised to reflect security-related issues that impact on the response. SOP tactical guidelines in responding to acts of terrorism should include the assignment of law enforcement to provide protection to first responders, response routes, staging areas, and all facets of operational and support considerations. Emergency response plans should include an annex that clearly identifies a local potential target site list. The target list should be developed in conjunction with local law enforcement. Once the target list is completed, a library of preplanned actions per specific site can be developed and will serve as an effective response tool in the event of a terrorist-related incident. Security precautionary measures and security-related preplans should immediately be considered and perhaps activated if the response to an incident location is identified within the preplans as being on the locally established potential target list.

The primary difference between responding to an act of terrorism and what may be perceived as a routine call is the requirement for armed security. Law enforcement personnel are trained, equipped, and tactically and operationally prepared to provide such protection. Dispatchers must therefore be trained to recognize the obvious warning signs of an act of terrorism. This includes the outward warning signs of each of the B-NICE terrorist threats. Recognizing the warning signs as information is gathered from the caller or, in some cases, from the perpetrator will greatly influence how initial responders will approach the incident. First responders must be alert and prepared to stop and wait for security assets to arrive before entering the hostile terrorist incident environment.

In response to what may initially be reported or perceived as a "routine" incident, law enforcement may not be initially considered and responders will move forward without security in mind. If the incident has been identified as an actual terrorist event, all responders must understand security-related self-protective measures and immediately initiate SOP security protocols. Law enforcement protocols routinely require a response to fire and emergency service calls regardless of whether an act of terrorism has taken place or not. As we know, law enforcement services include crowd control, isolation of the incident and, in some cases, security as it pertains to the actual incident.

For responders to effectively accomplish the task of preserving human life, security considerations must be factored into the response plan and must include a more comprehensive relationship between law enforcement and fire and emergency services organizations. The sharing of threat intelligence between fire and emergency services is not common practice.

To effectively enhance first-responder survivability when responding to acts of terrorism, intelligence sharing must improve. Fire and emergency services and law enforcement leadership must therefore develop a closer working relationship that will facilitate a higher level of cooperation in the planning phases of preparation in responding to acts of terrorism.

Opening lines of communication between firefighters, EMS, and law enforcement will be easier said than done, however. For the most part, historical traditions between each will cause this process to undergo many growing pains. What's important is that lines of effective communication are initiated by all parties concerned and that the tradition of a closed-society mentality be put aside for the good of the responders and, more importantly, the general public.

Effective self-protective measures should be considered and employed when responding to areas within your communities that are known to be areas of criminal activities and are listed within Local Emergency Response Plans (LERPs) as possible terrorist target locations. First responders should always maintain a high level of awareness of the surroundings when responding to incidents determined to be or suspected of being acts of terrorism. Remaining alert and aware of the surroundings will greatly enhance an opportunity to seek effective cover in the event of an armed or secondary device attack on the first responder and responder assets.

The basic concept for enhancing self-preservation or self-protection is to possess a clear understanding of exactly what effective "cover" means versus what "concealment" means. Ideal cover is best described as any hardened object or material that will provide effective physical protection against small-arms fire, fragmentation, explosive blasts, thermal blasts and moving debris. Concealment is defined as blending into the environment and can be provided by any object or material that simply keeps an individual from being seen but does not necessarily provide adequate physical protection from hazards.

If fire and emergency service organizations respond to an identified or potential terrorist event in the traditional manner (without security considerations), great potential exists for danger. The result could be that an already complicated situation might become even more disastrous.

Response Security

When responding to suspected or confirmed acts of terrorism, the response route must be chosen and movement through the response corridors must be accomplished with extreme caution and in accordance with preplanned procedures. The use of alternate response routes or corridors should be considered in choosing the appropriate response route for a given incident. Security and safety of the responders and response equipment must be considered of primary interest. Liaison with local law enforcement must be initiated and security procedures must be activated.

Potential targets within your localities should have preplanned emergency response routes, and these should be established within the LERP and organizational SOPs. Both primary and alternate routes should be identified and, for security reasons, disseminated to responders on a need-to-know basis. Routes should be established that will minimize the possibility and effect of a planned ambush of personnel and equipment assets. Remember to establish law enforcement security prior to responding if possible or along the response route once an act of terrorism has been identified.

Response route choke points, specific locations along a route where an ambush or delaying action would most likely be launched against the responding units, should be identified along the pre-planned and established response routes. Reconnaissance and security at choke points should be initiated to ensure that response personnel and equipment assets can safely travel to the incident site.

In case responders are separated during the initial response phase to the incident site because of an attack on response assets, rally points should be established. A rally point is defined as a specific location within the response locality where responders will assemble or regroup at a preplanned, designated safe area. Security at the rally points should be established as a precaution and the location of rally points should be disseminated on a need-to-know basis.

Incident Site Security

Commanding an emergency response to acts of terrorism is complicated and will offer new challenges to response leadership. Various areas and functions involved directly or indirectly in managing the incident will present particular security challenges.

It must be understood that command and control locations will require security to ensure continuity in managing the incident. Security of these locations will therefore be critical. During terrorist operational planning the command and control locations will most certainly be targeted if a secondary attack plan is initiated.

The rest and rehabilitation (R&R) site may also be a prime target for a secondary attack. Personnel undergoing rehabilitation due to fatigue and exhaustion will be at their most vulnerable point. As personnel gather to replenish fluids, energy, and equipment, potential for attack may be at its highest, and this site will require diligent security considerations. The action plan should allow for the rapid and safe evacuation of responders and equipment assets from the R&R location in the event of a secondary attack threat.

The isolation perimeter established initially will be the first line of defense when identifying the required isolation zones and will need to be diligently manned by law enforcement authorities to ensure that perimeters are not compromised. Identifying resources to accomplish this requirement in a timely manner will be the biggest challenge. Emergency responders will not be able to slow down the response momentum to accomplish this task. It will therefore be of paramount importance to consider this need during the preplanning stage of a potential response.

The actual incident site perimeter will be a critical line of defense primarily because of its proximity to the operating responders and will therefore warrant the strictest security considerations by law enforcement. Bystanders will gather in large numbers in this area and will present a potentially threatening atmosphere to responders when considering the likelihood of secondary attacks. Once again, during incident preplanning considerations, security procedures to govern this area should be factored into the overall response plan.

Access control points in hazard zones will also require passive security measures. Law enforcement probably will not be available or properly equipped to assist the responder at the access control points, so it will be primarily up to the responder to ensure that only authorized personnel have access to the site. An access identification system should be instituted to ensure access security and should be strictly monitored to ensure consistency in access control.

All staging areas will require effective security and control measures to ensure that vital equipment and manpower resources are protected and that equipment moving into these areas is properly inspected and screened in accordance with appropriate procedures. Law enforcement authorities should be in position to undertake this requirement. Effective recognition of suspicious devices or persons will be necessary to perform this function.

Only authorized response personnel should be allowed access to the actual exclusion zone (point of origin). An individual identification system should be implemented to ensure proper identification of authorized personnel. Unauthorized persons will attempt to penetrate this position in order to make damage assessments, casualty counts, etc.

During the response to suspected or identified acts of terrorism one must assume that leaks, spills and fires may not only be the result of the attack but may also be a prelude to the primary or follow-on attack. A higher degree of precaution should be observed during the initial response phase to properly evaluate the scene and determine potential terrorist-related hazards.

Emergency medical service resources are considered a prime target in the terrorist attack plan. If these resources can be eliminated or effectively minimized mass confusion and hysteria will ensue. All will be at risk and both responders and civilian casualties will be greatly affected. Security of these resources must therefore be considered of primary importance.

Equipment and personnel assets prepositioned in staging areas at the incident site or outside the incident will require adequate security at the location of the assets and while en route to forward operating areas. The potential for the planting of improvised explosive devices aboard staged response equipment is real, and serious consideration should be given to providing a secure environment to staged assets.

Reserve assets prepositioned to rapidly respond to the incident site and/or the exclusion zone must be protected to facilitate rapid intervention to effect the rescue of response personnel operating within the exclusion zone. The rapid intervention team (RIT) will be in position to react to the call for help and will require some form of either passive or active security consideration.

Decontamination sites both at the incident site location and at the hospital site locations may be targeted. If the terrorist can halt decontamination operations for any length of time, the effectiveness of the planned attack will be maximized, especially if the attack is of a chemical, biological or radiological nature. If the decontamination process is delayed or ceases, then contaminated victims cannot be turned into decontaminated patients.

Establishing Security-Related Procedures

Potential target location response routes should be established within the LERP and organizational SOPs. Primary and alternate routes should be identified and, for security reasons, disseminated to responders on a need-to-know basis. Routes should be established that would minimize the possibility of a planned ambush of personnel and equipment assets.

As noted earlier, security at choke points should be provided to ensure that response personnel and equipment assets can safety travel to the incident site. Security at rally points should be established as a precaution, and the location of rally points should be disseminated on a need-to-know basis.

To minimize potential loss of valuable personnel and equipment resources, staging areas should be dispersed in a manner that will facilitate rapid resupply to the incident site. Ensure that adequate security is established at each of the designated dispersed staging areas.

Once personnel are properly identified and are authorized to have access to the incident site, a personnel and equipment inspection process should be conducted. The physical inspection of personnel and equipment assets will minimize the possibility of secondary devices being covertly introduced into the incident site and increase overall security awareness and the survivability of the responders.

A reliable responder identification system should be established to ensure that only authorized response personnel gain access to the incident site, staging areas, rally points and other vital incident-related sites or locations. The system will need to be flexible enough to facilitate changes as the response progresses. The security and credibility of the system must be evaluated and validated for effectiveness.

An incident site emergency egress plan of action should be established within organizational SOPs. The action plan should allow for the rapid evacuation of responders and equipment assets from the incident site in the event of a secondary attack or attack threat. Egress instructions should be disseminated during the initial stages of the response and should include specific routes, locations and rally points for personnel and equipment. The method of activating the egress plan should be clear and concise and must include law enforcement to ensure that security of movement is effected.

A zone emergency egress plan of action should be established within organizational SOPs. As with the incident site emergency egress plan, allowances must be made for evacuation of responders and equipment and for dissemination of egress instructions. Consideration must be given to how responders will be quickly decontaminated (if applicable) and moved from the potential danger to a predesignated safe area. Resources must be available to accomplish this egress effectively.

Fire service assets should be staged within the incident site in a manner that will facilitate a rapid egress of personnel and equipment in the event of a secondary attack or threat of attack. Equipment assets should not be staged in such a manner that if one piece of equipment is affected by some sort of attack, other equipment will be equally affected. Dispersal of assets is essential when a security threat exists. The facing of vehicles will be critical to minimize bottlenecking of resources.

Alternate incident command post (ICP) contingencies should be included in all terrorist response preplanning. Command and control assets, both personnel and equipment, are essential in managing any incident. If the primary command post is compromised for any reason, the management of the incident will need to be shifted to a planned alternate (contingency) command post with all of the essential command and control mechanisms in place.

A reserve response unit should be established to ensure that qualified response personnel and equipment assets are available and in position to aggressively react to incident site contingencies. These contingencies would include the possibility of a secondary attack being launched against the initial responders. Security of the reserve unit and its vital equipment resources must be adequate to ensure its successful intervention at the incident site.

Establish an understanding of diversionary tactics and evaluate the potential for the possibility of one incident being a diversion for the initiation of the primary attack. Terrorist operational tactics will include drawing in first responders during what may be dispatched as a routine call for assistance to specifically launch the primary attack on the responder. Alertness and awareness to the response surroundings will minimize the possibility of being drawn into a trap by diversionary tactics. Examples of diversionary or ruse tactics include:

- Redundant hoax calls to potential locality target sites.
- Calls to vehicular accident scenes with no apparent victims in sight.
- Responses to areas that are otherwise remote in nature and have very little potential for emergency response considerations.
- Whatever would be viewed as an obvious attempt to channel response resources into a potential ambush site.

It is likely that terrorist groups will acquire the radio frequencies used by the local emergency responders and will monitor the frequencies for intelligence purposes. It is also possible that the group involved will attempt to disrupt response protocols by issuing bogus orders to unsuspecting responders. Brevity codes or execution checklists should be utilized in lieu of the standard 10-code system to maximize secure communications. An example of this would be to formulate a system of common words familiar to the responders (sports teams, months of the year, etc.) that, when used during the response, would trigger a specific pre-planned action. For security reasons the brevity code system should be changed for each response.

Dispatcher, witness, and first-due unit checklists should be established to assist the first responder in determining the nature of the hazard present. The checklists should be detailed enough to provide a pattern of unusual incident site outward warning signs and should include specific B-NICE threat recognition indicators. Once the specific B-NICE threat indicators are recognized, the first responder should initiate self-protective measures and expeditiously inform the appropriate authorities in accordance with local protocols.

Topography

Topography is another critical consideration when choosing response strategies. Terrorists can exploit topographical features, both natural and man-made, to increase the effectiveness of their weapons. Shaping an explosion so the blast effect is more pronounced in a particular area, trapping responders in an area with few escape routes, removing cover that could provide protection, and combining topography with weather conditions to increase the potency of a chemical or prolong its contact with victims are just some of the ways terrorists can use topography to their advantage.

Bottlenecks--places that restrict efficient or rapid movement--allow a terrorist to take advantage of any responding agency and exploit its position. Funneling is the manipulation of access or egress to direct responders to bottlenecks where an ambush or attack can occur.

Limited access involves a location that has, by design, few streets or intersections that limit access. Limiting access also means limiting egress. An example of this type of location would be an address in an industrial park. Industrial parks have limited access, which makes it easier to funnel and bottleneck. Other such locations would be dead-end streets, and a hydrant at the dead end would guarantee that an apparatus will go to the end, stop for a few seconds, and then tether itself, which severely restricts movement, thus restricting egress. Using an obstacle and blocking the street could essentially create a dead-end street where one does not otherwise exist. When done in combination with funneling and bottlenecking, this could be lethal.

Responders should recognize limiting characteristics as they present themselves and should constantly assess their situation. They should be asking themselves relevant questions: Are you being drawn into a trap? Are you being forced to advance uphill? Are you being forced to park at the bottom of a hill? Is your approach being forced from downwind? Are terrain characteristics forcing you to deviate from your plan and be vulnerable? Is this going according to someone else's plan?

Natural Characteristics

Natural characteristics are geographic features such as creeks, rivers, lakes, ponds, or any other feature of the land that that could be used by terrorists to improve the effectiveness of their attack. Hills and low places may also be used by terrorists.

Man-Made Characteristics

Man-made characteristics are features such as highways, bridges, dead-end and narrow streets, or any other man-made feature that terrorists could use to improve the effectiveness of their actions and decrease, if not halt, the responders' efforts. For example, buildings on either side of the street will restrict vision and access, while also causing drafts that can create other problems.

These same features that could be used by terrorists should be used when possible by the responders for shelter. If possible, the feature should be placed between the responders and the hazard(s).

Because the terrain and the environment play a crucial role in successful terrorist strategies, command officers need to be aware and aggressive in observing conditions and choosing response strategies and tactics that will decrease exposure while focusing on accomplishing objectives.

Zones

There are many zones in the HazMat world. The ones that are most often used and that we are most familiar with are hot, warm, and cold. More zones are needed when dealing with terrorism because many agencies and responders from various parts of the country will be responding to a single event. Understanding of what constitutes hot, warm, and cold zones may become a problem. Many discussions have been generated, for example, by the simple question, "Which zone does decon occur within?" Why worry about where decon fits? It should be placed where it is efficient, and then that location becomes the decon area or zone.

Definitions of hot, warm, and cold zones may not coincide among the various responding organizations, leading to miscommunications. Further, the traditional hot zone doesn't really cover all the hazards that may be present with an attack by a terrorist.

The solution for this ambiguity is to call the zone what it is rather than simply labeling it hot, warm or cold. A toxic IDLH zone would be called a toxic zone or area. An area where an LEL is found and avoidance is desired is called a flammable area or zone. A water trap/mud area is called a water or mud trap stay away zone. A fall or collapse zone is called a fall or collapse zone or area. Keeping it simple will always work best. Clear language and clear zone names lead to clear communications.

The point can be illustrated by an incident at Tinker Air Force Base during the Oklahoma City bombing incident. When a task force was unloading from a C-141, a team member's attention was drawn to the large, unique aircraft. As he walked over to get a closer look, he crossed a red line painted on the ground. A moment later he heard the squeal of tires and was pushed to the ground by guards. While an M16 was thrust in the back of his head, he was ordered to put his hands where they could be seen! He was handcuffed and taken away for questioning. He was released later when it was confirmed that he was only a lost and confused firefighter. He crossed into a zone where he didn't belong, a zone that was not hot until he entered it. The zone was called a security area.

When operational assignments are needed, locating them is simplified by placing the operation in an accepted zone. Placing them in a safe and clear area will help make decisions fast and appropriate. Do not make everything conform to the standard HazMat way of thinking of hot, warm and cold zones. Your problems will be different and in many cases fail to fit a traditional pattern.

STRATEGIES AND TACTICS FOR SELF-PROTECTION

The question of paramount importance to a responder in assessing the scene of a terrorist incident is "What's wrong with this picture?" People can read all the theorized clues and flags that can be identified to help the responder recognize that he/she is the target and still fail to realize that fact, or they may just be so caught up in the attack that they do not see the signs. What will the responder use to determine who is being hit? How will the responder know who is the intended target? Unfortunately the responder as well as the target most likely won't know until they're hit. It's kind of like looking for evidence at a crime scene. You may not know what you're looking for, but when you see it you'll know it--you hope. In some cases, you pick up everything and sort it out later. There are some things to look for, but they're not the same things that have been discussed in the past. They are so general that they may sound hard to recognize. That's because they may be hard to see; it may be planned that way by those making the attack.

Whether or not an attack is obvious will depend on who is delivering the attack. It may be one of those situations in which after it's all over you'll kick yourself and ask why you didn't see it sooner. This is in part because the two most effective attack strategies are deception and surprise. Both involve camouflage and distraction. If the terrorist can deceive the responders and blind them to the fact that there's anything wrong, the better the surprise, the better, the more successful the attack.

Initial Reconnaissance

Reconnaissance is the noun meaning information gathering. To reconnoiter means to spy, survey, examine, gather intelligence. Reconnoiter then is the verb, the act of sending in a recon team. Site characterization is the accumulation of data that report all the hazards of a location, both hazardous materials and hazardous conditions. Reconnaissance is the most dangerous of all strategies, but it will provide the most information. If digital photography is possible, it is preferred. A detailed account of the site is needed, including the appearance of victims, vegetation, and surfaces and the makeup of the objects being described. Samples of air, soil, vegetation, and debris will need to be taken quickly after the incident.

In contrast to a standard HazMat incident, where shipping papers, placards, and labels may exist, the only information that may be present at a terrorist incident are the signs and circumstances of the site. Recording them carefully and accurately is of utmost importance. Having the discipline to slow down and make the time to perform this action is the purpose of the strategy. Answering questions hours, days, weeks, even years later will be a challenge even with this data.

One method of increasing survivability after terrorist acts is to establish a list of those organizations, establishments, agencies, and other buildings of significance that a potential terrorist may view as a viable target for attack. Reconnaissance must be conducted to complete pre-response planning in these areas and will afford the first responder with a checklist of actions to take in the event of an incident. This in itself will maximize first-responder survivability. These actions should be included in the preplanning phase of the Local Emergency Planning Committee and placed into each location's Emergency Response Plan or Standard Operating Procedures.

Site Characteristics

There are some site characteristics that will need to be considered when recognizing and surviving an attack: in particular, the discipline and leadership of the responders, the weather stability and the lay of the land in the area of the attack. When responding to an attack, you are put at a disadvantage simply by the fact that you are reacting to the consequences of a pre-emptive strike. That disadvantage or the exposed ground you are in and the resulting conditions are all related to your vulnerability. To assess it and act upon that decision will take discipline on the part of the entire crew.

If the responder is lucky enough not to be the attacker's primary target, then there may be some time for recognition that a terrorist act is being perpetrated. If the responders are the primary target, there may be little if any time to act. If the first phase of the attack has already been delivered and the target has sustained heavy casualties, but the responders were missed, then the existence of a mass casualty incident should be the first sign that this could be a terrorist incident. But in either case, some conditions will need to be present for the attack to benefit the attackers, such as stable weather (for the most part) and a low and restrictive lay of the land. Obviously, if there are a lot of people down (a mass casualty incident) for no apparent reason, you have a real problem. But in a matter of speaking, you've got a real problem whether or not you have established a reason: After all, there are mass casualties. Sometimes we miss the obvious; we get so busy looking at the trees we never see the forest burning around us. It is part of the terrorists' plan that the responders will see only the mass casualties and fail to realize what they are doing and where they are doing it; thus the responders become casualties.

Discipline

Discipline is the first thing needed at one of these terrorist incidents or attacks. Discipline in leadership and among subordinates will be needed to ensure that actions taken are not the obvious, knee-jerk reactions to a given situation but those that have been carefully planned as a response to that particular type of situation. The goal is to do what must be done for the sake of the most lives saved and the fewest lost. In many cases it will be the hardest decision you will ever make, as you are making it, and then it will be even harder to live with. It's one thing at a tabletop exercise to say, "We're going to write off those people." It's another thing entirely to turn your back on real people; in the real world, some of those people you write off may be responders, and you may have to do it anyway. You may decide to save your crew, leaving you to live with the consequences of the decision you made about whom not to save or whom to write off to save your crew. If you don't allow someone (not yourself) to go in after potential casualties to try to save them, you'll be considered a murderer. But if you hold back your crew(s) to save them and get the persons that are nearby away and write off those potential casualties, you'll be considered a murderer. You're on the scene; you're going to make decisions that can be looked at in different ways. You're stuck in a bad position, no matter what decision you make.

Clues

Mass casualties may very well be a clue that a terrorist has struck, but they also may not be; further, not every terrorist attack will have mass casualties as a first, immediate consequence. It could be the case, for example, that the first victim of what is eventually going to become a mass casualty incident is you; the rest of the victims may be the next wave of responders coming in. To many, mass casualty is the key element in the recognition of a terrorist incident, and it might well be, in cases where the attack has already begun reaping its harvest. On the other hand, if the harvest is just now beginning, then the casualties are yet to become mass. In the latter case, what can be used to assess danger/hazard? Is there any risk?

To identify the agent/product involved in the attack may take time and trained personnel with the best personal protective equipment (PPE), intelligence, and instruments. The agent would also have to have good persistency to be identifiable. The only things that provide invariable clues are the conditions needed for the agent to reap the best harvest. If you are about to identify the agent as one that targets people, there will have to be people present. If your identification efforts lead you to suspect an agent whose target is property, then property of substance must be present.

To recognize that an attack is underway is the first step in assessing hazard and risk/vulnerability and in establishing protection measures.

Questions That Should Be in the Minds of Responders

- Are there conditions present for disaster?
- Am I going to be a target? Are persons, property, or infrastructure the targets?
- Is there a hazard or a threat present? Chemical? Explosion?

- Why am I needed? Trouble unknown? Assist public?
- Does the lay of the land place me at a disadvantage? (If I want to leave, can I?)
- Bottlenecked?
- Restricted in access and egress?
- Exposed to low area or by a storm drain?
- Support is slowed or detained?
- Is the weather stable, unstable, or neutral?
- Is there just something wrong that makes me feel anxious?

If some of these conditions are present, your next responsibility is to protect the crew. After arrival, as the potential pitfalls and disadvantages manifest themselves, stopping before the situation worsens is important. Place your unit and crew in an advantageous position. Their safety should be your only concern.

Protective Measures

The following protective measures may counteract disadvantages and place you and your crew in a safer position:

- Face the unit out.
- Determine/Locate multiple egress routes that will limit bottlenecking, including those that involve egress by foot, without the unit.
- Determine/Locate hard shelter, possibly multiple hard shelters.
- Look for low areas, anything with mass.
- Confirm that you still have communications with dispatch.
- Ask for support, and communicate your concerns.
- Use a brevity code that only your units know for help and rescue.

- Alert next-in units to protect themselves upon arrival.

- If you think chemicals are being used, use your booster line to improvise a makeshift decon station for each other. Or use a master stream from another unit to spray on you and your crew.

After some actions have been taken and the situation has improved to your satisfaction, your mind can refocus on what brought you to this point in the first place. You, the officer/supervisor, should be on full alert to anything that may not be just right--such as something else happening that will draw you further in.

If your protection measures upon arrival do not fit the terrorists' plan, the terrorists may create a diversion to counteract those measures. Never forget that thinking outside the box is important; everything inside the box can be anticipated and, therefore, countered with appropriate actions by the terrorists. From a strategic standpoint the Incident Commander (IC) may be the safest person at the site. If the IC is an "ICS purist," then the command decisions will be easily anticipated and the plan to destroy the target more simply constructed: Take out everyone but the IC; after all, the IC will do exactly what he has done for years--the IC will think inside the box.

If you are uncomfortable with the incident as you have assessed it, some personal protective measures could help:

- Keep an officer/supervisor in the clear.

- Leave two people in the clear with communication and knowledge of what to do--that is, rendering the necessary aid or backup--in case of loss of contact with entry team.

- Use brevity codes between entry and people in the clear.

- Use close hard shelter.

- Have SCBA if not all PPE on and at the ready.

- Have and use criteria for minimizing losses, withdrawal measures.

Minimize Losses

It goes without saying that your aim should be to minimize losses, but this may be a lot harder and more complicated than it sounds. Earlier we discussed discipline, the discipline not to run in or act on your knee-jerk reaction. How many times has it been said: "'Rescue' is our middle name--'Fire *Rescue* Services'--You don't understand, we're going in, that's what we do." And that is exactly what the terrorist is betting on. Everything the responders do should be focused on minimizing losses. The key word is *minimize*. We don't think in terms of minimizing: We want no losses; no loss is acceptable. That's the way we think; we can't help it--or can we? The military projects losses for any operation; the fire service should be at the same place in its thinking.

The discipline that was discussed earlier was in fact that used to minimize losses. Have you ever realized how easy it is to undertake a position of great risk, in which you were vulnerable, but which was an acceptable risk in your mind? But take the same position and order another crew to occupy the same vulnerable position and it could then be considered unacceptable. You trust your judgment and experience. You may not be as familiar with another's abilities. What all this boils down to is, at what point will you stop throwing good money after bad? How many people will you risk in a planned event to rescue others?

If you use terms such as "calculated risk," "risk-benefit," or even "err on the side of safety," you will be providing ammunition for your own personal weapon of destruction. Each one of these terms can be turned back on the user, in court or in an investigation.

A policy for withdrawal will provide the criteria to support difficult decisions in such situations. The officer/supervisor on the scene will still need to make the determination for the course of action while in the middle of a real incident. Though all the policies in the world won't take the place of the officer/supervisor on the scene, they will supply support afterward, and help, if only minimally, with living with the decision. This brings us back to the root of the problem, which is what no one wants to talk about: What is an acceptable loss?

Trying not to be crass about the matter, the idea of acceptable loss involves asking the question, when do you stop throwing live people into a situation to get dying or dead ones? The fire service says no loss of life is acceptable and that is understood. Another way to ask the same question: What level of casualties that you elect not to attempt to retrieve can you live with afterward? As mentioned earlier, the military considers, in planning an attack, that a certain number of personnel will be lost. Military commanders recognize that a percentage of the masses will be sacrificed to gain the desired objective--but they have a completely different agenda than we do.

The price for rescuing a crew or two may be the loss of the rescuer and rescuee both. Of course not going after them in the first place is not a pleasant thought either. However we want to cut it, there are going to be some very difficult questions and even more difficult answers involved in an incident that is planned to take out the public and responders alike. If "acceptable loss" doesn't fit in your ethical world, try thinking of the concept as "acceptable price" or "acceptable bet." What would you be willing to pay or bet in lives to get through an emergency, where rescue will need to be addressed?

To rescue or not to rescue is the question. No one can pretend to have all the answers. It would be nice to have a risk chart: one that allows you to put one finger on the number of people on the left side of the chart, and the other on a number at the bottom of the chart for time, and then gives you an acceptable risk factor where the row and column intersect. The fact is that whichever way you go you'll be criticized. You'll be cruel, heartless, and negligent if you send in rescuers and they are injured or killed. If they are not hurt, the armchair chief, officers, or public will consider you reckless and just lucky this time. On the other hand if you do not send rescuers in you could be considered cruel, heartless, and negligent, and you might even be charged with malfeasance or have a letter of no confidence written about you. Because of the type of event, problems involving risk assessment are bound to occur; because of the sheer masses affected, the laws of probability are on the side of some sort of situation arising that will necessitate a decision about acceptable loss. As much as we don't like talking about it, you must still make the decision: What will be your acceptable loss? There is no right or wrong answer, but when on the scene, and the clock is running, and people are breathing, a decision will be required.

PROTECTION

Protection measures are the actions taken to resolve the unacceptable risk(s) and provide an acceptable risk. You must understand your vulnerability to the point that you can change something that improves your position and decreases risk. If enough protection methods are used and each sufficiently lowers vulnerability, the level of risk will become acceptable. When at the scene of a terrorist incident, the risk is great, whether responders are targets or simply present at the event. Casualties will be a real possibility. If applicable and usable protection measures are not determined and established in seconds, others will manage the consequences.

The supervisor at the scene will have to:

- Learn of the hazard.

- Assess the risk as acceptable or unacceptable.

- Establish effective protection measures.

These sound easy but being aware of your surroundings will be a key factor. Also your personal discipline to take the time to correctly assess the conditions present. Your discipline will also be required to work from your head as you've been trained and not from the heart. It will be necessary to acquire a trained response or reaction. As in previous lessons, when selecting protection measures a little different slant can be placed on old but viable terms: time, distance, and shielding. Although very general in nature they still provide some guidance.

Time--What can be provided to limit your crew's exposure time to the hazard?

Distance--Can anything be done to distance you and your crew from the hazard?

Shielding--What barrier can be interposed between the hazard and your crew?

The practice of combining or layering protection methods should be addressed whenever possible.

But, if precisely why and to what the crew is vulnerable is not known, the protection measures may be wrong or inadequate. To best understand the hazards and risk and provide protection measures, you must take in all the general considerations in order to recognize your vulnerability.

TACTICS TOWARDS MINIMIZING YOUR LOSSES

Hard decisions are yours to make, as we said: Now is when they'll have to be made. You'll be criticized whichever choice you make, so make decisions that get your people out. These decisions will have to be made by someone, and it might as well be you. Use whatever shelter is available: hard, if you've got it; concealment/soft shelter if that's all you've got. Now's the time to do as you've been trained. If you believe a chemical agent has been delivered, use your PPE, get in the clear upwind, and get your PPE off, then decon the best you can.

Use discipline to work from the head not from the heart. There will be time later to break down, to think about what is happening. All that matters is that you and your crew make it out to respond another day.

Reconnaissance

Reconnaissance of response routes (primary and secondary), the incident site and staging areas should be accomplished during responses to acts of terrorism. Law enforcement resources will be required to conduct the reconnaissance and provide escort security support. However, the first responder should understand the purpose of reconnaissance and proper reconnaissance techniques.

Another security consideration is to establish within the preplan a requirement for response route, incident site and staging site reconnaissance. The responsibility for conducting the reconnaissance should be assigned to law enforcement. The level of training required to effectively recognize potential dangerous environments is higher than that usually possessed by fire and EMS first responders.

Improvised Explosive Devices

Political, racial and labor disturbances have provided a breeding ground for terrorists and extortionists in many areas of the world. Terrorists are being trained in the preparation and use of improvised devices. There has been an increase in the printing and dissemination of books and pamphlets detailing the construction of improvised devices. As a result, bombings and other acts of terrorism and extortion have intensified, producing a variety of improvised devices that are becoming more and more sophisticated.

Improvised explosive devices (IEDs) are nonstandard devices fabricated from common materials, incorporating explosives or destructive, lethal, noxious, or pyrotechnic chemicals. In addition to standard military and commercial explosives and incendiary mixtures, improvised fillers can be manufactured from available chemicals and materials. Some explosive mixtures in a confined state are considered incendiary; some incendiaries, when confined, may detonate.

The hazards of improvised devices include all those related to conventional and nuclear munitions plus the additional hazards of diversity and unpredictability of design compounded by the ingenuity or incompetence of the designer. Practically any container or material can be used to house or construct an IED. In addition to ordinary containers, plaster-of-paris, cement, concrete, incendiary resins, or similar materials can be cast into any shape to form a container.

Improvised devices are generally homemade and limited in quantity. They may be made with rudimentary tools and be of crude design.

However, groups have been known to produce devices on an assembly-line basis. Since these devices are nonstandard, there are no specific guidelines to enable fire and emergency service responders to positively identify or categorize them. Today's improvised devices are extremely diverse and may contain any type of firing device or initiator, plus various commercial, military, or contrived fillers.

The unpredictability of the improvised device demands more caution on the part of fire and emergency service personnel. Each suspected item must be treated as an unknown and should not be approached by fire and emergency service responders.

Improvised devices, regardless of how they are employed, are classified as closed or open devices.

Generally, emergency response personnel recognize the dangers associated with managing incidents that involve explosives. An understanding of associated dangers of explosive devices is important. Once this association is made, then an effective responder protection plan can be achieved. Fire and emergency services personnel should never approach what is suspected to be an improvised explosive device. Only trained Explosive Ordnance Disposal personnel should approach the suspected device. If you suspect an improvised explosive device you should immediately clear the area in and around the suspected device and notify the appropriate EOD personnel in support of the incident.

Terrorists will have no regard for the traditional transportation restrictions. IEDs are designed and assembled for one purpose: to explode. Remember that explosive materials come in many sizes, shapes and containers.

Explosive devices placed specifically to harm emergency services personnel or to hinder emergency operations should be considered a definite possibility at any terrorist incident and should be addressed in both the development of operational guidelines and the training of personnel.

Recognizing Explosive Synergy

Explosives require a synergistic effect to occur among four components: (1) a combustible chemical or solid material, (2) an oxidizer to support the rapid burning process, (3) a device to cause ignition, and (4) confinement of the ingredients. If any of the four parts is altered or fails to interface with the process, the explosion will be influenced or may not occur.

Hazards of Improvised Devices

Bombs will vary in size, and the size will be relative to the intended target. Terrorists use an assortment of dangerous materials in bomb formulas, many of which are their own recipes. It is important to keep in mind that terrorists will dedicate many hours to planning and developing strategies to cause harm and destroy property. In this process, the terrorist becomes very familiar with the potential targets and the local emergency response capabilities.

The use of improvised explosive devices is not a new concept. However, they have become more complex and more destructive and should no longer be considered just a law enforcement issue.

Recognizing the hazards and risks involved with IEDs is important. In 1995 the United States experienced a total of 5,296 explosive incidents. Of those incidents, 1,979 were bombings, 598 were incendiary, and 2,619 were other types of explosive incidents. The majority of incidents involved pipe bombs and numbered 667.

A significant amount of explosives are stolen each year throughout the United States. In 1995 a total of 3,429 pounds of explosives were stolen. In 1996 the total rose to 9,138 pounds, and from January through August 1997, a total of 6,013 pounds of explosives were stolen. As you can see, a great deal of explosives that have not been accounted for are circulating throughout the United States, and a terrorist group can easily get their hands on them.

Of primary concern to fire and EMS responders in responding to an IED is the possibility that the primary blast may not have detonated all of the explosive material. Unexploded materials may be lying among the debris. To deal with this potential hazard, initial operations at a terrorist bombing scene should be directed toward establishing and managing control zones similar to those of a hazardous materials incident. Response procedures should provide direction for the initial responder to create and designate specific zones of operations.

Recognizing Distraction Techniques

Previous bombing incidents have proven that terrorists use various distraction techniques to attract attention and draw in crowds. Once the audience of onlookers and emergency responders has assembled, a larger, more powerful bomb will be detonated. This delayed attack technique is commonly known as the "secondary device."

Another deceptive tactic used by terrorists is to display a countdown timer designed to give the observer a false sense of security. The bogus timer may indicate 30 minutes remaining on the display, even though but the device is actually programmed to explode at the 10-minute mark.

Maximizing Responder Survivability

One technique in maximizing responder survivability is to establish within your local operational plans the policy that only personnel with IED hazard training are allowed to enter the blast zones to identify unexploded ordnance or a potential secondary device. Once a device has been identified or is suspected, the plan should direct the initial responders to back off and call for trained EOD technicians. In areas where there is a threat of potential terrorist acts, it may be advisable to pre-position an EOD technician along with fire and EMS services. The EOD technician can then respond initially to the site to provide direction for safe fire and rescue operating practices.

Establish a clear and concise methodology of informing the public which emphasizes efforts at the scene and downplays the cause of the incident. Radio communications should be controlled so as to minimize bomb or IED-related language.

Hoax Device Tactics

One must keep in mind that many hoax devices are planted each year specifically to disrupt daily activities. Determining whether a device is real or fake is not the role of a first responder. Regardless of the presenting conditions, maximum precautions must be observed until experts render the scene safe. Untrained personnel should never be routinely used for bomb searches in the primary target area.

Ambush Tactics

The ambush tactic presents an extremely dangerous scenario for first responders. The terrorist may attempt to bait responders by using a distracter technique to facilitate an emergency incident. Fire and EMS units that arrive on site may then be victimized by a secondary explosion intended for a larger crowd. Reconnaissance of the incident site can minimize the possibility of a secondary device being used against the responders. Recognition training is important to effectively identify the existence of a secondary device. Remember, law enforcement personnel should conduct the incident site reconnaissance. Terrorists have mastered the art of transforming common containers and packages to disguise bombs and IEDs.

The following conditions will likely have an effect on response operations when an IED is discovered:

- Disposition threat upon arrival, pre-blast or post-blast.
- Size of the device and type of explosives.
- Proximity of device to exposures.
- Evacuation and protection variables.
- Number, location, and condition of casualties.
- Condition of damaged structure.
- Response capabilities, available technical resources.
- Response time of needed resources.
- Duration of the incident.
- Training level of responders.
- Commitment level of resources, which must be in concert with the technical capabilities at the incident site.
- Effective risk analysis of post-blast structural conditions, which requires the expertise of structural engineers.
- Outward warning signs of bombs and IEDs.

The following list should aid in the recognition of IEDs or in the recognition that an IED may be present:

- Any abandoned container out of place for the surroundings.
- Obvious devices containing blasting caps, timers, booster charges, etc.
- Unusual or foreign devices attached to compressed gas cylinders, flammable liquid containers, bulk storage fixtures, and other chemical containers.

- Abandoned vehicles not appropriate to the immediate environment, such as a gasoline tanker in front of a potential terrorist target site.
- Entrance thresholds that present wires or attached hardware that appear out of place.
- Detection of strong chemical odors for no apparent reason.
- Apparent trip wires.
- Written or verbal threats.
- Resemblance to any of the five basic bomb/IED incidents that first responders may encounter.
- Devices that have completely exploded (no residual materials present).
- Partially exploded devices (fragmented material present).
- Bombs/IEDs found intact.
- Hoax devices.
- Bomb threats (actual presence of a device is not substantiated).

The following types of firing devices are typically used in IEDs and booby traps (see detailed explanation and illustration of these devices in Appendix F).

- Pressure.
- Pull.
- Pressure release.
- Tension release.
- Barometric pressure.
- Disturbance.
- X-ray.
- Hydrostatic pressure.

- Light-heat-sound.
- Electro-chemical delay (E-cell).
- Collapsing circuit.
- Proximity.
- Time-delay.
- Controlled.

Improvised Nuclear Devices

Improvised nuclear devices are devices constructed for nonmilitary use that have, appear to have, or are claimed to have the capability to produce a nuclear explosion or produce radioactive contamination of an area without a nuclear explosion.

Types of Chemical Reaction Bombs

There are five basic types of chemical reaction bombs: acid bombs, caustic bombs, dry ice bombs, blowtorch bombs, and bleach bombs.

Questions That EOD Personnel Will Ask

If an improvised device is suspected, there are generalized questions that trained EOD personnel will ask the first responder: What is the exact location of the device? What are its size, shape and appearance? What sounds, if any, is it making? Additionally, any information concerning a disturbance to the device (items moved or jarred, lights turned on or off in the room, etc.) should be provided to the EOD personnel. Be prepared also to describe to EOD personnel the path that you traveled to exit the suspected device location.

Note whether the device has been placed on or near any hazardous materials and utilities. Evacuation of the immediate area, if not already begun, should commence.

Device Location

As a general rule the easiest place to plant a device outside is often a vehicle or a shrubbery surrounding a building. If personnel are evacuated, they may be increasing rather decreasing their risk of injury. The most likely place to conceal a device inside of a building is in an area to which the public has the easiest access. Therefore, any evacuation that requires personnel to move through public areas (such as halls near restrooms, waiting rooms, or lobbies) will increase the risk in the event of detonation.

Courses of Action for Suspected Devices

There are three possible courses of action when a device is suspected: (1) take no action, (2) evacuate and search, (3) search without evacuation. Evacuation initially appears to be the appropriate response to any bomb threat situation. However, there are factors that may weigh against the evacuation response. Even when total evacuation is possible and desirable, the process itself is not a simple one.

Evacuation Considerations

Assistance should be requested early when resources have been committed to evacuation. Identify the type of technical assistance needed (EOD, HazMat, rescue, radiological, etc.). Request law enforcement assistance to control access to the outer perimeter and for assistance in evacuation procedures.

A sudden evacuation may cause panic and unpredictable behavior leading to unnecessary risk of injury. When there is reason to believe that occupants of a building will panic if advised of a bomb threat, it may be advisable to have evacuation ordered on some other pretext. It should be noted, however, that the pretext of a fire should not be used. During fire drills, windows and doors are closed and are often locked. For evacuation involving improvised explosive devices doors must be left open so that rooms are readily available to search teams; doors and windows should be open so that a detonation (should it occur) will not be contained within the building.

Remember that when an evacuation is ordered for a suspected improvised device, you may need to alter established routes in favor of an exit pattern that will provide the greatest protection in the event of a detonation during evacuation. Greater supervision and control will be required, especially if a decision has been made not to announce the purpose of the evacuation.

Gather as much information from the dispatch center or units operating on the scene. Early information should be used to determine initial stand-off distance.

When actual or explosive devices have been located, identify at least a 500-meter (1,650 ft.) isolation perimeter for staging personnel and apparatus; relay coordinates via radio. (Make sure that you are at least 100 meters (330 ft.) from the hazard.)

Do not intervene; carry out only essential tasks that support public protection measures. Maintain defensive posturing and use the minimum number of personnel to achieve the task.

Deny access to the immediate hazard area. Attempt to control main points of entry such as streets, front and rear access to structures. Do not rely on banner tape to restrict movement of people; request law enforcement assistance to accomplish this task.

Utilize the highest level of personal protective equipment available. Structural firefighting clothing will offer limited protection from shrapnel and cut hazards. Use protective clothing and breathing apparatus when operating inside the hazard area.

Use of Communications Precautions

Restrict or discontinue radio, cellular, and mobile data terminal communication when explosives are present. Radio transmitters can create a field of electric energy sufficient to trigger electric blasting caps. Low-frequency transmissions are more dangerous to use.

When possible, prevent exposure of explosives to excessive ambient heat and attempt to eliminate static (electric) discharges.

Power Source and Utilities Consideration

Gain control of utilities, but do not disconnect or engage circuitry until the scene has been evaluated by trained personnel. If a device is suspected or discovered, do not change the condition of the surroundings; this includes moving power or light switches to a different position.

Staging Areas

When establishing staging areas, consider using structures and natural barriers that will provide blast protection. Be sure to plan for reflecting overpressures and stay upwind.

All staging areas should be located away from any buildings containing large amounts of glass and away from line of sight of the target area.

When evacuees are located inside buildings remote from the target, open all windows and doors to prevent pressure differentials.

Be sure to identify water supply sources and prepare to establish water supply lines for firefighting operations.

If explosives are involved in the fire, do not attempt to fight the fire. Isolate the area and protect exposures. The isolation distance will depend on the conditions present and the type of material. Prepare to isolate for distances up to at least one mile in all directions.

If Detonation Occurs

If a detonation has occurred, estimate the number, status, and condition of any casualties and initiate mass casualty incident protocols.

Identify what type of rescue equipment will be needed for entrapped victims.

Establish command and activate a personnel accountability system. Clearly identify the person responsible for command and control and the location of the command and control. Make an attempt to accomplish this face to face due to security concerns.

Think before you rush in. It is important not to become complacent, and it is important to deviate from your typical response mode when responding to an explosive device incident.

Use of Pyrotechnics

Pyrotechnics are mixtures of solid chemicals and are designed to function in the absence of oxygen. Pyrotechnic mixtures produce light, color, smoke, heat, noise, and motion. The chemical reactions involved are of the electron-transfer or oxidation-reduction type.

Fireworks are perhaps the most common form of pyrotechnic devices, although highway flares and air bag inflaters are other examples of civilian pyrotechnics. The military also uses a broad assortment of pyrotechnic devices for signaling, screening (with smoke), illumination and training simulation.

Reaction rates in pyrotechnics can vary from very low burning to instantaneous detonations with rates greater than a kilometer per second. Pyrotechnics is closely related to the fields of explosives and propellants, and exactly where one field ends and another begins can be debated at great length.

Numerous devices are made using pyrotechnic compositions. These devices produce a visible or audible effect by combustion, deflagration, or detonation for entertainment purposes. Remember, pyrotechnics can easily be used by a terrorist organization to initiate an attack.

Secondary-Device Considerations

Access to a detonation area should be strictly controlled until a search for secondary devices is completed and thereafter to protect the crime scene. Perimeters of the detonation area should be established quickly and access allowed only to remove the injured until a thorough search for secondary devices has been completed. Searches should be conducted by only trained EOD personnel.

Considering that secondary devices target first responders the bomber may anticipate where staging areas and command posts are likely to be located. Searches for IEDs should include these areas.

Improvised explosive devices can easily be disguised and may be concealed in seemingly harmless objects. Do not touch or move anything at or near a bomb scene. Any suspicious items should be brought to the attention of trained EOD personnel.

Extensions of the isolation areas can save lives.

Command posts should be located upwind of the scene of an explosion to reduce the possibility of exposure to airborne toxins or hazardous vapors that may have been released or caused by the blast.

Record the scene with a hand-held video camera, photographs and/or sketches or some type of drawings. This will help for time sequencing of the event and may reveal valuable information in later review.

Rapid Evacuation Considerations

Modify the traditional "load and go" principle. Treat the bomb scene as you would a car engulfed in flame. The potential for further danger and harm is very real.

Remove the victims from the scene and take them to a safe distance away from the scene to render first aid.

Be aware of damage to infrastructure in the area of the explosion, such as gas lines and tanks, electrical transformers, downed power lines, etc., that may create other hazards to first responders.

Responsibilities When a Suspected Explosive Device Is Found

When in the process of conducting search operations, or when responding to an incident, and a suspected explosive device is discovered, the following actions should take place:

Cease all search operations and ensure that the building or area is evacuated and that a secure perimeter is established. Only trained EOD personnel should conduct further operations. All firefighting and EMS personnel should remain clear of the incident site until the all clear is sounded by trained EOD personnel and law enforcement.

Inform law enforcement and fire dispatch by radio (at a safe distance), runner, or telephone and request that proper notifications be made (police, EOD, public works, gas, electric, phone, etc.).

Designate safe response routes of approach for incoming equipment and personnel.

Ensure that a written chronological events log is maintained to include responding units, times and locations, displaced individuals, injuries, and other pertinent information. Remember the incident will be designated a "crime scene" and all of the above-mentioned information will serve to assist law enforcement during the crisis management phase of the incident.

Dispatch Procedures During A Terrorist or Criminal Bomb Incident

If the dispatcher receives a telephonic bomb threat when first responders are en route to the incident site or are at the incident site, the dispatcher should immediately notify the on-scene Incident Commander and advise him/her that a bomb threat has been received at the incident site. Immediate evacuation of all responders must take place. Only trained

EOD personnel should breach the established safety perimeter to locate or identify the suspected device.

The dispatcher should ensure that the exact time is noted, then ask the following questions:

- When is the bomb going to explode?
- Where is the bomb located?
- What does the bomb look like?
- What kind of bomb is it?
- What will cause it to explode?
- Did you place the bomb?
- Why did you place the bomb?
- What is your name or the name of your group?

After obtaining as much information as possible from the caller, the dispatcher should contact the incident site and provide law enforcement with the details of the caller's responses.

TACTICAL OPTIONS FOR THE COMMON STRATEGIES OF TERRORISM

Protection

Once a hazard has been found or suspected and it is judged that the hazard poses an unacceptable risk, vulnerability assessment is necessary to identify precise points for direct protection measures. The intent, as stated before, is to turn an unacceptable risk into an acceptable one. Enhancing overall responder survivability and supportability is the overall direction of the strategy. Many tactics may be employed; even the layering of protection measures will increase the chances that a successful job is done:

- Observing proper procedures and precautions for physically hazardous conditions.
- Employing proper PPE for the hazard present.
- Establishing decontamination operations to protect the responders and the casualties as soon as possible.

- Slowing down of operations.
- Selecting an efficient location that will assist entry and exit needs of the site.
- Quality controlling the actions of the decon operation.

Physical Shelter (Hard Shelter)

There are a number of points to consider with physical shelter. Each type of shelter, soft and hard, has a function, and each has its advantages, but obviously each has limitations. Soft shelter, although it provides no structure that would stop or slow any projectile, will hide you from view, and there is a certain amount of protection that comes just from being out of sight. Before someone can be assaulted, their location needs to be ascertained. Obviously being concealed from view contributes to that end. But concealment carries only a limited measure of protection.

Hard shelter provides a greater level of protection but is limited in that it's harder to find. Although many objects will hide you and your crew, fewer will stop a viable projectile. Depending on your vicinity, hard shelter may be difficult to find when you're in a hurry. Many will seek soft shelter because it's close and they just aren't thinking; after all, you are in a hurry, and you may need to direct your crew.

Any heavy structure with mass will serve as hard shelter. Some examples, each having its own set of pros and cons, are ditches, masonry buildings and walls, depressions, gullies, and again anything with mass.

Ditches, gullies, basements, and other below-grade shelters have one significant limitation that may make them dangerous: Any below-grade shelter may be a depository for heavier-than-air agents or products. By jumping or diving into one of these shelters, you and your crew may be leaping into a hazard.

Below-grade shelters do offer some advantages, however, in that if the depression is long and deep enough, it may provide an egress route, if it hasn't been already found and planned for by an attacker. Some depressions that may prove good for this are creeks, rivers, storm drains and areas under bridges.

Another problem with hard shelters is that the bad guys can preplan them. If terrorists plan to deliver an attack at a particular point, any hard shelters in that area can be found and adjustments can be made in preplanning, or the shelters can be booby-trapped.

Buildings can be very deceiving: Many appear to provide protection, but in reality they may offer little more than simple concealment. Buildings of light construction, such as metal and wood frame, will allow many projectiles to pass through them. What they do offer is egress from the area while hidden. For improved protection and egress, masonry buildings should be sought out.

In closing, the biggest disadvantage of hard shelter is that while you and your crew are protected with mass and hidden from the terrorist's sight, the terrorist is hidden from your sight as well.

RECONNOITER

This strategy presents a high hazard and risk level because of greater vulnerability. The response team will be the first group in and will see everything. They must be able to restrict themselves to their mission.

Information that depends on what is not seen can be fatal. The information the team members receive before going in will direct them to gather appropriate information and intelligence concerning the site.

The need to rescue the recon team is a possibility that must be considered. The team might be attacked at the site or might trip a device of some kind. Sending in a rescue team, however, should be done with caution.

Team Development

Like the rescue team, the recon team should have representatives from all groups--EMS, law enforcement, rescue, and HazMat. As with the rescue team, each member must be directed to his/her task specific to his/her discipline. Each discipline has expertise that will be needed to further the team efforts. The EMS people will have to separate their attention from team aid and from casualty. If they should leave the team to render aid to a casualty and a team member goes down, what will be done?

This team development has a lot in common with the development of the rescue team. Everyone will want to be the first inside the site. It may be difficult to select the right people for the job.

Because of the character of its members, who are disciplined and professional yet willing to go the extra mile for the facts that will be needed, the team may be slow to develop. Team members are disciplined to do their job and not engage in sightseeing, to gather the necessary data and get out.

It is important to keep the team together. Even after the initial entry to the site, the team needs to stay together. Information will be needed throughout the incident, and no one will have greater knowledge than the people who saw it first. They will be able to say with assurance whether something has always looked like that or something has changed.

Team members should be detail-oriented, data-oriented, and driven by the facts. Team members must acquire all the detailed information possible in their first mission. Everyone from the various agencies that contribute team members will be limited to what the team sees and records. It is much easier to say that nothing must be forgotten or overlooked than it is to do it, however. Every effort must be made to gather as much factual intelligence on the site as possible.

Recon Team Activities

The recon team works the main scene or the area thought likely to yield the most information. The team works their way into the site to gather the facts and then get that intelligence back out to the people who will be deciding strategy and developing tactics for the incident.

Safety of the team is of paramount importance. The team makeup has a lot to do with their safety. Members must act together as a team, each gathering data and each looking out for the other, as only each member can do, as safety issues apply to their own knowledge. Discipline will make or break the team only doing what they do best.

Rescue Team

A rescue team may be needed to rescue the recon team. They must be located in a secure area and be trustworthy to have site intelligence reported to them as it is recovered. They must be able to monitor the communications from the recon team to be adequately prepared to extract the team if the situation warrants.

MAPS

Maps will be needed in every work group. An incident may encompass a building or a geographical area. Although the site may appear to be large, it will seem smaller as it is committed to memory and is traveled frequently. Because of the added burden of being a crime scene, there is an emphasis on detail. Everything that happens will need to be tracked and communicated as to the exact location. In the fire service when ICS is used, a geographical location may be given a division designation. Maps will allow Operations to designate areas if divisions would be applicable.

All maps should be accurate, up to date, readable, and of reproducible quality.

Area Maps

Area maps may not be drawn to scale but will show landmarks that a normal street map would not have. Some of these maps may be used for tourism, and depending on the type of incident involved, many landmarks shown on the map may no longer be present.

Street Maps

A clear street map that is small enough to be carried and large enough to be posted to track team progress is necessary. It should be sufficiently detailed to show dead-end streets, one-way streets, lane widths, etc.

Utilities Maps

Maps that show size and depth of water mains, electric lines and vaults, telephone lines and vaults, and sewer lines are a must. They will

- Allow the team to assess damage to the infrastructure.
- Facilitate the establishment of access routes for other responders.
- Facilitate movement and setup of heavy equipment to avoid utility damage.

Topographical Maps

Topographical maps show how the land rises and falls. This information is needed to show the entry teams how to stay on high ground or determine which areas to avoid.

Census Maps

The ability to distinguish higher densities of population from lower densities may give insight to a target or possible exposures. Also, in the event of a weather change, a shift of tactics may be necessary. Being able to recognize population density and proximity to the emergency allows development of contingency plans.

PHOTOGRAPHY

Combined with the work of the documentation group, photography will provide a perspective that is both accurate and in real time. The real-time perspective will benefit all work teams.

Site Photos, Before and After

"Before" shots of the site will help determine the location of landmarks for reference during the emergency and post operations. These shots may require contact with the building management office or building superintendent's office. "After" shots will provide a reference as to what has changed and what may no longer be present.

Aerial Photographs

Aerial photos will provide an overall size-up of the site, which is a reality check for the recon team and other teams going in. A recon team is limited to what can be seen from only their location, but aerial shots may give them cause to seek out a particular area to investigate. Aerial shots may also aid in hazard recognition, providing a look at a hazardous condition that may not be seen from the recon team's level of sight.

Real-Time Photographs

Shots made during an incident provide several advantages. The information that is gleaned through photography shows how the site currently appears in real time.

Real-time photos should be taken of hazardous conditions. A shot should also be taken of conditions after the hazard has been dealt with. As other agencies arrive, inquiries will be made of conditions at the site. What appears to them to be a problem may already have been addressed and resolved. The photos will depict the current condition and confirm that the condition was addressed.

Real-time photos also can be used to identify changing conditions. They might indicate, for example, that an object has been moved or that a moving object is creating safety concerns.

Real-time photos can be used to brief other recon teams and workers on problems or concerns inside the most secure area.

BUILDING PLANS

Emergency Response Plans

Emergency response plans cover any preplanning required by local or Federal agencies that may have a bearing on data at the site. Knowledge of any preplan emergency exits or egress routes will help in the search for casualties and may aid in their identification.

Blueprints

Accurate drawings along with the scale distance will help recon, rescue, and work teams to find their way through buildings at the incident site.

Activity 3.1

Post Office Scenario (Part 1)

Purpose

To identify real concerns, problems, and response issues associated with a simulated incident at a post office.

Directions

You will work in small groups.

Time-sensitive information will be shown on the screen.

The instructor can answer questions to clarify information as needed but will not volunteer information.

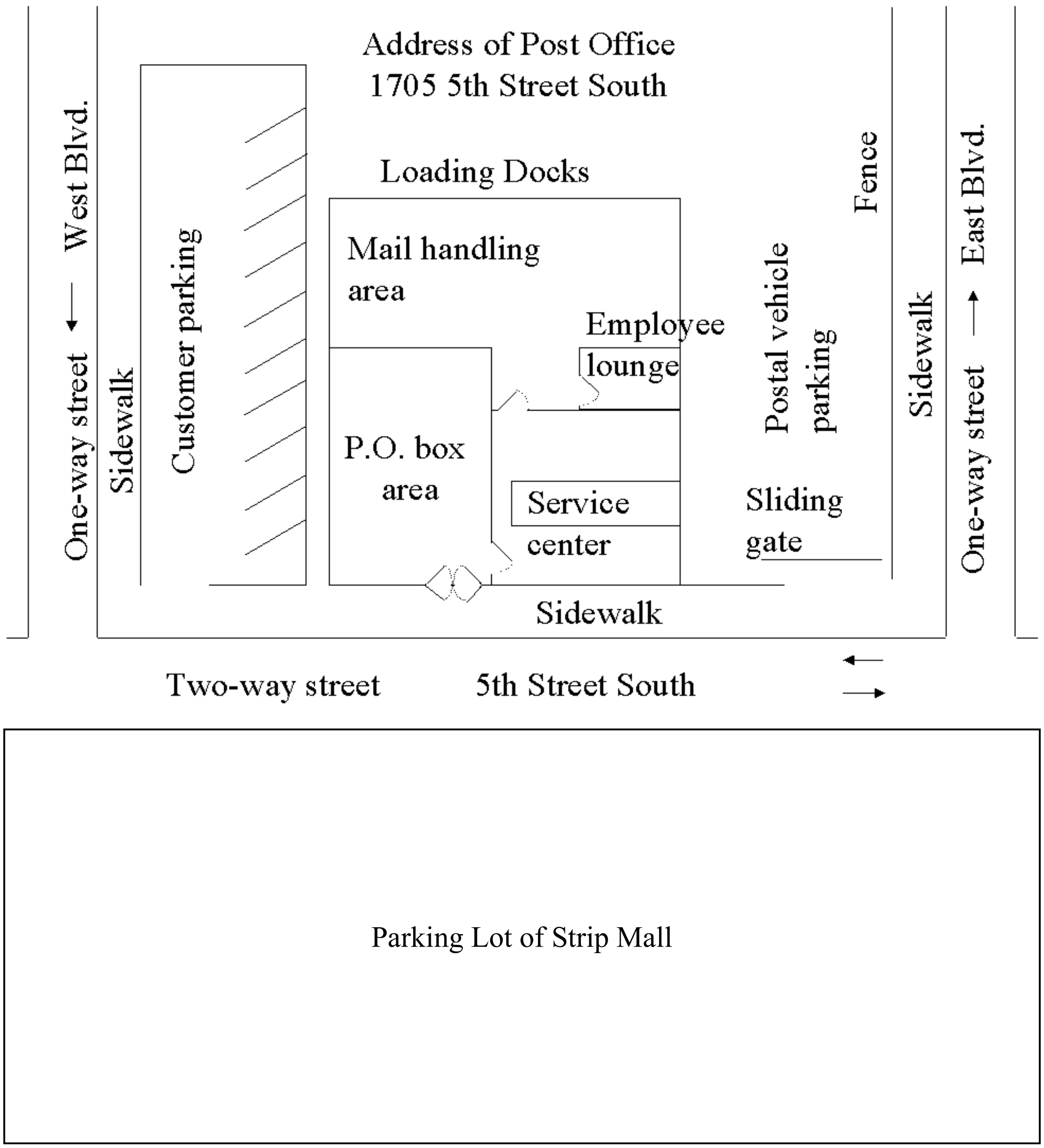
Based on the information given, answer the questions on the appropriate worksheets.

Phase 1 answers should be based on your own agency. Phase 2 answers should be based on Blue Water City.

Activity 3.1 (cont'd)

Post Office Scenario (Part 1)

Diagram of Post Office



Questions for Phase One

What is your normal response to this alarm?

Do you have a pre-plan of the facility?

What other information can you obtain?

What concerns for security do you have while responding, and what steps can you take to reduce the security risk to you?

Questions for Phase Two

1. What are your next five actions?

2. Based on index of suspicion, what are likely causes for this incident?

3. What self-protective measures are you going to implement?

4. What assistance are you going to request?

5. What information will you relay to the dispatcher?

6. What information will you relay to the incoming assistance?

7. What sectors will you establish?

Unit 4:
Patient Care

Terminal Objective

- The student will be able to develop a patient treatment plan for a terrorist incident with casualties involving B-NICE materials.

Enabling Objectives

The student will be able to:

- Identify potential agents used in a terrorist event involving a B-NICE material and triage patients into an appropriate treatment order.

- Identify appropriate personal protection for use during patient care based upon hazard(s), risks, and available protective equipment.

- Based upon the signs and symptoms presented by patients, suggest likely materials involved.

- Identify considerations for the safe transport of patients to traditional and nontraditional medical treatment facilities.

INTRODUCTION

We have discussed in previous units the basic strategies for the overall management of the terrorist event and the strategies that must be considered for a safe response. Strategies that are essential to the safety of our personnel include

- recognition of the terrorist event;
- isolation of the event;
- security measures; and
- protection of responders and the public.

Only when these strategies have been ensured can we consider beginning the medical treatment to the casualties of the terrorist event.

To ensure the proper care for the casualties, we will discuss in this unit the appropriate sequence of patient care (or the mainstays of patient care) and the general treatment considerations appropriate to the weapon used.

Physiological Effects of Terrorist Weapons

In this section we will discuss a variety of different toxicological processes regarding weapons of mass destruction. This information is provided to support the lecture materials for those wishing to understand, in more detail, how these materials actually affect the body.

The overriding emphasis of this section is to instill the importance of specialized resources needed for these events as well as to improve understanding of how to recognize particular weapons based upon signs and symptoms.

BIOLOGICAL, NUCLEAR, INCENDIARY, CHEMICAL, AND EXPLOSIVE

One acronym you may have heard is B-NICE. This acronym stands for Biological, Nuclear, Incendiary, Chemical, and Explosive. All of the weapons we will be discussing can be placed into one of these categories. Although other weapons may exist (e.g., armed attack), such weapons generally do not present with unique patient care considerations (e.g., traumatic injuries). In this unit, we will discuss the different patient care issues concerning each of the classes of weapons. In the event the terrorist has used a combination weapon, you will know what the primary hazards and patient care issues are and how to look at the whole patient. This would be much like patients you encounter with different ongoing disease processes; you prioritize the presenting problems and then begin patient care.

The chapter is designed to follow the B-NICE acronym for organization, and commonality among programs. A more basic introduction to these weapons can be found in the *Emergency Response to Terrorism: Self Study Guide* and *Basic Concepts* course. In addition, guidance documents for these weapons can be found at www.rris.fema.gov or www.nbc_med.org. These sources contain extensive information concerning the recognition and care of nuclear, biological, and chemical weapons. Although we will be making frequent references to them for suggested courses of treatment, use of these materials does not in any way substitute for your local protocols and decisions of your medical director.

Patient Care Mainstays

The "mainstays of patient care" form a logical and sequential approach to caring for the victims of a terrorist event that takes into consideration the protection of the rescuers, the patient, and the downstream medical community while ensuring that the patient receives lifesaving medical intervention as soon as is safely possible. Using the mainstays concept, broad strategic goals regarding patient care are defined and then further refined based upon the weapon involved and the health and safety threats present.

Prior to discussing the actual mainstays of patient care, we must first identify the "patient." We must remember that the primary goal of our operations at a terrorist event is to minimize suffering and loss of life while ensuring the safety of our responders. With that goal in mind, it becomes apparent that no patient care actions can be taken until we have properly protected our personnel against unreasonable risks.

Casualty (victim): A person who has been injured (traumatically, psychologically, illness) or killed as a result of the event.

Patient: Those casualties who are (1) viable to medical intervention without (2) causing unreasonable risk of permanent injury or death of the rescuer.

In earlier units we discussed the potential harms that are likely to be present at terrorist events through the use of the "TEAM CPR" acronym. These potential harms are the **hazards** that our personnel are faced with. Based upon these hazards, we must take appropriate protective measures to provide reasonable assurances that the risks to our personnel are minimized. Risk is the likelihood that actual harm will occur. Appropriate protective measures include

- Administratively preventing exposure to the hazards by isolating the hazardous area and denying entry.

- Elimination of the hazard by its removal. Examples of elimination might include a bomb disposal team rendering safe an explosive device or ventilating work areas of toxic gases or vapors.

- Securing the hazard. The hazard is still present but its potential effects upon personnel are minimized.

- Protecting personnel from exposure to the hazard, e.g., by having them wear personal protective equipment (PPE) designed to prevent or minimize direct exposure to the hazard.

These four protective measures can be used singly or in any combination to ensure a work environment that is reasonably safe for our responders. Ideally, we would like to prevent exposure totally by isolating the area and denying entry, and initially, such actions will be taken until we can develop other protective measures to minimize risks. But we all know that isolation and denial of entry will not be the final answer to the incident. Actions within the hazard area will be required and therefore we must implement appropriate measures to minimize the risks. **Only when we have taken the appropriate protective measures does a viable casualty become a treatable patient.**

Mainstay #1: Appropriate Protective Measures

First and foremost is the initiation of any one or combinations of the four protective measures listed above to reduce the risks to our personnel to an acceptable level. Based upon the viability of the casualties and the urgency of the situation, these protective measures may range from the use of PPE in a highly hazardous area (moderate- or high-risk operation) to the total elimination of the hazard from the area prior to intervention (low-risk operation). The decisions with regard to risk/benefit operations must be made based upon an awareness of both the potential hazards (TEAM CPR) and the capabilities and limitations of the four protective measures that might be used.

Mainstay #2: Prevent Further Exposure to the Hazard

Depending upon the weapon used, measures must be undertaken to prevent the viable casualties' further exposure to life-jeopardizing hazards. In the case of a collapsed structure resulting from a bombing, for example, this might involve rapid extrication or even respiratory protection from dusts and airborne hazards during the extrication process. In the case of a nuclear, biological, or chemical (NBC) event, it most likely will involve rapid removal and decontamination.

Mainstay #3: Provide Supportive Medical Care as Soon as Safely Possible

The basic ABC's of medical care should be initiated as soon as it is safe for both the patient and rescuer to do so. The point at which such care begins will depend upon the circumstances of the event. Those viable casualties who can be removed rapidly from the highly hazardous areas should not have interventions initiated (except very basic immobilization techniques) until they have been removed. Those viable casualties whose extraction is impeded might have basic treatment measures started in the hazard area, as long as such action does not unreasonably jeopardize the health and safety of the rescuers or other viable casualties. Other interventions that may be unique to the NBC environment at this time might include the use of self-injectors designed for antidotal treatment of the effects of specific chemical weapons.

Mainstay #4: Decontaminate

Again, depending upon the weapon used and the circumstances surrounding the event, decontamination may be required. Therefore, all patients should be assessed for decontamination needs, and the appropriate decontamination measures must be instituted to protect the casualty, responders, and downstream medical community.

NBC events will require decontamination of some form. Remember, however, that persons exposed only to vapors and gases present little risk of secondary contamination once clothing is removed. Those contaminated by or exposed to radiological materials more than likely will require extensive decontamination and monitoring for decontamination effectiveness. Those contaminated by or exposed to biological or chemical agents most likely will require decontamination with 0.5 percent hypochlorite solution at a minimum. Afterwards, further decontamination with soap and water should be considered.

Decontamination steps include gross decontamination, involving the removal or inactivation of gross or bulk contaminants, and secondary decontamination, which is the thorough washing, rinsing, and irrigation of the body. Tertiary decontamination measures also may be necessary at a medical facility.

Mainstay #5: Maintain Personal Protective Measures (Assess Potential for Contagious Disease Processes and Take Appropriate Measures)

If the terrorist event involves the use of biological weapons, then the potential for transmission of the disease to others must be assessed and appropriate isolation and personal protective measures must be instituted.

Generally speaking, the majority of the weaponized contagious diseases are transmitted through the respiratory tract, and this mode of transmission is easily protected against through the proper use of High Efficiency Particulate Arresting (HEPA) filter masks or PPE/SCBA and standard universal precautions. A small number of other biological weapons are contracted through cutaneous or gastrointestinal contact, but the majority of these are not transmittable from human to human. When in doubt, the use of positive-pressure self-contained breathing apparatus (SCBA) or HEPA filters in conjunction with standard universal precautions provides a very high level of protection against the **majority** of the biological agents.

Mainstay #6: Basic Life Support/Advanced Life Support Intervention

Initiate basic life support (BLS) and advanced life support (ALS) medical intervention. Ideally, ALS intervention measures should not be started until after at least gross decontamination procedures have been completed.

Remember that, during a mass casualty event, the pulseless/apneic patient would not be considered a viable patient. Committing excessive resources to an arrested casualty can impede our system's ability to render lifesaving care to more viable patients. Many times, ALS measures will be supportive in nature. In these cases, ALS care is directed at supporting respiratory and circulatory systems, maintaining proper perfusion, and enhancing the elimination of any chemical products. Many terrorist events use weapons that require specific medical treatment considerations in addition to the supportive ALS treatments. These treatment considerations may include

- Nerve agent treatment protocols directed toward preventing stimulation of acetylcholine receptors.
- Treating the pulmonary effects created by respiratory irritants and vesicants.
- Treatment for potential crush syndrome.
- Treating cyanide poisoning by reversing the effects of cyanide upon the oxidative phosphorylation process.
- Treatment of traumatic injuries resulting from explosions.
- Treatment of burn injuries resulting from the use of incendiary devices.

Mainstay #7: Medical Receiving Facility (Traditional and Nontraditional)

Obviously, patients will need to be transported to a receiving medical facility that is capable of and prepared to deal with such events. These medical facilities can be either the well-prepared traditional medical facilities or nontraditional medical facilities that have been designated or established specifically to handle patients of the unique medical nature involved in the incident.

Remember that efforts must be made to keep the local medical community intact during and after a terrorist event. Therefore, the destination facilities should be prepared or established to handle the number and types of patients who will be received without impeding the community's ability to provide continued health care. To help keep the local medical infrastructure intact, nontraditional receiving facilities may need to be established. Such nontraditional receiving facilities could include the use of nonemergency medical "walk-in" and other health care facilities for minor injuries and walking wounded and the establishment of casualty collection points (CCP's) and patient staging areas (PSA's) to aid in the control of patient flow to traditional hospital emergency rooms.

The concepts of CCP's and PSA's have been developed so that patients can be collected and treated in nontraditional locations. This method of patient care continues until time permits patients to be placed into the local community's traditional health care system while minimizing the potential for overwhelming or contaminating any single receiving medical facility.

A CCP is a predefined location at which patients can be collected, triaged, and provided initial medical care. Generally, the CCP is staffed during the initial stages of the event by EMS personnel and other medical care providers who are sent into the field. Once initial treatment has been received, those requiring continued medical care then are transferred to either a PSA or, if it is not overwhelmed or directly affected, a local or regional hospital.

If the local or regional medical capabilities have been overwhelmed or directly affected by the event, then PSA's can be further developed to hold the patients for long periods of time. This greater involvement of the PSA's generally will require the additional support of resources such as Disaster Medical Assistance Teams (DMAT's) or specialty resources such as National Medical Response Teams (NMRT's), which are a specialty NBC DMAT team available through the U.S. Public Health Service's National Disaster Medical System (NDMS).

Mainstay #8: Transfer at the Receiving Facility

Regardless of whether the destination facility is of a traditional or nontraditional nature, the patient must be transferred in such a manner to ensure that any potential cross-contamination of the receiving facility is minimized. This process takes place outside the doors of the receiving facility through a "clean-team transfer."

During the clean-team transfer process, field units avoid entering the medical facility with the patient. Instead, a clean medical team meets the transporting unit outside and transfers the patient from the litter onto a clean bed. Any equipment, clothing, or personal articles are left with the transporting team or packaged securely prior to allowing the items to enter the hospital. Direct contact between the field unit personnel and hospital personnel must be avoided.

Medical facilities themselves need to be prepared for such events. The EMS system must urge local medical facilities to prepare for contaminated patients regardless of terrorist attack or hazardous materials accidents within the community. The EMS system also should be prepared to assist in that effort.

As a result of the Tokyo sarin attack on March 20, 1995, a local hospital, St. Luke's, was inundated with 640 patients within a two-hour period. What is important to realize is that of the 640 patients seen by the St. Luke's Hospital Emergency Department, only 64 arrived by ambulance and 35 by EMS minivans. The remaining 541 victims or 84 percent of those seen by St. Luke's arrived by private vehicle and were not seen by

EMS field units. Had it not been for the implementation of the Hospital Disaster Plan that required the stopping of any routine or nonemergency surgeries and the suspension of all outpatient care procedures, the hospital would have been unable to cope with the massive onslaught of victims. However, because the hospital had and used the plan, it was able to quickly reallocate more than 100 physicians and 300 nurses and volunteers to care for the patients.

Sarin, when used in a manner as it was in the Tokyo subway, produces a vapor that caused the illness of the several thousand affected victims. Had direct contact with the sarin occurred in the Tokyo incident, the likelihood of viable victims would have been greatly reduced. Additionally, had agents other than sarin been used that presented a significant risk of secondary contamination, St. Luke's ED as well as any other hospital easily could have been shut down due to contamination. Hospital emergency departments therefore must be prepared to control the inward flow of patients as well as to decontaminate those who arrive.

AGENT DISSEMINATION

As we discuss the medical impacts of the B-NICE weapons, it is important to consider the potential methods for dissemination of these materials, particularly the biological, chemical, and nuclear agents.

One must not forget that many industrial materials can be used just as effectively as military agents.

The most effective and most common means of dissemination is to enable the material to enter through the respiratory tract. If we recall from our basic studies of medicine, be it from a first responder, EMT, or paramedic-level program, the respiratory tract has a vast and delicate surface area. It is the exposure of this surface to the outside environment (through respiration) that enables many of the devices we will discuss to be very effective. The deeper into the passageways of the lungs that a terrorist can "place" the material and the longer the material remains there, the more effective it becomes. It is not to say that other routes of exposure are not possible. In fact, dermal contact with many of the materials can be lethal, depending upon the weapon used. However, the most effective means of achieving mass casualties is to have the materials enter the body through respiration.

If you recall, the passageways of the respiratory system become smaller and smaller the deeper we go. Therefore, particulates, gases, and vapors will be trapped and held at various levels based upon factors such as the size of the material, the depth and rate of respiration, and whether or not the material is water or lipid (nonwater) soluble.

Other means of dissemination also are possible depending upon the agent used. Effectiveness of the ingestion (alimentary) route of exposure will be dependent upon whether the agent used can survive the acidic environment of the stomach. When discussing the biological agents, we find that many bacteria cannot exist in low pH conditions, whereas others, for example, sporelating bacteria such as anthrax, can. Considering the ingestion route of exposure, some people have raised concerns over a terrorist's ability to contaminate a domestic water supply. Processes such as dilution, filtration, and chlorination greatly reduce this potential threat. That, coupled with the fact that only 1 percent of a domestic water supply is consumed through ingestion, further reduces the potential effectiveness of this means of dissemination.

The dermal (percutaneous) route of exposure is very effective with the blister (vesicating) agents, but less effective with many of the biological agents. As we will find, only a few biologicals are dermally active materials because healthy, intact skin provides an excellent barrier. And the use of vectors such as fleas to disseminate biological agents (e.g., bubonic form of the plague) would present significant logistical difficulties to the terrorist and is not likely to be a readily selected means of weaponization.

Human-to-human transmission does become a particular concern. Some of the bacterial and many of the viral agents can be disseminated effectively by human-to-human contact. That, coupled with the delayed incubation period and the potential to infect numerous other persons prior to detection, leads to significant concerns about smallpox, pneumonic plague, and viral hemorrhagic fevers, to name a few.

In summary, weaponization of **most** of the agents we will discuss is best achieved through the inhalation route. If the terrorist can get the materials into a respirable form, that is to say, less than approximately 3 to 5 microns in diameter, then the creation of higher casualties is more likely to occur. Such airborne dissemination can be created by applying various forms of energy to the material. Energy such as heat would cause a liquid to evaporate faster, resulting in a higher airborne concentration, and explosives or sprayers could be used to aerosolize the materials.

AGENT CHARACTERISTICS

Biological Agent Characteristics

Biological agents are defined as a microorganism or toxin that can cause disease processes. Most commonly, the biological agents are bacteria, viruses, or toxins, and numerous different biological agents are of common concern. Virtually any biological material could be weaponized and disseminated; some are just more effective than others.

It is important that we understand the difference between a bacterium, virus, and toxin. The differences between the three can indicate the ease of manufacture, the availability of antidotes, and, to some extent, their effectiveness.

A **Bacterium** is a small "free-living" microorganism. By free living we mean that it can live outside of a host cell. If provided the proper environment (temperature, moisture, food) these cellular organisms can survive on their own and reproduce by simple cellular division. Many of the bacteriological agents respond to specific antibiotic therapies and, for the most part, are treatable conditions if detected early enough.

A **Virus** is an organism that requires a host cell to live and reproduce and it is intimately dependent upon the cell that it infects. The diseases that viruses produce generally do not respond to antibiotics, but may be responsive to the few antiviral compounds that are in existence.

In comparison to the bacteria and viruses, **toxins** are not living organisms. Simply put, a toxin is a poisonous chemical compound that is produced by or derived from another living organism. The producing living organism could be plant, animal, or microorganism. Examples might include ricin which is derived from the castor bean, mycotoxins produced by fungi, or the botulinum toxin which is produced by the bacterium *Clostridium botulinum.*

Although numerous other types of biological agents exist, these are the three most common forms.

Regardless of whether the agent is a bacterium, virus, or toxin there are certain features of the agents that influence their potential for use as weapons:

- infectivity;
- virulence;
- toxicity;
- incubation period;

- transmissibility;
- lethality; and
- stability.

Unique to many of these agents, and distinctive from their chemical counterparts, is the ability to multiply over time and actually increase their effect. Therefore, if the biological material can replicate itself readily it has a greater potential to be able to be transmitted from person to person. The epidemiological impacts of such a biological weapon would become obvious.

Infectivity--The infectivity of an agent reflects the relative ease with which the microorganisms involved establish themselves in a host species. Pathogens with high infectivity cause disease with relatively few organisms, whereas those with low infectivity require a larger number. High infectivity does not necessarily mean that the symptoms and signs appear more quickly, nor that the illness is more severe, simply that it takes only a small number of organisms to produce symptoms, regardless of timing or severity.

Virulence--The virulence of an agent reflects the relative severity of disease produced by that agent. Different strains of the same microorganism may cause diseases of different severity.

Toxicity--The toxicity of an agent reflects the relative severity of illness or incapacitation produced by a toxin.

Incubation period--A sufficient number of microorganisms or a sufficient quantity of toxin must penetrate the body to produce infection (the infective dose), or intoxication (the intoxicating dose). Infectious agents then must multiply (replicate) to produce disease. The time between exposure and the appearance of symptoms is known as the incubation period. This is governed by many variables, including the initial dose, virulence, route of entry, rate of replication, and host immunological factors.

Transmissibility--Some biological agents can be transmitted directly from person to person. Indirect transmission (for example, via vectors) may be a significant means of spread as well. In the context of biological warfare casualty management, the relative ease with which an agent is passed from person to person (that is, its transmissibility) constitutes the principal concern.

Lethality--Lethality reflects the relative ease with which an agent causes death in a susceptible population. We can observe the relative lethality of a material by determining its "Lethal Dose" or "Lethal Concentration" (LD or LC).

Stability--The viability of a biological agent is affected by various environmental factors, including temperature, relative humidity, atmospheric pollution, ultraviolet light, and sunlight. A quantitative measure of stability is an agent's decay rate (e.g., "aerosol decay rate").

Additional factors that may influence the suitability of a microorganism or toxin as a biological weapon include ease of production, stability when stored or transported, and ease of dissemination.

The biological weapons of greatest concern are listed in the following biological quick reference table. As you review this table, note that the primary concern for all of the biological agents would be personal protection if the agent is transmitted from human to human. Additionally, EMS's role regarding patient care and treatment will be primarily supportive in nature.

Biological Agent Quick Reference Guide

Disease (Class)	Route of Infection	Incubation Period/ Onset Time	Transmission to Humans	Signs + Symptoms	Decontamination or Infection Control Procedures	Prehospital Care
Tularemia (Bacterium)	V, R, D	2 to 10 days	No	Ulceroglandular--local ulcer and regional lymphadenopathy, fever, chills, headache, and malaise. Typhoidal or septicemic-fever, headache, malaise, substernal discomfort, weight loss, nonproductive cough.	Secretion and lesion precautions, strict isolation not required, use of heat or disinfectants renders organism harmless.	Supportive care.
Q-Fever (Bacterium)	V, R	2 to 10 days	Rare	Fever, cough, and pleuritic chest pain.	Use of soap and water or a weak 0.5% hypochlorite solution.	Supportive care.
Smallpox (Virus)	R, S, DC	10 to 12 days	High	Malaise, fever, rigors, vomiting, headache, backache; 2 to 3 days later, lesions which develop into pustular vesicles, more abundant on face and extremities, developing synchronously.	Strict quarantine with respiratory isolation for a minimum of 16 to 17 days following exposure for all contacts. Patients are infectious until all scabs heal.	Supportive care.
Venezuelan Equine Encephalitis (Virus)	R, V	2 to 6 days	Low	Sudden onset, with, malaise, spiking fever, rigors, severe headache, photophobia, and myalgias. Nausea, vomiting, cough, sore throat, and diarrhea may follow.	Body substance isolation; infectious through mosquito bites.	Analgesics for headache and myalgia, anticonvulsants and respiratory support.
Viral Hemorrhagic Fevers (Virus)	DC, V, ?R	3 to 21 days	Moderate	Fever, easy bleeding, petechiae, hypotension, shock, edema, malaise, myalgia, headache, vomiting, and diarrhea.	Decontamination with hypochlorite or phenolic disinfectants. Body substance isolation required.	Supportive care directed at respiratory and circulatory support.

V=vector, R=respiratory, D=digestive, DC=direct human-to-human contact, S=skin

Biological Agent Quick Reference Guide (cont'd)

Disease	Route of Infection	Incubation Period/ Onset Time	Transmission to Humans	Signs + Symptoms	Decontamination or Infection Control Procedures	Prehospital Care
Botulinum Toxins (Toxin)	D, R	24 hours to several days	No	Ptosis, weakness, dizziness, dry mouth and throat, blurred vision and diplopia, dysarthria, dysphonia, dysphagia, followed by symmetrical descending paralysis and respiratory failure.	0.5% hypochlorite solution and/or soap and water.	Aggressive respiratory support, and supportive care for other symptoms.
Staphylococcal Enterotoxin B (SEB) (Toxin)	D, R	4 to 6 hours	No	Sudden onset, with fever, chills, headache, myalgia, and nonproductive cough. Some may develop respiratory distress and retrosternal pain. If ingested, nausea, vomiting, and diarrhea.	0.5% hypochlorite solution and/or soap and water.	Supportive care directed at respiratory support.
Ricin (Toxin)	D, R	24 to 72 hours	No	Weakness, fever, cough, and pulmonary edema 18 to 24 hours post exposure, followed by severe respiratory distress and death from hypoxemia in 36 to 72 hours.	0.5% hypochlorite solution and/or soap and water.	Supportive care with aggressive airway management. Volume replacement of GI fluid loss.
Trichothecene Mycotoxins (T2) (Toxin)	R, S, DC, D	Minutes to hours	Yes	Skin pain, pruritus, redness, vesicles, necrosis; nose and throat pain, nasal discharge, itching and sneezing, cough, dyspnea, wheezing, chest pain; and hemoptysis; ataxia, shock, and death.	Soap and water, after clothing has been removed. Eye exposure--copious saline irrigation.	Supportive care directed at respiratory and circulatory support.

V=vector, R=respiratory, D=digestive, DC=direct human-to-human contact, S=skin

Biological Agent Quick Reference Guide (cont'd)

Disease	Route of Infection	Incubation Period/ Onset Time	Transmission to Humans	Signs + Symptoms	Decontamination or Infection Control Procedures	Prehospital Care
Anthrax (Bacterium)	S, D, R	1 to 6 days	No except for cutaneous type	Fever, malaise, fatigue, cough, and mild chest discomfort, followed by severe respiratory distress with dyspnea, diaphoresis, stridor, and cyanosis; shock and death within 24 to 36 hours of severe symptoms.	Universal body fluid precautions, decontamination with low-pressure soap and water wash, then 0.5% hypochlorite solution, then 2nd soap and water wash.	Supportive care according to local protocol.
Cholera (Bacterium)	D, DC	1 to 5 days	Rare	Asymptomatic to severe with sudden onset, vomiting, abdominal distension, and pain with little or no fever followed rapidly by diarrhea. Fluid loss can exceed 5 to 10 liters per day.	Enteric precautions, soap and water washes, and a hypochlorite solution for equipment. Personal contact rarely causes infection.	Supportive care directed at rapid fluid replacement.
Pneumonic Plague (Bacterium)	V, R	2 to 3 days	High	High fever, chills, headache, hemoptysis, and toxemia, with rapid progression to dyspnea, stridor, and cyanosis; death is due to respiratory failure, circulatory collapse.	Strict isolation precautions. Use of soap and water for personnel decon, heat, UV rays, and disinfectants for equipment.	Supportive care and respiratory and circulatory support.
Bubonic Plague (Bacterium)	V, R	2 to 10 days	High	High fever, chills, malaise, tender lymph nodes (buboes), may progress to septicemic form, with spread to the CNS, lungs, and elsewhere.	Isolation precautions, secretion and lesion precautions. Use of soap and water for personnel decon; use heat, UV rays, or disinfectants for equipment.	Supportive care and respiratory and circulatory support.

V=vector, R=respiratory, D=digestive, DC=direct human-to-human contact, S=skin

Anthrax (Bacterium)--Anthrax is a naturally occurring zoonotic (a disease that can move through the animal-human barrier) disease found commonly in livestock. As carriers of anthrax, cattle, sheep, and horses can infect humans naturally, particularly those who handle hair, wool, hides, or excrement of infected animals.

The most common human form of anthrax seen in natural cases is the cutaneous form of anthrax which is also known as "Woolsoter's Disease." This condition is found in those persons who have had open sores or lacerations contaminated with anthrax spores during the handling of hides or shearing of wool.

Anthrax also can be transmitted by contaminated meat; however, this is extremely rare in occurrence due to cooking. In such a case, the gastrointestinal form of anthrax would be seen. It is important to understand why anthrax can survive the acids of the stomach when so many other biological agents are not readily transmitted through the ingestion route of exposure.

Anthrax is a "sporulating bacterium." Simply put, sporulating bacteria produce a "hard" seed-like shell over themselves that makes them very resistant to breakdown by UV light and other insults. Therefore, areas contaminated by anthrax can remain contaminated for long periods of time. This is why special sporucidal soaps are best used as decontamination materials.

The form of anthrax that is of greatest concern is the inhalational form. If anthrax were aerosolized in small enough particles (e.g., 3 to 5 microns in diameter) so that they could be inhaled and retained in the deeper portions of the respiratory tract, then this form of anthrax could be contracted. This form of anthrax is very lethal.

With all forms of anthrax, antibiotic therapy works well to counteract the effects, provided that antibiotics are given early enough in the disease process. The problem with inhalational anthrax, however, is that it commonly presents as nonspecific respiratory symptoms and may not be recognized as anthrax. Therefore, the start of antibiotics may be delayed and, if they are not started before the "anthrax eclipse," such therapy may have little benefit. The eclipse is a brief, 12 to 36 hour period during the disease process in which recovery seems to be occurring and the patient feels much better. However, shortly after the eclipse begins, the symptoms return and death follows in 2 to 3 days.

Cholera (Bacterial)--Outbreaks of cholera typically are seen in developing nations, particularly those without effective sanitary systems.

This gastroenteritis agent is more incapacitating than it is lethal if proper care is rendered.

Essentially, cholera is a diarrheal disease caused by the bacterium *Vibrio cholera*. This bacterium readily multiples within the small intestines and releases an enterotoxin that causes the intestines to release large volumes of fluids. This results in severe diarrhea and a characteristic "rice water" stool. Death generally occurs from the secondary effects of severe dehydration and electrolyte imbalances. Proper supportive care aimed at correcting these dehydration-related problems and the use of antibiotics is generally very effective.

From a personal protection standpoint, responders should avoid direct contact with bodily fluid and excrement. Otherwise, human-to-human transmission is low.

Plague (Bacterial)--We know it best as the "Black Death" of the Middle Ages. But actually, the Black Death was a naturally occurring form of the plague that started as the bubonic form. The "Plague" bacterium (actually *Yersinia pestis*) is a zoonotic bacterium carried by rats and ground squirrels. The bacterium then is transmitted to humans by fleas. After natural infection of the human, the plague begins as the bubonic form ("bubo-" meaning a swollen or enlarged lymph node), primarily in the legs. With lack of treatment the natural form progresses to the systemic form followed by the highly contagious "pneumonic plague."

Pneumonic plague would be the primary syndrome seen if plague were aerosolized and inhaled, whereas bubonic would be seen first in natural occurrences or weaponization via vectors such as fleas. The incubation period for the plague is 2 to 10 days depending upon form. The pneumonic form has an incubation period of as little as 2 to 3 days. As with many of the aerosolized biological weapons, the initial symptoms would be fever, weakness, and nonspecific respiratory symptoms. As the pneumonia progresses rapidly, bloody sputum, severe dsypnea, and cyanosis would be found. Diagnosis can be made by laboratory tests and are impossible in the field.

Again, the pneumonic form is highly human-to-human transmittable by aerosolized droplets generated by coughing. Therefore, respiratory precautions would be indicated. Field care would be self-protection and supportive treatment. Again, antibiotics will be required and are most effective if started within 24 hours of the onset of the pneumatic form.

Toxins--As we discussed before, toxins are not living organisms but rather chemical compounds produced by living organisms. Toxins constitute some of the most deadly materials known to man. Botulinum toxin, shiga toxin, shellfish toxin and ricin are some of the most deadly compounds known.

Toxins are not volatile (they do not vaporize or aerosolize without the application of energy such as an explosive). In addition, most toxins are not dermally active and intact skin provides an effective barrier (an exception is the T2 mycotoxin which is derived from a fungus). Since the toxins do not replicate themselves, they are not human-to-human transmittable. The best method of weaponization varies with the particular toxin. As examples, botulinum is best disseminated through ingestion where the T2 mycotoxin is most effective when aerosolized.

Staphylococcal enterotoxin B (SEB) (Toxin)--SEB is a toxin that most commonly affects the gastrointestinal tract when ingested to produce a form of food poisoning. After aerosolization and inhalation, SEB produces a potentially deadly syndrome.

Again, with most of the biological toxins, the respiratory form normally would present in the early stages with fever, general weakness and nonspecific respiratory symptoms. Later, fevers ranging from 103 to 106°F (39° to 41°C), retrosternal chest pain, and pulmonary edema may be seen.

Severe cases can be fatal, but more often, SEB (especially after ingestion) is mainly incapacitating in nature. Treatment is supportive and no specific antitoxin is available.

Ricin (Toxin)--Ricin is a potent protein toxin that is derived from the beans of the castor plant. Ricin has gained a lot of attention in recent years because some groups in the United States have manufactured the material with the specific intent of killing law enforcement officers and public officials. In addition, the recipe for ricin has been published (along with others) on the Internet and in various books. Assassinations, as well as nonterrorist murder attempts, have occurred using ricin.

The major effect of ricin is to interrupt the body's protein manufacturing process at the cellular level by altering the RNA needed for proper proteins. This results in cellular death and necrosis. It is readily available and easily made. It is very effective by any route of exposure and is most effective through inhalation. The patient will present with symptoms characteristic of the route of exposure. Treatment is supportive again, depending upon the route of exposure.

Botulinum Toxin (Toxin)--The botulinum toxin is one of the deadliest compounds known to man. It has a $LD_{(50)}$ (lethal dose for 50 percent of the test population) of 0.001µg/kg or 0.1 µg for a 220-pound human. By weight, botulinum is 15,000 to 100,000 times more toxic than the nerve agents.

The botulinum toxin is produced by the sporulating bacterium *Clostridium botulinum*. This bacterium is commonly found in the dirt and intestines of cattle and other meat-producing animals. The bacterium releases the toxin during anaerobic metabolism. Once released, however, the toxin is very susceptible to heat and will break down at 212°F (100°C) in 10 minutes and 100°F (38°C) after 30 minutes. Thus, proper food preparation readily inactivates the toxin to present little risk to humans. However, since the toxin is resistant to digestive tract acids, ingestion of very small quantities will more than likely yield its toxic effects.

Botulinum is very easily manufactured. As stated earlier, the parent bacterium is readily found in dirt and in animals and the toxin is produced by anaerobic metabolism.

Botulism, the resulting neurotoxic disease process, is unique. It is commonly referred to as "paralytic food poisoning." The botulinum toxin blocks the release of acetylcholine from the peripheral, presynaptic neurons that mediate the skeletal muscles. Therefore, stimulation of skeletal muscles is prevented. The patient presents with a characteristic descending, symmetrical, progressive weakness. The eyelids become flaccid, facial muscles droop, the patient begins to have difficulty swallowing and speaking and, ultimately, the patient dies from respiratory arrest due to paralysis if he/she does not receive ventilatory support. Intensive and prolonged nursing care (weeks to months) can reduce the mortality rate to less than 5 percent. Care in the field would be supportive in nature and, since botulinum is a toxin, human-to-human transmission is not a major concern.

Viruses--Viruses are the simplest microorganisms and are obligatory intracellular parasites; i.e., they replicate only inside a host cell. In contrast, normal living cells generally contain a nucleus, DNA, RNA and various organelles necessary for life and reproduction. A virus contains only one nucleic acid, either DNA or RNA.

A virus replicates by attaching itself to a host cell and penetrating the cell with its own genetic code (DNA or RNA). Then, the genetic code instructs the cell to produce the necessary components to allow the virus to replicate. During this process the cell then might release the virus or it might be destroyed.

Since the replication of a virus is dependent upon a complicated process using host cells, it is not easy to manufacture them in large quantities. A terrorist organization trying to "grow" viruses would have significant logistical demands. Any such organization would need to have well-educated personnel and be very well financed compared to those attempting to make weapons using bacteria or biological toxins. Therefore, although possible, the use a virus is less likely than the other biological weapons we have already discussed. However, many viruses have no cure and are transmittable from human to human.

Smallpox--The smallpox virus was declared to have been eradicated worldwide by the World Health Organization (WHO) in 1980. Through immunization efforts, the last eight cases of smallpox occurred in the United States in 1949. The last documented case of smallpox occurred in 1978 in Birmingham England, when the virus accidentally escaped its containment and infected and killed an unimmunized medical photographer. The director of the laboratory from which the escape occurred later committed suicide.[1] To this day, there are only two known repositories of the virus, the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, and the Russian equivalent, Vector, in Novizbresk, Russia. The extent of clandestine stockpiles in other parts of the world is unknown.

Immunization against smallpox in the United States stopped in the 1970's and those immunizations given had only an effective duration estimated at 10 years. Therefore, the majority of U.S. citizens have no immunity to the virus.

Smallpox is a highly contagious disease with an incubation period that averages 12 days. Early signs and symptoms include acute onset fever, weakness, headache, backache, and vomiting. This is followed in 2 to 3 days with the development of a rash and "chickenpox"-like vesicles starting in the area of the mouth, throat, and face, and spreading to the hands and forearms. Although the vesicles also form on the trunk of the body, they are more predominate on the face and extremities than are the vesicles found in chickenpox (an important diagnostic feature). The patient should be considered contagious until all of the scabs separate from the skin. The mortality rate for smallpox is 30 percent in the previously unvaccinated patient.

Transmission of smallpox occurs by respiratory droplets, therefore requiring respiratory isolation. Furthermore, a strict 17-day quarantine is required for any person in contact with a smallpox patient.

Encephalitis--Encephalitis (inflammation of the brain) has numerous forms; Eastern, Western, St. Louis, and others. The weaponized concern is the Venezuelan Equine Encephalitis or VEE. This zoonotic disease is, as the name states, endemic to the geographical region of Venezuela. An outbreak of this form must be scrutinized closely.

Naturally occurring encephalitis is a disease found in birds and wild animals and is transmitted to horses and humans by mosquitoes. Thus, any naturally occurring VEE outbreak should be associated with an outbreak in animals. If humans only were infected with VEE without the corresponding effects on indigenous animals, then the potential for an unnatural occurrence should be investigated.

As stated before, encephalitis causes swelling of the brain. Therefore, it would be reasonable to assume that a patient would present with neurological-type symptoms. VEE onset is sudden with fever and the profound CNS effects of headache, photophobia, and altered consciousness. It is estimated that 90 to 100 percent of persons exposed to VEE would be susceptible to its effects. However, because the fatality rate is 1 percent or less, VEE would be more incapacitating in nature.

Human-to-human transmission is possible, so appropriate body substance precautions should be taken, including respiratory protection (HEPA) in the case of any patient with a productive cough.

The Viral Hemorrhagic Fevers (VHF's)--Names of these diseases are commonly heard and, in the public's perception, are associated with deadly diseases. In fact, VHF is a classification of a group of diseases such as Ebola, Dengue Fever, Yellow Fever, Lassa Fever, and many more. What these diseases have in common are their effects. These diseases, caused by viruses, change the clotting characteristics of the blood, and the permeability of the capillaries. This results in systemic hemorrhage and liquefaction of solid organs all in association with a fever (viral hemorrhagic fevers).

These highly contagious and highly lethal diseases present with a rapid onset fever, weakness, and easy bruising and bleeding. Many times the effects can be seen first in the sclera of the eyes (the white fibrous tissue covering the "whites" of the eyes). It is in this area that easy bleeding and leaking of the capillaries may be found. This then is followed by the involvement of all mucous membranes.

The method of transmission to humans varies as much as the number of diseases included in this classification. Definitely contact with blood and other secretions as a mode and, depending upon the particular disease, the respiratory portal of entry is a high probability. Therefore, aggressive respiratory precautions must be taken. With limited exceptions, there are no vaccines and no cures and the use of antiviral therapies has met with only limited success. The field treatment of patients will be directed to preventing the spread of the disease and providing supportive care and treatment for hypovolemia. Depending upon the disease, the mortality rate will range between 5 and 90 percent.

NUCLEAR/RADIOACTIVE DEVICES

When considering the possibility of a terrorist organization using a nuclear weapon, four potential scenarios should be evaluated; 1) the use of a military nuclear weapon; 2) the use of an improvised nuclear weapon; 3) the use of a "dirty bomb" or radiological dispersal device, and 4) the sabotage of a nuclear facility.

Military Nuclear Devices--Although not unheard of, it is highly unlikely that any organization could both a) successfully obtain such a device, and b) successfully deploy and activate the device without detection by U.S. intelligence-gathering agencies. In addition, the retaliatory response by the United States is a powerful deterrent.

Improvised Nuclear Device--Everyone has heard that the basic information needed to construct a nuclear device is easily obtained. This very well might be the case. However, knowing how to construct the device to the exacting specifications necessary to make it work is another issue. In addition, the physical act of assembling the weapon, that is, placing the radioactive material into the device without the proper shielding, would expose the individual to unsurvivable levels of radiation. Even if all of these conditions could be met, the intelligence community more than likely would detect the acquisition of the prerequisite materials and information.

Radiological Dispersal Device (RDD) or "Dirty Bomb"--The RDD is simply a means to disseminate a radioactive material. This is a more likely scenario than the first two possibilities. However, the same logistical problems exist: getting the radioactive material out of its containment and into the device without killing oneself. And, if we as emergency responders treat all explosive incidents as a potential dissemination means for radioactive materials (as well as chemical and biological materials), we can use very readily available detection equipment to confirm or rule out the presence of radioactive materials.

Sabotage--From the standpoint of nuclear terrorism, the most likely scenario would be the sabotage of an existing facility. Nuclear power plants within the United States are highly hardened facilities. With close regulation, the security at these facilities can be tightened significantly if intelligence-gathering activities indicate creditable threats. Furthermore, the checks and balances and redundant safety measures used at such plants would make it very difficult for an act of sabotage to occur without being detected in advance. The more likely target would be the less hardened, small-scale facilities such as those found in universities.

This is not to say that there is no potential for any act of nuclear terrorism. However, the possibility of success is limited, and a terrorist might better be served to take an action that will yield definite success.

We all have been taught the safety measures for radiological incident response. Time, distance, and shielding are still the mainstays of self-protection. This, coupled with treating all explosive incidents as potential disseminations, will ensure the appropriate response.

If a radiological material were to be used, three body systems will be affected. The blood forming system (specifically the bone marrow), the gastrointestinal system, and the central nervous system.

STARTING DOSE	SYSTEM AFFECTED	EFFECTS
150 REM	Blood	• Suppression of the blood form characteristics of the bone marrow. • Opportunistic diseases after the white blood cells die and are not replaced (7 days). • Anemia as red blood cells die off (in approximately 30 days). • Clotting difficulties as platelets are not replaced (30-60 days).
500 REM	Gastrointestinal system	• Death of the tissues of the GI tract. • Nausea and vomiting with profound fluid loss. • Hypovolemia and shock. • Prognosis is poor if symptom onset is within 2 hours of the exposure.
1,000 REM	Central Nervous System	• Damage to the vascular bed of the CNS. • Results in cerebral edema and profound CNS effects (headaches, blurred vision, stroke-like symptoms, and death). • Prognosis is poor for radiological exposures with CNS effects.

INCENDIARY DEVICES

The use of incendiary devices is a more plausible event. Obviously, it is not hard to either obtain or initiate items like Molotov cocktails, propane bombs, or even small, shaped charges on existing storage containers of flammable gases or liquids. In addition, the terrorist may elect to initiate the weapon with complicated chemical, electronic, or mechanical initiation devices. In these cases, the impacts of these items must be considered (chemicals, the use of radios, etc.).

The treatment for patients who incur thermal injuries from these weapons would not differ for any other thermal injury, and local protocols must be followed. However, at the scene of numerous, even hundreds of injuries, your knowledge of the system's triage procedures will be essential (as it would be with any weapons of mass destruction (WMD) event).

CHEMICAL AGENTS CHARACTERISTICS

Physical Considerations--Known agents cover the whole range of physical properties. Under ambient conditions their physical state may be gaseous, liquid, or solid. Their vapor pressures vary from high to negligible. Their vapor densities vary from slightly lighter than air to considerably heavier. The range of odors varies from none to highly pungent or characteristic. They may be soluble or insoluble in water. In this section we will discuss many of these physical properties. This discussion may give an indication of the behavior of the agent in the field with respect to vapor hazard, persistency, and possible means of decontamination, etc.

Volatility Considerations--Agents that have a low boiling point and high vapor pressure tend to be nonpersistent: they will evaporate more readily. This evaporation presents us with good news and bad news. The bad news is that the more volatile a material, the greater the airborne concentration that will be released. The good news is that the more volatile a material, the less time it will remain on a surface area. Agents that have a high boiling point (therefore, a lower vapor pressure) tend to be more persistent.

Chemical Considerations--The only general characteristic of the known agents is that they are sufficiently stable to survive dissemination and transport to the site of their action. Their inherent reactivity and stability can vary widely. Some chemically reactive agents naturally denature rapidly, whereas other, less-reactive agents require, for example, bleach solutions to inactivate them. Solid adsorbents (e.g., Fuller's earth) are also very effective decontaminants.

Toxicological Considerations--Keep in mind that not all individuals of a species react in the same way to a given amount of agent: some are more or less sensitive as a result of many factors, including genetic background, race, and age. Also, toxicological studies estimate the biological effects of potential chemical agents by different routes of entry. The physical properties of such materials may affect the toxicological studies, since the response of the system concerned may vary depending on the physical state of the material.

Classifications of Chemical Agents

Chemical weapons can be classified broadly in the following manner:

- **Choking agents** are predominately respiratory irritants and can be found not only as weaponized materials but also as commonly encountered industrial chemicals.

- **Vesicating agents (blister agents)** cause chemical changes in the cells of exposed tissues almost immediately on contact. However, in many cases, the effects are not felt or realized until hours after the exposure.

- **Cyanides,** formerly referred to as "blood agents," actually have no impact on the blood. They work by prohibiting the use of oxygen with the cells of the body.

- **Nerve agents** inhibit an enzyme that is critical to proper nerve transmission, allowing the parasympathetic nervous system to run out of control.

- **Riot control agents** include irritating materials and lacrimators. Effects of these materials seldom last more than several minutes after the exposure has ended.

Chemical Agents Quick Reference Guide

Agent Civilian (Military) Name	Route of Exposure	Onset of Symptoms	Signs + Symptoms	Decontamination	Pre-Hospital Care
Nerve Tabun (GA) Sarin (GB) Soman (GD) VX	R, S	seconds to 18 hours	Miosis, difficulty breathing, headache, muscular twitching, Salivation, Lacrimation, Urination, Defecation, Gastrointestinal distress, Emesis (SLUDGE), seizures, coma, death	Universal body fluid precautions for responders, decontamination with 0.5% hypochlorite solution, then soap and water wash.	Respiratory Support, Atropine 2 mg IM repeat until Atropinization occurs, Pralidoxime chloride (2-PAM CI) 600 mg IM maximum pre-hospital dose 1800 mg, Diazepam 10 mg IM repeated according to local protocol.
Vesicants (Blister) Nitrogen Mustard (HN1)(HN2)(Hn3) Lewisite (L) Phosgene Oxime (CX)	R, S	2 to 24 hours	Tearing or burning eyes, runny nose, sneezing, cough, nosebleed, redness on skin followed by blisters. **Symptoms are delayed but tissue damage occurs within minutes of contamination.**	Universal body fluid precautions for responders, decontamination with 0.5% hypochlorite solution, then soap and water wash.	Aggressive burn management, airway support, and for Lewisite, British Anti-Lewisite. The blister fluid will not contain Vesicant Agent.
Blood Hydrogen Cyanide (AC) Cyanogen Chloride (CK)	R, I	15 seconds to 2 minutes	Increased respirations, loss of conscious, seizures, death, **all rapid onset.**	Universal body fluid precautions for responders, decontamination with soap and water wash.	Supportive care and respiratory and circulatory support, use of cyanide antidote kit or IV Sodium Nitrate and Sodium Thiosulfate.
Pulmonary (Choking) Phosgene (CG) Chlorine	R	20 minutes to 24 hours	Eye and airway irritation, dyspnea, chest tightness, bronchospasm, delayed non-cardiogenic pulmonary edema.	Universal body fluid precautions for responders, decontamination with soap and water wash.	Supportive care and respiratory and circulatory support. Aggressive airway management, use of intubation with PEEP, use of ACLS pulmonary edema medications may be ineffective.
Incapacitating (Riot Control) Mace (CN) (CS) Pepper Spray Adamsite (DM)	R, S, I	seconds	Burning pain on mucous membranes, skin and eyes, tearing, burning in nostrils, elevated blood pressure, irregular respiration, has been fatal in confined spaces. Symptoms will usually resolve in 15 to 20 min. after removal to fresh air.	Eyes, flush with water or saline, skin copious amounts of water, alkaline soap, or mild alkaline solution, sodium bicarbonate or sodium carbonate. **Do not use hypochlorite, which will worsen skin symptoms.**	Supportive Care, as the effects are usually self limiting. May trigger asthma attacks in sensitive patients in a confined space.

S - Skin Absorption I - Ingestion R - Respiratory

Choking Agents

In order to understand how the choking agents work, we must first discuss irritation and the inflammatory response. The inflammatory response is a combination of processes that attempts to minimize injury to tissues. This inflammatory response is a natural process designed to protect the body from materials such as chemical irritants, bacteria, mechanical injuries, cuts, and even burns. The inflammatory response also may accompany immune system reactions.

When an irritation occurs, the affected site releases chemical compounds (inflammation mediators) such as histamines that initiate the inflammatory response. During the response three specific things begin to happen. First, the vascular system in the affected area dilates to allow a greater flow of blood to the area. This results in characteristic redness in the area and allows for white blood cells to move into the area. Second, the inflammation mediators also cause the vascular system in the area to increase its permeability. This allows fluids and white blood cells to leave the capillaries and come into direct contact with the tissues that have been irritated or injured. As fluid permeates the tissues, swelling occurs and the white blood cells hold the affected area in check so that the offending material cannot spread. This results in inflammatory exudate or pus formation. Third, chemotaxis is brought about to consume the damaged cells and bacteria through phagocytosis (or "amoeba-like eating"). This results in some collateral damage to area tissues, scarring, and the formation of fibrotic tissues. Ultimately, the irritant is destroyed and removed.

Why is this important? Many of the most commonly manufactured industrial materials in the world act upon the body in very much the same way as the choking agents. This inflammatory response is what makes choking agents deadly.

Effects on the Respiratory System

As we discussed earlier, the respiratory tract is uniquely susceptible to materials that can make their way to the lower respiratory passages. Materials of between 0.5 and 3 microns can make their way down to the alveoli, where gas exchange takes place with the red blood cells (RBC's). The initial response of the body to these irritants is to cough in order to get the offending materials out of the respiratory passageways. In addition, the bronchioles will begin to close, causing shortness of breath and wheezing in an attempt to further minimize exposure of the delicate membranes. However, if the gas or vapor that was inhaled is water soluble, it will quickly mix with the moisture in the upper passageways of the lungs, possibly forming corrosive and irritating liquids. On the other hand, lipid-soluble materials will dissolve in the lipids found in the lower passageways. Once the irritation occurs, particularly in the terminal bronchioles and alveoli that are found in the lower passageways, the inflammatory response begins.

Solubility and insolubility of the agent have a direct bearing on the level of effect and thus the damage to the lung tissue. Typically, the lungs are lined with a mucous barrier; at the upper level of the respiratory tree the mucous is a water-based material. Thus a water-soluble chemical will affect this area. An example is chlorine, which is water-soluble. When inhaled, the water-based mucous and chlorine mix, causing irritation at this site. Lower-level lung damage is limited except under high concentrations and long-duration exposure.

Nonwater-soluble chemicals have a tendency to bypass the upper portion, of the respiratory tree and attack the lower portion, which is lipophilic (surfactant), causing damage in the fine bronchioles and alveoli. The water-based mucous in the upper airways tends to repel the nonwater-soluble products, sending them deeper into the respiratory tree. Phosgene, a nonwater-soluble chemical, is a good example of this.

However, in both cases, the length of time and degree of concentration have a direct effect on the lung tissue. For example, if a water-soluble chemical is present in high concentrations over a period of time, deep injuries can occur. Conversely, if a nonwater-soluble chemical in high concentrations reaches the lower regions of the lungs, the damage is devastating; an example of one of these chemicals is sulfur mustard.

Vapor pressure also has a hand in this equation. The higher the vapor pressure, the higher the velocity of the chemical; thus, deeper penetration if the individual is within the said atmosphere. All these principles work together in reference to respiratory injuries.

As the alveoli become irritated, the inflammatory mediators are released, and the three phases of the inflammatory response begin. The capillaries that are in direct contact with the outside of the alveoli dilate, allowing greater blood flow to the area. The permeability of the capillaries increases to allow the fluid and the white blood cells to come into direct contact with the outer wall of the alveoli. When this occurs, fluid begins to build up between the capillary wall and the alveolar wall, and pressure begins to develop. Since the pressure will follow the path of least resistance, it will begin to leak into the alveoli and pulmonary edema (fluid within the lungs) begins to develop. Finally, phagocytosis begins and the damaged cells are destroyed, along with some neighboring undamaged cells. This results in long-term damage and scarring of the lung tissues and, depending upon the extent of damage, may lead to long-term adverse health effects if the patient survives the pulmonary edema.

Patients who suffer this form of edema require aggressive airway control, the use of positive-end expiratory pressure (PEEP or CPAP) to minimize inward leakage of the fluids, and possibly the use of steroid therapy to minimize the inflammatory effects and to stabilize the cell membranes.

The most common chemicals in the world, not to mention the choking agents, cause respiratory irritation and noncardiogenic pulmonary edema. Chlorine, sulfur dioxide, anhydrous ammonia, mixing household bleach and ammonia, and even vapors from acids in sufficient doses can result in this syndrome. There are copious amounts of these chemicals in any given community. If you were a terrorist, what might be your weapon of choice --something that you have to manufacture and hide, or something so common that everybody has it?

Vesicating (Blister) Agents

As the names implies, the "vesicants" or "blister agents" cause the formation of vesicles (blisters) to the tissues that they contact. We will discuss the vesicants in a generic manner. The materials in this category include

Name	Designation
Sulfur Mustard	Mustard, H, HD
Nitrogen Mustards	HN
Lewisite	L
Phosgene Oxime	CX

Vesicant agents, specifically sulfur mustard (H; HD), have been major military threat agents since their introduction in World War I. They constitute both a vapor and a liquid threat to all exposed skin and mucous membranes. Mustard's effects are delayed, appearing hours after exposure. Organs most commonly affected are the skin (with erythema or rednesses and vesicles), eyes (with mild conjunctivitis to severe eye damage), and airways (ranging from mild irritation of the upper respiratory tract to severe bronchiolar damage leading to necrosis and hemorrhage of the airway mucosa and musculature). Following exposure to large quantities of mustard, precursor cells of the bone marrow are damaged, leading to reduction in all cellular elements of blood and increased susceptibility to infection. The gastrointestinal tract may be damaged, and there are sometimes central nervous system signs. There is no specific antidote, and management is symptomatic therapy. **Immediate decontamination is the only way to reduce damage.**

Mustard is an oily liquid with a color ranging from a light yellow to brown. Its odor is that of garlic, onion, or mustard (hence its name), but because of accommodation of the sense of smell, odor should not be relied on for detection. Under temperate conditions mustard evaporates slowly and is primarily a liquid hazard, but its vapor hazard increases with increasing temperature. At 100°F or above, it is a definite vapor hazard. Mustard freezes at 57°F (13.9°C) and, since a solid is difficult to disperse, it is often mixed with substances with a lower freezing point, e.g., Lewisite (the mixture is HL), or agent T, a closely related vesicant (the mixture is HT) so that the mixture will remain liquid at lower temperatures.

Mustard binds irreversibly to tissue within several minutes after contact. If decontamination is not done immediately after exposure there is no way to prevent injury, although later decontamination might prevent a more severe lesion.

The clinical effects of mustard are delayed. Signs and symptoms may appear as early as 2 hours after a high-dose exposure, whereas following a low-dose vapor exposure the latent or asymptomatic period may extend to 24 hours. The typical onset time is between 4 and 8 hours. The concentration (C) of the mustard vapor, the time (t) of exposure, the ambient weather, and the body site exposed are factors in the onset time.

It must be emphasized that mustard causes tissue damage within several minutes after contact without causing any immediate clinical effects, e.g., burning or erythema. Because of the lack of immediate effects, the contaminated person often is unaware of the exposure and does not decontaminate. To prevent injury, decontamination must be done immediately after contact. Later decontamination may prevent further damage, absorption, or spread of the agent.

After absorption into the body, mustard rapidly cyclizes (seconds to minutes) in extracellular water. This cyclic compound is extremely reactive and quickly binds to intra- and extracellular enzymes, proteins, and other substances. Mustard has many biological actions, but the exact mechanism by which it produces tissue injury is not known. According to one prominent hypothesis, biological damage from mustard results from DNA alkylation and crosslinking in rapidly dividing cells, such as basal, mucosal epithelium, and bone marrow precursor cells. This leads to cellular death and inflammatory reaction and, in the skin, protease digestion of anchoring filaments at the epidermal-dermal junction and the formation of blisters.

Mustard possesses mild cholinergic activity, which may be responsible for effects such as early gastrointestinal symptoms and miosis (pinpoint pupils).

Mustard reacts with tissue within minutes of entering the body and is no longer an intact molecule. Blood, tissue, and blister fluid do not contain mustard, and one cannot become exposed to mustard by contact with body fluids or tissues.

Clinical Effects

Topical effects of mustard occur in the eye, airways, and skin. Systemically absorbed mustard may produce effects in the bone marrow, the gastrointestinal tract, and the central nervous system. Direct injury to the GI tract also may occur following ingestion of the compound.

Erythema (reddening of the skin) is the mildest and earliest form of skin injury after exposure to mustard. It resembles sunburn, and is associated with burning, stinging pain. Erythema begins to appear in 2 to 24 hours after vapor exposure, with time of onset dependent on concentration/ duration of exposure (Ct), ambient temperature, and humidity, and skin site exposed. The skin sites most sensitive are the warm, moist locations with thinner skin, such as the perineum, external genitalia, axillae, antecubital fossae, and neck.

Within the affected areas, small vesicles can develop, which may later coalesce to form bullae. The typical bulla, or blister, is large, dome-shaped, thin-walled, translucent, yellowish, and surrounded by erythema. The blister fluid is clear, at first thin and straw-colored, but later yellowish and tending to coagulate. The fluid does not contain mustard and is not a vesicant.

At extremely high doses, such as those from liquid exposure, lesions may develop a central zone of necrosis (tissue death) with blister formation at the periphery. These lesions take longer to heal and are more prone to secondary infection than the uncomplicated lesions seen at lower exposure levels.

The primary airway lesion from mustard is necrosis of the moist membranes with later damage to the musculature of the airways if the amount of agent is large. The damage begins in the upper airways and descends to the lower airways in a dose-dependent manner. Usually, the terminal airways and alveoli are affected only as a terminal event. Pulmonary edema usually is not present unless the damage is very severe and then it usually is hemorrhagic.

The earliest effects from mustard--perhaps the only effects from a low concentration/duration exposure--involve the nose, the sinuses, and the pharynx. There may be irritation or burning of the nares, epistaxis, sinus pain or irritation, and irritation or soreness of the pharynx. As the exposure increases, other effects occur: laryngitis with voice changes and a nonproductive cough. Damage to the trachea and upper bronchi leads to a cough productive of sputum. Lower airway involvement causes dyspnea and an increasingly severe cough with increased quantities of sputum. Terminally, there may be necrosis of the smaller airways with hemorrhagic edema into surrounding alveoli. This hemorrhagic pulmonary edema is rarely a feature.

Necrosis of the airway mucosa with resulting inflammation can cause false membrane formation, and pseudomembranes may occur from the most proximal parts of the airways to the most distal portions. These membranes may cause local airway obstruction at the sites of formation, and detachment may lead to obstruction of lower airways.

The common cause of death in mustard poisoning is respiratory failure. Mechanical obstruction by false membranes may be a cause, but more commonly deaths occurring from the third to the sixth day after exposure result from secondary bacterial pneumonia caused by bacterial invasion of respiratory tract and necrotic debris. Agent-induced bone marrow suppression is a contributory factor in later septic deaths from pneumonia.

The eyes **are the organs most sensitive to mustard vapor injury**. The latent period is shorter for eye injury than for skin injury and is also exposure dependent.

After low-dose vapor exposure, irritation, evidenced by reddening of the eyes, may be the only effect. As the dose increases, the spectrum of injury includes progressively more severe conjunctivitis, photophobia, spasm, pain, and corneal damage.

Blisters do not normally form in the eyes. Instead, swelling and loosening of corneal epithelial cells leads to corneal edema and clouding with leukocytes (which affects vision). Severe effects may be followed by scarring between the iris and lens; this scarring may restrict pupillary movements and may predispose victims to glaucoma.

The most severe damage is caused by liquid mustard from airborne droplets or by self-contamination. After extensive eye exposure, severe corneal damage with possible perforation of the cornea and loss of the eye can occur. Eye loss also results if appropriate therapy is not instituted.

The mucosa of the gastrointestinal (GI) tract are very susceptible to mustard damage, either from systemic absorption or ingestion of the agent. However, reports of severe GI effects from mustard poisoning are relatively infrequent.

Mustard exposure, even exposure to a small amount, often will cause nausea, with or without vomiting, lasting 24 hours or less. The nausea and vomiting appear not to be a direct effect of the agent on the gastrointestinal tract, but rather are from a stress reaction, a nonspecific reaction to the odor, or cholinergic stimulation by mustard. Further GI symptoms are usually minimal unless the exposure was severe (even then, GI signs are not common), or unless exposure resulted from ingestion of contaminated food or drink. Diarrhea has been reported; constipation is equally common. Diarrhea (rarely bloody) and vomiting beginning days after a high-dose exposure imply a poor prognosis.

EFFECTS OF MUSTARD EXPOSURE

Organ	Severity of Exposure	Effects	First Onset
Eyes	Mild	Teary Itching Burning Gritty feeling	4-12 hours
	Moderate	Above plus reddening; swelling of the lids; moderate pain	3-6 hours
	Severe	Marked swelling of lids Possible cornea damage Severe pain	1-2 hours
Airway	Mild	Runny nose Sneezing Nosebleed Hoarseness Hacking cough	12-24 hours
	Severe	Above plus severe productive cough; mild to severe shortness of breath.	2-4 hours
Skin		Redness (erythema) Blisters	2-24 hours

Triage

Most mustard casualties will be triaged as delayed. Those with skin lesions covering several percent to 50 percent of the body surface area (BSA) will require further medical care, but do not need immediate life-saving assistance. (In contrast, patients with thermal burns covering 20 to 70 percent of their BSA are considered immediate because of their fluid requirements.) Those with mild to moderate pulmonary effects also eventually will require further care, but are not in the immediate category for triage. Eye injuries from other causes require immediate care, but by the time the mustard eye lesion develops there is no possibility of reducing the injury. These casualties are also in the delayed category.

Patients with skin lesions covering a small percent of BSA (under 5 percent) when these lesions are not in vital areas (a burn on the face might prevent mask donning) are triaged as minimal.

The only mustard casualties who might be triaged as immediate are those with moderately severe to severe pulmonary signs and symptoms. Two factors should temper this decision: (1) Casualties who develop severe pulmonary effects within four to six hours of exposure probably will not survive despite maximal medical care, and it might be better to expend limited medical resources elsewhere. (2) If evacuation to a maximal medical care facility is required, the casualty may survive the lengthy trip, but during the delay his/her lesion may progress to an irreversible stage.

A mustard casualty who has severe pulmonary effects that developed within 4 to 6 hours of exposure should be triaged as expectant. A casualty who has more than 50 percent BSA burns from mustard liquid might also be categorized as expectant, but this decision would depend on available medical resources. (The LD_{50} for liquid mustard is about 7 grams, or between one and one and a half teaspoons of liquid. This amount will cover about 25 percent BSA, so an individual with a 50 percent BSA burn could possibly have 2 LD_{50}'s on his/her skin. This person might be saved, but at great expenditure of medical resources.)

Medical Management

The medical management of vesicant casualties will be rapid decontamination and supportive care of the dermal, respiratory, and ocular injuries.

Nerve Agents

Nerve agents are the most toxic of the known chemical agents. They are hazards in their liquid and vapor states and can cause death within minutes after exposure. Nerve agents inhibit acetylcholinesterase in tissue, and their effects are caused by excessive acetylcholine. An excess of this neurotransmitter substance results in the overstimulation of the parasympathetic nervous system resulting in the characteristic "SLUDGEM" effects.

S	Salivation
L	Lacrimation
U	Urination
D	Diarrhea
G	Gastrointestinal pain
E	Emesis
M	Miosis (pinpoint pupils)

Although the SLUDGEM acronym describes the basic concepts of the effects of parasympathetic overstimulation, it is important to understand that many of the effects are late in presentation and may never appear in mild to moderate exposures. For example, in the Tokyo subway event, a weak form of sarin was used and many of the symptomatic patients only received mild exposure. **The most common symptoms in these patients were the miosis and visual disturbances.**

Nerve agents were developed in pre-World War II Germany. Germany had stockpiles of nerve agent munitions during World War II, but did not use them for reasons that are still unclear. In the closing days of the war, the United States and its allies discovered these stockpiles, developed the agents, and manufactured nerve agent munitions. Agents in this category include the following. Note the vapor pressures and lethal concentrations associated with these materials.

NAME	DESIGNATED	VAPOR PRESSURE	$LC_{t(50)}$ (INH) [1] (Lethal Concentration/minute)
VX	VX	0.007 mm/Hg	50 mg-min/m^3
Tabun	GA	0.037 mm/Hg	400 mg-min/m^3
Soman	GD	0.4 mm/Hg	70 mg-min/m^3
Sarin	GB	2.9 mm/Hg	100 mg-min/m^3

1 - Lethal concentration by inhalation in 50% of the test population expressed as milligrams for 1 minute per square meter of air.

The only known battlefield use of nerve agents was in the Iraq-Iran conflict. Intelligence analysts indicate that many countries have the technology to manufacture nerve agent munitions. The sarin used in the Tokyo event was crudely made in a well-financed facility, yet the purity was estimated to be only 30 to 40 percent (whereas military-grade sarin is 90 percent or better). Because of its poor quality, the terrorists placed additives in the sarin in hopes of increasing its volatility. Had the sarin been more volatile or had a better means of dissemination been used, many more deaths would have occurred.

Nerve agents are liquids under temperate conditions. When dispersed, the more volatile ones constitute both a vapor and a liquid hazard. Others are less volatile and represent primarily a liquid hazard. The "G-agents" (tabun, soman and sarin) are more volatile than VX. Sarin (GB) is the most volatile, but it evaporates less readily than water. Tabun is the least volatile of the G-agents.

Nerve agents can be dispersed in a variety of ways. The application of energy is the best method. Heating the product to increase its vapor pressure or aerosolizing the materials with either a sprayer or an explosive greatly increases the effectiveness.

The initial effects of exposure to a nerve agent depend on the dose and on the route of exposure. The initial effects from a sub-lethal amount of agent by vapor exposure are different from the initial effects from a similar amount of liquid agent on the skin.

Exposure to a small amount of nerve agent vapor causes effects in the eyes, nose, and airways. These effects are from local contact of the vapor with the organ and do not indicate systemic absorption of the agent. In this circumstance, the anticholinesterase (ACHE) levels may be normal or depressed. A small amount of liquid agent on the skin causes systemic effects initially in the gastrointestinal (GI) tract. Lethal amounts of vapor or liquid cause a rapid cascade of events culminating within a minute or two with loss of consciousness and convulsive activity followed by apnea and muscular flaccidity within several more minutes.

Effects on the Eyes and Nose

Miosis (constricted pupils) is a characteristic sign of exposure to nerve agent vapor. It occurs as a result of direct contact of vapor with the eye. Liquid agent on the skin will not cause miosis if the amount of liquid is small; a moderate amount of liquid may or may not cause miosis; and a lethal or near-lethal amount of agent usually causes miosis. A droplet of liquid in or near the eye also will cause miosis. Miosis will begin within seconds or minutes after the onset of exposure to agent vapor, but it may not be complete for many minutes if the vapor concentration is low. Miosis is bilateral in an unprotected individual, but occasionally may be unilateral in a masked person with a leak in his/her mask eyepiece.

Miosis often is accompanied by complaints of pain, dim vision, blurred vision, nausea, and, occasionally, vomiting. The pain may be sharp or dull in or around the eyeball, but more often is a dull ache in the frontal part of the head. Dim vision is due in part to the small pupil, and cholinergic mechanisms in the visual pathways also contribute. The complaint of blurred vision is less easily explained, as objective testing usually indicates an improvement in visual acuity because of the "pinhole" effect. Nausea (and sometimes vomiting) are part of a generalized complaint of not feeling well. Miosis, pain, dim vision, and nausea can be relieved by topical homatropine or atropine in the eye.

A runny nose (rhinorrhea) may be the first indication of nerve agent vapor exposure. Its severity is dose-dependent.

Effects on Respirations

Nerve agent vapor causes broncho constriction and increased secretions of the glands in the airways in a dose-related manner. The exposed person may feel a slight tightness in his/her chest after a small amount of agent and may be in severe distress after a large amount of agent. Cessation of respiration occurs within minutes after the onset of effects from exposure to a large amount of nerve agent. This apnea is probably mediated through the CNS, although peripheral factors (skeletal muscle weakness, e.g., the intercostal muscles, and broncho constriction) may contribute.

Effects on the GI Tract

After they are absorbed, nerve agents cause an increase in the motility of the GI tract and an increase in secretions by the glands in the wall of the GI tract. Nausea and vomiting are early signs of liquid exposure on the skin. Diarrhea may occur with large amounts of agent.

Effects on Glands

Nerve agent vapor causes increases in secretions from the glands it contacts, such as the lacrimal, nasal, salivary, and bronchial glands. Both localized sweating around the site of liquid agent on the skin, and generalized sweating after a large liquid or vapor exposure are common.

Increased secretions of the glands of the GI tract occur after systemic absorption of the agent by either route.

Skeletal Muscles

The first effect of nerve agents on skeletal muscles is stimulation producing muscular fasciculations and twitching. Fasciculations are best described as "the appearance of worms under the skin". After a large amount of agent, fatigue and weakness of muscles are rapidly followed by muscular flaccidity. Fasciculations are sometimes seen early at the site of a droplet of liquid agent on the skin, and generalized fasciculations are common after a large exposure. These may remain long after most of the other acute signs decrease. The acute CNS signs of exposure to a large amount of nerve agent are loss of consciousness, seizure activity, and apnea. These begin within a minute after exposure to a large amount of agent vapor, and may be preceded by an asymptomatic period of one to 30 minutes after contact of liquid with the skin.

CNS Effects

After exposure to smaller amounts of nerve agents, CNS effects vary and are nonspecific. They may include forgetfulness, an inability to concentrate fully, insomnia, bad dreams, irritability, impaired judgment, and depression. They do not include frank confusion and misperceptions (i.e., hallucinations). These may occur in the absence of physical signs or other symptoms of exposure. After a severe exposure these symptoms occur upon recovery from the acute severe effects. In either case, they may persist for as long as 4 to 6 weeks.

Heart Rate

The heart rate may be high, low, or in the normal range. Although parasympathetic overstimulation would suggest bradycardia, it is not absolutely characteristic of nerve agent exposure. The heart rate may be decreased because of stimulation by the vagus nerve, but it is more often increased because of other factors, such as fright, hypoxia, and the influence of excessive amounts of acetylcholine in the preganglionic sympathetic nerve tissues.

The following table summarizes the effects of stimulating the parasympathetic nervous system.

Parasympathetic Effects Upon Organs

Organ	Effect of Parasympathetic Stimulation	Considerations
Eyes Pupils Ciliary muscle	 Constrict Constrict	 Greater available light not needed. Near vision.
Glands Nasal Gastric Salivary Sweat	 Stimulation of secretion Stimulation of secretion Stimulation of secretion Sweating on palms of hands	 Stimulation of digestive tract secretions is increased to facilitate the "feed" effect. Since metabolic rate is slowing, less cooling is required.
Blood vessels	Little to no effect	
Heart	Slowing of rate and force	Less perfusion required.
Lungs	Constrict	Less oxygen demand.
Gut	Increased peristalsis and tone Sphincter relaxes (mostly)	Increases digestive activity.
Liver	Slight glycogen synthesis to glucose	
Kidney	No effect	
Basal metabolism	No effect	
Adrenal	No effect	No need for adrenaline dump.
Mental activity	No effect	

<u>Treatment</u>

Management of a casualty with nerve agent intoxication consists of decontamination, ventilation, administration of the antidotes, and supportive therapy. The condition of the patient dictates the need for each of these and the order in which they are done.

Decontamination is described elsewhere in this manual. Skin decontamination is not necessary after exposure to vapor alone, but clothing should be removed because it may contain "trapped" vapor.

The need for ventilation will be obvious, and the means of ventilation will depend on available equipment. Airway resistance is high because of broncho constriction and secretions, and initial ventilation is difficult. The resistance decreases after atropine administration, after which ventilation will be easier. The copious secretions, which may be thickened by atropine, also impede ventilatory efforts and require frequent suctioning. In reported cases of severe nerve agent exposure, ventilation has been required from 0.5 to 3 hours.

Three drugs are used to treat nerve agent exposure: atropine, pralidoxime chloride (2-PAM), and diazepam (Valium) for seizures.

MARK I Self-Injectors

Although it is not normally considered Basic Life Support (BLS) treatment, a discussion of the antidotes for nerve agent exposures is warranted. Many organizations are purchasing "Mark I" antidote kits for responder self and/or partner administration even at the BLS level. The following discussion is provided only as an overview. **Should this discussion conflict with local medical protocols, local protocols shall prevail.**

Atropine is a cholinergic blocking, or anticholinergic, compound. It is extremely effective in blocking the effects of excess acetylcholine at peripheral muscarinic sites. Under experimental conditions, very large amounts may block some cholinergic effects at nicotinic sites, but these antinicotinic effects are not evident even at high clinical doses. When small amounts (2 mg) are given to normal individuals without nerve agent intoxication, atropine causes mydriasis (pronounced dilation of pupils), a decrease in secretions (including a decrease in sweating), mild sedation, a decrease in GI motility, and tachycardia. The amount in three MARK I kits may cause adverse effects on performance in a normal person. In people not exposed to nerve agents, amounts of 10 mg or higher may cause delirium. Potentially, the most hazardous effect of inadvertent use of atropine (2 mg, i.m.) in a young person not exposed to a cholinesterase inhibiting compound in a warm or hot atmosphere is inhibition of sweating, which may lead to heat injury. In the Mark I self injector antidote kit, atropine is found in 2 mg.

Pralidoxime chloride (Protopam chloride; 2-PAMCl) is an oxime. Oximes attach to the nerve agent that is inhibiting the cholinesterase and break the agent-enzyme bond to restore the normal activity of the enzyme. Clinically, this is noticeable in those organs with nicotinic receptors (e.g. skeletal muscles). Abnormal activity in skeletal muscles decreases, and normal strength returns. The effects of an oxime are not apparent in organs with muscarinic receptors (Parasympathetic nervous system). For example, oximes do not cause a decrease in secretions. They also are less useful after aging occurs, but with the exception of GD (soman) intoxicated individuals, casualties will be treated before significant aging occurs. Pralidoxime chloride (600 mg) is in the Mark I autoinjector self-use along with the atropine.

Diazepam is an anticonvulsant drug used to decrease convulsive activity and to reduce the brain damage caused by prolonged seizure activity. Without the use of pyridostigmine pretreatment, experimental animals died quickly after superlethal doses of nerve agents despite conventional therapy. With pyridostigmine pretreatment (followed by conventional therapy) animals survived superlethal doses of soman, but had prolonged periods of seizure activity before recovery. They later had performance decrements and anatomic lesions in their brains. The administration of diazepam with other standard therapy to soman-poisoned animals pretreated with pyridostigmine reduced the seizure activity and its sequelae. Current military doctrine is to administer diazepam with other therapy (three MARK I's) at the onset of severe effects from a nerve agent, whether or not seizure activity is among those effects.

Each military person carries one autoinjector containing 10 mg of diazepam for his buddy to administer to him (if he could self-administer it, he would not need it). Diazepam should be administered with the three MARK I's when the casualty's condition warrants the use of three MARK I's at the same time. Medical personnel can administer more diazepam to a casualty if necessary. The medical corpsman carries extra diazepam injectors and is authorized to administer two additional injectors at 10 minute intervals to a convulsing casualty.

The doctrine for self-aid for nerve agent intoxication states that if an individual has effects from the agent he/she should self-administer one MARK I. If there is no improvement in 10 minutes, he/she should seek out a buddy to assist in the evaluation of his/her condition before further MARK I's are given. If a buddy finds an individual severely intoxicated (e.g., gasping respirations, twitching, etc.) so that the individual can not self-administer a MARK I, the buddy should administer three MARK I's and diazepam immediately. The discussion below is advice for medical assistance.

The appropriate number of MARK I kits to administer initially to a casualty from nerve agent vapor depends on the severity of the effects. Systemic atropine will not reverse miosis (unless administered in very large amounts), and miosis alone is not an indication for a MARK I. If the eye or head pain and nausea associated with the miosis are severe, topical application of atropine (or homatropine) in the eye will bring relief. Topical atropine should not be used without good reason (severe pain), because it causes blurred vision for a day or longer. A casualty with miosis and rhinorrhea should be given one MARK I only if the rhinorrhea is severe and troublesome (he can not keep his mask on because of fluid). A casualty with mild to moderate dyspnea should be given one or two MARK I's, depending on the severity of his distress and the time between exposure and therapy. Some of the respiratory distress from a mild exposure will spontaneously decrease within 15 to 30 minutes after termination of exposure, so if the casualty is not severely uncomfortable only one MARK I should be used initially. Atropine is quite effective, and care should be taken not to give too much in a casualty who does not need it.

A severe casualty from nerve agent vapor has miosis, copious secretions from the nose and mouth, severe difficulty breathing or apnea, possibly some degree of cyanosis, muscular fasciculations, and twitching or convulsive activity, and is unconscious. He should be given three MARK I's and diazepam immediately. Ventilation will be needed and should be done via an endotracheal airway if possible. Suctioning of the excessive airway secretions will be necessary to enhance air exchange and will make ventilatory efforts easier. Atropine, 2 mg, should be repeated at three- to five-minute intervals and should be titrated to a reduction of secretions and to reduction of ventilatory resistance. When the intravenous preparation is available, the preferred route of atropine administration is via the intravenous route, but this route should be avoided until hypoxia is corrected, because intravenously administered atropine in hypoxic animals has produced ventricular fibrillation. In a hypotensive patient or a patient with poor veins, atropine might be given intratracheally, either via the endotracheal tube or directly into the trachea, for more rapid absorption via the peribronchial vessels.

Source: "Medical Management of Chemical Casualties", Chemical Casualty Care Office, Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, MD.

The casualty with skin exposure to liquid is more difficult to evaluate and manage than is a casualty from vapor exposure. Agent on the surface of the skin can be decontaminated, but agent absorbed into the skin cannot be removed. The initial effects from absorbed liquid agent can start 2 to 3 hours after thorough decontamination of agent droplets on the skin. A casualty from liquid exposure on the skin may continue to worsen because of continued absorption of the agent from the skin adipose .

The first effects of a liquid droplet on the skin are sweating with or without blanching and occasionally with muscular fasciculations at the site. Gastrointestinal effects (nausea, vomiting, and sometimes diarrhea) are the first systemic effects, and these may start from 0.5 to 18 hours after contact with the agent. If these effects occur within the first several hours after exposure, they may portend more severe effects, and initial therapy should be two MARK I's. If effects begin later, initial therapy should be one MARK I.

A large amount of liquid agent on the skin will cause effects 1 to 30 minutes after contact, whether or not decontamination was done. Nevertheless, early decontamination may lessen the magnitude of the effects. After a 1- to 30-minute latent or asymptomatic period, the casualty will suddenly lose consciousness and begin seizure activity. The condition and management of the casualty are the same as described for a severe casualty from vapor exposure.

The Cyanides (Blood Agents)

The term "blood agent" is misleading. In fact, the cyanide compounds have little to no effect on the blood.

As we know, hemoglobin in the blood carries oxygen to the cells of the body. Once the oxygen arrives at the cell it is used in a major energy-producing process call oxidative phosphorylation (the ion transport chain). This energy-producing process also is referred to as aerobic (requiring oxygen) metabolism.

Aerobic metabolism (oxidative phosphorylation) must have oxygen in order to work properly. Conversely, for the purposes of our discussion, oxygen will be consumed only by properly functioning oxidative phosphorylation.

What does this mean to our study of cyanides? Cyanides shut off the oxidative phosphorylation process in every cell of the body that produces energy (neurons, muscle cells, cardiac cells, etc.) Therefore, oxygen is not consumed but it is still being carried by the blood without difficulty. Therefore, the blood becomes, if you will, "super-oxygenated," hence, bright red blood.

The military form of the agents that cause these effects are

Name	Designation	Vapor Pressure	$LC_{t(50)}$[1]
Hydrocyanic Acid	AC	> 1 atm (Gas)	2500-5000 mg-min/m^3
Cyanogen Chloride	CK	> 1 atm (Gas)	11,000 mg-min/m^3

1 - Lethal concentration by inhalation in 50% of the test population expressed as milligrams for 1 minute per square meter of air.

Cyanide is a rapidly acting lethal agent that is limited in its military usefulness by its high lethal concentration and high volatility. Death occurs in 6 to 8 minutes after inhalation of a high concentration. Sodium nitrite and sodium thiosulfate are effective antidotes.

The fruits and seeds (especially pits) of many plants, such as cherries, peaches, almonds, and lima beans, contain cyanogens capable of releasing free cyanide. The edible portion (the roots) of the cassava plant (widely used as a food staple in many parts of the world) is also cyanogenic. The combustion of any material containing carbon and nitrogen has the potential to form cyanide; some plastics (particularly acrylonitriles) predictably release clinically significant amounts when burned. Industrial concerns in the U.S. manufacture over 300,000 tons of hydrogen cyanide annually. Cyanides have widespread use in chemical syntheses, electroplating, mineral extraction, dyeing, printing, photography, and agriculture, and in the manufacture of paper, textiles, and plastics. Therefore, as with many other materials, the weaponization of the industrial forms of these materials cannot be overlooked.

The organs most susceptible to cyanide are the central nervous system (CNS) and the heart. Most clinical effects are of CNS origin and are nonspecific.

About 15 seconds after inhalation of a high concentration of cyanide vapor concentration there is a transient hyperpnea followed in 15 to 30 seconds by the onset of convulsions. Respiratory activity stops 2 to 3 minutes later, and cardiac activity ceases several minutes after that, or at about 6 to 8 minutes after exposure.

The onset and progression of signs and symptoms after ingestion of cyanide or after inhalation of a lower concentration of vapor are slower. The first effects may not occur until several minutes after exposure, and the time course of these effects depends on the amount absorbed and the rate of absorption. The initial transient rapid breathing may be followed by a feeling of anxiety or apprehension, agitation, vertigo, a feeling of weakness, nausea with or without vomiting, and muscular trembling. Later, consciousness is lost, respiration decreases in rate and depth, and convulsions, apnea, and cardiac dysrhythmias and standstill follow. Because this cascade of events is prolonged, diagnosis and successful treatment are possible.

The effects of cyanogen chloride include those described for hydrogen cyanide. Cyanogen chloride also is similar to the riot-control agents in causing irritation to the eyes, nose, and airways as well as marked lacrimation, rhinorrhea, and bronchosecretions.

Physical findings are few and nonspecific. The two that are said to be characteristic are, in fact, not always observed. The first is severe respiratory distress in a patient without cyanosis. When seen, "cherry-red" skin suggests either circulating carboxyhemoglobin from carbon monoxide poisoning or a high venous oxygen content from failure of extraction of oxygen by tissues poisoned by cyanide or hydrogen sulfide. However, cyanide victims may have normal-appearing skin and may even be cyanotic, although cyanosis is not classically associated with cyanide poisoning.

The second classic sign is the odor of bitter almonds. However, about 50 percent of the population is genetically unable to detect the odor of cyanide.

The casualty may be diaphoretic with normal-sized or large pupils. An initial hypertension and compensatory bradycardia are followed by a declining blood pressure and tachycardia. Terminal hypotension is accompanied by bradyarrhythmias before asystole.

Triage

An immediate casualty is one who presents within minutes of inhalational exposure with convulsions or the recent onset of apnea, but with circulation intact. Immediate antidote administration will be lifesaving.

A minimal casualty is one who has inhaled less than a lethal amount and has mild effects. The antidotes may reduce his/her symptoms, but are not lifesaving.

The delayed casualty is one recovering from mild effects or from successful therapy. Generally, it will be hours before full recovery. Evacuation is not necessary, but might be considered until full recovery takes place.

An expectant casualty is apneic with circulatory failure.

Generally, a casualty who has had inhalation exposure and survives long enough to reach medical care will need little care.

Treatment

At the BLS level, treatment will be supportive and directed towards maintaining respirations. However, in the mass casualty setting, a patient in respiratory arrest would be triaged as expectant, unless the arrest can be corrected with airway maneuvers.

The primary goal of ALS therapy is to restore the function of aerobic metabolism by removing the cyanide from the end of the oxidative phosphorylation process (the terminal cytochrome). However, this is complicated by the speed at which cyanide causes death.

After the cyanide is removed, the next goal is to detoxify or bind the cyanide so that it cannot reenter the cell to reinhibit the metabolism. A closely associated goal is supportive management.

Methemoglobin (a special form of hemoglobin in the blood) has a high affinity for cyanide, and cyanide will preferentially bind to methemoglobin rather than to the cytochrome. Most methemoglobin formers have clinically significant side effects. The nitrites, which were first used to antagonize the effects of cyanide over a century ago, cause orthostatic hypotension, but this is relatively insignificant in a supine casualty. **Amyl nitrite**, historically the first nitrite used, is a volatile substance formulated in a perle that is crushed or broken for the victim to inhale. In an apneic patient a means of ventilation is necessary.

Another methemoglobin former, **sodium nitrite**, is formulated for intravenous use. The standard ampule contains 300 mg of the drug in 10 mL of diluent, and this is injected intravenously over a 2- to 4-minute period.

Detoxification of cyanide is accomplished by the administration of a sulfur-containing compound that combines with cyanide to produce thiocyanate, a relatively nontoxic substance which is rapidly excreted via the kidneys. Sodium thiosulfate is packaged in a 50-mL ampule containing 12.5 grams of the drug. Intravenous injection of all 12.5 grams follows successful completion of the intravenous injection of sodium nitrite. Half of the original dosage of each drug may be repeated if symptoms persist.

The Lilly Cyanide Antidote Kit, containing amyl nitrite, sodium nitrite, and sodium thiosulfate, is available to medical facilities, and ALS responders. However, only the intravenously administered compounds (sodium nitrite and sodium thiosulfate) are available to field treatment facilities.

Supportive care consists of providing oxygen and correcting the metabolic acidosis. Although in theory oxygen should not help (because hemoglobin is saturated and the intracellular pathway for oxygen use is blocked), in both experimental studies and in actual patient management oxygen has provided some benefit. There is no firm evidence to support the use of hyperbaric oxygen. Correction of the acidosis has helped cyanide-poisoned patients in whom the etiology was not recognized and to whom the antidote was not given.

EXPLOSIVE WEAPONS

By far, the most common terrorist weapon is explosives. These materials are easily obtained, manufactured, deployed, and initiated. They possess a high success rate and their use receives extensive media attention.

The World Trade Center, the Murrah building, and the bombings of U.S. Embassies are all examples of the effectiveness of such devices. More terrorist events involve the use of explosives than any other form of weapon.

Methods for constructing bombs are not a secret. Information and recipes are widely available on the construction of explosives as well as numerous other weapons of mass destruction. With explosives, however, the components are readily obtainable from any hardware, lawn and garden, agricultural supply, or even drugstores. If ammonium nitrate isn't available, then any one of a dozen other components will work.

Explosives are classified by the rate at which they react. A detonation is the fastest, and deflagration tends to have a slower reaction. The speed of reaction is of little value to responders. For all intents and purposes it is immaterial. For an example of the destructive power of even a small car bomb, look at the following table provided by the Bureau of Alcohol, Tobacco and Firearms (ATF).

ATF	VEHICLE DESCRIPTION	MAXIMUM EXPLOSIVES CAPACITY	LETHAL AIR BLAST RANGE	MINIMUM EVACUATION DISTANCE	FALLING GLASS HAZARD
	COMPACT SEDAN	500 Pounds 227 Kilos *(In Trunk)*	100 Feet 30 Meters	1,500 Feet 457 Meters	1,250 Feet 381 Meters
	FULL SIZE SEDAN	1,000 Pounds 455 Kilos *(In Trunk)*	125 Feet 38 Meters	1,750 Feet 534 Meters	1,750 Feet 534 Meters
	PASSENGER VAN OR CARGO VAN	4,000 Pounds 1,818 Kilos	200 Feet 61 Meters	2,750 Feet 838 Meters	2,750 Feet 838 Meters
	SMALL BOX VAN *(14 FT BOX)*	10,000 Pounds 4,545 Kilos	300 Feet 91 Meters	3,750 Feet 1,143 Meters	3,750 Feet 1,143 Meters
	BOX VAN OR WATER/FUEL TRUCK	30,000 Pounds 13,636 Kilos	450 Feet 137 Meters	6,500 Feet 1,982 Meters	6,500 Feet 1,982 Meters
	SEMI-TRAILER	60,000 Pounds 27,273 Kilos	600 Feet 183 Meters	7,000 Feet 2,134 Meters	7,000 Feet 2,134 Meters

This table and other information can be obtained from the ATF's web page at http://www.atf.treas.gov/core/explarson/explarson.htm.

Bombing incidents are not uncommon. Use of explosives for furthering a political or social agenda may not rank as one of the highest uses in the country, but it is increasing. The following tables indicate the use of explosives by both motive and target and were obtained from the Federal Bureau of Investigation's (FBI's) Bomb Data Center.

Bombing Incidents By Target 1991-1995

TARGET	91	92	93	94	95	RANK	TOTAL	% OF TOTAL
RESIDENTIAL	453	662	699	881	597	2	3,292	24%
COMMERCIAL	297	369	335	398	298	4	1,697	12%
VEHICLES	286	426	408	373	348	3	1,841	13%
EDUCATION	93	151	167	112	116	6	639	5%
MAIL BOXES	495	789	872	815	699	1	3,670	27%
OPEN AREAS	91	126	146	238	192	5	793	6%
UTILITIES	37	38	16	25	29	11	145	1%
LAW ENFORCEMENT	15	38	24	34	21	12	132	1%
STATE/LOCAL GOVERNMENTS	38	50	36	51	32	10	207	2%
FEDERAL GOVERNMENT	9	11	10	6	15	14	51	0.4%
BANKS	17	16	15	25	13	15	86	1%
MILITARY	8	5	8	2	0	19	23	0.2%
AIRPORTS/ AIRCRAFT	3	2	2	1	2	18	10	0.1%
APARTMENTS	0	146	98	66	59	8	369	2.7%
RELIGIOUS FACILITIES	0	14	16	17	16	13	63	0%
ENERGY FACILITIES	0	4	7	6	5	17	22	0.2%
PARKS	0	45	44	38	44	9	171	1%
MEDICAL FACILITIES	0	12	14	12	11	16	49	0.4%
OTHER	157	85	63	63	80	7	448	3%
TOTAL	1,999	2,989	2,980	3,163	2,577		13,708	100%

Source: Bureau of Alcohol, Tobacco and Firearms (ATF) Additional information can be obtained from the ATF at http://www.atf.treas.gov/core/explarson/explarson.htm

Explosive Incidents by Motive 1991-1995

MOTIVE	Number of incidents and Dollar loss in million	91	92	93	94	95	5-YEAR
VANDAL	Number	665	1,069	1,044	1220	967	4,965
	Dollars	17.9	24.0	17.7	23.3	33	116
REVENGE	Number	214	259	284	283	221	1,261
	Dollars	70.6	107.0	107.7	25.8	24	336
PROTEST	Number	22	16	12	9	10	69
	Dollars	1.3	1.2	1.4	2.2	5	11
EXTORTION	Number	29	36	20	37	30	152
	Dollars	5.8	36.0	2.0	9.3	3	56
LABOR RELATED	Number	8	10	16	12	9	55
	Dollars	0.7	0.3	0.0	0.7	0	2
INSURANCE FRAUD	Number	1	1	3	5	1	11
	Dollars	0.0	2.0	0.6	11.3	4	17
HOMICIDE/ SUICIDE	Number	19	20	22	28	24	113
	Dollars	39.1	16.5	5.8	5.5	13	80
TOTAL	Number	958	1,411	1,401	1594	1,262	6,626
	Dollars	135.4	187	135.2	78.1	82	618
Not Reported or Determined	Number	627	884	854	844	717	3,926
	Dollars	95.6	74.3	51.6K	184.8	10.1K	62,146.1
Source: Bureau of Alcohol, Tobacco and Firearms (ATF) Additional information can be obtained from the ATF at http://www.atf.treas.gov/core/explarson/explarson.htm							

The **primary mechanisms** of injury related to explosives are related to pressure. When an explosive device detonates or deflagrates, the oxidation reaction that takes place generates tremendous amounts of gas that move outward away from the epicenter. These pressure waves will move in a straight line until they come into contact with another surface (e.g., building, bodies, earth, clouds). Once in contact with another surface, the energy from the wave may be absorbed, deflected in another direction, or both.

The pressure waves developed can exceed 700 tons per square inch (psi) and move outward at a rate of up to several thousand miles per hour. (In order to place the pressure in perspective, the pressure exerted by 150-mph winds generated by a hurricane only reach 0.3 psi.) As the wave moves outward, the psi of the pressure decreases as a function of distance. Depending upon the speed at which the wave is moving, the effects can be "shoving," such as is seen in blasting agents, or "shattering," as is seen in high explosives. Both the shoving and shattering effects also contribute to the **second mechanism** of injury, shrapnel. Anything in the direct path of the wave (including the explosive's container itself) is hurled outward with tremendous speed and force.

When the pressure wave comes in contact with body tissue it is transferred to the tissues of the body. As these tissues are higher in density than air, the wave accelerates as it passes through the solid tissues. Once that energy arrives at a location in the body where the solid tissues interface with tissues of lessor density or air (e.g., the hollow organs) the result is a "spalding" or "tearing" of the solid tissues at the interface. This, with the shrapnel, is what leads to tremendous internal injuries.

Another secondary effect of blasts is crushing. When a building collapses and the victims become trapped by rubble and debris, "crush syndrome" becomes a significant concern.

Crush Syndrome

Historically, victims of collapse were rescued live from the rubble only to die minutes, hours, days, or weeks later. The proper management of victims in the rubble can reduce this mortality rate.

When a person's tissues become compressed, several conditions begin to develop. The amount of time that it takes for these conditions to develop can range from 1 to 6 hours, depending upon surface area impact, condition of the patient, amount of compression, etc.

Once compressed, arterial blood flow to the area is greatly reduced or stopped. This results in the cells in the affected area switching to an energy-production process known as anaerobic (without oxygen) metabolism. The end result of this process, and the primary concern, is production of lactic acid.

In addition to the lactic acid formation in the oxygen-starved tissues, the membranes of the tissue cells begin to leak into the interstitial spaces. The materials that leak out of the cells contain high levels of potassium, myoglobin, others toxins, and uric acid.

In addition to the cells leaking, the capillary walls also begin to leak; this allows mixing of the blood and the impurities released by the cell. The table below summarizes some of the effects of compressed tissue.

Problems of Compression	Potential Resulting Effects
Hypoxia/anoxia of the tissues	• Anaerobic metabolism and the production of lactic acid in the affected tissue. • Lactic acidous.
Cell membrane leakage	• Release of potassium into the tissues. This potassium can result in severe cardiovascular effects once the blood flow is restored.
Myoglobin release from the cells	• Highly toxic to the kidneys in acidic conditions.
Other toxins and uric acid	• Further increases the acidity of the tissue (lowers the pH) and other impurities can be highly toxic to the body. • Adult respiratory distress syndrome.
Capillary leakage	• Hypovolemia and mixing of the blood with the impurities.

These are just some of the effects of compression of the tissues. Therefore, once compression is released

- Blood pressure drops because of the shift of fluids out of the capillaries.

- Cardiac disorders develop due to high potassium levels in the blood.

- The body becomes acidic due to this release of highly acidic blood which was trapped in the compressed tissues.

The results? The person is talking prior to the release of compression. Shortly after release occurs (minutes to an hour), the patient begins to get anxious and thirsty, vitals go awry, and cardiac difficulties and respiratory problems develop. If not managed properly, the patient likely dies. If they are managed effectively when these symptoms onset, the patient is likely to live, only to die weeks later of renal failure. This renal failure is caused by the fact that the myoglobin converts to a solid (precipitates) in the kidneys when the pH is low. When we released the compression, we released acidic blood and myoglobin, the two components necessary to destroy the kidneys.

The bottom line--these patients need aggressive "in the rubble" medical support, including airway, oxygenation, fluids, medication (e.g., bicarb), and cardiac monitoring. ALS support is absolutely necessary for anyone who has a high potential for crush syndrome. Once he/she is released from the compression, the level of medical support must continue.

Three Major Causes of Crush Injury Death after Release

Hypovolemia
Cardiac and respiratory problems
Renal failure

CASUALTY DECONTAMINATION

Chemical Casualty Decontamination

(Source: Medical Management of Chemical Casualties)

OVERVIEW

Decontamination is the reduction or removal of chemical agents. Decontamination may be accomplished by removal of these agents by physical means or by chemical neutralization or detoxification. Decontamination of skin is the primary concern, but decontamination of eyes and wounds must also be done when necessary. Personal decontamination is decontamination of self; casualty decontamination refers to the decontamination of casualties; and personnel decontamination usually refers to decontamination of non-casualties.

The most important and most effective decontamination of any chemical exposure is that decontamination done within the first minute or two after exposure. This is self-decontamination, and this early action by the soldier will make the difference between survival (or minimal injury) and death (or severe injury). Good training can save lives. Decontamination of casualties is an enormous task. The process requires dedication of both large numbers of personnel and large amounts of time. Even with appropriate planning and training the requirement demands a significant contribution of resources.

Liquids and solids are the only substances that can be effectively removed from the skin. It is generally not possible or necessary to decontaminate vapor. Removal from the atmosphere containing the vapor is all that is required. Many substances have been evaluated for their usefulness in skin decontamination.

The most common problems with potential decontaminants are irritation of the skin, toxicity, ineffectiveness, or high cost. An ideal decontaminant will rapidly and completely decontaminate all known chemical and biological warfare agents. Furthermore, a suitable skin decontaminant must have certain properties that are not requirements for decontaminants for equipment. Recognized desirable traits of a skin decontaminant include:

- Neutralization of all agents
- Safety (compound to be both nontoxic and noncorrosive)
- Ease of application by hand
- Readily available
- Rapid action
- Nonproduction of toxic end products
- Stability in long-term storage
- Short-term stability (after issue to unit/individual)
- Affordability
- Nonenhancement of percutaneous agent absorption
- No irritability
- Hypoallergenicity
- Ease of disposal

Decontamination issues have been explored since the beginning of modern chemical warfare. After years of research worldwide, simple principles which consistently produce good results still apply.

The first, which is without equal, is timely physical removal of the agent. To remove the substance by the best means available is the primary objective. Chemical destruction (detoxification) of the offending agent is a desirable secondary objective. Physical removal is imperative because none of the chemical means of destroying these agents do so instantaneously. While decontamination preparations such as fresh hypochlorite react rapidly with some agents (e.g., the half-time for destruction of VX by hypochlorite at a pH of 10 is 1.5 minutes), the half-times of destruction of other agents, such as mustard, are much longer. If a large amount of agent is present initially, a longer time is needed to completely neutralize the agent to a harmless substance.

Decontamination studies have been conducted using common household products. The goal of these studies was identification of decontaminants for civilians as well as field expedients for the soldier. Timely use of water, soap and water, or flour followed by wet tissue wipes produced results equal, nearly equal, or in some instances better than those produced by the use of Fuller's Earth, Dutch Powder, and other compounds. (Fuller's Earth and Dutch Powder are decontamination agents currently fielded by some European countries.) This is easily understood because 1) no topical decontaminant has ever shown efficacy with penetrated agent, 2) agents in large enough quantity, especially vesicants, may begin penetrating the skin before complete reactive decontamination (detoxification) takes place, and 3) early physical removal is most important.

Military personnel may be questioned for guidance by local civilian authorities or may deal with supply shortages in the field. Knowledge of the U.S. doctrinal solutions may not suffice in these situations, and awareness of alternative methods of decontamination will prove very beneficial.

However, it is not so much what method is used, rather it is how and when it is used. Chemical agents should be removed as quickly and completely as possible by the best means available.

The M291 resin kit and 0.5% hypochlorite for casualty decontamination are state-of-the-art. The M291 kit is new, whereas hypochlorite has been around since World War I. The M291 kit is the best universal dry decontaminant for skin. Fresh 0.5% hypochlorite solution with an alkaline pH is the best available universal liquid decontaminating agent. Liquids are best for large or irregular surface areas. Hypochlorite solutions are well suited for medical treatment facilities with adequate water supplies. For hypochlorite to be the best universal liquid skin decontaminant it has to be relatively fresh (made daily or more frequently, particularly in a warm environment where evaporation will occur) and at a concentration of 0.5% at an alkaline pH.

Hypochlorite solutions are for use on skin and soft tissue wounds only. Hypochlorite should not be used in abdominal wounds, in open chest wounds, on nervous tissue, or in the eye. Surgical irrigation solutions should be used in liberal amounts in the abdomen and chest. All such solutions should be removed by suction instead of sponging and wiping. Only copious amounts of water, normal saline, or eye solutions are recommended for the eye. Contaminated wounds will be discussed later.

The M291 resin kit is best for spot decontamination of skin only. It rapidly adsorbs the chemical agent with carbonaceous material physically removing the agent from skin contact. Later an ion exchange resin neutralizes the offending agent by chemical detoxification. Since the M291 kit is small and dry and easily carried by the soldier, it is well suited for field use. It will be the early intervention with the use of this kit that will reduce chemical injury and save life in most cases. Decontamination of the casualty using an M291 kit does not obviate the need for decontamination at a field facility. The decontamination station is more conducive to thorough decontamination. Chemical agent transfer is a potential problem that can be resolved by a second deliberate decontamination. Decontamination at the medical treatment facility prevents spread of the agent to areas of the body previously uncontaminated, contamination of personnel assisting the patient, and contamination of the medical facility.

CERTIFICATION OF DECONTAMINATION

Certification of decontamination is accomplished by any of the following: processing through the decontamination facility; M-8 paper; M-9 tape; M256A1 ticket; or by the CAM (Chemical Agent Monitor). If proper procedure is followed the possibility of admitting a contaminated casualty to field medical facility is extremely small. The probability of admitting a dangerously contaminated casualty is miniscule to non-existent. Fear is the worst enemy, not the contaminated soldier.

METHODS OF DECONTAMINATION

Three basic methods of decontamination are physical removal, chemical deactivation, and biological deactivation of the agent. Biological deactivation has not been developed to the point of being practical.

PHYSICAL REMOVAL

Several types of physical and chemical methods are at least potentially suitable for decontaminating equipment and material. Flushing or flooding contaminated skin or material with water or aqueous solutions can remove or dilute significant amounts of agent. Scraping with a wooden stick, i.e., a tongue depressor or popsicle stick, can remove bulk agent by physical means. For the decontamination of clothing only, adsorbents and containment materials (to be used on outer garments before their removal and disposal) have been considered. A significant advantage of most physical methods is their nonspecificity. Since they work nearly equally well on chemical agents regardless of chemical structure, knowledge of the specific contaminating agent or agents is not required.

Flushing with Water or Aqueous Solutions

When animal skin contaminated with GB was flushed with water (a method in which physical removal predominates over hydrolysis of the agent), 10.6 times more GB was required to produce the same mortality rate as when no decontamination occurred. In another study, the use of water alone produced better results than high concentrations of hypochlorite (i.e., 5.0% or greater, which are not recommended for skin). Timely copious flushing with water physically removes the agent and will produce good results.

Adsorbent Materials

Adsorption refers to the formation and maintenance of a condensed layer of a substance, such as a chemical agent, on the surface of a decontaminant as illustrated by the adsorption of gases by charcoal particles and by the decontaminants described in this section. Some NATO nations use adsorbent decontaminants in an attempt to reduce the quantity of chemical agent available for uptake through the skin. In emergency situations dry powders such as soap detergents, earth, and flour, may be useful. Flour followed by wiping with wet tissue paper is reported to be effective against GD, VX and HD.

M291 Resin

The current method of battlefield decontamination by the individual soldier involves the use of a carbonaceous adsorbent, a polystyrene polymeric, and ion exchange resins (M291). The resultant black resin is both reactive and adsorbent. The M291 Kit has been extensively tested and proven highly effective for skin decontamination. It consists of a wallet-like carrying pouch, containing 6 individual decontamination packets. Each packet contains a non-woven fiber-fill laminated pad impregnated with the decontamination compounds. Each pad provides the individual with a single step, non-toxic/non-irritating decontamination application, which can be used on the skin, including the face and around wounds. Instructions for use are marked on the case and packets. The individual decontamination pads are impregnated with the decontamination compound "Ambergard XE-555 Resin", which is the black, free-flowing, resin based powder. As the pad is scrubbed over the contaminated skin the chemicals are rapidly transferred into and trapped in the interior of the resin particles. The presence of acidic and basic groups in the resin promotes the destruction of trapped chemical agents by acid and base hydrolysis. Because the resin is black it maps out the areas that have been decontaminated.

CHEMICAL METHODS

Three types of chemical mechanisms have been used for decontamination: water/soap wash; oxidation; and acid/base hydrolysis. HD (mustard) and the persistent nerve agent VX contain sulfur molecules that are readily subject to oxidation reactions. VX and the other nerve agents (GA, GB, GD, and GF) contain phosphorus groups that can be hydrolyzed. Therefore, most chemical decontaminants are designed to oxidize HD and VX and to hydrolyze nerve agents (VX and the G series).

Water/Soap Wash

Both fresh water and sea water have the capacity to remove chemical agents not only through mechanical force but also via slow hydrolysis; however, the generally low solubility and slow rate of diffusion of CW agents in water significantly limit the agent hydrolysis rate.

The predominant effect of water and water/soap solutions is the physical removal or dilution of agents; however, slow hydrolysis does occur particularly with alkaline soaps. In the absence of hypochlorite solutions or other appropriate means of removing chemical agents, these methods are considered reasonable options.

Oxidation/Hydrolysis

The most important category of chemical decontamination reactions is oxidative chlorination. This term covers the "active chlorine" chemicals like hypochlorite. The pH of a solution is important in determining the amount of active chlorine concentration. An alkaline solution is advantageous. Hypochlorite solutions act universally against the organophosphorus and mustard agents.

Both VX and HD contain sulfur atoms that are readily subject to oxidation. Current doctrine specifies the use of a 0.5% sodium or calcium hypochlorite solution for decontamination of skin and a 5% solution for equipment.

Hydrolysis

Chemical hydrolysis reactions are of two types: acid and alkaline. Acid hydrolysis is of negligible importance for agent decontamination because the hydrolysis rate of most chemical agents is slow, and adequate acid catalysis is rarely observed. Alkaline hydrolysis is initiated by the nucleophilic attack of the hydroxide ion on the phosphorus atoms found in VX and the G agents. The hydrolysis rate is dependent on the chemical structure and reaction conditions such as pH, temperature, the kind of solvent used, and the presence of catalytic reagents. The rate increases sharply at pH values higher than 8 and increases by a factor of four for every 10^{o}C rise in temperature. Several of the hydrolytic chemicals are effective in detoxifying chemical warfare agents; unfortunately, many of these (e.g., NaOH) are unacceptably damaging to the skin. Alkaline pH hypochlorite hydrolyzes VX and the G agents quite well.

Biological Casualty Decontamination

(Source: "Medical Management of Biological Casualties", US Army Medical Research Institute on Infectious Diseases, Fort Detrick, MD)

Contamination is the introduction of microorganisms into tissues or sterile materials. Decontamination is disinfection or sterilization of infected articles to make them suitable for use (the reduction of microorganisms to an acceptable level). Disinfection is the selective elimination of certain undesirable microorganisms in order to prevent their transmission (the reduction of the number of infectious organisms below the level necessary to cause infection). Sterilization is the complete killing of all organisms. BW agents can be decontaminated by mechanical, chemical and physical methods.

Decontamination methods have always played an important role in the control of infectious diseases. However, we are often unable use the most efficient means of rendering infectious diseases harmless (e.g., toxic chemical sterilization) in order to not hurt people or damage materials which are to be freed from contamination.

Mechanical decontamination involves measures to remove but not necessarily neutralize an agent. An example is the filtering of drinking water to remove certain agents (e.g., Vibrio cholera or Clostridium botulinum) that may have been used to purposefully contaminate a water supply.

Chemical decontamination renders BW agents harmless by the use of disinfectants which are usually in the form of a liquid, gas or aerosol. One has to remember that some disinfectants are harmful to humans, animals, the environment, and/or materials.

Dermal exposure with a suspected BW agent should be immediately treated by soap and water decontamination. Careful washing with soap and water removes a very large amount of the agent from the skin surface. It is important to use a brush to ensure mechanical loosening from the skin surface structures, and then rinse with copious amounts of water. This method is often sufficient to avert contact infection. The contaminated areas should then be washed with a 0.5% sodium hypochlorite solution, if available, with a contact time of 10 to 15 minutes.

Ampules of calcium hypochlorite (HTH) are also currently fielded in the Chemical Agent Decon Set for mixing hypochlorite solutions. The 0.5% solution can be made by adding one 6-ounce container of calcium hypochlorite to five gallons of water. The 5% solution can be made by adding eight 6-ounce ampules of calcium hypochlorite to five gallons of water. These solutions evaporate quickly at high temperatures so if they are made in advance they should be stored in closed containers. Also the chlorine solutions should be placed in distinctly marked containers because it is very difficult to tell the difference between the 5% chlorine solution and the 0.5% solution.

To mix a 0.5% sodium hypochlorite solution, take one part Clorox and nine parts water (1:9) since standard stock Clorox is a 5.25% sodium hypochlorite solution. The solution is then applied with a cloth or swab. The solution should be made fresh daily with the pH in the alkaline range.

Chlorine solution must NOT be used in patients with (1) open abdominal wounds, as it may lead to the formation of adhesions, or (2) brain and spinal cord injuries. However, this solution may be instilled into non-cavity wounds and then removed by suction to an appropriate disposal container. Within about 5 minutes, this contaminated solution will be neutralized and nonhazardous. Subsequent irrigation with saline or other surgical solutions should be performed. Prevent the chlorine solution from being sprayed into the eyes, as corneal opacities may result.

For decontamination of fabric clothing or equipment, a 5% hypochlorite solution should be used. For Decontamination of equipment, a contact time of 30 minutes prior to normal cleaning is required. This is corrosive to most metals and injurious to most fabrics, so rinse thoroughly and oil metal surfaces after completion.

BW agents can be rendered harmless through such physical means as heat and radiation. To render agents completely harmless, sterilize with dry heat for two hours at 160 degrees centigrade. If autoclaving with steam at 121 degrees centigrade and 1 atmosphere of overpressure (15 pounds per square inch), the time may be reduced to 20 minutes, depending on volume. Solar ultraviolet radiation (UV radiation) has a certain disinfectant effect, often in combination with drying. This is effective in certain environmental conditions but hard to standardize for practical usage for decontamination purposes.

Rooms in fixed spaces are best decontaminated with gases or liquids in aerosol form (e.g., formaldehyde). This is usually combined with surface disinfectants to ensure complete decontamination. Environmental decontamination of terrain is costly and difficult and should be avoided, if possible. If contaminated terrain, streets, or roads must be passed, spray with a dust-binding spray to minimize reaerosolization. If it is necessary to decontaminate these surfaces, chlorine-calcium or lye may be used. Otherwise, rely on the natural processes which, especially outdoors, leads to the decontamination of agent by means of drying and solar UV radiation.

MASS PATIENT DECONTAMINATION

One of the unique considerations of terrorist events is the potential need for mass patient decontamination. Primarily, the decontamination of mass numbers of patients will be related to the biological, nuclear (radiation), and chemical events. However, even in explosive and incendiary events mass patient decontamination may be required due to the agents involved and the spread of bodily fluids.

Historically, fire and EMS operations have focused decontamination on one to several individuals. However, now we must develop systems to decontaminate potentially several hundred people in a short period of time.

Regardless of the system your community establishes, the basic concept of decontamination applies to the mass patient decontamination arena: gross decon must occur to remove the bulk of the contaminants. This stage involves stripping and flushing the patient. If the situation permits, efforts should be made to protect the victims' modesty. However, when chemicals (particularly the vesicants) are involved, rapid decon is essential for the minimization of toxic effects. Under no circumstances should contaminated persons be allowed to leave the scene without at least gross decontamination.

After gross decontamination, various levels of secondary decontamination will be required. This process involves the systematic washing and rinsing of all body surface areas in order to remove, to the extent possible, any remaining contaminates.

Further decontamination may or may not be required. Tertiary decontamination generally is performed at the medical facility and may involve actions such as gastric decontamination and further wound cleansing.

When conducting decontamination there are two objectives: (1) prevent further extension of the incident (gross or secondary contamination), and (2) minimize adverse health effects of continued contact. In order to determine the extent of decontamination that is required, several factors should be considered.

Physical state of the agent involved: Is the agent a solid, liquid, gas, or vapor? Solids and liquids on the surface of the body require more aggressive decontamination efforts, whereas exposure to only gases or vapor generally results in minimal residual contamination. Therefore, those exposed only to gases and vapor present little risk of secondary contamination once clothing is removed. The safety level for both the patient and responder is greatly enhanced simply by flushing with water. If solids or liquids are involved, stripping and flushing may or may not be fully effective. In these cases, the next two items should be considered.

Water solubility of the agent: If the solid or liquid is water soluble, then flushing with water is very effective. However, if the material is not hydrophilic (water loving) then some form of emulsification will be required. Thorough washing of all surface areas with soap and water would be indicated. Plain soap is very effective; however, many references recommend the use of "tincture of green soap." This type of soap is available from medical supply houses or can be mixed by many pharmacies.

Vapor pressure of the agent: The vapor pressure of the liquid agent also must be considered. The higher the vapor pressure, the less persistent the material and the faster it will evaporate. For example, cyanide gas has a vapor pressure greater than 1 atomsphere and therefore will evaporate immediately. However VX, with a vapor pressure of 0.0007, will remain for days. (In the case of VX, though, the casualty that you are trying to decontaminate from liquid contact generally will not be a viable patient.)

There are numerous layouts and systems for the field decontamination of mass casualties. We have determined three major types of layouts: (1) crowd emergency decontamination, (2) two-corridor decontamination, and (3) three-corridor decontamination.

Crowd emergency decontamination generally involves the use of existing fire department resources to achieve the goal of stripping and flushing patients. In this type of operation, handlines and master stream devices operating at approximately 50- to 60-psi nozzle pressure in a narrow fog pattern are used to surround and flush the patients. In other cases, fire apparatus are positioned side by side to create an area that provides the patients with a logical direction of movement as well as some very basic modesty protection. The use of ladder trucks with elevated streams can further assist this process.

Two- and three-corridor decontamination systems allow for a greater level of protection for the patients (both from the elements and from observation). These systems generally require greater resources specifically designed or adapted for this process. Two-corridor decon systems permit an area for ambulatory and nonambulatory patients, and three corridors allow male and female ambulatory patients to have an area separate from that of the opposite gender. This may seem extensive for an emergency situation. However, the more modesty we provide, the better the chance that decontamination will occur. Patients will be more likely to shower more thoroughly if they are not placed into severely embarrassing situations.

In addition to the design of the system, other equipment can be helpful in decontaminating patients. Items such as mesh stretchers (such as the "Raven"® stretcher or wire Stokes baskets), tents, stretcher basins, and specially designed decontamination trailers can be helpful.

NOTE TO STUDENTS

The previous information has laid a basic understanding of how terrorist weapons might affect the body. This information, combined with the information in the appendices and the Internet resources, provides an excellent initial study of the medical aspects of terrorism. However, as stated at the beginning of this program, the docrine is going to change very dramatically over the next several years. It is incumbent upon you, the student, to keep abreast of these changes.

An excellent single starting point for Internet-based research of the terrorism problem is in the Federal Emergency Management Agency's "Rapid Response Information System" located at http://www.rris.fema.gov. This single site provides extensive links to authoritative sources of information.

Activity 4.1

Biological Agent Impacts

Purpose

Given a biological agent job aid, the students will identify the key information regarding symptoms, onset, and EMS system impacts for the agents.

Directions

Working individually, take 20 minutes to answer the questions based upon the information in the quick reference.

1. Are the disease processes caused by biological toxins transmissible from human to human? Explain your answer.

2. List the biological agents that might be selected by a terrorist if he/she desired to create mass casualties through human-to-human transmission. Also indicate the incubation period for each.

3. What are the common signs and symptoms that can be found in the majority of the biological agents listed in the quick reference guide?

4. Generally speaking, of the three major types of biological agents (bacterial, viral, and toxins), which has the shortest duration to onset of symptoms?

5. If you were a terrorist and you wanted to select a weapon that would severely tax the local medical infrastructure, which of the biological agents would you select? Explain the reasoning behind your selection.

Activity 4.1 (cont'd)

Biological Agent Quick Reference Guide

Disease (Class)	Route of Infection	Incubation Period/ Onset Time	Transmission to Humans	Signs + Symptoms	Decontamination or Infection Control Procedures	Pre-Hospital Care
Tularemia (Bacterium)	V, R, D	2 to 10 days	No	Ulceroglandular--local ulcer and regional lymphadenopathy, fever, chills, headache, and malaise. Typhoidal or septicemic-fever, headache, malaise, substernal discomfort, weight loss, nonproductive cough.	Secretion and lesion precautions, strict isolation not required, use of heat or disinfectants renders organism harmless.	Supportive care.
Q-Fever (Bacterium)	V, R	2 to 10 days	Rare	Fever, cough, and pleuritic chest pain.	Use of soap and water or a weak 0.5% hypochlorite solution.	Supportive care.
Smallpox (Virus)	R, S, DC	10 to 12 days	High	Malaise, fever, rigors, vomiting, headache, backache; 2 to 3 days later, lesions which develop into pustular vesicles, more abundant on face and extremities, developing synchronously.	Strict quarantine with respiratory isolation for a minimum of 16 to 17 days following exposure for all contacts. Patients are infectious until all scabs heal.	Supportive care.
Venezuelan Equine Encephalitis (Virus)	R, V	2 to 6 days	Low	Sudden onset, with, malaise, spiking fever, rigors, severe headache, photophobia, and myalgias. Nausea, vomiting, cough, sore throat, and diarrhea may follow.	Body substance isolation; infectious through mosquito bites.	Analgesics for headache and myalgia, anticonvulsants and respiratory support.
Viral Hemorrhagic Fevers (Virus)	DC, V, ?R	3 to 21 days	Moderate	Fever, easy bleeding, petechiae, hypotension, shock, edema, malaise, myalgia, headache, vomiting, and diarrhea.	Decontamination with hypochlorite or phenolic disinfectants. Body substance isolation required.	Supportive care directed at respiratory and circulatory support.

V=vector, R=respiratory, D=digestive, DC=direct human-to-human contact, S=skin

Activity 4.1 (cont'd)

Biological Agent Quick Reference Guide

Disease	Route of Infection	Incubation Period/ Onset Time	Transmission to Humans	Signs + Symptoms	Decontamination or Infection Control Procedures	Prehospital Care
Botulinum Toxins (Toxin)	D, R	24 hours to several days	No	Ptosis, weakness, dizziness, dry mouth and throat, blurred vision and diplopia, dysarthria, dysphonia, dysphagia, followed by symmetrical descending paralysis and respiratory failure.	0.5% hypochlorite solution and/or soap and water.	Aggressive respiratory support, and supportive care for other symptoms.
Staphylococcal Enterotoxin B (SEB) (Toxin)	D, R	4 to 6 hours	No	Sudden onset, with fever, chills, headache, myalgia, and nonproductive cough. Some may develop respiratory distress and retrosternal pain. If ingested, nausea, vomiting, and diarrhea.	0.5% hypochlorite solution and/or soap and water.	Supportive care directed at respiratory support.
Ricin (Toxin)	D, R	24 to 72 hours	No	Weakness, fever, cough, and pulmonary edema 18 to 24 hours post exposure, followed by severe respiratory distress and death from hypoxemia in 36 to 72 hours.	0.5% hypochlorite solution and/or soap and water.	Supportive care with aggressive airway management. Volume replacement of GI fluid loss.
Trichothecene Mycotoxins (T2) (Toxin)	R, S, DC, D	Minutes to hours	No	Skin pain, pruritus, redness, vesicles, necrosis; nose and throat pain, nasal discharge, itching and sneezing, cough, dyspnea, wheezing, chest pain, and hemoptysis; ataxia, shock, and death.	Soap and water, after clothing has been removed. Eye exposure--copious saline irrigation.	Supportive care directed at respiratory and circulatory support.

V=vector, R=respiratory, D=digestive, DC=direct human-to-human contact, S=skin

Activity 4.1 (cont'd)

Biological Agent Quick Reference Guide

Disease	Route of Infection	Incubation Period/ Onset Time	Transmission to Humans	Signs + Symptoms	Decontamination or Infection Control Procedures	Prehospital Care
Anthrax (Bacterium)	S, D, R	1 to 6 days	No except for cutaneous type	Fever, malaise, fatigue, cough, and mild chest discomfort, followed by severe respiratory distress with dyspnea, diaphoresis, stridor, and cyanosis; shock and death within 24 to 36 hours of severe symptoms.	Universal body fluid precautions, decontamination with low-pressure soap and water wash, then 0.5% hypochlorite solution, then 2nd soap and water wash.	Supportive care according to local protocol.
Cholera (Bacterium)	D, DC	1 to 5 days	Rare	Asymptomatic to severe with sudden onset, vomiting, abdominal distension, and pain with little or no fever followed rapidly by diarrhea. Fluid loss can exceed 5 to 10 liters per day.	Enteric precautions, soap and water washes, and a hypochlorite solution for equipment. Personal contact rarely causes infection.	Supportive care directed at rapid fluid replacement.
Pneumonic Plague (Bacterium)	V, R	2 to 3 days	High	High fever, chills, headache, hemoptysis, and toxemia, with rapid progression to dyspnea, stridor, and cyanosis; death is due to respiratory failure, circulatory collapse.	Strict isolation precautions. Use of soap and water for personnel decon, heat, UV rays, and disinfectants for equipment.	Supportive care and respiratory and circulatory support.
Bubonic Plague (Bacterium)	V, R	2 to 10 days	High	High fever, chills, malaise, tender lymph nodes (buboes), may progress to septicemic form, with spread to the CNS, lungs, and elsewhere.	Isolation precautions, secretion and lesion precautions. Use of soap and water for personnel decon; use heat, UV rays, or disinfectants for equipment.	Supportive care and respiratory and circulatory support.

V=vector, R=respiratory, D=digestive, DC=direct human-to-human contact, S=skin

Activity 4.2

Assessing Biological Indicators

Purpose

The students, working in small groups, will be able to assess the signs and symptoms of biological agents and relate those symptoms to the epidemiological impact of recognizing a terrorist event using biological agents.

Directions

1. Work in small groups.
2. Study the Blue Water County maps in Appendix D.
3. You will be assigned either scenario #1 or scenario #2.
4. Review the scenario in your Student Manual and then complete the requested information on the pages that follow. Complete one page prior to moving to the next. You will have no more than 20 minutes for this step of the activity.
5. Someone from each group will be asked to present the group's answers to the class.
6. After each group has presented, there will be a classroom discussion.

Scenario #1 Part 1

It is 1300 hours on a summer Tuesday afternoon and you are a medic in charge of a Blue Water County Fire and Rescue ALS ambulance (Medic 31). You work 24/48-hour shifts and have been on duty since 0800 hours this morning.

You have just been dispatched to a private residence off Jasper Pike for an ill person. Your initial assessment is that of a 38-year-old female complaining of flu-like symptoms that have been getting progressively worse since approximately 1800 hours yesterday. Vital signs are

Blood Pressure:	128/76
Pulse:	104
Respiratory rate:	20
Temperature:	102.2
Lung sounds:	Unremarkable but nonproductive cough

Patient complains of fever, chills, increasing weakness and general malaise, loss of appetite and tightness in the chest. She has no medical history, is taking no medications and has no allergies. She states that she last ate yesterday afternoon and her bowel movements are unremarkable.

Scenario #1 Part 1 Questions

Is there anything that would indicate a biological event?

What situations would you need to see to consider a biological event?

What personal protective measures would be indicated for you and your partner?

Scenario #1 Part 2

You return to your station after the first call and another call to a vehicle accident. At 1700 hours you and your partner are dispatched to an ill person in the Kingston area. On arrival you find a 58-year-old male complaining of flu-like symptoms. Your assessment reveals:

Vital Signs:

Blood Pressure:	108/60
Pulse:	100
Respiratory Rate:	18
Temperature:	101.8
Lung Sounds:	Absent of rales or ronchi slightly diminished lower lobes

Patient states that he went to work this morning with chills and later felt that he was running a fever. He complains of weakness, nausea, loss of appetite, moderate chest tightness. Patient has a history of triple cardiac bypass 2 years ago and currently takes Coumadin and nitroglycerine as needed. He has taken 2 nitros in the last hour without significant relief of the chest tightness. EKG shows a slightly tachy sinus rate but is otherwise unremarkable.

While you are attending this patient, you hear Medic 43 being dispatched to another ill person with flu-like symptoms in the Gold Mine area of the county.

Scenario #1 Part 2 Questions

1. Is there anything about the current situation that would specifically indicate a biological event?

2. What additional information would you want to further guide your decision as to whether a biological event has occurred?

3. If the additional information you obtained did lead you to believe there was a biological event, who in your organization would you notify and what personal protective actions would you take?

Scenario #2 Part 1

Assume you are an EMS supervisor for Blue Water County Fire Rescue (BWCFR). Your system operates 10 ALS ambulances on the mainland of Blue Water (refer to maps in Appendix D). Additional EMS services in Blue Water County are

Central City EMS with 5 ALS and 3 BLS
Apple Valley Fire Rescue with 2 ALS
Bayport Community Hospital with 2 ALS and 1 BLS

It is a summer Tuesday afternoon and you have been on duty since 0800 this morning. You and the medics working in your system all work 24/48-hour shifts. Since the start of your shift, the following EMS calls have occurred within BWCFR:

0804 --Medic 51 and 71 to an MVA at SR 52 and 13--one priority 1 trauma, two lesser injuries, all transported
0915 --Medic 71 to a CVA on West Route 10--stable CVA, transported
0930 --Medic 31 to a cardiac at Blue Water County Regional Airport--unstable angina, transported
0945 --Medic 51 to a fallen person in Blue Water--elderly woman fractured right hip, transported
1125 --Medic 41 assist Fisherville Medic 21 & 22 with a MVA on I-107--transported one priority 3 patient
1137 --Medic 23 to an ill person, flu-like symptoms--transported with a high fever
1205 --Medic 51 to a nursing home for a fall, minor injury, transported by private vehicle
1300 --Medic 31 to an ill person, high fever--refused ambulance transport, transported by private vehicle

Scenario #2 Part 1 Questions

1. Is there anything in this summary that would indicate a potential biological terrorist event?

2. What additional information would be helpful in recognizing such an event if one would actually happen?

Scenario #2 Part 2

At 1330, you receive a call from your Operations Chief. The Chief advises you that the county Medical Director contacted him stating that Central City Hospital, Baptist Hospital, and Bayport Community Hospital all have seen an unusually rapid buildup of cases of nonspecific flu-like symptoms coming in both as walk-ins and through EMS. Current epidemiological data prior to the onset of this trend consisted of 3.3 cases of influenza per 10,000 population. Based upon information being received, that incidence rate has jumped to 8 per 10,000 population in the last 12 hours.

Scenario #2 Part 2 Questions

Does this information provide any reason for concern for a biological terrorist event? Explain your response.

1. What other information is necessary?

2. What recommendations would you make to increase the safety of your personnel?

Activity 4.3

Determining Patient Care Considerations

Purpose

Given signs and symptoms of patients, the students will identify the likely terrorist agent involved and the proper considerations for patient care.

Directions

1. Work in small groups.

2. Review all of the scenarios and develop your answers for each. You will have 15 minutes for this process.

3. Present the answers for the questions you are asked to present. Your group will be able to provide input on each question during the classroom discussion of the answers.

Scenario #1

You are the medic in charge of an ALS unit dispatched to 11th Street next to the railyard to assist units already on scene for a reported explosion. When you arrive, fire department, police, two other medic units, and your EMS supervisor are on scene. The isolation area has been established and fire department personnel are performing emergency decontamination of approximately 30 persons leaving the area under their own power. The other medic units have been assigned to triage, and your unit is assigned the task of establishing a treatment area. There are currently 3 patients in the treatment area, all triaged as priority 2. The first patient you assess is a 25-year-old female complaining of a burning sensation in her nose and throat, tightness in the chest and dyspnea. Her skin is cool and wet, pulse of 110, respiratory rate of 28. Lung sounds reveal inspiratory and expiratory wheezes and diffuse rales.

Scenario #1 Questions

What class of agent is likely to be involved?

What additional information would be helpful to finalize your prediction?

What personal protective measures should be taken by treatment personnel?

What BLS treatment would be indicated for this patient?

Scenario #2

You are dispatched to the local offices of the Internal Revenue Service for a reported ill person. On arrival, you are met by a male employee who states that three coworkers have collapsed in the office. He is very agitated and panicked and states that he smelled an unusual, nondescript odor. The 40-year-old patient states that he is having problems seeing and everything appears dark. His eyes are watering and his nose is running profusely. The fire department is arriving on scene.

Scenario #2 Questions

What indicators are present to suggest a terrorist event?

Based upon the information you have, if it were a terrorist event, what types of products do you think might be involved?

What considerations would you give to the rescue of the three coworkers?

You have the patient remove his clothing and the fire department flushes the patient with large amounts of water. After this is completed, you assess the patient and find the following: pulse irregular and tachy at 110; BP 110/50; respiratory rate is 36; lung sounds reveal diffuse wheezing, diffuse rales and ronchi in the lower lobes; pupils are pinpoint; the patient still has a runny nose and is complaining of general weakness. Can you revise or confirm your previous predictions concerning the agent?

What would your BLS treatment of the patient be?

Activity 4.4

Post Office Scenario--Part 2

Purpose

Given a simulated incident, the students, working in small groups, will develop a patient care plan for victims of a potential terrorist event.

Directions

1. You will work in small groups.

2. Scenarios will be shown on the screen, giving you time-sensitive information.

3. The instructor can answer questions to clarify information as needed but will not volunteer information.

4. Review the information and develop a patient care plan using the "Mainstays of Patient Care" worksheet that is attached. You will have 15 minutes for this portion.

5. When all groups are ready, there will be a discussion of the answers.

Review of Scenario (Phase One)

1000 hours Monday

Your agency is dispatched to the local post office on an EMS call for a female with shortness of breath. The local police department also responds with one police car. While responding, your dispatcher notifies you that there are additional calls. Some of the callers are reporting a male victim.

Review of Scenario (Phase Two)

1005 hours Monday

Upon arrival, you see approximately 15 people outside the main door to the post office coughing, tearing, calling for help. Several are on their knees. As you put the vehicle in park, five (5) people start running toward you calling for help.

The people report that there was a white cloud in the lobby and their eyes and skin are burning.

PATIENT CARE MAINSTAYS WORKSHEET

APPROPRIATE PROTECTIVE MEASURES FOR EMS PERSONNEL	
DURING DECONTAMINATION	AFTER DECONTAMINATION
PREVENT FURTHER EXPOSURE OF PATIENTS	
PROVIDE SUPPORTIVE CARE	
DECONTAMINATION	
MAINTAIN PERSONAL PROTECTION (Assess for potential contagious diseases or secondary contamination)	
MEDICAL INTERVENTION	
BLS TREATMENT	ALS TREATMENT
PATIENT TRANSPORT AND TRANSFER CONSIDERATIONS	

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Unit 5: Conclusion

Terminal Objective

- Given a simulated terrorist event, the student will be able to identify standard response equipment and specialized detection equipment and its application in the response to a terrorist incident.

CONCLUSION

By modifying the basic tenets of response safety for application in a terrorist incident, you can go a long way toward keeping yourself and others safe. The main principles we discussed in this class were safety, security, patient care and incident planning.

By safety, we mean the prevention of injury or illness. The way to accomplish that is strict adherence to procedures designed to prevent secondary contamination and to ensure body substance isolation. Use of a Site Safety Plan developed by the Incident Safety Officer also assists with safe work practices. These practices include proper use of PPE and CPC, as well as correct decontamination procedures.

Security issues are different at a terrorist incident than at a routine response. Unfortunately, since you may not know you are responding to a terrorist incident, you will always have to maintain a sense of awareness. This awareness includes route security, identification of choke points, and scene safety. The need for security at a terrorist event cannot be understated, since you are a likely target for the terrorist.

As an EMS provider, you will have a key role in determining what type of agent was used in the incident. Based on patient symptomology, you will be able to determine relatively quickly the class and agent family used. Although you may not know the specific agent, knowing the symptoms and treatments based on agent family will greatly improve the patient outcome.

Lastly, proper planning will help with the patient outcomes. Identifying resources and preplanning facilities puts you in a much better position to respond to a terrorist incident.

By taking this class, you have already started to prepare yourself for response to a terrorist event. Continuing education courses, networking with your peers, and preparing your agency will continue to improve your capabilities.

Activity 5.1

Post Office Scenario (Part 3)

Purpose

Given a simulated incident the student, working in small groups, will develop a patient care plan for victims of a potential terrorist event.

Directions

1. You will work in small groups.

2. Review the Blue Water County information in Appendix D.

3. Scenarios will be shown on the screen, giving you time-sensitive information.

4. The instructor can answer questions to clarify information as needed but will not volunteer information.

5. Based on the information given, answer the questions on the worksheets that follow. You will have 10 minutes to answer the questions for each scenario.

6. When all groups are ready, there will be a discussion of the answers.

Review of Scenario (Phase One)

1000 hours Monday

Your agency is dispatched to the local post office on an EMS call for a female with shortness of breath. The local police department also responds with one police car. While responding your dispatcher notifies you that there are additional calls. Some of the callers are reporting a male victim.

Review of Scenario (Phase Two)

1005 hours Monday

Upon arrival you see approximately 15 people outside the main door to the post office coughing, tearing, calling for help. Several are on their knees. As you put the vehicle in park 5 people start running toward you calling for help.

The people report that there was a white cloud in the lobby and their eyes and skin started burning.

Review of Scenario (Phase Three)

1010 hours Monday

Law enforcement units are arriving to secure the outer perimeter and the high ground around the post office. Your EMS director has arrived and has formed a unified command with law enforcement and the fire department command officer.

1015 hours Monday

Two additional ambulances have arrived and your EMS supervisor is currently serving as the Mass Casualty Branch director and has ordered you to assume command as treatment group leader. You are still presented with 15 patients generally complaining of burning eyes, respiratory irritation and coughing.

Scenario (Phase Four) Questions

1. Based on index of suspicion, what are likely causes for this incident?

2. Who is going to be the Incident Commander?

3. What patient care are you going to render and who will provide it?

4. What is the proper level of protective equipment for this incident?

5. Which boundaries have been established and where are they?

Scenario (Phase Five) Questions

1. What are your next four actions?

2. How have you modified your zones?

3. Has there been a change in Incident Commander?

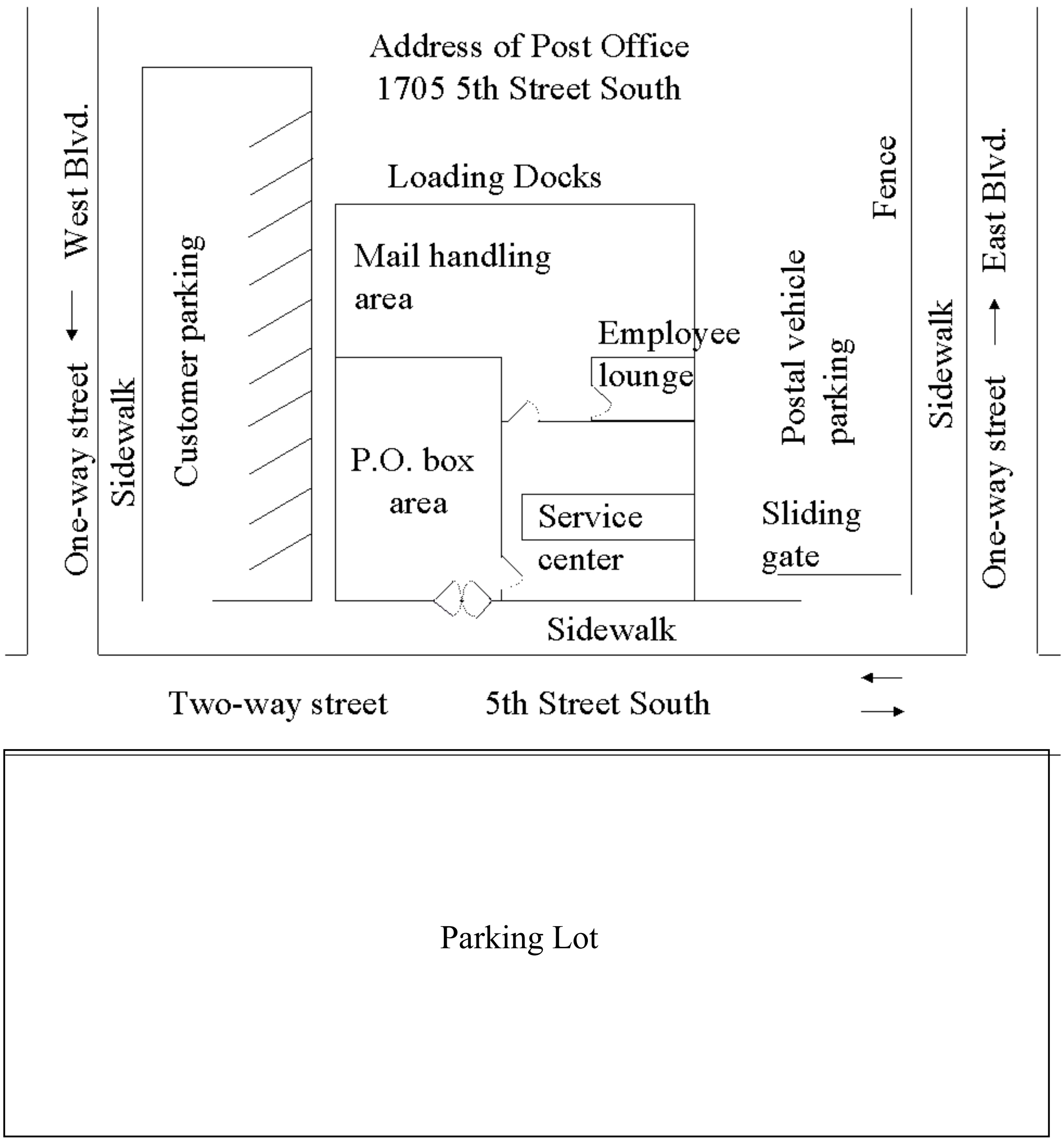
4. What patient care has been provided?

5. Was there a need to move any sectors?

6. Are any specialty resources required that you have not called for? What are they?

Activity 5.1 (cont'd)

Diagram of Post Office



Appendix A:
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Emergency Response to Terrorism: Basic Concepts
Hazardous Materials Operating Site Practices
Health and Safety Officer
Incident Safety Officer

The following are Department of Defense Courses

Domestic Preparedness: Awareness
Domestic Preparedness: Operations
Domestic Preparedness: EMS Provider
Domestic Preparedness: Hospital Provider
Domestic Preparedness: Haz-Mat Technician
Domestic Preparedness: Incident Commander

Appendix B:
Glossary

Absorption	The process of an agent being taken in by a surface (clothing, fabrics, wood, etc.) much like a sponge and water.
Acetylcholine	A chemical compound formed from an acid and an alcohol which causes muscles to contract (neurotransmitter). It is found in various organs and tissues of the body. It is rapidly broken down by the enzyme cholinesterase (acetylcholinesterase).
Acetylcholinesterase	An enzyme (a protein produced in the cells) which stops (inactivates) the action of acetylcholine by separating the acetylcholine into its components of acetic and choline. This occurs as soon as acetylcholine has produced a muscle contraction. Nerve agents combine with acetylcholinesterase to prevent it from performing its inactivation of acetylcholine.
Adsorption	The process of an agent sticking to or becoming chemically attached to a surface.
Aerosol	Fine liquid or solid particles suspended in air; for example, fog or smoke.
Agent dosage	The concentration of a toxic vapor in the air multiplied by the time that the concentration is present.
Alpha particle	A positively charged particle of matter consisting of two protons and two neutrons (such as a helium-4 nucleus). The alpha particle has a marginal ability to penetrate other materials but a strong ability to ionize materials. Alpha particles are not an eternal radiation hazard but alpha-emitting nuclides inside the body as a result of inhalation or ingestion are a considerable internal radiation hazard.
Alpha radiation	The least penetrating type of nuclear radiation; not considered dangerous unless alpha-contaminated or source emitter particles enter the body.
Ammonia Nitrate Fuel Oil (ANFO)	A blasting agent.
AMS	Aerial Measuring System.
Anthrax	A disease of animals. The main sources of human infection are cattle and sheep. The organism that causes anthrax is Bacillus anthracis.

Antibiotic	A substance that inhibits the growth of or kills microorganisms.
Anticholinergic	An agent or chemical that blocks or impedes the action of acetylcholine, such as the (also cholinolytic) antidote atropine.
Anticholinesterase (ACHE)	A substance which blocks the action of cholinesterase (acetylcholinesterase), such as nerve agents.
Antidote	A substance which neutralizes toxic agents or their effects.
Antisera	The liquid part of blood containing antibodies.
Arsenical	Pertaining to or containing arsenic; a reference to the vesicant Lewisite.
Arsine	A colorless, flammable, extremely poisonous gas with an odor like garlic. One of the blood agents.
Asphyxiants	Substances that interfere with oxygen flow during normal breathing. There are two types of asphyxiants: simple and systemic.
Atropine	An anticholinergic used as an antidote for nerve agents to counteract excessive amounts of acetylcholine. It also has other medical uses.
ATF	Bureau of Alcohol, Tobacco, and Firearms.
Bacteria	Single-celled organisms that multiply by cell division and that can cause disease in humans, plants or animals.
BDO	Battle Dress Overgarment; multi-piece suit used by the military for protection against chemical warfare agents (also known as MOPP).
Beta particles	High energy electrons emitted from the nucleus of an atom during radioactive decay. They normally can be stopped by the skin or a very thin sheet of metal.
Beta radiation	A type of nuclear radiation that is more penetrating than alpha radiation, and can damage skin tissue and harm internal organs.
B-NICE	Pertaining to biological, nuclear, incendiary, chemical, or explosives.

Binary device	A chemical device divided into two sections, each containing precursor chemicals that combine and react to release a chemical agent.
Biochemicals	The chemicals that make up or are produced by living things.
Biohazard	A biological agent or condition that constitutes a hazard to humans or the environment.
Biological agents	Pathogens (bacteria, viruses, or fungi) and toxins that have the potential to be exploited for warfare or terrorism.
Biological warfare	The use, for military or terrorist purposes, of biological agents to cause death or incapacitation in humans, animals, or plants.
Biological warfare agents	Living organisms or the materials derived from them that cause disease in or harm humans, animals, or plants, or cause deterioration of material. Biological agents may be used as liquid droplets, aerosols, or dry powders.
Biological warfare	The intentional use of biological agents as weapons to kill or injure humans, animals, or plants, or to damage equipment.
Bioregulators	Biochemicals that regulate bodily functions. Bioregulators that are produced by the body are termed "endogenous." Some of these same bioregulators can be chemically synthesized.
Blister agent	A chemical warfare agent which produces local irritation and damage to the skin (vesicant) and mucous membranes, pain and injury to the eyes, reddening and blistering of the skin, and when inhaled, damage to the respiratory tract.
Blood agent	A chemical warfare agent which is inhaled and absorbed into the blood. The blood (cyanogen) carries the agent to all body tissues where it interferes with the tissue oxygenation process.
Botulism	A highly toxic form of food poisoning. If untreated, the whole body becomes paralyzed, which leads to death by suffocation within a few days.
CAM	Chemical Agent Meter/Monitor.
Causative agent	The organism or toxin that is responsible for causing a specific disease or harmful effect.
CBIRF	Chemical/Biological Incident Response Force.

CCFD	Central City Fire Department.
CBDCOM	Chemical and Biological Defense Command.
Ceiling exposure value	The maximum airborne concentration of a biological or chemical agent to which a worker may be exposed at any time without protective equipment.
Chemical agent	A chemical substance that is intended for use in military operations to kill, seriously injure, or incapacitate people through its physiological effects. Excluded from consideration are riot control agents, and smoke and flame materials. The agent may appear as a vapor, aerosol, or liquid; it can either be a casualty/toxic agent or an incapacitating agent.
Chemical agent symbol	A code usually consisting of two letters that are used as a designation to identify chemical agents, e.g., GB for the chemical agent sarin.
Chemical asphyxiant	Referred to as blood poisons, these are compounds that interrupt the flow of oxygen in the blood or the tissue in three ways: (1) They react more readily than oxygen with the blood. Carbon monoxide is the best-known example. (2) They liberate the hemoglobin from red blood cells, resulting in a lack of transport for oxygen. Hydrazine is one such asphyxiant. (3) They cause a malfunction in the oxygen-carrying capability of the red blood cells. Benzene and toluene are two of these.
Chemical contamination	The presence of a chemical agent on a person, object, or area.
Chemical explosion	A chemical explosion is caused by the extremely rapid conversion of a solid or liquid explosive compound into gases having a much greater volume than the substances from which they are generated. The entire process takes only a fraction of a second, produces extremely high temperatures (several thousand degrees) and is accompanied by shock and loud noise. With the single exception of nuclear explosives, all manufactured explosives are chemical explosions.
Chemical warfare	The military use of chemical agents to kill, injure, or incapacitate humans or to cause adverse effects on materials.

Chemical warfare agent	A chemical substance which, because of its physiological, psychological, or pharmacological effects, is intended for use in military operations to kill, seriously injure, or incapacitate humans (or animals) through its toxicological effects. Excluded are riot control agents, chemical herbicides, and smoke and flame agents.
Chlorine	A choking agent that is typically a nonpersistent, heavy, greenish-yellow gas.
Choking agents	These agents exert their effects solely on the lungs and result in the irritation of the alveoli of the lungs. Agents cause the alveoli to constantly secrete watery fluid into the air sacs, which is called pulmonary edema. When a lethal amount of a choking agent is received, the air sacs become so flooded that the air cannot enter and the victim dies of anoxia (oxygen deficiency); also known as dry land drowning.
CIA	Central Intelligence Agency.
CIRG	Critical Incident Response Group.
CISD	Critical Incident Stress Debriefing.
Classification of chemical agents	Chemical agents are classified according to their physical chemical state, use and physical action.
CNS	Pertaining to the central nervous system.
COG	Continuity of Government.
Cold (support) zone	Clean area outside the inner perimeter where command and support functions take place. Special protective clothing is not required in this area.
Concentration	The amount of a chemical agent present in a unit volume of air or water; usually expressed in milligrams per cubic meter (mg/m^3).
Concentration time	The amount of a chemical agent present in a unit volume of air multiplied by the time an individual is exposed to that concentration.
Contagious	Capable of being transmitted from one person to another.
Conjunctivitis	Redness in the eye.

Consequence management	Measures to alleviate the damage, loss, hardship, or suffering caused by emergencies. It includes measures to restore essential government service, protect public health and safety, and provide emergency relief to affected governments, businesses, and individuals. This role is assigned to FEMA in the FRP.
Contagious	Capable of being transmitted from one person to another.
Containment	The attempt to prevent or limit the spread of contamination by holding it in, enclosing, encapsulating, or by controlling it.
Contamination	The condition resulting from the deposit of radioactive material, biological agents, or chemical agents in or upon structures, areas, bodies of water, personnel and objects or from failure of normal sanitary safeguards. This includes food, water, and medical supplies.
Corrosive materials	A type of chemical, found in liquid or solid form, which causes visible destruction or irreversible alterations in human tissue at the site of contact.
Crisis management	Measures to resolve the hostile situation, investigate, and prepare a criminal case for prosecution under Federal law. This role is assigned to the FBI in the FRP.
Cross contamination	Secondary contamination caused when a person or object is contaminated by coming into contact with another person or object which has not been properly or fully decontaminated. Elements of contamination can be nuclear, biological or chemical.
Cryogenics	Materials which exist at extremely low temperatures, such as nitrogen.
Culture	A population of microorganisms grown in a medium.
Cumulative	Additional exposure rather than repeated exposure. For example, a one-hour exposure of HD followed within a few hours by another exposure of one hour, had the same effect as a single exposure lasting for two hours.
Cutaneous	Pertaining to the skin.
Cyanide	A very poisonous compound that contains a nitrogen and a carbon atom and affects that ability of tissues to use oxygen.

Cyanogen bromide	A colorless or white crystalline, volatile solid with a penetrating odor. One of the blood agents.
Cyanogen chloride	A colorless gas or liquid with a pungent odor. One of the blood agents, its effects are similar to those of hydrogen cyanide.
Cyanogen iodide	A colorless or white needle like solid material with a very pungent odor and acrid taste. One of the blood agents.
CWA	Chemical Warfare Agents.
Decay	The process by which an unstable element is changed to another isotope or another element by the spontaneous emission of radiation from its nucleus.
Decontamination	The process of making any person, object, or area safe by absorbing, destroying, neutralizing, making harmless, or removing the hazardous material.
Defensive staging	Provides for all personnel to remain on the assigned apparatus, ready to respond or move at a moment's notice. It means stopping short of intersections, always having two means of egress from the staging area, having multiple staging areas, and generally being prepared for the unexpected.
Deflagration	A rapid burning process.
Delivery method	The manner in which an explosive or incendiary device was transported or positioned at the site of an explosives incident.
Desorption	The reverse process of absorption. The agent will be "removed" from the surface (outgassing).
Detonation	An instantaneous chemical reaction.
Dilution factor	Dilution of contaminated air with uncontaminated air in a general area, room, or building for the purpose of health hazard or nuisance control, and/or for heating and cooling.
Diphosgene	A choking agent that is a colorless liquid with an odor of newly mown hay.
Distance	One of the three components of the time, distance, and shielding (TDS) response; it refers to the recommendation that one should maintain distance from a hazard if at all possible. Refer to the *North American Emergency Response Guidebook* (NAERG) as an appropriate resource.

Distilled mustard	One of the blister agents that in its normal state is a colorless or amber colored oily liquid with the faint smell of garlic.
DOD	Department of Defense.
DOE	Department of Energy.
Dosage	The concentration of a chemical agent in the atmosphere (C) multiplied by the time (t) the concentration remains, expressed as mg-min/m. The dosage (Ct) received by a person depends upon how long he is exposed to the concentration. That is, the respiratory dosage in mg-min/m is equal to the time in minutes an individual is unmasked in an agent cloud multiplied by the concentration of the cloud.
DOT	Department of Transportation.
Downwind distance	The distance a toxic agent vapor cloud will travel from its point of origin, with the wind.
Dusty agent	A solid chemical agent that can be disseminated as an aerosol. CS (tear gas) is one example of a dusty agent.
EOC	Emergency Operations Center.
EOD	Explosive Ordnance Disposal.
EMA	Emergency Management Agency.
EMS	Emergency Medical Services.
Emergency Operations Plan (EOP)	An EOP is a document that (1) assigns responsibility to organizations and individuals for carrying out specific actions at projected times and places in an emergency that exceeds the capability or routine responsibility of any one agency; (2) sets forth lines of authority and organizational relationships, and shows how all actions will be coordinated; (3) describes how people and property will be protected in emergencies and disasters; (4) identifies personnel, equipment, facilities, supplies, and other resources available for use during response and recovery operations; and (5) identifies steps to address mitigation concerns during response and recovery activities.
ERT	Evidence Response Team.

Emergency Support Functions (ESF)	The Federal Response Plan (FRP) details 12 ESFs to coordinate operations during Federal involvement in an incident: transportation, communications, public works and engineering, firefighting, information and planning, mass care, resource support, health and medical services, urban search and rescue, hazardous materials, food, and energy.
ESE	Emergency Services Environment.
Etiological harm	Involves exposure to a living microorganism, or its toxins, which causes, or may cause, human disease. Biological agents are the most obvious examples of etiological agents.
Evaporation rate	The rate at which a liquid changes to vapor at normal room temperature.
Explosive	As defined by the US Department of Transportation, "a substance fitting into one of these two categories: (1) any substance or article, including a device, designed to function by explosion; or (2) any substance or article, including a device, which, by chemical reaction within itself, can function in a similar manner even if not designed to function by explosion."
FBI	Federal Bureau of Investigation.
Federal Response Plan (FRP)	Developed to help expedite Federal support to disasters. Generally, the FRP is activated when the State's resources are not sufficient to cope with a disaster, and the governor has requested Federal assistance.
FEMA	Federal Emergency Management Agency.
First responder	Personnel, such as firefighters, police officers and EMS teams, who have responsibility to initially respond to emergencies. They will be the first on the scene of an incident and will be responsible for the size-up and determining if additional resources are needed.
Fungi	Any group of plants mainly characterized by the absence of chlorophyll, the green colored compound found in other plants. Fungi range from microscopic single-celled plants (such as mold and mildews) to large plants (such as mushrooms).
GA	See Tabun.
GB	See Sarin.

GD	See Soman.
Gamma radiation	A high-energy, ionizing radiation that travels at the speed of light and has great penetrating power. Gamma rays can cause skin burns, severely injure internal organs, and have long-term, physiological effects.
GEDAPER	An acronym used to describe an incident analysis process developed by Dave Lesak. The steps include (1) Gathering information, (2) Estimating course and harm, (3) Determining strategic goals, (4) Assessing tactical options and resources, (5) Planning and implementing action, (6) Evaluating, and (7) Reviewing.
G-series nerve Agents	Chemical agents of moderate to high toxicity that were developed in the 1930s. Examples are Tabun (GA), Sarin (GB), and Soman (GD).
Hazard	A known or perceived danger.
HazMat	Hazardous Materials.
HD	See distilled mustard.
Herbicide	A chemical compound used to damage or kill plants including defoliants, desiccants, plant growth regulators, and soil sterilants.
High explosive	Those materials which detonate at velocities above 3300 feet per second.
Hoax device	An inactive or dummy device designed and intended to appear as a bomb or explosive material.
Host	An animal or plant that harbors or nourishes another organism.
Hot (exclusion) zone	Area immediately around the incident where serious threat of harm exists. It should extend far enough to prevent adverse effects from B-NICE agents to personnel outside the zone. Entry into the hot zone requires appropriately trained personnel use of proper personal protective equipment.
HN	See nitrogen mustard.
HVAC	Heating, Ventilation, and Air Conditioning.

Hydration	The combining of a substance with water.
Hydrogen cyanide	A poisonous blood agent that is usually a gaseous compound and has a taste associated with bitter almonds.
Hydrolysis	The reaction of any chemical substance with water, moisture, or vapor by which decomposition of the substance occurs and one or more new substances are produced.
IC	Incident Commander.
ICP	Incident Command Post.
ICS	Incident Command System.
IDLH	Concentrations immediately dangerous to life and health.
IED	Improvised explosive device. A homemade device consisting of an explosive/incendiary and firing components necessary to initiate the device.
Incapacitating agents	Produce temporary physiological and/or mental effects via action on the central nervous system. Effects may persist for hours or days, but victims usually do not require medical treatment. However, such treatment speeds recovery.
Incendiary device	Any mechanical, electrical or chemical device used intentionally to initiate combustion and start a fire.
Incident Command System (ICS)	The combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure with responsibility for the management of assigned resources to effectively accomplish stated objectives pertaining to an incident.
Industrial agents	Chemicals developed or manufactured for use in industrial operations or research by industry, government, or academia. These chemicals are not primarily manufactured for the specific purpose of producing human casualties or rendering equipment, facilities, or areas dangerous for use by man. Hydrogen cyanide, cyanogen chloride, phosgene, chloropicrin and many herbicides and pesticides are industrial chemicals that also can be chemical agents.
Infectious agents	Biological agents capable of reproducing in an infected host.

Infectivity	(1) The ability of an organism to spread. (2) The number of organisms required to cause an infection to secondary hosts. (3) The capability of an organism to spread out from the site of infection and cause disease in the host organism.
IG	Instructor Guide.
Initial downwind vapor hazard area	Areas initially established to evacuate all unprotected personnel and to prevent other unprotected personnel from entering and thus encountering agent vapors or any other type of contamination.
Latent period	Specifically, in the case of mustard, the period between exposure and onset of signs and symptoms; otherwise, an incubation period.
LD50	Lethal Dose 50. The amount of exposure required to cause death in 50% of the population.
LD90	Lethal Dose 90. The amount of exposure required to cause death in 90% of the population.
Lethal chemical agent	An agent that may be used effectively in a field concentration to produce death.
Level "A" protection	The level of protective equipment required in situations where the material is considered acutely vapor toxic to the skin and hazards are unknown. Full encapsulation, air tight chemical suit with SCBA or SABA.
Level "B" protection	The level of protective equipment required in situations where the environment is not considered acutely vapor toxic to skin but may cause respiratory effects. Chemical splash suit or full coverage non-airtight chemical suit with SCBA or SABA.
Level "C" protection	The level of protective equipment required to prevent respiratory exposure but not to exclude possible skin contact. Chemical splash suit with air purifying respirator (cartridge respirator).
Level "D" protection	The level of protective equipment required when the atmosphere contains no known hazard, when splashes, immersions, inhalation, or contact with hazardous levels of any chemical is precluded. Work uniform such as coveralls, boots, leather gloves, and hard hat.

Lewisite	A blister agent that is an alipathic arsenic compound. The pure form is colorless to brown or violet liquid with a fruity or geranium like odor.
Liquid agent	A chemical agent that appears to be an oily film or droplets. The color ranges from clear to brownish amber.
Local EOP	The local Emergency Operations Plan focuses on essential measures for protecting the public, to include warning, emergency public information, evacuation and shelter. Local EOPs should include a mechanism for emergency responders and managers to notify and activate State resources.
Low explosives	Those materials that detonate at velocities below 3299 feet per second.
Mechanical explosion	A mechanical explosion may be illustrated by the gradual buildup of pressure in a steam boiler or pressure cooker. As heat is applied to the water inside the boiler, steam is generated. If the boiler is not equipped with some type of safety valve, the mounting pressure will eventually reach a point at which it will overcome the structural or material resistance of its container and an explosion will occur. Such a mechanical explosion will be accompanied by high temperatures, a rapid escape of gases or steam and a loud noise. Another example of mechanical explosion is that of a dust explosion in a grain elevator.
Median incapacitating dosage (ICT50)	The volume of a chemical agent vapor or aerosol inhaled that is sufficient to disable 50% of exposed, unprotected people (expressed as mg-min/m^3).
Median lethal dosage (LCT50)	The amount of liquid chemical agent expected to kill 50 percent of a group of exposed, unprotected individuals.
Methods of dissemination	The way a chemical agent or compound is released into the atmosphere.
Microorganism	Any organism, such as bacteria, viruses, and some fungi, that can be seen only with a microscope.
Miosis	A condition where the pupil of the eye becomes contracted (pinpointed). This condition impairs night-vision. It is a possible indicator of a nerve agent.

M8 chemical agent detector paper	A paper used to detect and identify liquid V- and G-type nerve agents and H-type blister agents.
M256 kit	A kit that detects and identifies vapor concentrations of nerve, blister, and blood agents.
Mustard agent	A clear yellow or amber colored oily liquid with a smell similar to garlic and usually classified as a blistering or vesicant chemical agent. Some examples include sulfur mustard and nitrogen mustard.
Mycotoxin	A toxin produced by fungi.
MAC	Multi-Agency Coordination (Committee, Group and Command are used in various jurisdictions).
Multi-Agency Coordination System (MACS)	The combination of facilities, equipment, personnel, procedures, and communications integrated into a common system with responsibility for coordination of assisting agency resources and support to agency emergency operations. (FIRESCOPE)
MATTS	Mobile Air Transportable Telecommunications System.
MERS	Mobile Emergency Response System.
Mustard (vesicants) agent	See Blister agent.
NAERG	The *North American Emergency Response Guidebook*.
NBC	Nuclear, Biological and Chemical.
Nerve agents	Substances that interfere with the central nervous system. Exposure is primarily through contact with the liquid (skin and eyes) and secondarily through inhalation of the vapor. Three distinct symptoms associated with nerve agents are pinpoint pupils, an extreme headache, and severe tightness in the chest.
NEST	Nuclear Emergency Search Team.
Nitrogen mustard	A blister agent that is colorless or amber colored oily liquid and has a faint geranium smell.
NFA	National Fire Academy.
NFPA	National Fire Protection Association.
NMRI	Naval Medical Research Institute.

Nonpersistent agent	An agent that upon release loses its ability to cause casualties after 10 to 15 minutes. It has a high evaporation rate and is lighter than air and will disperse rapidly. It is considered to be a short-term hazard. However, in small, unventilated areas, the agent will be more persistent.
Nuclear explosion	A nuclear explosion may be induced either by fission (the splitting of the nuclei of atoms) or fusion (the joining together under great force of the nuclei of atoms). When fission or fusion occurs, a tremendous release of energy, heat, gas and shock waves take place.
Organism	Any individual living thing, whether animal or plant.
Organophosphate	A compound with a specific phosphate group which inhibits acetylcholinesterase. Used in chemical warfare and as an insecticide.
Organophosphorus compound	A compound, containing the elements phosphorus and carbon, whose physiological effects include inhibition of acetylcholinesterase. Man-made pesticides (malathion and parathion) and virtually all nerve agents are organophosphorus compounds.
OSHA	Occupational Safety and Health Administration.
Overpacking	The placement of the agent or its container within another container.
Parasite	Any organism that lives in or on another organism without providing benefit in return.
Pathogen	Any organism (usually living) capable of producing serious disease or death, such as bacteria, fungi, and viruses.
Pathogenic agent	Biological agents capable of causing serious diseases.
PEL	Permissible exposure limit. An occupational health term used to describe exposure limits for employees. Usually described in time weighted averages (TWA). Established by OSHA.
Percutaneous agent	Able to be absorbed through the body.
Permeation	The process by which a chemical moves through protective clothing.

Permeation rate	The rate at which a chemical permeates a solid, such as fabric.
Persistence	A measure of the duration for which a chemical agent is effective. The property is relative and varies by agent, method of dissemination, and environmental conditions, such as weather and terrain.
Persistent agent	An agent that upon release retains its casualty-producing effects for an extended period of time, usually anywhere from 30 minutes to several days. A persistent agent usually has a low evaporation rate and its vapor is heavier than air. Therefore, its vapor cloud tends to hug the ground. It is considered to be a long-term hazard. Although inhalation hazards are still a concern, extreme caution should be taken to avoid skin contact as well.
Phosgene	A colorless gas that is a severe respiratory irritant. It smells like new mown hay and imparts a metallic taste similar to tobacco smoke.
Physiological action	Most toxic chemical agents are used for their toxic effects, that is, to produce a harmful physiological reaction when applied to the human body externally, or when breathed, or taken internally. This reaction of chemical agents, within the body or on the body, is the physiological action.
PID	Photoionization Detectors.
PIO	Public Information Officer.
Plan of Action	A written document that consolidates all of the operational actions to be taken by various personnel in order to stabilize an incident.
PPE	Personal protective equipment.
Precursor	A chemical substance required for the manufacture of chemical agent.
Presidential Decision Directive 39 (PDD-39)	Issued in June 1995, PDD-39, *United States Policy on Counterterrorism*, directed a number of measures to reduce the nation's vulnerability to terrorism, to deter and respond to terrorist acts, and to strengthen capabilities to prevent and manage the consequences of terrorist use of nuclear, biological and chemical weapons.

Protection	In the context of chemical, biological, nuclear or radiological, exposure, protective measures may include masks, self-contained breathing apparatus, clothing, buildings and so forth.
PSA	Public Safety Announcements.
Psychochemical	An agent, such as LSD, that incapacitates by distorting the perceptions and cognitive processes of the victim.
Radiation	This course is concerned with nuclear, not heat, radiation. There are three types of nuclear radiation: (1) alpha, (2) beta, and (3) gamma.
Radiological Dispersal Devices (RDD)	A conventional explosive device incorporating radioactive material(s); sometimes referred to as a "dirty" bomb.
Rally point	A predetermined location to which all persons evacuate in an emergency. In industry, facilities are evacuated and a rally point is usually predetermined. It is at this rally point that resources can regroup and a revised plan can be established.
RAP	Radiological Assistance Program.
Rate of action	The rate at which the body reacts to or is affected by a chemical substance or material.
Rate of detoxification	The rate at which the body can counteract the effects of a poisonous chemical substance.
Rate of hydrolysis	The rate at which the various chemical agents or compounds are decomposed by water.
Reconnaissance (RECON)	A primary survey used to gather information.
Respiratory dosage	This is equal to the time in minutes an individual is unmasked in an agent cloud multiplied by the concentration of the cloud.
Rhinorrhea	A runny nose.
Ricin	A plant toxin derived from the coat of the castor bean. Ricin poisoning occurs through blockages of the body's synthesis of proteins.

Rickettsia	Any of a family (Rickettsiaceae) of pleomorphic rod-shaped nonfilterable microorganisms that cause various diseases (such as typhus).
Risk	Being exposed to a known or perceived danger--exposure to a hazard.
Route of exposure	The path by which an agent or micro-organism enters the body (breathing, digestion, skin contact).
SABA	Supplied air breathing apparatus.
Safe Refuge Area (SRA)	An area within the contamination reduction zone for the assemblage of individuals who are witnesses to the incident. This assemblage will provide for the separation of contaminated persons from non-contaminated persons.
SAC	Special Agent in Charge.
SARA	Superfund Amendments and Reauthorization Act of 1986.
SCBA	Self-contained breathing apparatus.
Sarin	One of the G series nerve agents. It is composed of methylphosphoryldifluoride (DF) plus isopropanol.
Secondary device	A device placed by perpetrators at the scene of an incident, specifically designed to harm responders.
SEE Principle:	The idea of establishing strategies based on the principle that actions required will be Safe, Effective, and Efficient.
Sensitize	To become highly responsive or easily receptive to the effects of toxic chemical agents after the initial exposure.
SAC Shielding	On of the three components of TDS; it refers to maintaining significant physical barriers between the responders and the hazard. Examples include vehicles, buildings, walls and PPE.
Short Term Exposure Limit (STEL)	A 15-minute time-weighted average exposure which should not be exceeded at any time during a work day even if the 8-hour time-weighted average (TWA) is within the threshold limit value (TLV). Exposures at the STEL should not be repeated more than four times a day and there should be at least 60 minutes between successive exposures at the STEL.

Simple asphyxiant	Generally, an inert gas that displaces the oxygen necessary for breathing or dilutes the oxygen concentration below the level that is useful to the human body.
Site safety plan (SSP)	An Emergency Response Plan describing the general safety procedures to be followed at an incident involving hazardous materials.
Size-up	The rapid evaluation of the factors that influence an incident. Size-up is the first step in determining a course of action.
Skin dosage	This is equal to the time of exposure in minutes of an individual's unprotected skin multiplied by the concentration of the agent cloud.
SLUD syndrome	Acronym for salivation, lacrimation, urination, defecation. These symptoms are often present in a person exposed to organophosphates, such as nerve agents.
SLUDGE syndrome	Acronym for salivation, lacrimation, urination, defecation, gastric distress, and emesis.
SLUDGE M	Acronym for salivation, lacrimation, urination, defecation, gastric distress, emesis and miosis.
SM	Student Manual.
SOGs	Standard Operating Guidelines.
Solubility	The ability of a material to dissolve in water or another liquid.
Solvent	A material which is capable of dissolving another chemical.
Soman	A G series nerve agent composed of methylphosphonylfluoride (DF) plus pinacolyl alcohol.
Source strength	The weight of a chemical agent that is at the chemical accident/incident site and may be released into the environment.
Specific gravity	The weight of a liquid compared to the weight of an equal volume of water.
Spore	A reproductive form some microorganisms can take to become resistant to environmental conditions, such as extreme heat or cold, while in a "resting phase."

State EOP	The State EOP is the framework within which local EOPs are created and through which the Federal government becomes involved. The States play three roles: (1) they assist local jurisdictions whose capabilities are overwhelmed by an emergency, (2) they themselves respond first to certain emergencies, and (3) they work with the Federal government when Federal assistance is necessary.
Sulfur mustard	See blister agent or distilled mustard.
Tabun	A G series nerve agent.
Team CPR	Acronym used to identify harm from the exposure that may be found at an event: **T**hermal, **E**tiological, **A**sphyxiant, **C**hemical, **P**sychological, **M**echanical.
Tear agents	Produce irritating or disabling effects such as a large flow of tears and intense eye pain and irritation of the skin that rapidly disappear within minutes after exposure.
Terrorism	A violent act or an act dangerous to human life, in violation of the criminal laws of the United States or any segment, to intimidate or coerce a government, the civilian population or any segment thereof, in furtherance of political or social objectives (US Department of Justice).
Terrorism Incident Annex	The annex to the FRP that describes the Federal concept of operations to implement PDD-39 when necessary to respond to terrorist incidents within the US.
Terrorist incident	A violent act, or an act dangerous to human life, in violation of the criminal laws of the United States or of any State, to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives (FBI definition).
Time	One of the three components of TDS; it refers to the amount of time a responder should be exposed to an incident. It is recommended that one should spend the shortest amount of time possible in the hazard area.
Time, Distance and Shielding (TDS)	Three types of protective measures commonly associated with hazardous materials training.
TIMPS	Terrorist Incident Management Plan Study.

Time-Weighted Average (TWA)	The average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed without adverse effect.
Toxic	Nonliving poisons that are the products of animals, vegetables, or micro-organisms. These poisons can kill or incapacitate when they are inhaled, swallowed, or injected into humans or animals. Snake venom is an example of a toxin.
Toxicity	A measure of the harmful effect produced by a given amount of toxin on a living organism. The relative toxicity of an agent can be expressed in milligrams of toxin needed per kilogram of body weight to kill experimental animals.
Toxins	Toxic substances of natural origin produced by an animal, plant or microbe. They differ from chemical substances in that they are not manmade. Toxins include botulism, ricin, and mycotoxins.
TRACEM	The acronym used to identify the six types of harm one may encounter at a terrorist incident: Thermal, Radioactive, Asphyxiation, Chemical, Etiological and Mechanical.
Triage sorting	A technique of establishing rescue, decontamination, treatment and transportation priorities in any event where the number of casualties overwhelms the resources of the emergency response organizations.
Unified command	In ICS, Unified Command is a unified team effort which allows all agencies with responsibility for the incident, either geographical or functional, to manage an incident by establishing a common set of incident objectives and strategies. This is accomplished without losing or abdicating agency authority, responsibility or accountability.
Upwind	In or toward the direction from which the wind blows. To be upwind of an item, the wind would be blowing from your position to the item.
Urticant	A chemical agent that produces irritation at the point of contact, resembling a stinging sensation, such as a bee sting. For example, the initial physiological effects of phosgene oxime (CX) upon contact with a person's skin.
Urticaria	A skin condition characterized by intensely itching, red, raised patches.

USAMRIC	US Army Medical Research Institute of Chemical Defense.
USAMRIID	US Army Medical Research Institute of Infectious Diseases.
USAR/US&R	Urban search and rescue. A team specifically trained and equipped for large or complex urban search and rescue operations. The multi-disciplinary organization provides five functional elements which include command, search, rescue, medical and technical.
V-series nerve agents	Chemical agents that are extremely toxic developed in the 1950s. They are generally persistent.
Vaccine	A preparation of killed or weakened microorganism products used to artificially induce immunity against a disease.
Vapor	A gaseous form of a chemical agent. If heavier than air, the cloud will be close to the ground, if lighter than air, the cloud will rise and disperse more quickly.
Vapor agent	A gaseous form of a chemical agent. If heavier than air, the cloud will be close to the ground; if lighter than air, the cloud will rise and disperse more quickly.
Vapor density	A comparison of any gas or vapor to the weight of an equal amount of air. Vapor density < 1 means the substance is lighter than air; vapor density > 1 means the substance is heavier than air.
Vapor pressure	Is the pressure produced or exerted by the vapors given off by a liquid. That is, as a liquid vaporizes, the vapors produce a pressure.
VEE	Venezuelan Equine Encephalitis.
Vesicant agent	An agent that acts on the eyes and lungs and blisters the skin.
Vesicles	Blisters on the skin.
Virus	An infectious microorganism that exists as a particle rather than as a complete cell. Particle sizes range from 200 to 400 manometers (one-billionth of a meter). Viruses are not capable of reproducing outside of a host cell.
Viscosity	The degree to which a fluid resists flow.
Volatility	With chemical agents, it refers to their ability to change from a liquid state into a gaseous state (the ability of a material to evaporate).

Vomiting agents	Substances that produce nausea and vomiting effects, and can also cause coughing, sneezing, pain in the nose and throat, nasal discharge, and tears.
Vulnerability	Being in an exposed position or being at a disadvantage.
VX	A persistent V series nerve agent with a consistency likened to a nonvolatile oil. Also known as O-ethyl S-2 diisopropylaminoethyl methylphosphonothiolate.
Warm Zone	A buffer area between the hot and cold zones. Personnel in this area are removed from immediate threat, but are not considered completely safe from harm. In HazMat incidents, this zone is also the contamination reduction zone where initial decontamination activities occur. This zone requires the use of proper personal protective equipment once contaminated people or equipment enter the zone.
Weapon of Mass Destruction (WMD)	(1) Any explosive, incendiary, poison gas, bomb, grenade, or rocket having a propellant charge of more than four ounces, missile having an explosive or incendiary charge of more than one-quarter ounce, or mine or device similar to the above. (2) Poison gas. (3) Any weapon involving a disease organism. (4) Any weapon that is designed to release radiation at a level dangerous to human life.
Wheal	An acute swelling of the skin. This condition is common to a bee sting.
Zoonotic	A disease that can move through the animal-human barrier.

Appendix C: Supplemental Information on Self-Protection

UNIVERSAL PRECAUTIONS FOR PREVENTION OF TRANSMISSION OF HIV AND OTHER BLOODBORNE INFECTIONS

"Universal precautions," as defined by CDC, are a set of precautions designed to prevent transmission of human immunodeficiency virus (HIV), hepatitis B virus (HBV), and other bloodborne pathogens when providing first aid or health care. Under universal precautions, blood and certain body fluids of all patients are considered potentially infectious for HIV, HBV and other bloodborne pathogens.

Universal precautions took the place of and eliminated the need for the isolation category "Blood and Body Fluid Precautions" in the 1983 CDC Guidelines for Isolation Precautions in Hospitals. However, implementing universal precautions does not eliminate the need for other isolation precautions, such as droplet precautions for influenza, airborne isolation for pulmonary tuberculosis, or contact isolation for methicillin-resistant Staphylococcus aureus.

In 1996, CDC published new guidelines (standard precautions) for isolation precautions in hospitals. Standard precautions synthesize the major features of BSI and universal precautions to prevent transmission of a variety of organisms. Standard precautions were developed for use in hospitals and may not necessarily be indicated in other settings where universal precautions are used, such as child care settings and schools.

Universal precautions apply to blood, other body fluids containing visible blood, semen, and vaginal secretions. Universal precautions also apply to tissues and to the following fluids: cerebrospinal, synovial, pleural, peritoneal, pericardial, and amniotic fluids. Universal precautions do not apply to feces, nasal secretions, sputum, sweat, tears, urine, and vomits unless they contain visible blood. Universal precautions do not apply to saliva except when visibly contaminated with blood or in the dental setting where blood contamination of saliva is predictable.

Universal precautions involve the use of protective barriers such as gloves, gowns, aprons, masks, or protective eyewear, which can reduce the risk of exposure of the health care worker's skin or mucous membranes to potentially infective materials. In addition, under universal precautions, it is recommended that all health care workers take precautions to prevent injuries caused by needles, scalpels, and other sharp instruments or devices.

GLOVING, GOWNING, MASKING, AND OTHER PROTECTIVE BARRIERS AS PART OF UNIVERSAL PRECAUTIONS

All health care workers should routinely use appropriate barrier precautions to prevent skin and mucous membrane exposure during contact with any patient's blood or body fluids that require universal precautions.

Gloves should be worn:

- for touching blood and body fluids requiring universal precautions, mucous membranes, or nonintact skin of all patients, and
- for handling items or surfaces soiled with blood or body fluids to which universal precautions apply.

Gloves should be changed after contact with each patient. Hands and other skin surfaces should be washed immediately or as soon as patient safety permits if contaminated with blood or body fluids requiring universal precautions. Hands should be washed immediately after gloves are removed. Gloves should reduce the incidence of blood contamination of hands during phlebotomy, but they cannot prevent penetrating injuries caused by needles or other sharp instruments. Institutions that judge routine gloving for all phlebotomies is not necessary should periodically reevaluate their policy. Gloves should always be available to health care workers who wish to use them for phlebotomy. In addition, the following general guidelines apply:

1. Use gloves for performing phlebotomy when the health care worker has cuts, scratches, or other breaks in his/her skin.
2. Use gloves in situations where the health care worker judges that hand contamination with blood may occur, e.g., when performing phlebotomy on an uncooperative patient.
3. Use gloves for performing finger and/or heel sticks on infants and children.
4. Use gloves when persons are receiving training in phlebotomy.

The Center for Devices and Radiological Health, Food and Drug Administration (FDA), has responsibility for regulating the medical glove industry. For more information about selection of gloves, call FDA at 301-443-8913.

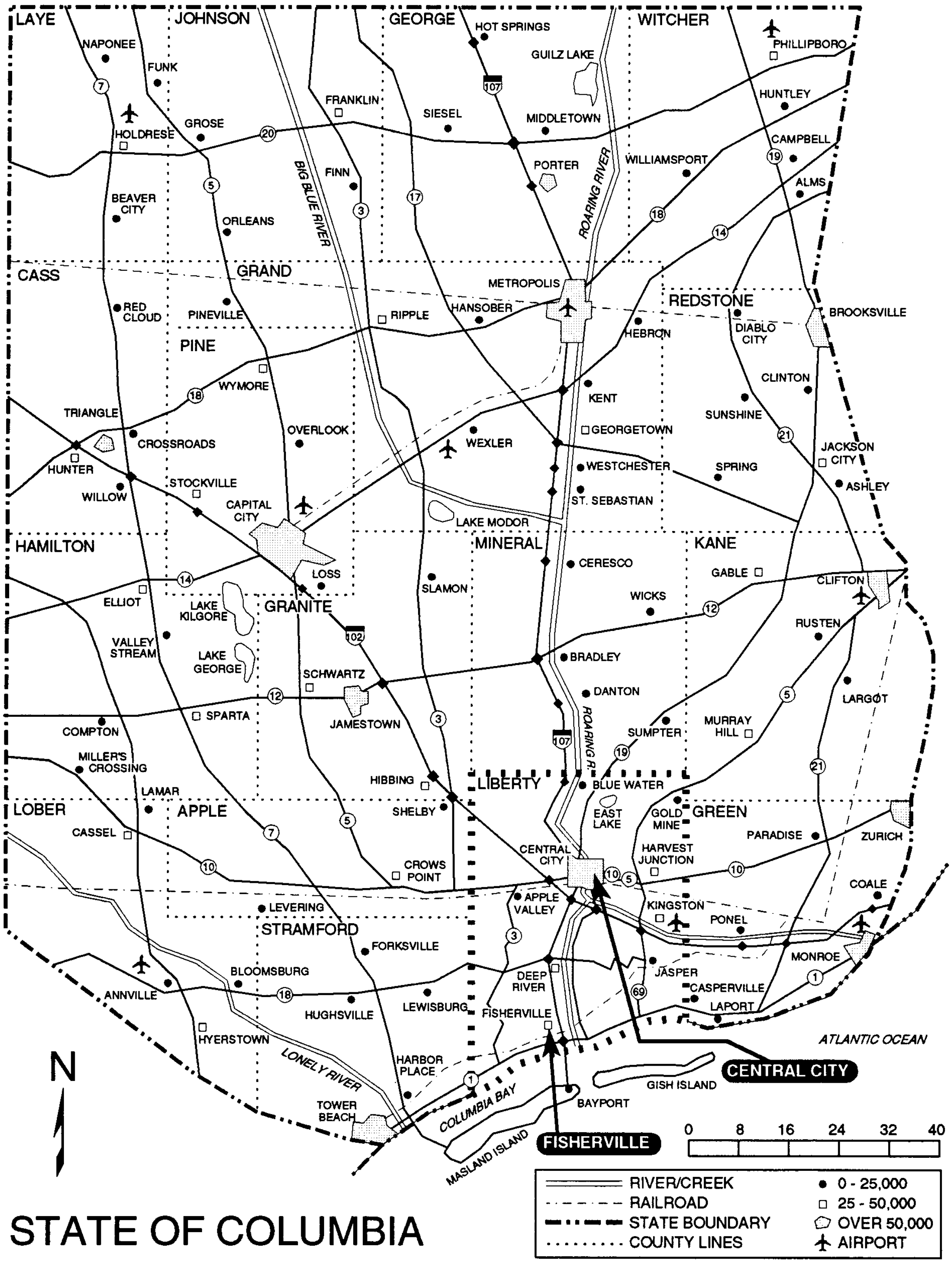
Masks and protective eyewear or face shields should be worn by health care workers to prevent exposure of mucous membranes of the mouth, nose, and eyes during procedures that are likely to generate droplets of blood or body fluids requiring universal precautions. Gowns or aprons should be worn during procedures that are likely to generate splashes of blood or body fluids requiring universal precautions.

All health care workers should take precautions to prevent injuries caused by needles, scalpels, and other sharp instruments or devices during procedures; when cleaning used instruments; during disposal of used needles; and when handling sharp instruments after procedures. To prevent needlestick injuries, needles should not be recapped by hand, purposely bent or broken by hand, removed from disposable syringes, or otherwise manipulated by hand. After they are used, disposable syringes and needles, scalpel blades, and other sharp items should be placed in puncture-resistant containers for disposal. The puncture-resistant containers should be located as close as practical to the use area. All reusable needles should be placed in a puncture-resistant container for transport to the reprocessing area.

General infection control practices should further minimize the already minute risk for salivary transmission of HIV. These infection control practices include the use of gloves for digital examination of mucous membranes and endotracheal suctioning, handwashing after exposure to saliva, and minimizing the need for emergency mouth-to-mouth resuscitation by making mouthpieces and other ventilation devices available for use in areas where the need for resuscitation is predictable.

National Center for Infectious Diseases
Centers for Disease Control and Prevention
Atlanta, GA
Updated: 03/19/97 10:42:26

Appendix D:
Blue Water County Model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GEORGE
WITCHER
NAPONEE
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HOT SPRINGS
GUILZ LAKE
PHILLIPBORO
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SIESEL
MIDDLETOWN
HUNTLEY
HOLDRESE
GROSE
CAMPBELL
PORTER
WILLIAMSPORT
FINN
ALMS
BIG BLUE RIVER
ROARING RIVER
BEAVER CITY
ORLEANS
CASS
GRAND
METROPOLIS
REDSTONE
RED CLOUD
PINEVILLE
RIPPLE
HANSOBER
BROOKSVILLE
HEBRON
DIABLO CITY
PINE
WYMORE
KENT
CLINTON
TRIANGLE
SUNSHINE
OVERLOOK
GEORGETOWN
CROSSROADS
WEXLER
JACKSON CITY
HUNTER
WESTCHESTER
SPRING
STOCKVILLE
ASHLEY
WILLOW
ST. SEBASTIAN
CAPITAL CITY
LAKE MODOR
HAMILTON
MINERAL
KANE
CERESCO
GABLE
LOSS
SLAMON
CLIFTON
ELLIOT
LAKE KILGORE
GRANITE
WICKS
RUSTEN
VALLEY STREAM
LAKE GEORGE
BRADLEY
SCHWARTZ
LARGOT
DANTON
SPARTA
JAMESTOWN
MURRAY HILL
COMPTON
SUMPTER
ROARING R.
MILLER'S CROSSING
HIBBING
LIBERTY
BLUE WATER
LAMAR
LOBER
APPLE
SHELBY
EAST LAKE
GOLD MINE
GREEN
CASSEL
PARADISE
ZURICH
HARVEST JUNCTION
CENTRAL CITY
CROWS POINT
COALE
APPLE VALLEY
KINGSTON
LEVERING
PONEL
STRAMFORD
FORKSVILLE
MONROE
BLOOMSBURG
JASPER
DEEP RIVER
CASPERVILLE
ANNVILLE
HUGHSVILLE
LEWISBURG
FISHERVILLE
LAPORT
HYERSTOWN
ATLANTIC OCEAN
LONELY RIVER
HARBOR PLACE
CENTRAL CITY
N
GISH ISLAND
TOWER BEACH
COLUMBIA BAY
BAYPORT
MASLAND ISLAND
FISHERVILLE
0 8 16 24 32 40
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RIVER/CREEK
RAILROAD
STATE BOUNDARY
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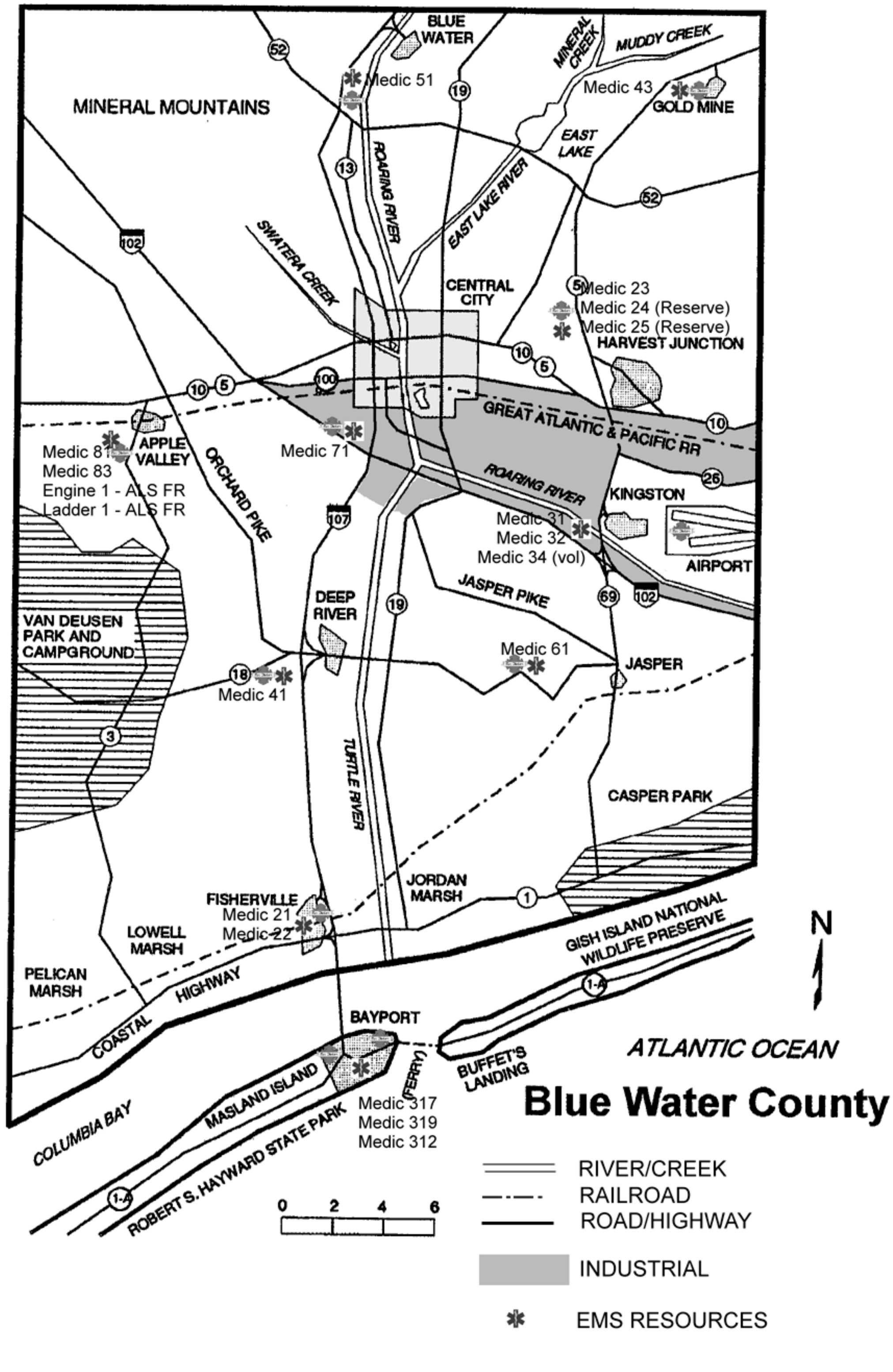
OVER 50,000
AIRPORT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MUDDY CREEK
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GOLD MINE
MINERAL MOUNTAINS
EAST LAKE
ROARING RIVER
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SWATERA CREEK
CENTRAL CITY
Medic 23
Medic 24 (Reserve)
Medic 25 (Reserve)
HARVEST JUNCTION
GREAT ATLANTIC & PACIFIC RR
APPLE VALLEY
Medic 81
Medic 83
Engine 1 - ALS FR
Ladder 1 - ALS FR
Medic 71
ORCHARD PIKE
ROARING RIVER
KINGSTON
AIRPORT
Medic 31
Medic 32
Medic 34 (vol)
JASPER PIKE
DEEP RIVER
VAN DEUSEN PARK AND CAMPGROUND
Medic 61
JASPER
Medic 41
TURTLE RIVER
CASPER PARK
JORDAN MARSH
FISHERVILLE
Medic 21
Medic 22
LOWELL MARSH
PELICAN MARSH
GISH ISLAND NATIONAL WILDLIFE PRESERVE
COASTAL HIGHWAY
BAYPORT
(FERRY)
BUFFET'S LANDING
ATLANTIC OCEAN
MASLAND ISLAND
COLUMBIA BAY
ROBERT S. HAYWARD STATE PARK
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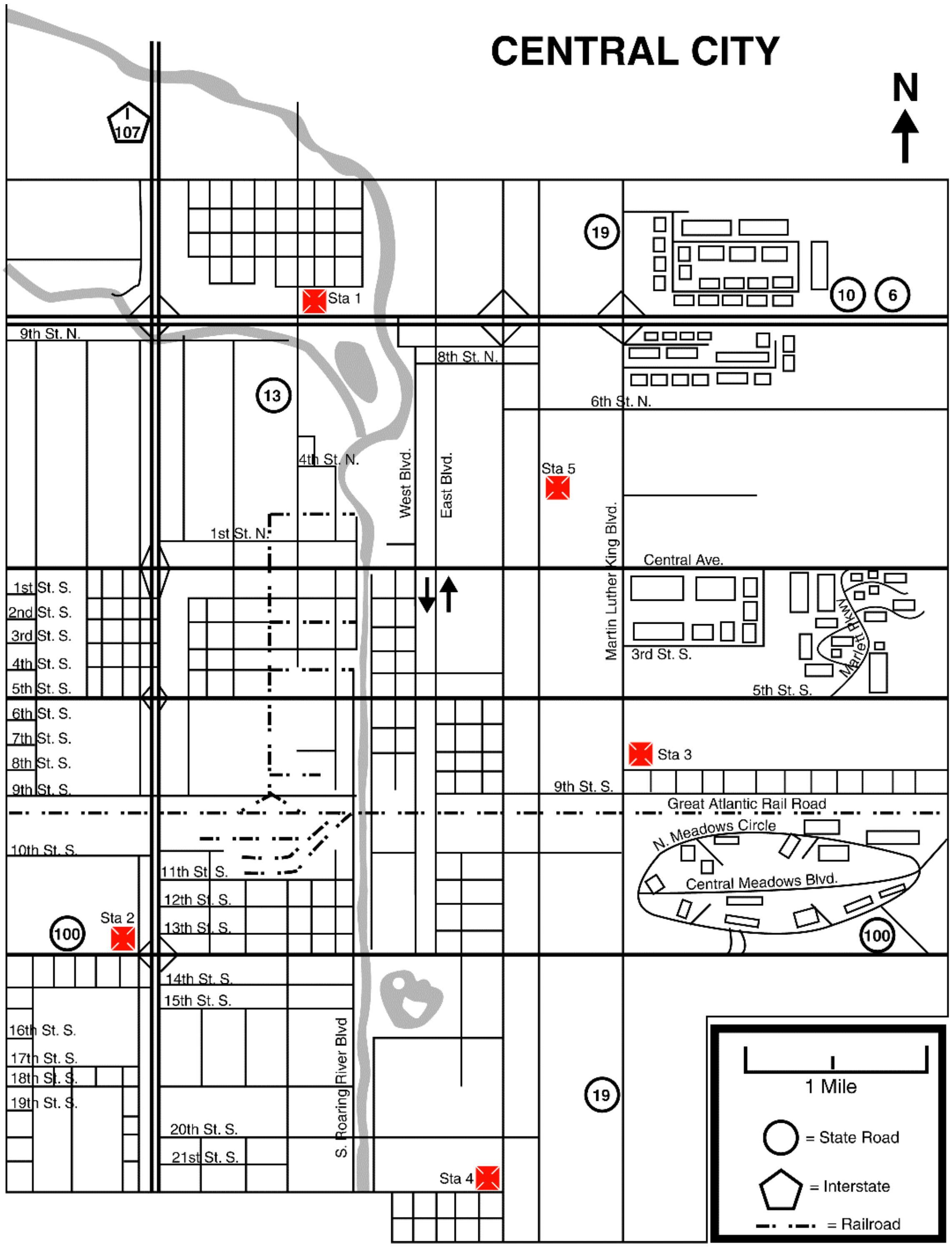
RIVER/CREEK
RAILROAD
ROAD/HIGHWAY
INDUSTRIAL
EMS RESOURCES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West Blvd.
East Blvd.
Sta 5
1st St. N.
Martin Luther King Blvd.
Central Ave.
1st St. S.
2nd St. S.
3rd St. S.
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9th St. S.
3rd St. S.
5th St. S.
Marlett Pkwy.
Sta 3
9th St. S.
Great Atlantic Rail Road
N. Meadows Circle
Central Meadows Blvd.
10th St. S.
11th St. S.
12th St. S.
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Sta 2
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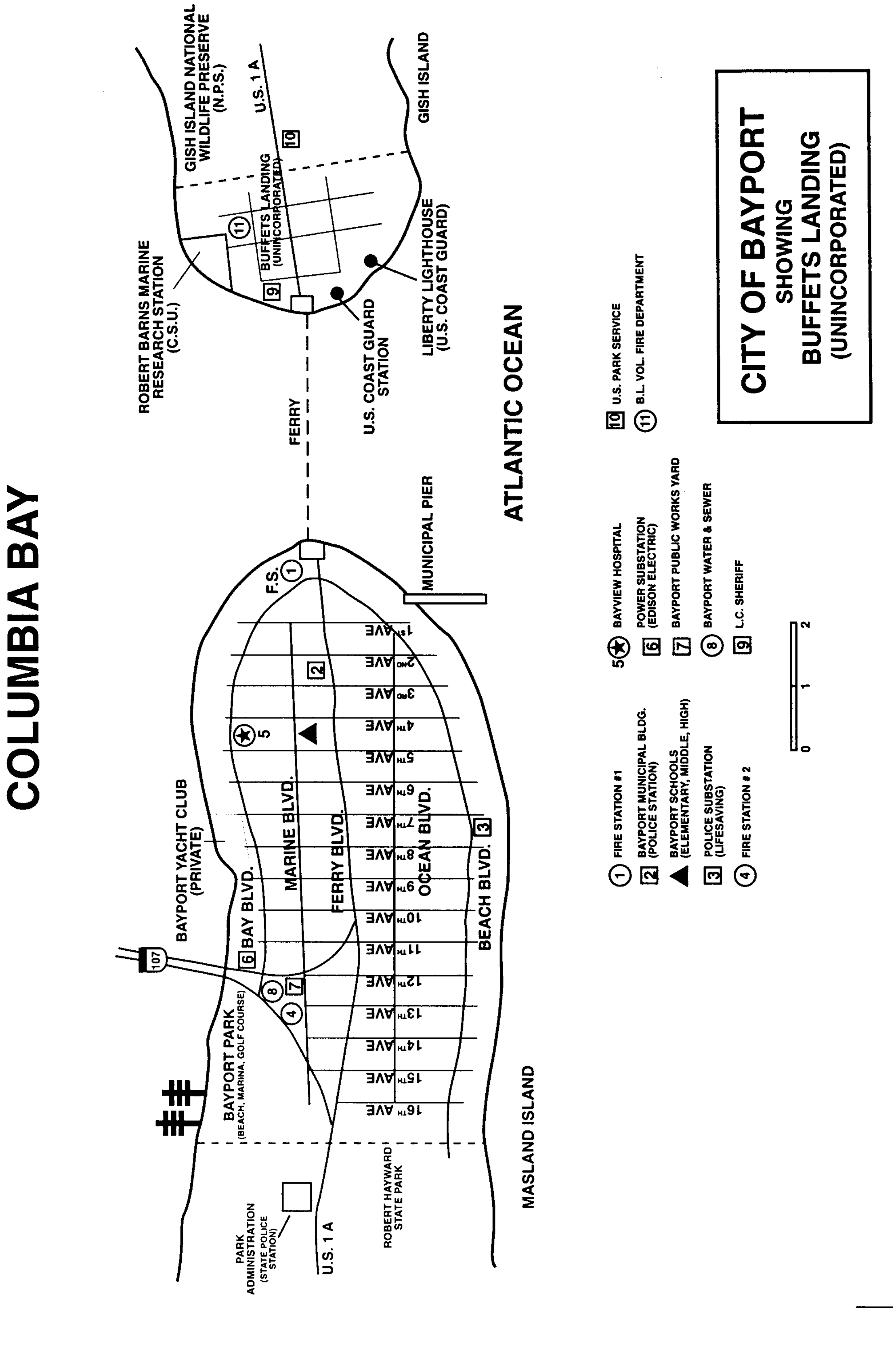
S. Roaring River Blvd
19
Sta 4
1 Mile
= State Road
= Interstate
= Railroad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ATLANTIC OCEAN
CITY OF BAYPORT
SHOWING
BUFFETS LANDING
(UNINCORPORATED)
GISH ISLAND NATIONAL WILDLIFE PRESERVE (N.P.S.)
U.S. 1 A
GISH ISLAND
BUFFETS LANDING (UNINCORPORATED)
ROBERT BARNS MARINE RESEARCH STATION (C.S.U.)
LIBERTY LIGHTHOUSE (U.S. COAST GUARD)
U.S. COAST GUARD STATION
FERRY
MUNICIPAL PIER
F.S.
BAYPORT YACHT CLUB (PRIVATE)
BAY BLVD.
MARINE BLVD.
FERRY BLVD.
OCEAN BLVD.
BEACH BLVD.
1ST AVE
2ND AVE
3RD AVE
4TH AVE
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7TH AVE
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11TH AVE
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13TH AVE
14TH AVE
15TH AVE
16TH AVE
107
BAYPORT PARK (BEACH, MARINA, GOLF COURSE)
MASLAND ISLAND
ROBERT HAYWARD STATE PARK
PARK ADMINISTRATION (STATE POLICE STATION)
U.S. 1 A
1 FIRE STATION #1
2 BAYPORT MUNICIPAL BLDG. (POLICE STATION)
BAYPORT SCHOOLS (ELEMENTARY, MIDDLE, HIGH)
3 POLICE SUBSTATION (LIFESAVING)
4 FIRE STATION # 2
5 BAYVIEW HOSPITAL
6 POWER SUBSTATION (EDISON ELECTRIC)
7 BAYPORT PUBLIC WORKS YARD
8 BAYPORT WATER & SEWER
9 L.C. SHERIFF
10 U.S. PARK SERVICE
11 B.L. VOL. FIRE DEPARTMENT
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Appendix E: State Of The Art Terrorism

KYLE B. OLSON, Research Planning Incorporated
Washington, DC March 1997

INTRODUCTION

The March 20, 1995 Tokyo subway nerve gas attack, with its sensational details and intense international media coverage, was the first event to really force most people to seriously consider the danger of nerve gas and other weapons of mass destruction in a terrorist context. This paper provides a brief summary of a study that actually began months before the Tokyo attack, in the fall of 1994. In October of that year I was approached by a Japanese television network seeking an on-camera expert to investigate the apparent release of the nerve agent, *sarin,* during the previous June in the city of Matsumoto.

I subsequently visited Japan for two weeks in December 1994. In the course of my studies there, I concluded that the nerve agent attack had been deliberately planned and executed by an unknown but technically sophisticated group; that this attack had probably been a demonstration or field-test of a newly acquired capability; and that, in all likelihood, the terrorists would use sarin again, probably striking at a higher profile objective. In a report published in January of 1995 in both Japan and the United States, I speculated that a likely target might be the Tokyo subway at rush hour.

In the six months following the now infamous March 20, 1995 poison gas attack on the Tokyo subway, I visited Japan eight more times and Russia once, gathering the information presented in this paper. The timeline of interest here roughly stretches from June 27th, 1994, the Matsumoto event, on through the Tokyo attack, and up to the present time.

THE TOKYO ATTACK

Tokyo, March 20, 1995, 8:00 a.m.. Packages were placed on five different trains during a Monday morning rush hour in the world's busiest subway system. Over the next several minutes, the packages began to leak a toxic chemical mixture including a significant quantity of sarin.

The original plan of attack had been to place the nerve gas on six different trains on three separate lines, all converging on the center of Tokyo. Because of an insufficient supply of sarin, the attackers chose to attack only one train on the Chiyoda line, so as a result there were only five trains attacked.

A map of the Tokyo subway system clearly demonstrates that the pattern of injury reports converged from the outskirts of the city toward Kasumigaseki, a central station for all three subway lines that serves most of the important Japanese government agencies, including the headquarters of the National Police Agency (NPA) which is directly above the station. Based on confessions obtained from some of the attackers themselves, we now know that the NPA, itself, was the actual target of the attack; more precisely, the targets were NPA officers and arriving for work during that morning rush hour.

By the end of the day, at least fifteen different subway stations had been affected and reported injuries, the heaviest casualty reports--in some cases, four or five hundred injuries at a single station--were reported along the Hibiya line, the oldest subway in the city.

The ultimate count of injuries would total 3,796. Some initial reports suggested more than 5,500 victims, but Tokyo authorities now lean toward the lower number. Of those 3800 injured, approximately 1,000 required hospitalization, some of those victims still being hospitalized at this time. Twelve men and women were dead or dying. (Another fatality, a heart attack which was not directly attributed to the gas itself, is usually not counted but was nonetheless probably brought on by the stress of the incident.)

TOKYO: THE RESPONSE

The official response to the incident was remarkable. In fact, it may have been somewhat too remarkable. Police and emergency personnel were very quickly on the scene, and in force. A number of reports have noted the extra police presence on Tokyo's streets that day. Japan Ground Defense Force chemical troops mobilized and moved from their base, located approximately two hours north of Tokyo, into the center city within four hours of being notified. Chemical troops were in Tokyo by 1:00 p.m.

Even casual observers noted the remarkable police and army efforts, inevitably leading to suggestions that some prior knowledge or warning of a threat against Tokyo must have been in the hands of authorities. In fact, police and army planners had staged a tabletop exercise around a possible CW attack in the city only a few weeks earlier. During the preceding week, JGDF specialists had provided the Tokyo police with chemical protective gear and training in its use, in anticipation of a series of police raids, scheduled to begin March 20th.

Interestingly, neither the medical community nor the fire and emergency agencies had been pulled into the planning process. Police determined, for one reason or another, that it was not necessary to have them involved. As a result, it is little more than a miracle that Tokyo's hospitals and emergency physicians responded as well as they did. It is also perhaps not surprising that a significant number of the casualties were firefighters and transit personnel who went into subway stations in an effort to try and address the problem that morning.

Within hours of the subway attack, Japanese police publicly focused their attention on a relatively obscure religious sect, the Aum Shinrikyo ("Supreme Truth"). Police raids and arrests began within 48 hours and have continued to the present day. In the course of raids on cult facilities, police found -- much to their shock -- not only precursor chemicals and equipment for the manufacture of Sarin, but also well equipped laboratories for the production of deadly biological organisms, including the agents responsible for cholera, anthrax, and botulism. On a more conventional front, police also found an automated assembly line for the manufacture of AK-47 style assault rifles.

Since March of 1995, there have been at least five additional gas attacks on train stations in Japan, as well as dozens of scares and false alarms involving everything from sewer gas to mis-adjusted gas cooking stoves. Two of the follow-on train station incidents were nuisance attacks, the work of a copycat inspired by the subway attack, involving a tear gas or mace-type compound. In three other instances, however, attacks linked to the Aum Shinrikyo cult involved the use of devices designed to produce cyanide gas.

Because of these acts, documented with relentlessly singular focus by the omnipresent Japanese media, fear is a lingering element in the country. Small wonder the Japanese have come to refer to 1995 (which was also marked by a continuing weak economy and the destructive Kobe earthquake) as having been their *annus horribilis,* or "horrible year." It would be difficult to argue with them.

Although the Tokyo attack caught most people around the world by complete surprise, it did not occur without warning. In fact, there were actually a number of highly visible warnings and precursors, which can only lead an observer to one possible conclusion: the Tokyo attack was anticipated. As previously noted, there was at least some preparation on the part of the military and the police regarding the possibility of a terrorist chemical weapons attack. There is overwhelming reason to assume that Japanese authorities had specific knowledge of the danger posed by the Aum Shinrikyo, probably months before the attack.

By comparison, there is little question that foreign intelligence services, including the Central Intelligence Agency and the rest of the American intelligence community, either misunderstood or simply dismissed a number of threat warnings. As a result, the subway attack caught the world's governments completely by surprise, initiating a furious round of re-evaluations of counter-terrorism preparedness that continues to this day. The failure to note and anticipate the threat of Aum Shinrikyo, however, continues to raise questions about our capacity to anticipate and deter other, more subtle terrorist threats. For those who paid attention, the indications that something was very wrong in the Land of the Rising Sun were obvious.

PRECURSOR EVENTS

The most dramatic and obvious warning of things to come was the June 27, 1994, release of sarin gas in the city of Matsumoto, Japan, which left seven people dead and more than 200 injured. A mysterious terrorist attack involving the unprecedented use of nerve gas, this incident received virtually no media play outside of Japan. Reports and Japanese newspaper accounts provided to Washington by the US Embassy in Tokyo were very quickly sent to the intelligence community's dead letter file.

On July 14th, less than three weeks later, in the village of Kamakuashiki near Mount Fuji, dozens of townspeople reported mysterious fumes that caused general nausea and a disorientation or tunneling of their vision. The results of a police investigation, not made public until January 1, 1995, revealed the presence of a unique degradation product of sarin.

March 6, 1995, a few weeks before the Tokyo attack, toxic fumes were released on a Yokohama-Tokyo commuter train.

Less than a week before the subway attack, three briefcase devices were found in the Tokyo subway system which, as will be seen, was perhaps the most ominous warning of all.

JUNE 27, 1994: MATSUMOTO

Located 200 miles northwest of Tokyo, Matsumoto is a city of light industry and tourism. Its primary claims to fame include a large Shogunate era castle, and the city's status as a gateway to the winter resorts of the Japanese Alps.

On a warm evening between 8:30 and 9:00 o'clock at night, a nondescript truck pulled up next to an empty parking lot on the edge of an undistinguished residential neighborhood less than a mile north of the old castle. Inside the truck were several members of the Aum Shinrikyo, tending to an assembly of equipment which pre-heated liquid sarin to its vapor point and released it through a vent on the side of the truck. Nerve gas is at its most dangerous as an aerosol, floating on the wind currents and being readily inhaled by potential victims. It was in this deadly form that a sarin cloud was released onto the unsuspecting residents of this typical Japanese neighborhood made up of medium rise apartments, some private homes, and an older, four story dormitory.

The following narrative is taken from my report of January, 1995, following my investigation of the incident. Note that a significant amount of the report is intended to help convince skeptical readers that sarin had actually been used:

Late on the evening of June 27, 1994, authorities in Matsumoto, Japan began to receive calls from frightened citizens in the area around the Kaichi Heights apartment building, a neighborhood near the old heart of the city. Over the next several hours, emergency responders would transfer dozens of persons to area hospitals where they would be treated for acute exposure to toxic chemicals. Doctors were astonished to find dramatically reduced cholinesterase levels in virtually all the victims, and followed a course of treatment for organophosphoric poisoning.

Through the efforts of the medical teams, several very seriously afflicted persons were saved, while others with less severe symptoms received appropriate treatment and were made comfortable. Some cases, however, were beyond help. The toll would ultimately number seven dead and more than 200 injured, with a number of the injured requiring lengthy hospital stays. One survivor suffered permanent and massive brain damage.

Subsequent sampling and analysis identified the presence of the supertoxic nerve gas sarin--a true chemical weapon--at several sites in the affected area.

I had the opportunity to visit Matsumoto in December, 1994, for the purpose of collecting information on this case, which has been little reported outside of Japan. The following pages detail my findings, based on interviews with victims, medical personnel, and government officials in Matsumoto. In addition, it reflects information compiled and reported by Japanese sources.

JUNE 27, 1994

Matsumoto is located 100 miles west of Tokyo on the Japanese main island of Honshu. An industrial and tourist city of several hundred thousand people, it sits at the feet of the rugged Japanese Alps. The city is still dominated by the majestic moated castle constructed by a powerful daimyo nearly 400 years ago.

On June 27, between 8:00 PM and midnight, overwhelming evidence indicates sarin gas was released in the area around the Kaichi Heights apartment block. The gas was apparently generated or released from a vacant lot, near a small fishpond. Although no containers or related equipment were found, significant damage to plant life that occurred that evening--apparently caused by another gas (HCl? HF?) released at the same time as the sarin--radiated from that point. In addition, dead fish found in the pond, and the water and soil in the immediate area, showed traces of sarin.

While the trees around the fishpond and the darkness of night apparently prevented anyone from observing the exact source of the gas, there were several reports of odd, sharp smells. Two eyewitnesses reported seeing a white, mist-like cloud emanate from the area.

CHRONOLOGY

The following is an edited chronology of the events of the evening of June 27, 1994 and the following days:

11:00 PM: A man visiting a friend in the neighborhood suddenly complained of a headache, dizziness, and narrowing of vision.

11:09 PM: A call was received by Matsumoto emergency officials from a man, Yoshiyuki Kini, saying that his wife was in pain and asking for an ambulance. The fire department medical team that arrived five minutes later was greeted by Kono, who was disoriented and ill himself. His wife, unconscious and not breathing, lay on the floor of the family dining room. The couple and one of their daughters was transported to Kyoritsu Hospital, the wife receiving CPR from the emergency medical technicians.

11:30 PM: Police were notified by the fire department of the "accident". All officers were placed on alert. There were numerous emergency calls, and many victims were taken to hospitals by ambulance.

12:45 PM: Police used loudspeakers to warn persons of toxic gases and to close their windows and doors.

1:00 AM: A police officer patrolling the area complained of stinging eyes.

1:20 AM: A shout from the Meiji Life Insurance Co. dormitory summoned help for a collapsed person on the 3rd floor, who ultimately died.

By 2:45 AM: Twelve out of eighteen persons brought in to Kyoritsu Hospital were hospitalized. Nurses handling the intake of victims, and in close physical proximity to them, subsequently reported having symptoms similar to those of the patients they assisted. Doctors observed physical symptoms of constricted pupils, nausea, and spasms, while blood tests revealed severely depleted cholinesterase levels in the persons brought to the hospital. Assuming organophosphoric poisoning of some kind, physicians prescribed atropine injections. Subsequent interviews with doctors also indicated a pattern of excessive salivation (a secondary characteristic of sarin poisoning) by many victims.

4:15 AM: Police announced that six persons had died. Another death was reported later that day.

5:00 AM: Five police officers investigating the scene were taken to Marinouchi Hospital complaining of nausea and stinging eyes.

5:35 AM: Rescuers wearing protective clothing and portable air supplies entered the Kaichi Heights neighborhood.

Approx. 7:00 AM: Matsumoto police set up a special investigation headquarters to look into the "accident".

10:30 AM: The city established a command post to work out a solution to the poison gas.

Sometime after 11:00 AM: Investigators from the Matsumoto Health Center checked the air and water around Kaichi Heights. Chief Yoko Midorikawa announced that, based on the symptoms of the victims, it appeared the toxic chemical was an organophosphorus compound.

3:00 PM: The Department of Medicine at Shinshu University conducted autopsies on three of the seven dead.

July 3: Local police authorities announced that they had found residual traces of the nerve gas, "sarin", at six different sites in the Kaichi Heights. The identity of the nerve gas was determined through gas chromatography of samples taken in the afflicted neighborhood.

One of the confounding elements for the police charged with investigating the crime was the total absence in the neighborhood, and indeed in the city, of any prominent political, military or symbolic target. Without any claims of responsibility or associated demands attached to the incident, the authorities were at a loss to provide a theory. In fact, the regional police were clearly over-matched by this convergence of bizarre factors. One Japanese writer described the situation as "a 21st Century crime investigated by a 19th Century police force."

At a loss for an obvious suspect, the police initially--and very publicly--focused their investigation on Yoshiyuki Kono, the man who had first called in a notification to the authorities. They based their allegations on the discovery of a modest quantity of gardening and photographic developing chemicals in Kono's home and outbuildings. The police theorized that Kono had somehow taken these garden chemicals and, accidentally or deliberately, produced *sarin,* which was then released from his property into the other residences. Police seemed unconcerned that Kono's own wife was left in a vegetative state by the attack, that his oldest daughter was significantly affected and was hospitalized for several days, or that Kono himself--losing forty pounds in the process--was in a Matsumoto hospital for nearly three weeks. Much of the police's investigation would be justified by Kono's neighbors, many of whom pointed to his history of idiosyncratic behavior: in pursuit of higher paying jobs he had, on several occasions, changed employers, and he had a small collection of Volkswagen "Beetles". In the Japanese maxim, he was the "nail that stuck up too high."

Ultimately, the world would learn that the attack in Matsumoto was an attempt by the Aum Shinrikyo "Doomsday Cult" to prevent a local court from handing down a ruling in a real estate dispute involving the sect. Aum leaders, convinced that the judges would rule against them, had determined to kill the three man panel. (The ruling was scheduled for June 28. One judge was killed, one was seriously injured. No ruling has ever been handed down in the land dispute.) It was decided to make use of a powerful new weapon developed by the cult's scientists, a toxic chemical called *sarin*.

Driving an old truck, specially modified for the release of the gas, and accompanied by lookout men in another car, the cult hit squad arrived in Matsumoto too late in the day to attack the judges in their downtown offices. Determined to carry out their mission without delay, they took advantage of the fact that all three members of the panel were staying in the same dormitory. Thus it was that the attack was staged, not in broad daylight in a crowded downtown area, but at night in a residential community.

When the gas was released, impurities in the heated chemical reacted with water vapor in the cooler air to form a white cloud, described by the witnesses mentioned earlier. While the puffy white cloud frightened the cult's lookouts, watching for police from a block away (convinced that something had gone wrong, they frantically drove back to the cult's compound thinking the attack team was dead), it quickly dissipated. The killing sarin gas moved slowly toward the residences, with lethal consequences.

JULY 14, 1994: KAMAKUISHIKI

A second precursor to the Tokyo attack occurred less than three weeks later in the rural hamlet of Kamakuashiki, at the foot of Mount Fujiyama. A rural community, Kamakuishiki boasts tidy farms, dairies, golf courses, and several small villages. The bucolic charm of the area is marred, however, by a notable anomaly: several ugly, litter strewn dormitory and factory compounds that constitute the headquarters of the Aum Shinrikyo.

On July 14 , dozens of people in the area around the largest of the cult compounds reported experiencing distress from some sort of chemical that they could smell in the air. This incident was the last in a series of releases of foul smelling and irritating chemicals from the large cult building known as Satian 7, but it was by far the most serious. A number of villagers reported difficulty breathing, disorientation and nausea, and, most significantly, a peculiar tunnel vision effect. The police also received revelatory reports from townspeople who described seeing members of the Aum Shinrikyo lying outside Satian 7 along the road, obviously ill, gasping for air, in some cases evidently having seizures.

It was around this time that the Aum Shinrikyo began a slick print and television public relations campaign alleging that its people had been targeted by the US and Japanese governments with chemical weapons attacks. Using video tape of actual overflights by aircraft en route to a nearby US Marine base and member testimonials, the cult claimed it was being sprayed with sarin from planes and helicopters. Aum concurrently began indoctrinating its own members, particularly children, into believing that chemical attacks were actually being carried out, staging frequent "air raid" exercises.

In the course of their investigation into the townspeople's complaints stemming from the July 14 incident, police scientists took environmental samples and tested them for various chemical agents that might have caused the reported symptoms. Nearly a half year later, on New Years Day, in an account buried on the slowest news day of the year, the National Police Agency reported finding dimethyl phosphonic acid, a unique degradation product of sarin. Coming as it did on the heels of the Matsumoto attack and given where the chemical was found, many knowledgeable observers in Japan began pointing accusing fingers towards the Aum Shinrikyo. Japanese police would eventually follow that lead, although meaningful action would come too late for a dozen Tokyo commuters.

MARCH 15, 1995: THE FIRST SUBWAY ATTACK

Less than a week before the subway nerve gas attack, Tokyo bomb squads were alerted when three abandoned briefcases were found under an escalator in the Kasumigaseki subway station. One of the cases appeared to be giving off a visible vapor. The briefcases were very carefully removed and disassembled. The police examination revealed that each contained identical components: a cylinder containing an "unidentified" substance, an ultrasonic vaporizer, and an electric fan and vents system, all powered by a camcorder battery. Both the fan and battery had been part of a large order placed and filled in the United States.

Although authorities have never chosen to formally identify what was in of the cylinder, word has been authoritatively leaked that it contained botulin toxin. The testimony offered by cult members in the trials now underway in Tokyo confirms the horrible truth: less than a week before the subway nerve gas attack, someone attempted a biological weapons attack using botulin toxin, the same deadly organic poison--a thousand times more lethal than sarin--that causes botulism. The attack, although unsuccessful, was the world-at-large's first clue that the Aum was working with supertoxic biological materials. It was also the last warning before the tragic events of March 20, 1995.

TOKYO'S SUBWAY, THE PERFECT TERRORIST TARGET

What are the attributes that define a terrorist target? First, you need victims, and in most cases, the more the better. A high body count can virtually guarantee an appearance on the evening news; since obtaining publicity and the attendant panic are central justifications for terrorism, this is no small consideration.

If a chemical or biological weapon is to be used, it is best if the target population is within a confined space. This maximizes the likelihood that lethal concentrations of the weapon agent will be delivered to the victims. For the same reason, a controlled environment is also highly desirable. Adverse conditions--too wet, too hot, too cold, too windy--can degrade the effectiveness of CBW, particularly in the relatively small quantities available to most terrorists.

If ensuring that the terrorists themselves can escape the weapons' effects is important, then it is also desirable to attack a site that offers a number of usable escape routes, ideally with sufficient twists, turns, and forks in the road to make apprehension after the fact unlikely.

Finally, to ensure maximum impact, the target should possess high symbolic value. The physical site or public event might be of political, military, or economic importance, but it should be an essential, trusted element of everyday life.

Given these criteria, the Aum decision to attack the Tokyo subway was highly predictable.

THE AUM SHINRIKYO--THE DOOMSDAY CULT

"Who could have done something like this?" That was the obvious question that crossed everyone's mind in the immediate aftermath of the subway attack. The answer was anything but obvious. In fact, the incredible truth behind the Aum Shinrikyo is still difficult to accept.

Aum Shinrikyo, or "Supreme True", was ostensibly a Buddhist sect; in fact, it's theology was an amalgam of beliefs drawn from Eastern and

Western religions. For example, the cult had elevated Shiva, the Hindu god of destruction and rebirth, to a prominent position in its pantheon. Aum erected a shrine to Shiva as a means of camouflaging its nerve gas production facility at Kamakuishiki. Concepts from the Bible, notably including the notion of Armageddon, were also incorporated into Aum Shinrikyo's belief system. In reality, the cult was less about religion and dogma than about the pursuit of naked, temporal power for its allegedly divine leaders.

While many Westerners might be forgiven for believing the cult burst onto the world scene without warning with the subway attack, the fact is the Aum Shinrikyo enjoyed a rather high profile in Japan. The cult's leader, Shoko Asahara, was a frequent guest on television talk shows in Japan, discussing various issues of religion and society. Cult members proselytized in the streets of most major Japanese cities, but its dark ministry had extended well beyond the borders of Japan. In early 1995, Aum Shinrikyo could legitimately say the sun never set on its operations.

Established in the early 1980s as a yoga school, (originally known as the Mountain Wizards Aum, or Sect), by the mid-'80s it had changed its name and gone corporate; using a variety of methods both illegal and legitimate, the cult was able to build a business and real estate empire in Japan. At the time of the subway attacks, Aum Shinrikyo's net value was estimated at somewhere between 500 million and one and a half billion dollars.

The cult is closely--and rightly--identified with its founder, the now infamous Shoko Asahara. Born Chizuo Matsumoto, he has claimed various titles, including Yogi, Holy Pope, and Venerated Master. On several occasions he has even declared himself to be the reincarnation of Jesus Christ. By all accounts highly charismatic, Asahara is at least partially blind, though he reportedly has pushed his chauffeur aside and driven his Rolls Royce around Tokyo on occasion.

There is no question that he is financially and politically ambitious. Asahara and nearly two dozen of his followers ran for election to the Diet, Japan's Parliament, in 1990. All were soundly defeated, which apparently surprised and embittered him. Some Japanese analysts believe the voters' rejection of his candidacy convinced Asahara that the system was inalterably rigged against him and that he would have to develop a more radical strategy to seize power.

His graphically apocalyptic writings and utterances fueled the sect's travels down this new path. He enthusiastically preached about the coming "Armageddon", a Third World War he said would start sometime in 1997, pitting most of the West against Japan. He taught that the war would devastate Japan, killing almost everyone save for true believers of Aum Shinrikyo.

In his prophecies, he specifically targeted the United States as a foe of both the cult and Japan. He also identified Jews and rival Buddhist sects, such as the politically influential Soko Gakkai, as enemies.

Asahara had a dream. He saw Aum Shinrikyo as a sovereign nation existing within Japan; that illusionary shadow state status in turn drove him to acquire a military capability with which to achieve his objectives and defend his conquests. Asahara knew that he couldn't build a large enough army nor acquire the conventional firepower needed to overthrow the authorities, and therefore logically pursued a trumping strategy. This was the genesis of Aum Shinrikyo's program to acquire weapons of mass destruction.

Just as Iraq's Saddam Hussein determined to pursue nuclear, chemical, and biological weapons in order to offset the greater military capabilities of Iran and Israel, so too did Asahara see weapons of mass destruction as a means of leveling the playing field *vis a vis* the Japanese police and military. In fact, Asahara became enraptured with the potential of such weapons at least in part after seeing CNN Gulf War reports showing huddled Israelis wearing gas masks waiting out the Iraqi Scud attacks on Tel Aviv. The combination of powerful television images and the associated media speculation on the possibilities of what Saddam's weapons could do led Asahara to vow that he would have such weapons at his disposal.

Pursuit of that vision required three things: will, money and talent. The first two Asahara had in abundance. The last he could acquire.

The cult was remarkably successful at recruiting new members from among the ranks of highly educated and technically sophisticated young adults. Relatively junior in the pecking order of Japanese corporations and research institutions, they were open to the combination of spiritual guidance and material support offered by the Aum. Always an important target audience for the cult's marketing efforts, the decision to press forward on building superweapons placed a new emphasis on bringing scientists and engineers into the fold.

The most dangerous Aum Shinrikyo scientist may have been Dr. Hideo Mori. The cult's "Minister of Science and Technology", Mori was in charge of developing weapons of mass destruction and was, by some accounts, second only to Asahara in the cult's hierarchy. By training a nuclear physicist, he left a position with a prestigious Japanese university to join Aum Shinrikyo. While he seems to have become enamored with Asahara's teachings, his commitment to the cult stemmed, at least in part, because he was provided better laboratory facilities and more of a research budget there than he had enjoyed in his relatively junior university position.

Aum found a receptive audience among the young, well-educated, but unworldly Japanese in their final years of college or early in their professional careers. But the cult's appeal reached beyond the population of its home territory.

AUM SHINRIKYO'S GLOBAL REACH

As mentioned before, Aum Shinrikyo operated around the world. In the early 1990's the cult established a tea plantation in Sri Lanka and a business and recruiting office in Bonn. They had opened an office in New York by 1986, and retained an agent in California to procure certain bits of technology, such as lasers, computer parts, and gas masks. He had filled an order for 200 small fans and camcorder batteries only a few weeks before the March 15, 1995 "briefcase attack" at Kasumigaseki, and had several hundred gas masks sitting in his warehouse at the time of the Subway Attack.

By March of 1995, Aum Shinrikyo had already bought, used and sold a 500,000 acre sheep station in western Australia. Authorities in the continent nation were invited in by the new owners following reports of the horror in Tokyo and the links to Aum Shinrikyo. They discovered the remnants of a chemical laboratory, as well as two dozen sheep carcasses buried well away from the ranch houses. Each carcass was tested and found to have been killed with the nerve agent, Sarin. Further investigation would reveal that the Aum had staked the animals out and tested the nerve gas on them early in 1994. A local aboriginal woman also described having seen a number of persons wearing what appeared to be spacesuits during an hot summer day near where the sheep were uncovered.

Perhaps more ominously, the cult had originally purchased the station for its uranium ore deposits. Investigators found that while some uranium had been mined and packed in barrels for shipment, the Australian government's refusal to issue an export permit to Aum Shinrikyo had apparently persuaded Asahara and company to pursue fissionable materials another way.

It should not, perhaps, then come as a surprise that the cult's greatest investments outside of Japan, and in many respects their greatest successes, were in the former Soviet Union. Some informed estimates suggest Aum Shinrikyo spent $6 million in a highly effective campaign to buy its way into Moscow's elite circles. The cult enjoyed regular contacts with well placed officials in the Kremlin, perhaps most prominently with Oleg Lobov, a Boris Yeltsin confidante and head of the Russian Security Council. Lobov apparently encouraged Aum financial support for his Japan-Russia University which, other than taking care of the needs of Oleg Lobov, seems to have little reason for being. The University, situated in a prestigious address across the street from the Bolshoi Theater near Red Square, was a favorite recipient of cult funds and a co-sponsor of many Aum-flavored activities.

As a consequence of its willingness to spread money around in Russia, Aum Shinrikyo gained a number of valuable concessions including offices and apartments, regular broadcasting time on Russian radio and television, introductions to leading scientists and engineers (even at some of the most sophisticated weapons research centers), and opportunities to have cult paramilitary personnel trained at *Spasnatz* (Special Forces) bases by the cream of the Russian Army. Asahara, on the occasion of trips to Russia, would routinely receive the treatment normally accorded to the head of a medium sized country, and clearly had entree to the nation's leadership. It is known that he met on several occasions with Prime Minister Chernomyrdin and others on the cabinet. And of course, there was always Lobov, the great fixer. Cult membership in Russia, driven in part by public perceptions of the influence wielded by Aum leaders may have numbered 30,000 at the time of the subway attack.

Total manpower of the cult, worldwide, has been estimated at somewhere between 20,000 and 60,000, with 10,000 in Japan. In evaluating this number, however, it is important to recognize the continuum that existed for membership. The membership might well include everyone from a young student lured by a pretty girl or a handsome boy to visit a cult storefront and watch one of their indoctrination videos; to members of a yoga class; to those people--and there were a significant number--who turned over all of their own earthly goods (and, in many cases, the possessions of their families) to the cult. These true believers were given new names and frequently lived in cult facilities.

Among the membership of Aum Shinrikyo were people from every walk of Japanese life. As previously noted, they had recruited heavily from colleges and businesses. But Asahara had another specific audience in mind when he sent his people out looking for converts. He had decided that in order to effectively wage a war on the government of Japan, he needed to know what that government, and particularly its police and military, were planning.

To this end he launched an aggressive campaign to bring police and army personnel into the sect. His recruiters were remarkably effective, enlisting officers and enlisted men in both organizations, and accomplishing what to many Japanese was unthinkable: the corruption of the National Police Agency and the Defense Forces. His success would lead directly to the attack on the Tokyo Subway.

COUNTDOWN

Despite the ham-handed efforts of police in Matsumoto and elsewhere, it was only a matter of time before Japanese authorities tumbled to the true nature of Aum Shinrikyo and the threat that it represented. For Westerners used to frequent updates from their police forces on the status of investigations, trying to piece together the path of police activity in this case is a difficult exercise. The reluctance to share what was done and when it occurred reflects aspects of the Japanese police method that seem alien, and which may have ill-served the people of that nation in this instance. Still, we can reconstruct the general pattern and reach some conclusions.

Given the extraordinary coincidence of events involving sarin at Matsumoto and Kamakuishiki, it requires little speculation to suggest that Tokyo-based officers in the National Police Agency had turned their attention to Aum Shinrikyo by August of 1994. Certainly there was already a buzz on the streets of Tokyo linking the violent, poison gas-loving cult to the Matsumoto incident, even before the Kamakuishiki test results.

The incredible brazenness of the cult's leadership makes it seem even more certain that police knew. Asahara routinely spoke of sarin in his sermons and writings; an Aum Shinrikyo song, similar in nature to the corporate anthems of "straight" Japan and extolling the virtues of sarin and the ways in which it could be used, was frequently sung at cult gatherings; even the Aum propaganda machine's protestations of innocence seemed to be constructed along lines intended to draw attention to the sect's shadowy activities, loudly identifying enemies and discussing what should be done to them.

How could the actions of this high profile group not have drawn a preemptive response? How could such openly dangerous and antisocial behavior not have called down the authorities' wrath? That is a simple question with several complex answers.

First, it is important to remember that Aum Shinrikyo operated under the protection of a Constitution imposed on the Japanese by the United States following the Second World War. That Constitution provides strong guarantees for the freedom of religion, which the Japanese have strongly embraced and even extended in the intervening decades. For example, it is almost impossible to obtain a search warrant to inspect a religious facility; in the case of the Aum, this even extended to commercial operations of the church, such as its computer manufacturing and retailing businesses. Similarly, the cult's financial dealings--many of which were, to say the least, shady--were effectively hidden from government oversight by this shield. It is interesting to note that in the aftermath of the Subway Attack and the police investigation, calls for changing the protections that Aum abused have been opposed by other religious groups concerned about possible infringements on their freedoms.

Second, the Japanese criminal justice system is built around the notion of proving guilt before making an arrest. Police procedure is to take as much time as it takes to assemble proof and build its case beyond a shadow of doubt **prior** to making an arrest. By comparison, the test in the US is not "proof of guilt" but "probable cause". This distinction is important, because it means that Japanese judges expect the police to spend far more time collecting and building a case before making an arrest and allowing them to question accused parties and examine their residences and places of business for incriminating evidence. As a consequence, although the conviction rate in Japan is extremely high

(98%+), it often takes the police several years to build a case, particularly in a high profile situation.

Third, the Aum Shinrikyo appears to have benefited from the help of some very influential friends who may have been effective in keeping the police from the door. It is no coincidence that three senior members of the ruling party in the Diet each decided to resign for health reasons in the days immediately following the gas attack in Tokyo. Each had rather openly received large cash contributions from the Aum Shinrikyo for a number of years in a mutually beneficial relationship, with one having been instrumental in providing Asahara with entree to Russia's leaders during the early 90's. Their association with the cult was a profound cause of disgrace. Resignation from their legislative posts was the political equivalent of hara kiri.

Members of the police and Japan Defense Forces had also been recruited by Asahara's minion as a source of both muscle and intelligence. This successful--and unprecedented--infiltration enabled the Aum to stay a step or two ahead of the authorities at several turns, and, when the end loomed near, helped precipitate the nerve gas assault on the Tokyo subway.

In the early spring of 1995, cult members on the police force and in the Japan Ground Defense Forces warned Asahara that the authorities were finally planning to move against Aum. On Friday, March 17, 1995, Asahara's informants delivered the fateful news that the JGDF had just completed training 500 Tokyo police officers in chemical weapons defense procedures, and provided them with chemical protective gear. Police officials had decided to begin a series of raids against Aum facilities, including Kamakuishiki, on Monday, March 20.

Asahara convened his "war council", including Dr. Mori. He directed his chemists to produce as much sarin as they could and to carry out an attack on the Tokyo subway during the morning rush hour on Monday, two days hence. By attacking the rail lines serving Kasumagaseki Station, the station nearest National Police Agency headquarters, the objective was to kill as many NPA officers as possible. Asahara hoped, at minimum, to deter the police from their plans to raid Aum and, at best, to cripple the NPA even as the cult's plans for a coup moved forward.

Of course, the attack failed in both those objectives. Japan's police responded to the subway attack without hesitation, conducting an aggressive and overwhelming series of raids on cult facilities throughout Japan and ultimately shattering the once strong sect. Still, the plan to carry out simultaneous attacks around the perimeter of the city center was a clever one. If not for technical deficiencies in the weapons (see below), the cult might have realized one of its intermediate goals by killing significant numbers of police officers, as well as many others.

THE TECHNOLOGY OF TERROR

The sarin used in the subway attack was literally manufactured on a desktop, using a piece of apparatus purchased in downtown Tokyo for less than $300,000. The device, manufactured in Switzerland by Metraum Contlabo, is commonly used in laboratories around the world for producing small, research quantities of chemicals. The short period of time and the equipment's low throughput capacity limited the subway attackers total sarin production to only about seven liters. Still, even such a small quantity of nerve agent could have been expected to cause hundreds of fatalities in Tokyo's crowded tunnels

Because of a number of critical technical and procedural compromises made by cult officers to accommodate Asahara's March 20 deadline for action against the police, the attack was extremely inefficient. Fortunately.

A key example of this was the tremendously inefficient method selected to release the sarin in the subway cars. The cult literally filled plastic bags with a sarin soup, containing various impurities and chemical additives, placed them on subway car floors, and then punctured the bags. Once punctured, the agent's principle mode of dispersal was either slow evaporation into the air or through contact of the liquid chemical on the train floor with passengers and subway personnel. Those at greatest risk were people who were actually touched by the sarin in its liquid form, either directly or secondarily, through contact with sarin residues on the persons of others who had been exposed to the chemical.

At Kasumigaseki station an assistant station manager ran on-board one stricken train and picked up the leaking package wearing no protective equipment other than his white cotton uniform gloves. He tried to remove the troublesome package and dispose of it. Directly in contact with the lethal compound, he carried the package nearly a hundred meters before he collapsed and died on the station platform.

A maintenance worker boarded the same train to clean what he thought was a simple chemical spill. Not having a mop at hand, he got some rags and old newspapers, went down on his hands and knees and started soaking the chemical up. He died on the train.

Each package consisted of one or more cult-manufactured two-ply polyethylene bags, filled with the hellish mixture, and sealed. The plastic bags were then wrapped in a newspaper, which served three functions:

First, it camouflaged the package. Japanese commonly wrap their lunches in newspapers and carry them around.

Second, the newspaper prevented any splashing when the plastic bags were punctured. This is particularly important considering Aum Shinrikyo never carried out suicide attacks; the cult's assassins always ensured they had a backdoor.

The third function of the newspapers was a bizarre and unsuccessful attempt to throw police off the cult's trail. The bags were wrapped in the newspaper of a rival Buddhist group. It was Aum's hope that the police would assume the other sect had staged the attack and then carelessly incriminated themselves. But while the subway attack was cobbled together with relatively little preparation, there was another, far more ominous aspect to their chemical weapons program, which went by the name of Satian 7.

SATIAN 7: TERROR ON AN INDUSTRIAL SCALE

Satian 7 was the large, ugly complex at Kamakuishiki that housed Aum Shinrikyo's full-scale nerve gas production plant designed to produce hundreds of tons of sarin as part of the cult's military buildup in anticipation of the November Coup. Hidden behind a false front shrine to Shiva, the Hindu and Aum god of destruction and rebirth, the plant was probably never successfully operated at full capacity. In fact, there are compelling reasons to believe that the July 15, 1994 incident at Kasumagaseki was probably an industrial accident.

As discussed earlier, several dozen villagers in the hamlets surrounding Satian 7 reported physical distress and peculiar chemical smells in mid-July, only a couple weeks after the Matsumoto incident. The descriptions of their symptoms matched with those of organophosphorous poisoning, including difficulty breathing, disorientation, and vision problems. Police also found traces of a chemical degradation product associated with sarin.

Residents also described to police having seen cult members lying outside the largest building at Satian 7, clearly in distress. Some were said to be convulsing and spasming, while others were said to be disoriented or having difficulty breathing. It is clear that the chemical, detected in modest amounts by the villagers and responsible for their symptoms, was generated by the nerve agent complex.

In photographs taken by an Italian journalist shortly after the police raids began on Aum facilities in March 1995, details of the plant can be seen, including an extraordinary, Rube Goldbergian assembly of reactor vessels, chemical storage tanks, and processing equipment. Examining several of the photographs in detail, however, offers a remarkable insight into the problems the cult must have confronted. In one picture, a number of pipes and feedlines are wrapped in plastic sheeting to apparently prevent contact with escaping chemicals. In another shot, a large barrel has clearly been positioned under a flange where two pipes join in an attempt to catch leaking material.

A principle common to most chemical weapons production processes is that leaking pipes are not a good thing.

The cult may well have been able to design a chemical production line that could theoretically perform all the steps required in the synthesis of sarin and other agents (The relatively high quality sarin used in the Matsumoto attack was produced in this facility.), but it appears to have lacked the experience required to maintain and operate that facility safely in the face of the high temperatures and highly corrosive properties of the chemicals in the process. In short, once the plant went on line, the Aum Shinrikyo scientists and engineers didn't know how to keep it on line. As often happened with cult activities, enthusiasm proved no substitute for practical knowledge. When the plant failed in mid-1994, Asahara and his lieutenants were desperate to find a way to get it fixed and to initiate full-scale production.

A few months later, in the early autumn of 1994, the Aum Shinrikyo dispatched people from the cult's Moscow offices to the Russian city of Volgograd (formerly Stalingrad). At Volgograd, they specifically attempted to recruit help from engineers at the facility known as Chimprom, a large, integrated Soviet-style chemical complex which, among its many industrial and civilian product lines, had at one time manufactured, sarin and other nerve agents for the Soviet military. Cult representatives offered Russian engineers with nerve gas production experience round-trip tickets to Japan and a payment of $1500.00 to assist in getting the Kamakuishiki plant up and running. Interestingly enough, there is no evidence that any of the Chimprom engineers took the Aum recruiters up on their offer. It may be that the amount of money offered was too low; $1500 doesn't go very far in the New Russia. It is equally likely, however, that the cult's hamfisted efforts to solicit nerve gas experts caught too much attention from the assertive and suspicious security personnel that still maintain a tight rein on life in this landmark to Soviet force of arms. Volgograd is still, in many ways, a Soviet city, and in this particular instance, that may have been a fortunate circumstance.

That Satian 7--a factory intended to manufacture thousands of kilos of nerve agent on an annual basis--was completely unable to produce sarin at the time of the Tokyo subway attack meant hundreds, if not thousands, of lives were spared.

Cult scientists who have been interrogated by the police have acknowledged making deadly chemical agents other than sarin, as well. We know that they made VX, an oily, more lethal nerve agent, which they used as a weapon of assassination. On at least three occasions they attacked "enemies" with VX, once killing their target and on the other putting him into a coma for nearly two weeks. The method involved filling a hypodermic syringe with VX, walking up behind the target, and spraying it on exposed skin.

The cult experimented with Tabun, another World War II-vintage nerve agent, and mustard, a World War I weapon that causes painful, and sometimes fatal chemical burns to moist tissues such as the eyes and lungs. Aum also dabbled in cyanide compounds. When members of the cult involved in the attack on the subway went into hiding, each of them was given five pounds of hydrogen cyanide as a potential weapon of last resort.

This deadly chemical resurfaced later in the spring of 1995 when Tokyo's Shinjuku train and subway station was attacked with a crude cyanide gas weapon. That device consisted of two plastic bags stacked atop one another, the top bag containing hydrochloric acid, the lower sodium cyanide. A condom in the acid-filled bag protected a timer-controlled thermal igniter. When the igniter caught fire the two bags would melt and the acid would react with the sodium cyanide, creating hydrogen cyanide gas.

Fortunately, a cleaning woman found the device while servicing the lavatory in which it had been concealed. Not knowing the nature of the weapon, she set the bags out by the front door of the men's room --separating them in the process--and called maintenance people to come get them. When the igniter went off, acid did spill out but, failing to come in contact with the cyanide, no hydrogen cyanide gas was released.

A few weeks later, there was a simultaneous double attack involving very similar devices at two different subway stations. While one device failed to go off, the other did function properly, generating toxic gases that injured about twelve people, though none seriously. The potential of such a device is significant, since the quantities of chemical involved could theoretically kill thousands. Fortunately, the relatively crude delivery method, which in turn produced a chemical reaction rate much slower than the terrorists had hoped for, helped to minimize the injuries.

BIOLOGICAL WEAPONS

One of the most shocking discoveries in the weeks after the police raids began involved the cult's interest in biological weapons. Chemical weapons, it seems, were not Asahara's first love. In fact, his first choice for a super weapon was BW. Aum Shinrikyo had an ongoing BW research and development program at least as early as 1990, with a dedicated laboratory for toxin production. That facility was subsequently replaced by two different laboratories, both of which were in operation at the time of the subway attack. One was located at Kamakuishiki, the other in a downtown Tokyo cult office building. Among the agents on Aum's R&D inventory: botulin toxin, anthrax, cholera, and Q fever. The cult attempted to release biological weapons in Tokyo on at least four occasions between 1990 and 1995. Three involved the release of botulin toxin, while the other involved anthrax.

In April of 1990, the cult released botulin toxin near the Diet and surrounding government office buildings. There were no reports of any injuries. The attack was deliberately staged while virtually all of the cult's followers were out of the country, on retreat at an island resort near Okinawa. Asahara, who had prophesied a great calamity for this time, assumed that, with the retreat as an alibi, blame for the attack would be directed toward other parties. As it turned out, the release went completely unnoticed.

Three years later, confident that they had solved the problems that had caused the first attack to fail, Aum's scientific warriors struck again. On June 3, 1994, in conjunction with the wedding of the Crown Prince, the cult again used a mobile release system, this time spraying an aerosol of botulin toxin from a car driven through the Ginza and districts surrounding the Imperial Palace. Asahara himself was reportedly in the car, until he apparently became nervous, directed the spraying to stop, got out of the vehicle, and then directed those inside to continue the spraying once he was out of the area. Once again, there are no official reports of any injuries.

Frustrated, but not prepared to back away from this potent source of power, Asahara's forces tried again. Three weeks after the failed attack on the royal wedding, the cult's new BW laboratory in eastern Tokyo came on-line. At Asahara's direction Aum scientists attempted, over a period of several days, to send a cloud of bacillus anthracis spores out over the city. There were, at that time, a number of reports from nearby residents of foul smells emanating from the cult's building and sticky, brown substances on cars parked nearby. Plants and small animals died, and several people complained of feeling ill. Once again, however, there were no official reports of anthrax.

Of course, nobody at this time in Japan was looking for anthrax releases, nor is there any evidence that the Japanese government has examined the records from that time to determine whether there were any deaths that might, upon reconsideration, be properly attributed to the cult's efforts.

Still, while it is true that biological weapons agents are easy to produce in the laboratory, it is much more difficult to transform them into weapons of mass destruction. It is possible that in their production process the cult's scientists may have denatured the anthrax. They may have overprocessed it to the point where it was no longer viable. Another possibility is that the anthrax may have released in a hardy spore form which might not produce immediate casualties but which, under certain conditions and over a long period of time, might still be in the environment waiting for the right conditions to trigger its lethal effects.

The fourth and final Aum BW incident was the March 15, 1995 briefcase incident. Reports attributed to police sources, as well as cult members' statements indicate that this was intended to be another botulin toxin release. Although unconfirmed, Tokyo rumors suggest that the Aum technician responsible for filling the cylinders with the incredibly lethal toxin may have had second thoughts at the last moment, substituting regular water for the weapons agent. We do know that there were no casualties in this final runup to the sarin attack.

Concerning the Aum Shinrikyo BW program, what we don't know far exceeds those things we do in both number and importance.

We know the cult's BW program predated its CW program, probably by several years. We don't know the details of its genesis nor of the *sources of technology upon which it drew. Did it obtain military BW knowledge from open sources, as it did with CW?*

We know they had a dedicated BW laboratory at least as early as 1990, and that they subsequently built two new laboratories. We know they had research underway involving a variety of organisms, including the nightmare flavor of the month, the Ebola virus. Where did they obtain their equipment and their bio-organisms, and what did it cost them? Do those sources exist for other would-be worldbeaters?

Asahara apparently embraced nerve gas only once it became clear that the BW wasn't working. Why didn't it work? Can it really be that the hurdles of weaponization are so great that the Aum, with its almost limitless resources couldn't lick the problems?

In an extensive conversation with a former member of the cult who had worked in the Aum's original BW laboratory, details were provided regarding the daily routine in the facility. He described the large, industrial-scale fermenters, the process of collecting the resulting biomass, walking it through a rudimentary airlock into a preparation area, where various cold and heat dryers, grinders, and aerosols were employed in pursuit of the ultimate weapon. Testing of the agent consisted of mixing the toxins and spores with water and then spraying it on guinea pigs. He also described, in some detail, Shoko Asahara's displeasure when the guinea pigs initially refused to die. The Holy Pope of Aum Shinrikyo needed a killing weapon.

There is a further question that begs asking. During 1996 there were approximately 8,000 victims in Japan of food poisoning caused by a bacteria called E. coli 0157. Nearly a dozen deaths have been attributed to the poisonings. The incidents were concentrated at three widely different locations: Osaka in the west, a small city in the far north, and another in a Tokyo suburb. Three outbreaks, widely scattered but very similar scenarios. In each instance, the epicenter of the food poisoning seems to have been a school lunch program.

Each school is separated from the others by hundreds of miles. Even with the involvement of a team from the US Centers for Disease Control (CDC), no clear source or cause for the outbreak has been identified. Speculation that contaminated water or radishes were responsible has been undercut by the failure of researchers to find any such contamination.

While incidents of this kind do happen--an outbreak at *Jack-in-the-Box* fast food outlets in the Pacific Northwest claimed several lives in the United States several years ago--a critical aspect makes this case stand out. Japan's media, including five national broadcasting television networks and dozens of major newspapers and magazines, is very competitive (in fact, a single network will routinely send out several news teams to compete among themselves for the sake of getting the best story). Despite the inevitable tendency to link the two, there has been virtually no speculation in the media tying E. coli 0157 to the biological weapons work of the Aum Shinrikyo. It seems unlikely that would be the case unless the government of Japan had specifically instructed the media, which largely defers to political wishes, not to speculate on that possibility.

SOME OBSERVATIONS

One of the central questions in the days following the attack centered on the relatively few deaths; why were there only a dozen fatalities?

First, the cult used a small quantity (<7 liters) of nerve agent, which was all they had time to produce in the two-day window that Asahara gave them, working night and day. Furthermore, the agent was very poor quality, perhaps only 25-30% pure, because the equipment that they had at hand did not allow them an easy way to distill the sarin.

Second, the dispersal method used in the subway was laughably inefficient. Water guns or spray bottles could have potentially delivered lethal doses to a much higher number of people. Such methods would, however, have required placing the cult attackers at greater risk than any of them were prepared to accept. The Aum Shinrikyo--unlike other extremist groups--did not believe in suicide attacks. They much preferred martyring others for their cause.

Third, the cult did not factor the subway's air circulation system into their thinking. The ceilings in Tokyo's newer subway stations are relatively low, with large air vents spaced relatively closely together. The air intake system is so strong from those vents that a small piece of paper, held over a person's head, will be sucked immediately into the system and kicked out through vents on the street above. As a result, that sarin that did evaporate was promptly diluted and removed. It is not a coincidence that the stations with the highest casualties were on the Hibya line, which is Tokyo's oldest. Hibya stations laid out as long, narrow, tunnels with two large air exchange vents in the middle. As a consequence, the much less efficient air cleaning provided little in the way of a dilution effect.

A fourth factor was Aum's inexperience. Cult members were very good at building things, but largely inept at turning theory into practice. Even their senior officers had precious little background in the art of making things work. This was certainly a key reason the nerve gas plant at Kamakuishiki was never successfully operated for any length of time.

From a policy perspective, it is important to keep in mind that the cult's weapons-related activities were perfectly legal under Japanese law, right up to the point where they began killing people. It was not illegal to manufacture Sarin. It is now. It is still not illegal to manufacture biological weapons agents in Japan.

The cult blatantly and rather openly pursued weapons technologies, both in Japan and abroad. Russian and American military manuals on chemical and biological weapons production and use doctrine have been recovered from the cult facilities. A husband and wife medical team crisscrossed the United States on several occasions, obtaining information from public and private sources on chemical, biological, and nuclear weapons technology.

The cult's Russian ties do not appear to have been central to the cult's successes with its weapons of mass destruction program. This is not to minimize that those ties could have been useful. That cult "soldiers" received training at Speznats bases from Russian special forces is more than a little distressing. Aum had purchased and then shipped a large Russian military helicopter to Japan, which they subsequently reassembled with the intention of using the craft to help deliver CBW against government targets during the planned November 96 coup.

But the Russian ties do not appear to have given them any significant edge that they weren't able to obtain from US or other foreign sources. As a case in point, the helicopter's pilots were both trained and licensed in Florida.

THE FUTURE

The impact of chemical weapons use on Tokyo has certainly been noted by terrorists and potential aggressors. A taboo was erased with the attack in Tokyo. It is no madness to believe that someone could use a weapon of mass destruction like this in a terrorist strike.

Those who follow in the footsteps of Aum Shinrikyo are not going to make the same, frankly elementary mistakes that Asahara and his disciples made. As a result, the consequences of the next chemical or biological terrorist strike will undoubtedly be more devastating.

Most of the technologies of mass destruction are now more than 50 years old, largely routine techniques well within the reach of terrorists around the world. It is an inescapable conclusion that a terrorist event orders of magnitude more destructive and costly in terms of human life than the Tokyo Subway attack could happen anywhere.

It is equally inescapable to conclude that it will happen, somewhere.

Appendix F: Improvised Explosive Devices

RECOGNITION OF IMPROVISED EXPLOSIVE DEVICES (IED'S) AND BOOBY TRAPS

Political, religious, racial and labor disturbances have provided a breeding ground for terrorists and extortionists in many areas of the world. And many of those terrorists are being trained in the preparation and use of improvised devices. In recent years there has been an increase in the printing and dissemination of books and pamphlets detailing the construction of improvised devices. As a result, bombings and other acts of terrorism and extortion have intensified, producing a variety of improvised devices that are becoming more and more sophisticated.

The hazards of improvised devices include all those related to conventional and nuclear munitions plus the additional hazards of diversity and unpredictability of design compounded by the ingenuity or incompetence of the designer. Practically any container or material may be used to house or construct an improvised device.

The unpredictability of the improvised device demands more caution on the part of fire and emergency service personnel. Each suspected item must be treated as an unknown and should not be approached by fire and emergency service responders.

Improvised devices are generally homemade and limited in quantity. They may be made with rudimentary tools and be of crude design. However, groups have been known to produce devices on an assembly-line basis. Since these devices are nonstandard, there are no specific guidelines to enable fire and emergency service responders to positively identify or categorize them. Today's improvised devices are extremely diverse and may contain any type of firing device or initiator, plus various commercial, military, or contrived fillers.

Generally, emergency response personnel recognize the dangers associated with managing incidents that involve explosives. An understanding of associated dangers of explosive devices is important. Once this association is made, an effective responder protection plan can be achieved.

Terrorists will have no regard for the traditional transportation restrictions. IED's are designed and assembled for one purpose--to explode. Remember that explosive materials come in many sizes, shapes and containers.

Explosive devices placed specifically to harm emergency services personnel or to hinder emergency operations should be considered a definite possibility at any terrorist incident and should be addressed in both the development of operational guidelines and the training of personnel.

Improvised explosive devices are nonstandard devices fabricated from common materials, incorporating explosives or destructive, lethal, noxious, or pyrotechnic chemicals.

In addition to standard military and commercial explosives and incendiary mixtures, improvised fillers can be manufactured from available chemicals and materials. Some explosive mixtures in a confined state are considered incendiary. Some incendiaries, when confined, may detonate.

Any container or material can be used to house or construct an IED. In addition to ordinary containers, plaster-of-paris, cement, concrete, incendiary resins, or similar materials can be cast into any shape to form a container.

Fire and emergency services personnel should never approach a suspected improvised explosive device. Only trained Explosive Ordnance Disposal personnel should approach the suspected device. If you suspect an improvised explosive device, you should immediately clear the area in and around the suspected device and notify the appropriate EOD personnel in support of the incident.

Recognizing Explosive Synergy

Explosives require a synergistic effect to occur between four components: (1) a combustible chemical or solid material, (2) and oxidizer to support the rapid burning process, (3) a device to cause ignition, (4) and confinement of the ingredients. If any of the four parts is altered or fails to interface with the process, the explosion will be influenced or may not occur.

Hazards of Improvised Devices

Bombs will vary in size and will be relative to the intended target. Terrorists use an assortment of dangerous materials in bomb formulas, many of which are their own recipes. It is important to know that terrorists will dedicate many hours to planning and developing strategies to cause harm and destroy property. The terrorist becomes very familiar with the potential targets and the local emergency response capabilities.

The use of improvised explosive devices is not a new concept. However, they have become more complex, more destructive and should no longer be considered just a law enforcement issue.

Recognizing the hazards and risks involved with IED's is important. In 1995 the United States experienced a total of 5,296 explosive incidents. Of those incidents 1,979 were bombings, 598 were incendiary and 2,619 were other types of explosive incidents. The majority of incidents involved was pipe bombs and numbered 667.

Of significant importance is the amount of explosives that is being stolen throughout the United States. In 1995 a total of 3,429 pounds of explosives were stolen. In 1996 a total of 9,138 pounds of explosives were stolen and in 1997 from January through August a total of 6,013 pounds of explosives has been stolen. As you can see, there is a lot of unaccounted explosives throughout the United States that a terrorist group can easily get their hands on.

Of primary concern to fire and EMS responder is the possibility that the primary blast may not have detonated all of the explosive material. Unexploded materials may be lying among the debris.

To deal with this potential hazard, initial operations at a terrorist bombing scene should be directed towards establishing and managing control zones, similar to those of a hazardous materials incident. Response procedures should provide direction for the initial responder to create and designate specific zones of operations.

Recognize Distraction Techniques

Previous bombing incidents have proven that terrorists use various distraction techniques to attract attention and draw in crowds. Once the audience of onlookers and emergency responders has assembled a larger, more powerful bomb will be detonated. This delayed attack technique is commonly known as the "secondary device."

Another deceptive tactic used is to display a countdown timer designed to give the observer a false sense of security. The bogus timer may indicate 30 minutes remaining on the display, while the device is actually programmed to explode at the 10 minute mark.

Maximizing Responder Survivability

One technique in maximizing responder survivability is to establish within your local operational plans that only personnel with IED hazard training are allowed to enter the blast zones to identify unexploded ordnance or a potential secondary device. Once a device is identified or suspected the plan should direct the initial responders to back off and call for trained EOD technicians. In cases were there is a threat of potential terrorist acts, it may be advisable to pre-position an EOD technician along with fire and EMS services. The EOD technician can then respond initially to the site to provide direction for safe fire and rescue operating practices.

Establish a clear and concise methodology of informing the public which emphasizes efforts at the scene and downplays the cause of the incident. Radio communications should be controlled so as to minimize bomb or IED related language.

Hoax Devices Tactics

One must keep in mind that many "hoax" devices are planted each year specifically to disrupt daily activities. Determining whether a device is real or fake is not the role of a first responder. Regardless of the presenting conditions, maximum precautions must be observed until experts render the scene safe. Untrained personnel should never be routinely used for bomb searches in the primary target area.

Ambush Tactics

The ambush tactic presents an extremely dangerous scenario for first responders. The terrorist may attempt to bait responders by using a distracter technique to facilitate an emergency incident. Fire and EMS units that arrive on site may become victims of a secondary explosion intended for a larger crowd. Reconnaissance of the incident site can minimize the possibility of a secondary device being used against the responders. Recognition training is important in order to effectively identify the existence of a secondary device. Remember, law enforcement personnel should conduct the incident site reconnaissance.

Terrorists have mastered the art of transforming common containers and packages to disguise bombs and IED's.

Conditions Likely to Affect Response Operations

- Disposition threat upon arrival, pre-blast or post-blast
- Size of the device and type of explosives
- Proximity of device to exposures
- Evacuation and protection variables
- Number, location and condition of casualties
- Condition of damaged structure
- Response capabilities, available technical resources
- Response time of needed resources
- Duration of the incident
- Training level of responders
- The commitment level of resources must be in concert with the technical capabilities at the incident site.
- Effective risk analysis of post-blast structural conditions requires the expertise of structural engineers.

Outward Warning Signs of Bomb and IED's

- Any abandoned container out of place for the surroundings.
- Obvious devices containing blasting caps, timers, booster charges, etc.
- Unusual or foreign devices attached to compressed gas cylinders, flammable liquid containers, bulk storage fixtures, and other chemical containers.
- Abandoned vehicles that are not conducive to the immediate environment, gasoline tanker in front of a potential terrorist target site.
- Entrance thresholds that present wires or attached hardware that appear out of place.

- Detection of strong chemical odors for no apparent reason.
- Apparent trip wires.
- Written or verbal threats.
- Recognizing five basic Bomb/IED incidents that first responders may encounter (Tactical Objective).
- Devices that have completely exploded (no residual materials present).
- Partially exploded devices (fragmented material present).
- Bombs/IED's found intact.
- Hoax devices.
- Bomb threats (actual presence of a device is not substantiated).
- Types of firing devices used in IED and Booby Traps (Tactical Objective).

Improvised devices, regardless of how they are employed, are classified as closed or open devices.

In a closed device the working parts are enclosed by a container and hidden from view. In an open device the container is open or absent, allowing the working mechanism to be viewed without disturbing the device.

SEE FIGURE 1

IED's may be initiated mechanically, chemically, electrically, or by a combination of these methods.

There are a number of different types of firing devices used in improvised devices:

Pressure: Pressure is applied directly on a moveable plunger or flexible material to complete an electric circuit, release a spring loaded firing pin, or merely drive a sharp object into an initiator. Materials often used in construction of pressure operated firing devices are sponges, rubber strips or blocks with retaining springs, and sharp nails.

SEE FIGURE 2

Pull: A pull is exerted against a wire or cord to complete an electric circuit, release a spring loaded firing pin, or pull an abrasive material through a match compound. Materials often used in construction are clothespins, knives, hacksaw blades and nails.

SEE FIGURE 3

Pressure-release: Pressure is released by lifting a weighted object or otherwise releasing a spring loaded firing device. Used universally as a boobytrap, the pressure-release-firing device is deceptive, sensitive and easy to conceal. Materials often used in construction are household mousetraps, spring-loaded plungers and electric microswitches.

SEE FIGURE 4

Tension-release: Tension is released as when a taut wire or cord is cut or broken, releasing a spring-loaded firing pin or closing electrical contacts.

SEE FIGURE 5

Tilt: A tilt-activated firing device may be used in an improvised device. Materials used in construction may be a ball bearing, sliding contacts, test tube, mercury switch, salt water or cooper sulfate solutions, or a stick (tilt rod).

SEE FIGURE 6

Barometric pressure: A change in barometric pressure initiates the device. With increasing altitude, air pressure drops, allowing air trapped in a balloon or bellows to expand and close a switch to either arm or fire the device. This type of initiating method is usually used on aircraft, but will not work in a pressurized cabin. Variations of the barometric pressure device include devices containing a bellows placed in either a pressurized container or a container on which a vacuum has been drawn. Any change to the ambient pressure of these devices would arm or fire the device.

SEE FIGURE 7

Disturbance: Any movement is sensed, as when objects or their wrappings are moved or disturbed, initiating a firing device. Sensitive mechanisms such as vibratory or trembler switches may be used.

Probe insertion (antiprobe): This firing device contains an open electrical circuit connected to two layers of conductive material separated by an insulator. Any attempt to probe or penetrate the package with an object may short one layer to the other. This completes the electrical circuit and initiates the device.

SEE FIGURE 8

Dissolution: Two elements are separated by a soluble material. An example would be metallic sodium is placed in a gelatin capsule and dropped into a vehicle's gas tank. The capsule dissolves and the metallic sodium reacts with any water in the gas tank.

X-Ray: This firing device is used primarily to limit the use of x-ray techniques to determine the contents of a suspected device. One method employed is to use a piece of intensifying screen and a sensitive photocell. X-rays illuminate the screen, which activates the photocell.

Hydrostatic pressure: A hydrostatic pressure change is sensed by bellows which expand or contract when lowered into various depths of water.

SEE FIGURE 9

Light, Heat and Sound: A change in any of these is sensed and used to initiate a firing device. A transistorized circuit employing a light, heat or sound sensing element, and/or a switching transistor such as those used in radios, televisions and computers could be used as a circuit breaker or triggering mechanism.

Electrochemical delay (E-cell): An E-cell consists of a case, two electrodes, and an electrolyte. This method of initiating a device involves the process of plating and deplating silver and gold. In this process when the platable silver has been transferred, the voltage rises sharply (resistance increases sharply). This increase in voltage may be used to operate an appropriate switching device or to complete a firing circuit to a detonator.

Collapsing circuit: An electrical field collapses when wires are severed or broken, a battery decays to a low energy level, or a component such as a battery is removed. The device is armed when a relay is energized. When the timing battery is depleted, or a wire in the holding circuit is broken, the relay energizes and the firing battery discharges through an initiator.

Proximity: This firing device is designed to fire as the victim approaches. One circuit works on the principle that the human body acts like half of a capacitor; the other half is contained in the circuit. When someone touches or gets near an antenna the circuit is completed, firing the device. Magnetic, acoustic, seismic, ultrasonic, microwave, and active or passive infrared sensors are some of the proximity devices that may be encountered.

Time delay: Delay devices introduce the additional danger of a time limit, usually unknown, into the IED procedures. These devices are most dangerous when used with an booby trapped-improvised device. Some delays, such as electrochemical delay, battery decay in the collapsing circuit, and dissolution (dissolving capsule), has been already mentioned. The most common delays are clockwork delays using alarm clocks, kitchen timers, wristwatches, to timers taken from home appliances. Another method is known as material fatigue (when a material is placed under stress). After a predetermined time the material separates and an electrical circuit is completed or a spring-driven plunger functions.

SEE FIGURE 10

Controlled: Initiation is usually wire or radio controlled by a operator. Controlled devices in entrapment or saturation bombing situations are definite possibilities. The initiation device could consist of intricate circuits designed to function by electrical or radio signals such as:

SEE FIGURE 11

- Radio control systems used with model airplanes, cars or boats.
- Paging systems.
- Remote control garage door openers.
- Remote control television tuners.
- Remote control joysticks used with video games.
- Remote appliance controllers.

Improvised Nuclear Devices

Improvised nuclear devices are devices that are constructed for nonmilitary use and which have, appear to have or are claimed to have, the capability to produce a nuclear explosion or produce radioactive contamination of an area without a nuclear explosion.

Types of Chemical Reaction Bombs

- Acid Bombs
- Caustic Bombs
- Dry Ice Bombs
- Blow Torch Bombs
- Bleach Bombs

Questions that EOD Personnel Will Ask

If a device is suspected there are generalized questions that trained EOD personnel will ask the first responder. What is the exact location of the device, size, shape and appearance, sounds. Additionally, any information concerning a disturbance to the device (items moved or jarred, lights turned on or off in the room, etc.) should be known. Be prepared to describe to EOD personnel the path that you traveled to exit the suspected device location.

Note whether the device has been placed on or near any hazardous materials and utilities. Evacuation of the immediate area, if not already begun, should commence.

Device Location

As a general rule, the easiest place to plant a device outside is often a vehicle or a shrubbery surrounding a building. If personnel are evacuated, they may be increasing rather decreasing their risk of injury. The most likely place to conceal a device inside of a building is in an area to which the public has the easiest access. Therefore, any evacuation that requires personnel to move through public areas (such as halls near restrooms, waiting rooms, or lobbys) will increase the risk in the event of detonation.

Courses of Action for Suspected Devices

There are three possible courses of action when a device is suspected. (1) take no action, (2) evacuate and search, (3) search without evacuation. Evacuation appears to be the appropriate response to any bomb threat situation. However, there are factors that may weigh against the evacuation response. Even when total evacuation is possible and desirable, the process itself is not a simple one.

Evacuation Considerations

Request assistance early when resources have been committed. Identify the type of technical assistance needed (EOD, HAZ/MAT, Rescue, radiological, etc.).

Request law enforcement assistance to control access to the outer perimeter and for assistance in evacuation procedures.

A sudden evacuation may cause panic and unpredictable behavior leading to unnecessary risk of injury.

When there is reason to believe that occupants of a building will panic if advised of a bomb threat, it may be advisable to have evacuation ordered on some other pretext. It should be noted that the pretext of a fire should not be used.

During fire drills, windows and doors are closed and are often locked. For evacuation involving improvised explosive devices doors must be left open so that rooms are readily available to search teams; doors and windows should be open so that a detonation (should it occur) will not be contained within the building.

Remember, that when an evacuation is ordered for a suspected improvised device, you may need to alter established routes in favor of an exit pattern that will provide the greatest protection in the event of a detonation during evacuation. Greater supervision and control will be required, especially if a decision has been made not to announce the purpose of the evacuation.

Gather as much information from the dispatch center or units operating on the scene. Early information should be used to determine initial "stand off" distance.

When actual explosive devices have been located identify isolation perimeter for staging personnel and apparatus, relay coordinates via radio (from the hazard) if safe.

Do not intervene, carry out only essential tasks that support public protection measures. Maintain defensive posturing and use the minimum number of personnel to achieve the task.

Deny access to the immediate hazard area; attempt to control main points of entry such as streets, front and rear access to structures; do not relay on banner tape to restrict movement of people, request law enforcement assistance to accomplish this task.

Utilize the highest level of personal protective equipment available. Structural fire fighting clothing will offer limited protection from shrapnel and cut hazards. Use protective clothing and breathing apparatus when operating inside the hazard area.

Use of Communications Precautions

Restrict or discontinue radio, cellular and mobile data terminal communication when explosives are suspected. Radio transmitters can create a field of electric energy sufficient enough to trigger electric blasting caps. Low frequency transmissions are more dangerous to use.

When possible, prevent exposure of explosives to excessive ambient heat and attempt to eliminate static (electric) discharges.

Power Source and Utilities Consideration

Gain control of utilities, but do not disconnect or engage circuitry until the scene has been evaluated by trained personnel. If a device is suspected or discovered do not change the condition of the surroundings to include moving power or light switches to a different position.

Staging Areas

When establishing staging areas consider using structures and natural barriers that will provide blast protection. Be sure to plan for reflecting overpressures and stay upwind.

All staging areas should be located away from any buildings containing large amounts of glass and away from line of sight of the target area.

When evacuees are located inside buildings remote from the target, open all windows and doors to prevent pressure differentials.

Be sure to identify water supply sources and prepare to establish water supply lines for fire fighting operations.

If explosives are involved in the fire, do not attempt to fight the fire. Isolate the area and protect exposures. The isolation distance will depend on the conditions present and the type of material. Prepare to isolate for distances up to at least one mile in all directions.

If Detonation Occurs

If a detonation has occurred, estimate the number, status and condition of any casualties and, if necessary, initiate mass casualty incident protocols.

Identify what type of rescue equipment will be needed for entrapped victims.

Establish command and activate a personnel accountability system. Clearly identify the person responsible for command and control and the location of the command and control. Make an attempt to accomplish this face to face due to security concerns.

Think before you rush in. It is important to not become complacent and it is important to change the way that you respond when responding to an explosive device incident.

Use of Pyrotechnics

Pyrotechnics are mixtures of solid chemicals and are designed to function in the absence of oxygen. Pyrotechnic mixtures produce light, color, smoke, heat, noise, and motion. The chemical reactions involved are of the electron-transfer, or oxidation reduction type.

The reaction rates can vary from very low burning to instantaneous detonations with rates greater than a kilometer per second. Pyrotechnics is closely related to fields of explosives and propellants, and exactly where one field ends and another begins can be debated at great length. Fireworks are perhaps the most common form of pyrotechnic devices, although highway flares and air bag inflaters are other examples of civilian pyrotechnics. The military also uses a broad assortment of pyrotechnic devices for signaling, screening (with smoke), illumination and training simulation.

Numerous devices are made using pyrotechnic compositions. These devices produce a visible or audible effect by combustion, deflagration, or detonation for entertainment purposes. Remember, pyrotechnics can easily be used by a terrorist organization to initiate an attack.

Secondary Device Considerations

Perimeters should be established quickly and access allowed only to remove the injured until a thorough search for secondary devices has been completed.

Searches should only be conducted by trained EOD personnel.

Improvised explosive devices can easily be disguised and may be concealed in seemingly harmless objects.

Do not touch or move anything at or near a bomb scene. Any suspicious items should be brought to the attention of trained EOD personnel.

Considering that secondary devices target first responders, the bomber may anticipate where staging areas and command posts are likely to be located. Searches for IED should include these areas.

Extensions of the isolation areas can save lives.

Command posts should be located upwind of the scene of an explosion to reduce the possibility of exposure to airborne toxins or hazardous vapors that may have been released or caused by the blast.

Access should be strictly controlled until a search for secondary devices is completed and thereafter to protect the crime scene.

Record the scene with a handheld video camera, photographs and/or sketches or some type of drawings. This will help for time sequencing of the event and may reveal valuable information in later review.

Rapid Evacuation Considerations

Modify the traditional "load and go" principle, treat the bomb scene as you would a car engulfed in flames--the potential for further danger and harm is very real.

Remove the victims from the scene and take them to a safe distance away from the scene to render first aid.

Be aware of damage to infrastructure in the area of the explosion, such as gas lines and tanks, electrical transformers, downed power lines, etc., which may create other hazards to first responders.

Key Points for Public Safety Development

- Are the necessary agreements, response plans and protocols in place in your area of responsibility?
- Do public safety agencies train together to respond effectively to bombing incidents?
- Know and list the location and contact numbers of your nearest Bomb K-9 support, EOD technicians and other related resources.

- Start all searches with the public access and parking areas, as well as outside of the buildings.

General Media Rules for Bombing Incidents (Tactical Objective)

- Do not comment on device components or allow filming or photographing of detail evidence from the device.

- Do not speculate on the amount of damage or injuries the device could have caused.

- Do not speculate when the incident scene may be released unless you are absolutely certain.

Responsibilities When a Suspected Explosive Device Is Found

When in the process of conducting search operations, or when responding to an incident, and a suspected explosive device is discovered, the following actions will take place:

- Cease all search operations and ensure that the building or area is evacuated and that a secure perimeter is established. Only trained EOD personnel should conduct further operations.

- Inform law enforcement and fire dispatch by radio (at a safe distance), runner, or telephone and request that proper notifications are made (police, EOD, public works, gas, electric, phone, etc.).

- Designate safe response routes of approach for incoming equipment and personnel.

- Ensure that a written chronological events log is maintained to include responding units, times and locations, displaced individuals, injuries and other pertinent information. Remember the incident will be designated a crime scene and all of the above mentioned information will serve to assist law enforcement during the crisis management phase of the incident.

- All fire fighting and EMS personnel will remain clear of the incident site until the all clear is sounded by trained EOD personnel and law enforcement.

Dispatch Procedures During a Terrorist or Criminal Bomb Incident

If the dispatcher receives a telephonic bomb threat while first responders are en route to the incident site or are at the incident site the following questions should be asked:

- When is the bomb going to explode?
- Where is the bomb located?
- What does the bomb look like?
- What kind of bomb is it?
- What will cause it to explode?
- Did you place the bomb?
- Why did you place the bomb?
- What is your name or the name of your group?

The dispatcher should ensure that the exact time is noted.

After receiving as much information as possible, immediately notify the On Scene Incident Commander and advise him/her that a bomb threat has been received at the incident site. Provide law enforcement with the details of the caller's responses.

Immediate evacuation of all responders must take place. Only trained EOD personnel should breach the established safety perimeter to locate or identify the suspected device.

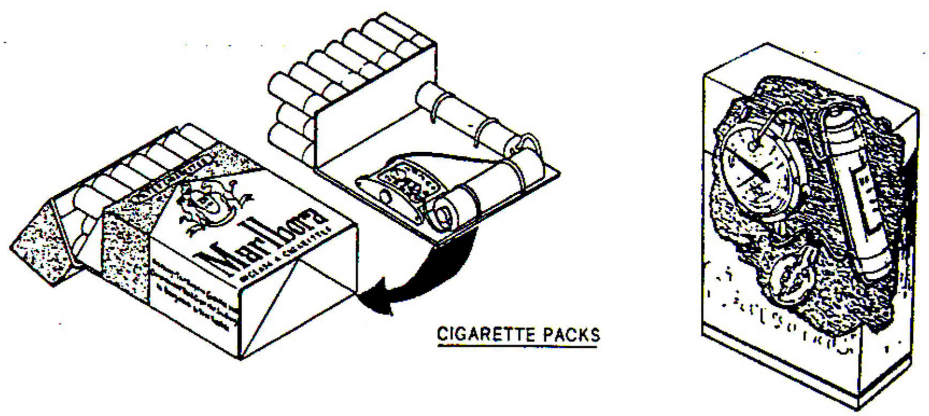

Figure 1

) EXAMPLES OF CLOSED DEVICES

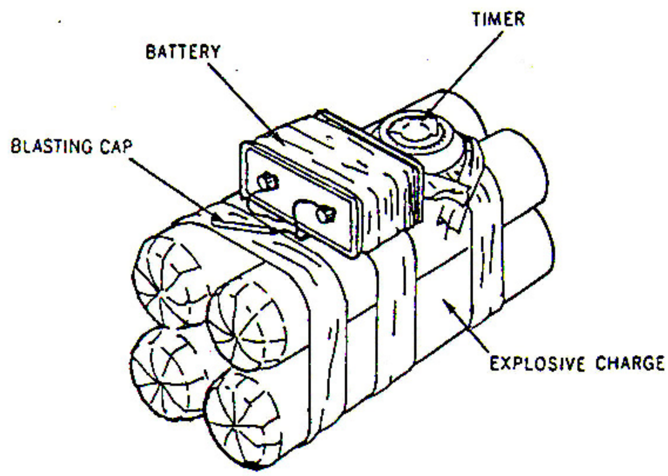

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Figure 2

EXAMPLE OF OPEN DEVICES

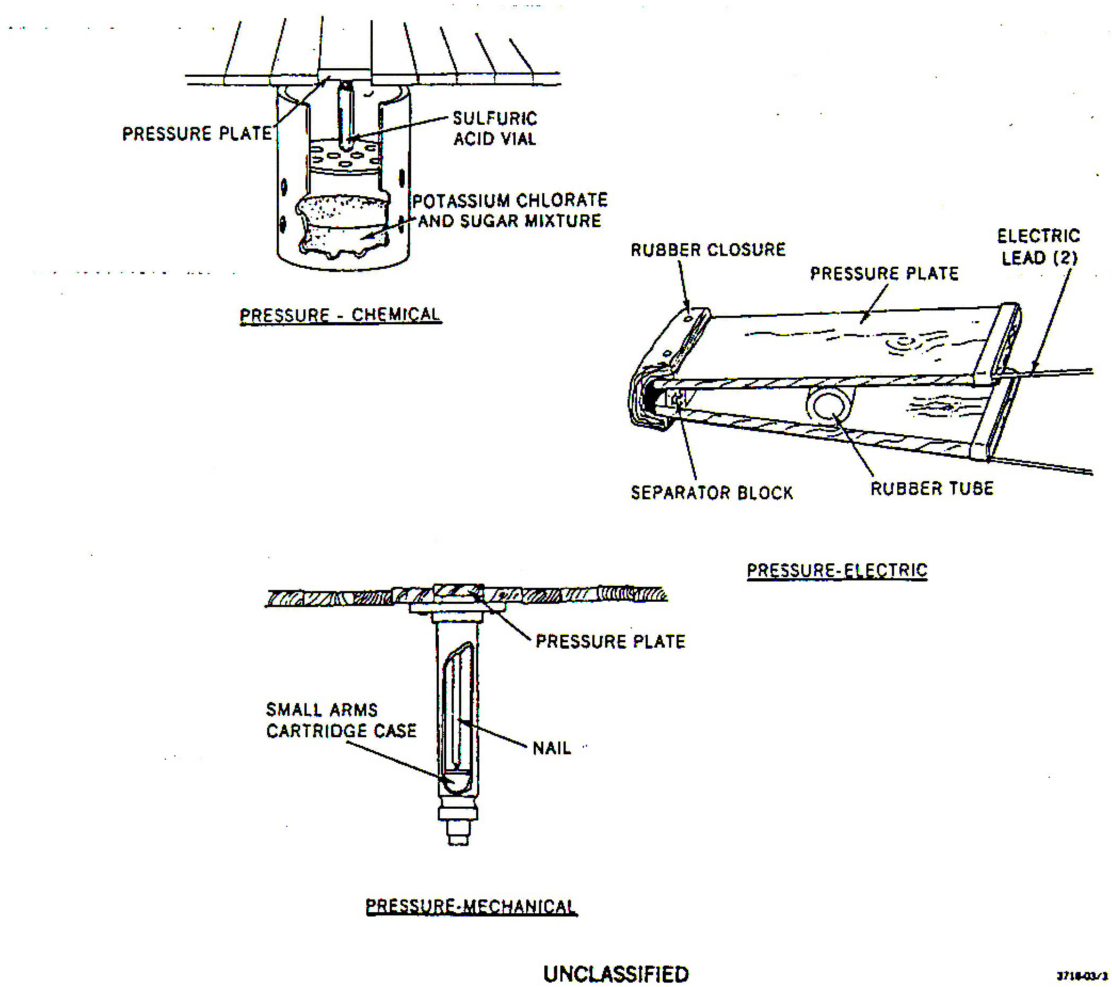

Figure 3

5) PRESSURE FIRING DEVICES

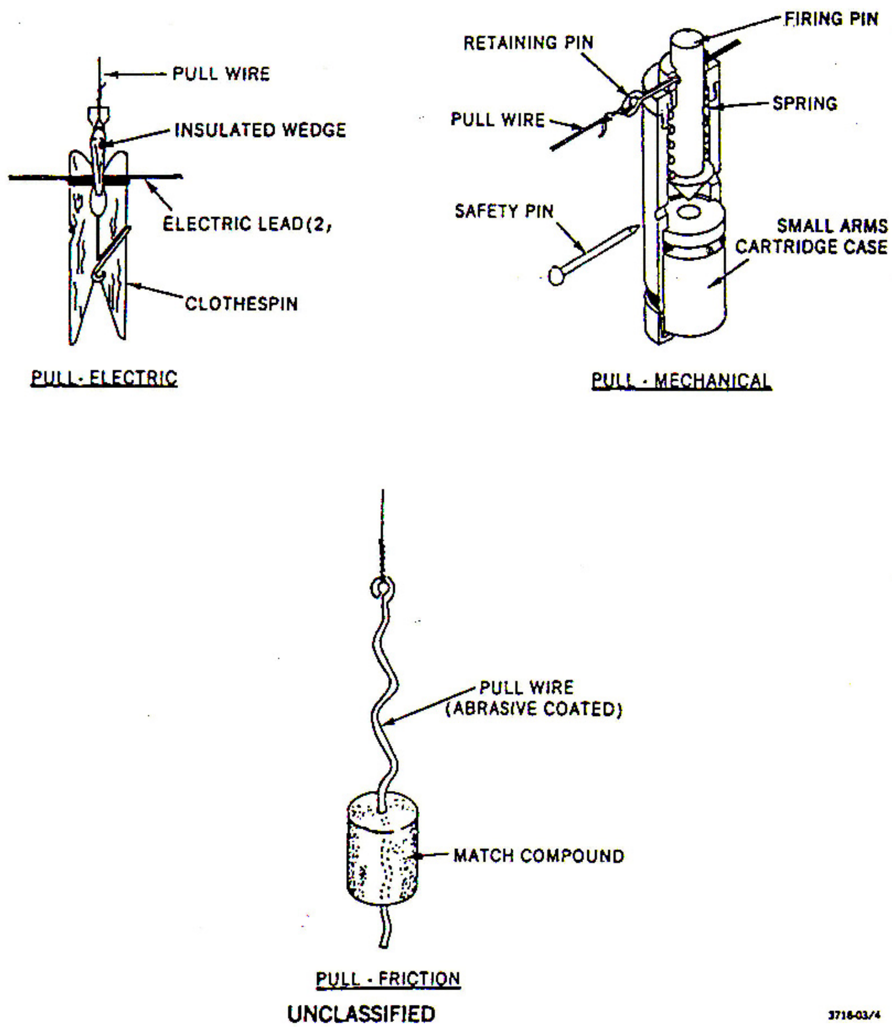

Figure 4

J) PULL FIRING DEVICES

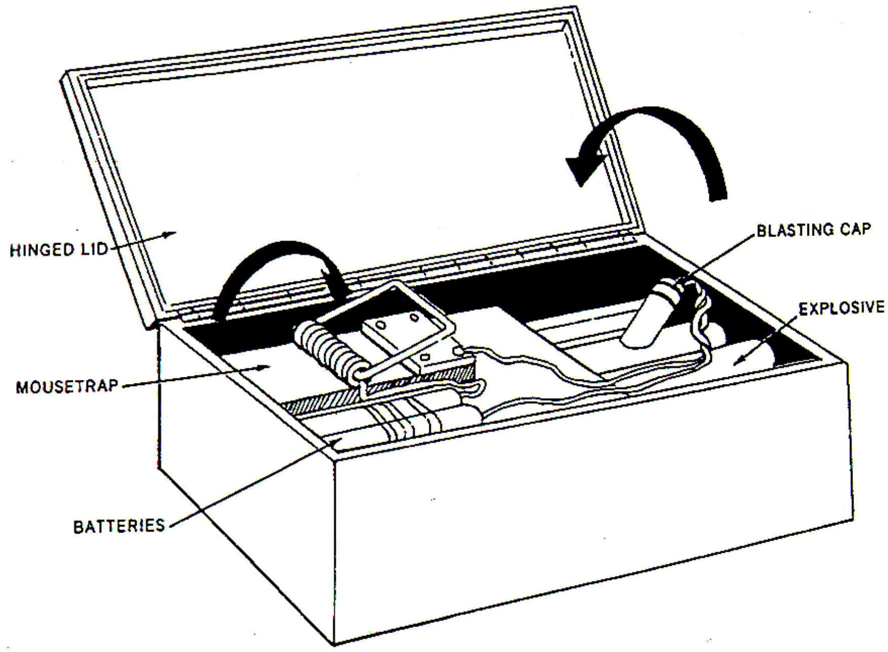

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Figure 5

PRESSURE-RELEASE FIRING DEVICE

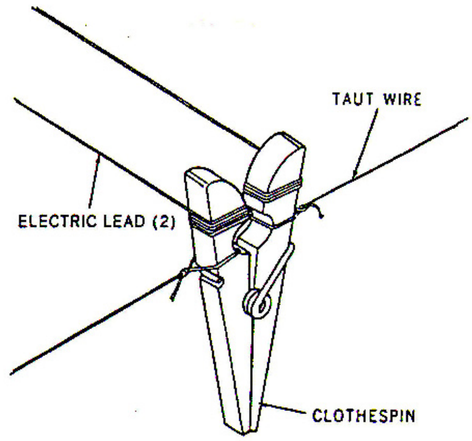

Figure 6

) TENSION-RELEASE FIRING DEVICE

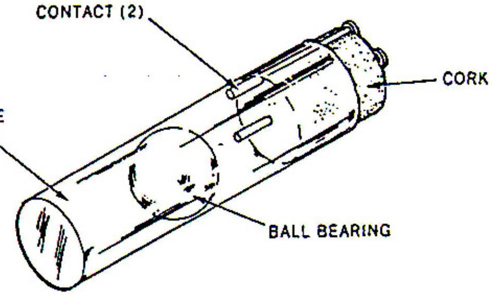

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Figure 7

J) TILT FIRING DEVICE

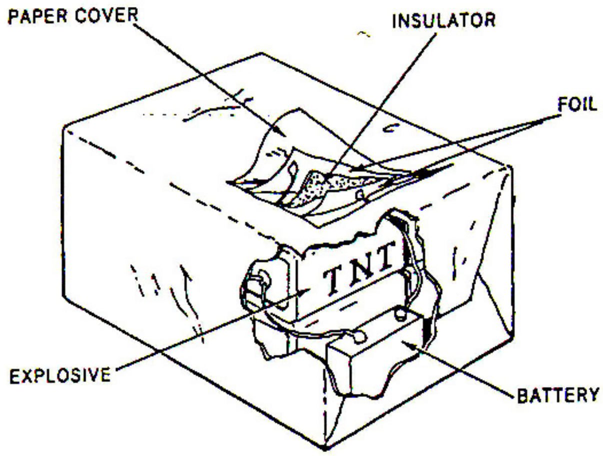

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Figure 9

ANTIPROBE FIRING DEVICE

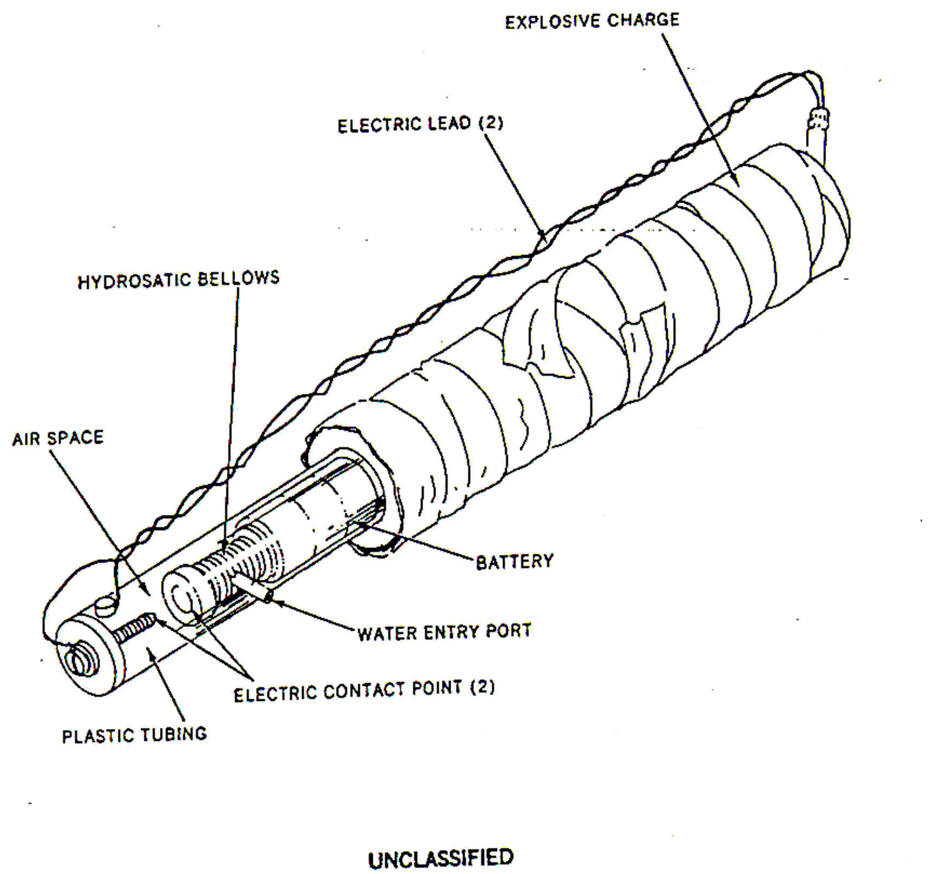


Figure 10
HYDROSTATIC PRESSURE FIRING DEVICE

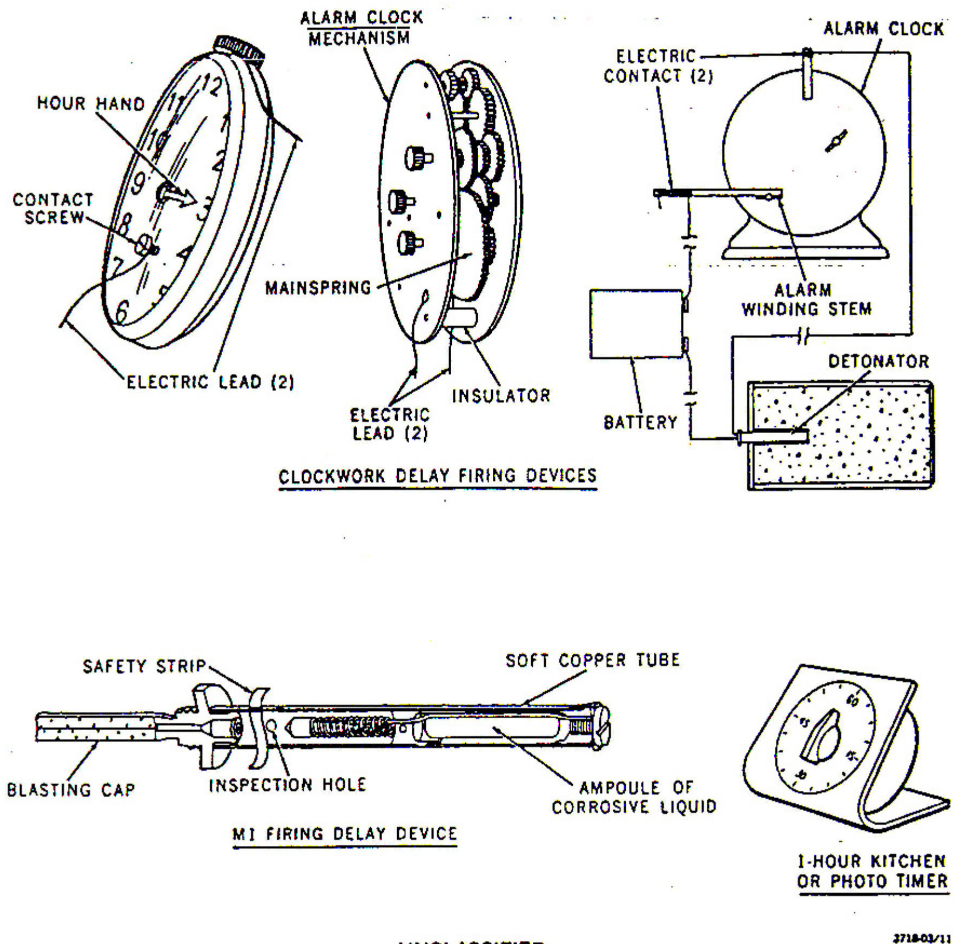


Figure 11

TIME-DELAY FIRING DEVICES

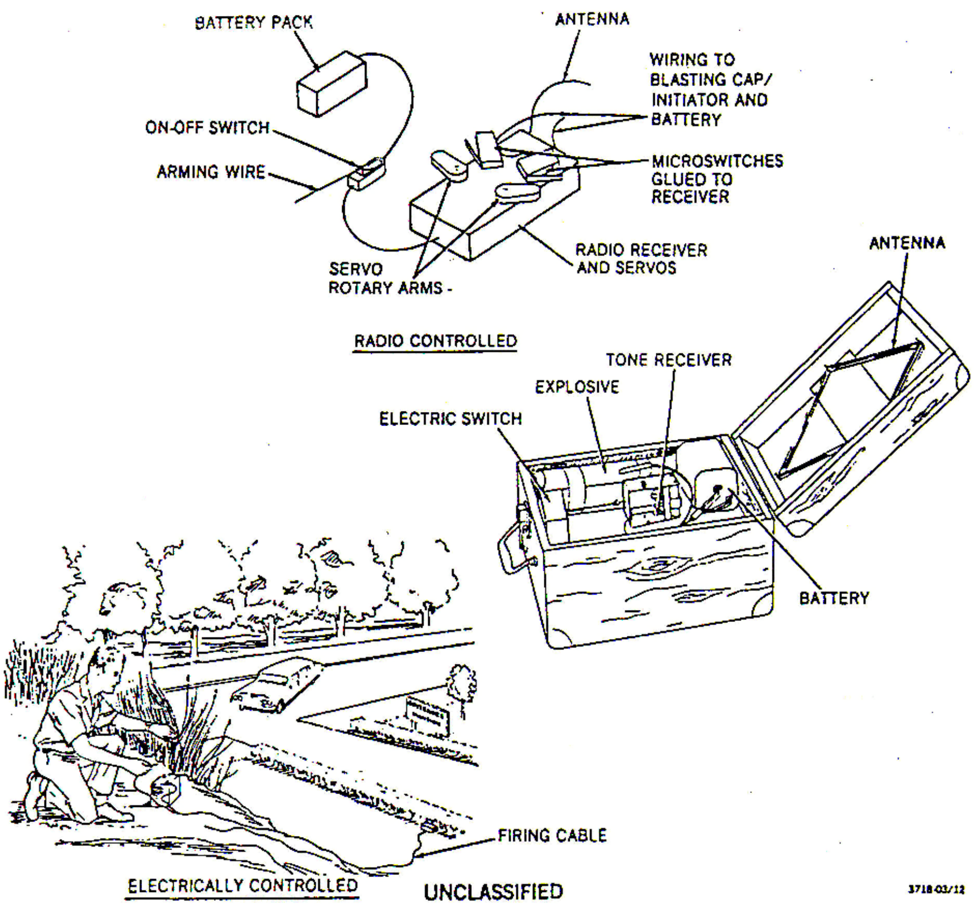


Figure 12

CONTROLLED FIRING DEVICES

Appendix G:
Turnout Gear Study

Turnout Gear Study – DRAFT

The Chemical and Biological Defense Command (CBDCOM) was asked to test Firefighters turnout gear and it's ability to protect a firefighter who may be exposed to a chemical warfare agent. **The study is not a recommendation**, but is data that will allow the incident commander to make an informed decision about PPE levels. You must consider that Firefighters are probably going to enter an atmosphere that contains a chemical agent before they realize the danger with which they are being confronted. This data provides information that shows that there is a risk in any operation, but in most cases the risk to a firefighter in turnout gear and SCBA is minimal risk in an incident involving chemical agents. Bottom line is, if civilians without protection are alive in an atmosphere then the risk to a protected firefighter is minimal.

Agents Tested: GB (Sarin), GD (Soman) VX (V-Agent), HD (Mustard)

Full Firefighters turnout gear, PBI/Kevlar (With W.L. Gore Crosstech™ vapor barrier) and SCBA. Sampling devices were placed on FF's who operated in a test environment, performing a standard set of exercises.

High Hazard Environment – vapor level sufficient to kill 19 out of 20 victims
Low Hazard Environment – vapor level sufficient to kill 1 out of 20 victims

Test Criteria: Two tests were set up low concentration and high concentration. They looked at threshold effects (e.g., headache, irritation, etc.), severe effects and lethal effects to the rescuer. The test provides a look at the chance that a rescuer would suffer those type of effects. As an example the high value for Sarin at the threshold level has a value of 3,700,000. This means that 1 rescuer in 3,700,000 may suffer a headache after being in that environment. The testing values used are listed below:

Victim Lethality	Low Level 5% (1 in 20 are dead)	High Level 95% (19 of 20 are dead)
Time before Rescue	30 mins	15 mins
Rescuer exposure (time)	2 mins	5 mins

High Level Test

Effect	Sarin	Soman	VX	Mustard
Threshold	3,700,000	11,000	7.6	1.1
Severe	12,000,000,000	6,000,000	460	2.8
Lethal	1,200,000,000,000	320,000,000	12,000	7.9

Low Level Test

Effect	Sarin	Soman	VX	Mustard
Threshold	5,200,000,000,000	96,000,000	18,000	290
Severe	> 5.2 trillion	10,000,000,000,000	1,100,000	Infinity
Lethal	> 5.2 trillion	300,000,000,000,000	Infinity	Infinity

Additional Protection

They also tested the impact of adding other protection methods, the table below shows the improvement of putting duct tape on your turnout gear.

Probability of lethal effects – Taping of TOG				
Hazard	GB	GD	VX*	HD*
High	Infinity	Infinity	80,556	476
Medium	Infinity	Infinity	831,000	11,797

* HD is not considered a lethal agent, and producing 95% lethality over a 15 minute exposure may also be impractical. Chemical warfare agent experts state that the amount of VX used to necessary to cause the effects noted may be impractical to achieve. – CBDCOM Study.

Additional Protection Measures

CBDCOM wanted to test some other protection measures, that may be available to the first responder. These are not recommendations, but offer data on protection factors that some of these items may provide.

Protective Garment	Protection Factor
Standard Turnout gear	10.5
Operational (self-taping)	16.7
Extensive Taping	20.7
Trash Bag (on top)	20.2
Double Trash Bag	26.4
Tyvek F	55.5
Tyvek F under TOG	94

Study information derived from meeting notes on CBDCOM Turnout Gear Study – information presented at the May 13, 1998 IPR meeting at APG, provided during a presentation on the study. Additional information from the CBDCOM manufacturers meeting in Bethesda, MD.

Appendix H: Emergency Medical Services Course Slides

Slide 1-1

Emergency Response to Terrorism
TC: Emergency Medical Services

Unit 1: Introduction

Slide 1-2

Terminal Objective

- Given a terrorist event, the student will be able to recognize the event and determine possible response strategies.

1-2

Slide 1-3

Enabling Objectives

- Distinguish between strategies & tactics.
- Identify strategic goals regarding terrorism response.
- Define terrorism & several categories of terrorist targets.
- List several cues for recognizing a terrorist event.
- Identify potential field medical resource needs.

1-3

Slide 1-4

The TC:EMS Course

- Instructor introduction & welcome
- Course goal
  - Increase survivability
  - Increase EMS operational effectiveness
- Administrative issues
- Student Manual overview
- Course background

1-4

Slide 1-5

Course Overview

- Unit 1 - Introduction
- Unit 2 - Safety
- Unit 3 - Security
- Unit 4 - Patient Care
- Unit 5 - Conclusion

1-5

Slide 1-6

Student Introductions

- Who are you?
- Where are you from?
- Anything in particular you hope to obtain through your attendance

1-6

Slide 1-7

Strategies versus Tactics

- Strategies
  - Broad objectives, e.g., extrication
- Tactics
  - Actual procedures employed, e.g.,
    - Gain access
    - Package patient
    - Disentangle
    - Develop means for removal
    - Move patient to triage

1-7

Slide 1-8

Activity 1.1

Strategic Considerations at a Terrorist Event: Masland Island Scenario

1-8

Slide 1-9

Terrorism Involves

- Mass casualties
- Hazardous materials
- Technical rescue
- Warfare
- Criminal investigation

1-9

Slide 1-10

Terrorism Involves (cont.)

- Numerous strategic goals systems exist to manage these events daily
  - Mass casualty
  - HazMat
  - Structural collapse

1-10

Slide 1-11

Terrorism Strategic Goals

- Sizeup
- Response and Arrival
- Security
- Protective Measures
- Establish Command
- Isolate
- Notification
- Evidence Preservation
- Product Identification
- Rescue
- Medical Care
- Control (spill, leak, fire)
- Recovery and termination

1-11

Slide 1-12

Emerging Response Doctrine

- Emerging strategies and tactics
- Sources
  - U.S. military
  - Lessons learned in U.S. and outside
  - Application of existing response technology
- Dynamic and rapidly changing

1-12

Slide 1-13

Terrorism Defined

- An act
  - Illegal (in U.S. or its subdivisions), or
  - Dangerous to human life, with
- Intent to intimidate or coerce
  - Government, or
  - Civilian population, that
- Furthers a political or social agenda

1-13

Slide 1-14

Key Concepts of Terrorism

- Violence need only be threatened
- Agent of change: fear
- Victims not necessarily the target
- Intended audience: observers
- Desired outcome: change in political or social structure

1-14

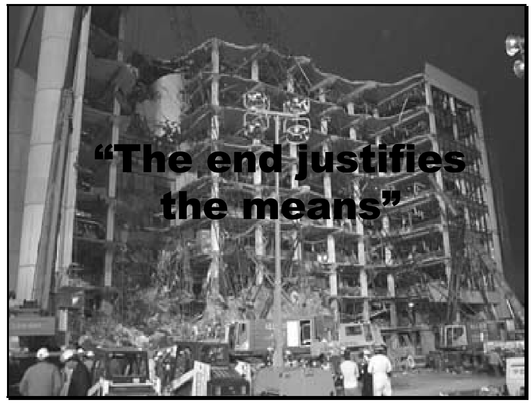
Slide 1-15

Issues of Terrorism

- Types of terrorists
  - Domestic versus international
  - Left versus right
  - Special interests
- Terrorist ideology
  - Extremist viewpoint
  - Intolerance of difference
  - Vilification

1-15

Slide 1-16



Slide 1-17

Terrorist Targets

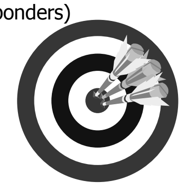
- Selection based on ability to:
  - Instill fear
  - Achieve high profile exposure
  - Demonstrate the cause
  - Create public distrust or frustration with government

1-17

Slide 1-18

Target Candidates

- Targets can be:
  - People (including responders)
  - Places
  - Infrastructure
- May be based upon
  - Criticality
  - Vulnerability



1-18

Slide 1-19

Recognizing Terrorist Events

- Recognition is the most important factor in an effective response
- Late recognition places responders in jeopardy
- Must use "clues" or "mental triggers"

1-19

Slide 1-20

Pre-Event Recognition

- Awareness of:
  - Political & social situations
  - Potential targets
  - Intelligence-gathering activities (others watching us)
- Integrated Threat Analysis Group (ITAG) development

1-20

Slide 1-21

Advisories

- ITAG issues advisories based on current threat
  - Tactical awareness
  - Tactical warning
  - Tactical alert

1-21

Slide 1-22

Event Phase Recognition

- Occupancy or location
- Types of events
- Conditions en route and on scene
  - Weather conditions
  - Channeling, choke points
  - Tactical disadvantages
- Timing
- On-site observations

1-22

Slide 1-23

Local Resources

- Local community resources
  - EMS mutual aid agreements
  - EMS regional response plans & response teams
  - Fire service response (HazMat engine companies)
  - Other local agencies
- Local Emergency Operations Plan

1-23

Slide 1-24

State Resources

- State emergency operations plan activated by local declaration of emergency
- Governor activates plan
- Enables state resources to be used
- May be developed under same organization as FRP
- When state resources exceeded, the FRP is activated

1-24

Slide 1-25

Federal Resources

- FRP implements Stafford Act
- Can be fully or partially activated
- 2 forms of Presidential activation
  - Disaster declaration
  - Declaration of major emergency

1-25

Slide 1-26

Resources Available from Feds

- FRP makes an exception by allowing Fed involvement
- Via FRP, Fed resources can be available to meet the need
- Fed response is organized under ESFs
- Each function has a lead federal agency

1-26

Slide 1-27

Unique Medical Resources

- ESF mobilized by PHS/OEP under NDMS
- DMATs (Disaster Medical Asst. Teams)
  - Burn DMATs
  - Crush DMATs
  - Other DMATs

1-27

Slide 1-28

Unique Medical Resources (cont.)

- MMSTs
  - Rescue & decon of mass casualties
- NMRTs are based in Denver, Winston-Salem, Los Angeles
  - Rescue & decon of mass casualties created by terrorism

1-28

Slide 1-29

Summary

- Definition of terrorism
- Terrorist targets
- Recognizing terrorism
- Strategies versus tactics
- Potential resource needs

1-29

Slide 2-1

Emergency Response to Terrorism
TC: Emergency Medical Services

Unit 2: Safety

Slide 2-2

Terminal Objective

- Given a simulated potential target hazard for a B-NICE incident, the student will be able to develop a safety plan that addresses the potential for secondary contamination, personal protective equipment, decontamination & monitoring considerations for personnel operating in the multi-casualty branch

2-2

Slide 2-3

Enabling Objectives

- Identify factors that contribute to the potential for secondary contamination
- Identify the precautions necessary for body fluid exposures
- Identify the resource needs and procedures for the decontamination of EMS personnel

2-3

Slide 2-4

Enabling Objectives (Cont.)

- Identify the level of personal protection needed by EMS personnel based upon their location and job function
- Identify the role of the Safety Officer and the Incident Safety Plan

2-4

Slide 2-5

Secondary Contamination

- Contamination by contaminated victims
- Not limited to people only
- Key factors in a pre-hospital setting for determining potential secondary contamination

2-5

Slide 2-6

Body Fluid Precautions

- Body substance isolation
- Dissemination of a biological agent
- Responders operating in CPC
- Responders treating/transporting patients still require PPE for body substances
- Proper containment of sharps

2-6

Slide 2-7

Supervisory Briefings

- Material(s) involved or suspected
- # of contaminated civilians & responders
- Estimated time of release
- Physical & chemical properties of the material
- Actions taken
- Hazard zones established & boundaries

2-7

Slide 2-8

Supervisory Briefings (cont.)

- Establishment of dedicated water supply for decon
- Response of technical assistance & estimated time of arrival
- Dedicated radio channel for responders operating in CPC
- Appropriate level of PPE for each zone

2-8

Slide 2-9

Responder Briefings

- Briefing includes:
  - Location of hazard zone boundaries
  - Location of decon lines
  - Proper radio frequency
  - Proper PPE & equipment needed
  - Incident assignment

2-9

Slide 2-10

EMS Responder Decon

- Prompt, safe and effective decontamination (decon) protects against & reduces effects of exposure.
  - NFPA definition
  - OSHA definition
  - Working definition

2-10

Slide 2-11

EMS Responder Decon (cont.)

- Phases of decon
  - Gross
  - Secondary
  - Tertiary (usually at medical facilities)

2-11

Slide 2-12

7 Mechanisms for Performing Decon

- Emulsification
- Chemical reaction (e.g., neutralization, oxidation, degradation)
- Disinfection
- Dilution
- Absorption and Adsorption
- Removal
- Disposal

2-12

Slide 2-13

Decon Situations

- Obvious contamination with known substance
- Suspected contamination with known substance
- Any likelihood of exposure to a hazardous substance
- Prevent spread of contaminant
- Environmental protection

2-13

Slide 2-14

Contamination Reduction Corridor

- Key difference is whether or not responders are in proper PPE
  - Lines for those with PPE
  - Lines for responders who become symptomatic

2-14

Slide 2-15

Basic Decon Equipment

- Buckets & brushes
- Decon solution & tubs
- Dedicated water supply
- Tarps or plastic sheeting
- Containment vessel for runoff & pump
- A-frame ladder
- Appropriate PPE

2-15

Slide 2-16

Objectives of Responders

- Determine appropriate level of PPE based on materials & hazards
- Properly wear & operate in PPE
- Establish operating time log
- Set up & operate decon line
- Conduct triage & communicate while in PPE

2-16

Slide 2-17

Decon of PPE - Responders

- Rinse, head to foot
- Scrub suit with brush, head to foot
- Attend to heavily contaminated areas, i.e., hands, feet, front of suit
- Rinse again, head to foot
- Assist responder in removing PPE

2-17

Slide 2-18

Decon Supervisor

- PPE limits vision, so it should not be worn
- Responsible for final walkthrough of corridor
- Ensures supplies & runoff containment
- Once decon begins, only PPE equipped personnel in zone

2-18

Slide 2-19

Decon Supervisor(cont.)

- Remains in radio contact with CP
- Supervises decon from outside the line
  - Medical Quality Control
  - Watches for need for medical intervention
  - Assigns tasks to decon and support personnel
- In position to observe all leaving hot zone

2-19

Slide 2-20

PPE for EMS Responders

- CPC protects from patients
- CPC protects skin & eyes from chem
- May be different levels of PPE at site
- There is no all-hazard-type ensemble
- EMS needs competency-based PPE training
- Two types of suits

2-20

Slide 2-21

3 Areas of CPC Testing

- Permeation
- Penetration
- Degradation

2-21

Slide 2-22

Levels of Protection

- Level A - vapor proof, totally encapsulating
- Level B - splash and high respiratory protection, not vapor proof
- Level C - similar to B, uses lower respiratory protection
- Level D - work uniform

2-22

Slide 2-23

Conditions for Selecting - Level A

- Confined
- Enclosed
- High splash
- IDLH dermal
- High concentration

2-23

Slide 2-24

Conditions for Selecting - Level B

- High respiratory
- O_2 less than 19.5%
- Minimum for unknown materials
- Moderate splash
- Not IDLH dermal

2-24

Slide 2-25

Conditions for Selecting - Level C

- No IDLH respiratory or dermal
- Contaminant known
- Air purifying respirator criteria met
- > 19.5 % O_2

2-25

Slide 2-26

Conditions for Selecting - Level D

- No chemical hazards present
- Might include aprons, gloves and eye protection for "lab" type activities

2-26

Slide 2-27

NFPA Standard 1991

- Defines vapor protective suit
- Worn when chem present IDLH
- Test all parts of suit to 17 chemicals plus
- Suit undergoes pressurization test
- Test burst strength
- Technical data package

2-27

Slide 2-28

Other NFPA PPE Standards

- NFPA 1992 - Splash Protective Garments
  - Chemical compatibility test
  - Puncture and tear
  - Temperature
- NFPA 1993 - Support Protective Garments
  - Used in support areas and roles
  - Areas of minimal potential for contamination

2-28

Slide 2-29

PPE Effects On Wearer

- Thermal stress
- Restricted movement
- Restricted vision
- Impaired hearing
- Impaired communication
- Promotes claustrophobia
- Offers no thermal protection

2-29

Slide 2-30

Military vs. Firefighter

- Aberdeen Proving Grounds
- Effectiveness of firefighter protective clothing
- Found to have limited effectiveness against chemical agents (only for rescue)

2-30

Slide 2-31

Military PPE

- Mission Oriented Protective Posture (MOPP)
  - Overgarment
  - Charcoal liner
  - Mask
  - Hood
  - Overboots
  - Gloves

2-31

Slide 2-32

Firefighter Protective Clothing

- Shell, vapor barrier and liner
  - Severe limits to dermal protection
- Positive pressure SCBA
  - High levels of respiratory protection

2-32

Slide 2-33

Medical Monitoring for PPE Wearers

- Heat stress
- Physical condition
- Psychological, mechanical & physiological stressors
- Heat rash, cramps, exhaustion, stroke
- Pre- and post-entry medicals according to local protocol

2-33

Slide 2-34

Proper Hydration

- No eating, drinking, or smoking at HazMat assignment
- Fluids prevent heat-related emergencies
  - Drink fluids prior to start of tour & continue throughout
  - Avoid caffeine & alcohol

2-34

Slide 2-35

Proper Hydration (cont.)

- Fluid loss
  - Usually underestimated
  - SCBA or APR use affects mucous membranes
  - Wearing of CPC will increase amt of fluid loss
- Rehydration
  - Plain water is best

2-35

Slide 2-36

7 Mechanisms of Harm

- TEAM CPR (formerly TRACEM)
  - **T**hermal
  - **E**tiological
  - **A**sphyxiant
  - **M**echanical
  - **C**hemical
  - **P**sychological
  - **R**adioactive

2-36

Slide 2-37

Role of Incident Safety Officer

- Ensure
  - Responders wear PPE
  - Work in teams
  - Have back up
  - Use accountability system for tracking
  - Follow safety practices
  - Follow those practices during training

2-37

Slide 2-38

Incident Safety Plan

- Location & size of zones
- Proper level of PPE in each zone
- Location & setup of decon line
- Rapid intervention team with CPC
- Medical monitoring of responders in CPC
- Emergency evacuation signals
- Responder accountability
- Responder medical treatment team

2-38

Slide 2-39

Weather Conditions

- Present & forecasted weather
  - Inversion gradient
  - Neutral gradient
  - Lapse gradient
  - Humidity
  - Barometric pressure
  - Clear skies & clouds

2-39

Slide 2-40

Controlled Weather

- Inversion
- Lapse
- Humidity
- Clear skies
- Cloud cover

2-40

Slide 2-41

Impact of Weather

- Factors that wear you out make many agents more effective!

2-41

Slide 2-42

Additional Monitoring

- Geographic
  - Weather
  - Size of zones
  - Patient monitoring

2-42

Slide 2-43

Activity 2.1

Emergency Response Plan Development

2-43

Slide 2-44

Summary

- Prevention of contamination
- Safety officer
- Incident safety plan
- Monitoring needs
- Recognizing TEAM CPR
- Wearing appropriate PPE
- Decontamination

2-44

Slide 3-1

Emergency Response to Terrorism
TC: Emergency Medical Services

Unit 3: Security

Slide 3-2

Terminal Objective

- Given a simulated terrorist event, the student will be able to ID security concerns regarding responses and on-site operation

3-2

Slide 3-3

Enabling Objectives

- ID difference between known and unknown incidents
- ID aspects of vulnerability
- ID primary security actions to take when a terrorist event occurs
- ID how lay of the land will impact security
- ID different strategies and tactics to be utilized for self-preservation

3-3

Slide 3-4

Pre-Response Conditions

- Different response if
  - Known terrorist incident
  - Unknown terrorist incident

3-4

Slide 3-5

Response Criteria

- Primary actions involving responders on the scene or en route to the incident
  - Life protection/preservation
  - Controlling chaos
  - Requesting assistance

3-5

Slide 3-6

Vulnerability Assessment

- Purpose - determine shortfalls and weaknesses when responding to terrorist acts
- Assistance of law enforcement necessary for security-related areas

3-6

Slide 3-7

Vulnerability Assessment: Areas to Consider

- Incident site operations
- Pre-planning response routes (primary and secondary)
- Command and control sites
- IED awareness training
- Secondary explosive devices/booby trap awareness training
- Multiple-incident site operations considerations

3-7

Slide 3-8

Vulnerability Assessment: Areas to Consider (cont.)

- Pre-planned and proposed staging areas
- Communications plans (primary and secondary)
- Medical operations
- Medical receiving facilities
- Casualty collection points
- Mortuary facilities (fixed and temporary)
- Evacuation sites

3-8

Slide 3-9

Vulnerability Assessment: Areas to Consider (cont.)

- Shelter-in-place considerations
- Personnel and equipment resources
- Re-supply resources
- Security resources
- Mass casualty response resources (transportation, medical, command and control)
- Responder knowledge of B-NICE threat outward warning signs

3-9

Slide 3-10

Vulnerability Assessment: Areas to Consider (cont.)

- Evidence preservation training
- Responder self-protection measures training
- Rescue operations

3-10

Slide 3-11

Protective Actions

- Hazard
  - A known or perceived danger
  - Chem agent, HazMat, hazardous conditions
- Risk
  - Acceptable or unacceptable
  - Exposure to known or perceived danger
  - Gamble whether or not danger will prevail

3-11

Slide 3-12

Vulnerability

- Disadvantage
- Exposed position
- Threat/Hazard

3-12

Slide 3-13

Security

- Response security: actions to be taken en route
- Establishing security-related procedures: Preplan

3-13

Slide 3-14

Response Security

- Response routes & corridors
- ID primary & alternate response routes
- ID choke points
- Designate rallying points

3-14

Slide 3-15

Preplanning for Survivability

- Incident site emergency egress plan
- Backup team
- Ruse tactics checklist
- Methods of alternate or secure communications
- Detailed checklist to query involved personnel
- Gather all info possible on what happened

3-15

Slide 3-16

Topography

- Controls access
- Bottlenecks
- Limited access
- Access & exit corridors
- Natural & manmade characteristics

3-16

Slide 3-17

Impacts

- Are you being drawn into a trap?
- Are you being forced to advance uphill?
- Are terrain features forcing you to deviate from your plan?
- Are things going according to someone else's plan?

3-17

Slide 3-18

Zones/Perimeter Communications

- Concise & clear naming
- Crosses all boundaries of countries & agencies
- Labeling by hazard or protection need

3-18

Slide 3-19

Perimeter Criteria

- Direct zone names & placement
- Security
- Hazardous materials
- Hazardous conditions
- Health
- Biological

3-19

Slide 3-20

Strategies & Tactics for Self-Protection Overview

- Recognition & survival - develop skills to minimize losses
- Initial reconnaissance
  - Route
  - Incident site
  - Vulnerability assessment

3-20

Slide 3-21

Initial Recon: Route

- Determine vulnerable areas
- Channeling
- Choke points
- Ambush

3-21

Slide 3-22

Initial Recon: Site

- Possibility of IEDs
- Hazards & associated devices
- Distraction techniques
- Hoax device tactics
- Maximize responder survivability

3-22

Slide 3-23

Initial Recon: Site (cont.)

- Ambush tactics
- Recognition skills: types of devices
- Rapid evacuation planning issues
- When device is discovered, what to do?

3-23

Slide 3-24

Vulnerability Assessment

- Where & what are the dangers?
- Discipline
- Time to assess
- ID things that place you at a disadvantage
- ID exposures & reduce

3-24

Slide 3-25

Protective Measures

- Rig placement
- Safety of crew
- Discipline
- Minimize losses

3-25

Slide 3-26

Tactical Options Overview

- Protection
- Reconnaissance

3-26

Slide 3-27

Protection Options

- Enhance overall responder survivability & supportability
- Physically hazardous conditions
- Proper PPE for the hazard
- Decon
- Monitoring
- Physical shelter
- Vulnerability assessment
- Security considerations

3-27

Slide 3-28

Reconnaissance Options

- Recon
- Team activities
- Topographical maps
- Census maps
- Building plans

3-28

Slide 3-29

Activity 3.1

Post Office Scenario (Part 1)

3-29

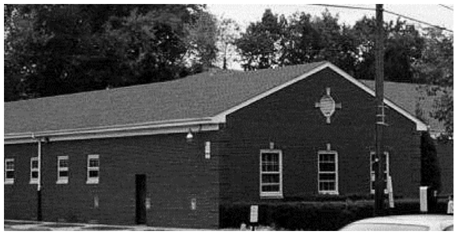
Slide 3-30

Activity 3.1 (cont.)

3-30

Slide 3-31

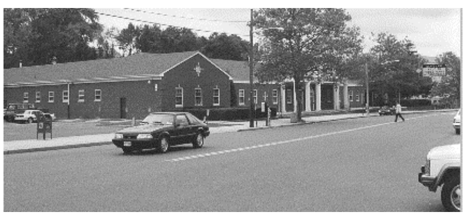
Activity 3.1 (cont.)



3-31

Slide 3-32

Activity 3.1 (cont.)



3-32

Slide 3-33

Activity 3.1 (cont.)

3-33

Slide 3-34

Post Office: Phase 1

- 1000 hours MONDAY
- Your agency is dispatched to the local post office on an EMS call for a female with shortness of breath. The local police department also responds with one police car. While you are responding, your dispatcher notifies you that there are additional calls. Some of the callers are reporting a male victim.

3-34

Slide 3-35

Post Office: Phase 2

- 1005 hours MONDAY
- Upon arrival you see approx. 15 people outside the main door to the post office coughing, tearing, & calling for help. Several are on their knees. As you put the vehicle in park, 5 people start running toward you calling for help.
- The people report that there was a white cloud in the lobby & their eyes & skin started burning.

3-35

Slide 3-36

Summary

- Primary actions: life protection, controlling chaos & requesting assistance
- ID the hazards, build acceptable risks, analyze vulnerability
- Establish procedures before you need them

3-36

Slide 4a-1

Emergency Response to Terrorism
TC: Emergency Medical Services

Unit 4: Patient Care
Part A

Slide 4a-2

Terminal Objective

- You will be able to develop a patient treatment plan for a terrorist incident with casualties involving B-NICE materials

4A-2

Slide 4a-3

Enabling Objectives

- ID potential agents used in a terrorist event involving B-NICE material & triage those patients into an appropriate treatment order
- ID appropriate personal protection for use during patient care based upon hazard(s), risks & available PPE

4A-3

Slide 4a-4

Enabling Objectives (Cont.)

- Based upon the signs and symptoms presented by the patients, suggest the likely materials involved
- ID considerations for the safe transport of patients to traditional & non-traditional medical treatment facilities

4A-4

Slide 4a-5

Introduction

- Before providing patient care we must:
  - Recognize the event as terrorist
  - Isolate & secure the event
  - Protect our personnel & ID viable victims
  - Understand how various weapons can affect the body
  - Understand the sequence of patient care events

4A-5

Slide 4a-6

Mainstays of Patient Care

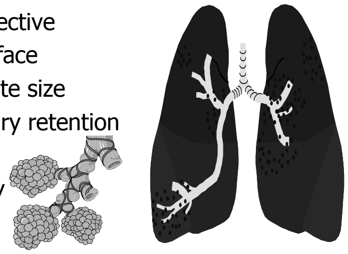
- Rescuer self-protection
- Prevention of further exposure
- Provide supportive care
- Decontamination
- BLS & ALS treatment
- Transport
- Transfer

4A-6

Slide 4a-7

Respiratory Dissemination

- Most effective
- Vast surface
- Particulate size
- Pulmonary retention
- Velocity
- Solubility



4A-7

Slide 4a-8

Other Dissemination Means

- Ingestion - alimentary route through contamination of food or water (municipal water very poor dissemination)
- Dermal - percutaneous
- Chemical
- Vector - (e.g., fleas and bubonic plague)
- Human to human - Very rare (plague and smallpox)

4A-8

Slide 4a-9

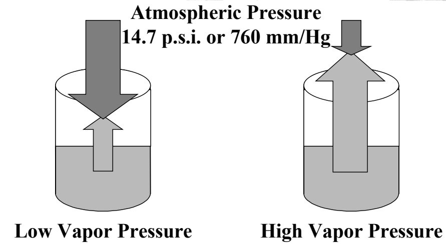
Agent Characteristics

- Infectivity (Bio)
- Volatility (Chem/Bio) Overview
- Persistency (Chem/Bio)

4A-9

Slide 4a-10

Volatility (Vapor Pressure)



4A-10

Slide 4a-11

Persistency

- Ability of a (Bio) agent to live in environment
- Ability of a (Chem) agent to remain in an environment
- Ex. of persistency
  - Anthrax
  - Tabun

4A-11

Slide 4a-12

Persistency (cont.)

- Virulence
- Incubation period
- Transmissibility
- Lethality

4A-12

Slide 4a-13

Weapon Types

B - Biological
N - Nuclear
I - Incendiary
C - Chemical
E - Explosives

4A-13

Slide 4a-16

Activity 4.1

Biological Agent Impacts

4A-16

Slide 4a-14

Biological Agents

- 3 classes:
  - Bacteria
  - Toxins
  - Viruses
- Other classes:
  - Rickettsia
  - Chlamydia
  - Fungi

4A-14

Slide 4a-17

Anthrax *(Bacillus anthracis)*

- Three forms
- Zoonotic, sporolating, bacteria
- Incubation: 1-6 days
- Clinical effects
- Signs & symptoms
- Personal protection
- Patient care and decon

4A-17

Slide 4a-15

Biological Agents

Overview

- History & use
- Agents, clinical effects, signs & symptoms, PPE, treatment & decon
  - Anthrax
  - Cholera
  - Plague
- Many others exist

4A-15

Slide 4a-18

Slide 4a-19

Anthrax *(Bacillus anthracis)*

4A-19

Slide 4a-20

Cholera *(Vibrio cholerae)*

- Gastroenteritis agent
- Incubation: 1-5 days
- Clinical effects
- Not readily transmissible (Intestinal fluid precautions)
- Treatment

4A-20

Slide 4a-21

Plague *(Yersinia pestis)*

- Three forms (bubonic, septicemic, pneumonic)
- Potential dissemination
- Incubation 2-3 days (Bubonic 2-10)
- Signs & symptoms
- Highly contagious
- Patient care

4A-21

Slide 4a-22

Toxins

- Description and types
- Difference between toxin & bacteria
- Agents, clinical effects, signs & symptoms, PPE, treatment & decon
  - SEB
  - Ricin
  - Botulinum
  - T2 Mycotoxin
  - And many more

Overview

4A-22

Slide 4a-23

Staphylococcal Enterotoxin B *(SEB)*

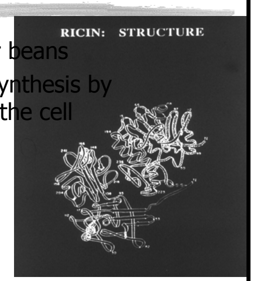
- Enterotoxin - Produced by *staphylococcus aureus* bacteria
- Onset 4–6 hours (inhalation)
- Clinical effects differ with portal
- Signs & symptoms
- Not transmissible
- Patient care

4A-23

Slide 4a-24

Ricin

- Derived from castor beans
- Interrupts protein synthesis by altering the RNA in the cell
- Onset 24-72 hours
- Signs & symptoms
- Not transmissible
- Patient care



4A-24

Slide 4a-25

Botulinum Toxin

- Neurotoxin
- Characteristics
- Clinical effects
- Onset 24-36+ (Inh)
- Signs & symptoms
- Not transmissible
- Patient care

4A-25

Slide 4a-26

Viruses

- Description
- Overall concerns:
  - Good news
    - Hard to make
    - Difficult to maintain
  - Bad news
    - Most, no cure
    - Many spread human to human

4A-26

Slide 4a-27

Smallpox *(Variola virus)*

- Historical perspective
- Incubation: 10–12 days
- Signs & symptoms
- Highly contagious
- Protection
- Patient care

4A-27

Slide 4a-28

Encephalitis

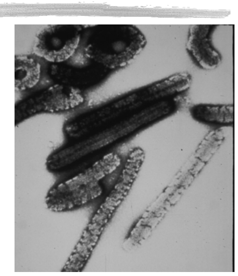
- Numerous forms
- Epidemiological considerations
- Clinical effects
- Signs & symptoms
- Transmission possible
  - Fluids and respiratory droplets
- Patient care

4A-28

Slide 4a-29

Viral Hemorrhagic Fevers

- Numerous forms
- Clinical effects
- Signs & symptoms
- Highly contagious
- Patient care



4A-29

Slide 4a-30

Activity 4.2

Assessing Biological Indicators

4A-30

Slide 4b-1

Emergency Response to Terrorism
TC: Emergency Medical Services

Unit 4: Patient Care
Part B

Slide 4b-2

Physiological Effects

B - Biological
N - Nuclear
I - Incendiary
C - Chemical
E - Explosives

4B-2

Slide 4b-3

Nuclear/Radioactive Devices

- Four possibilities
- Radioactive decay
- Types of ionizing radiation
  - Alpha, Beta, Gamma
- Units of measure
- Scene control considerations

4B-3

Slide 4b-4

Sample Exposure Limits

RAD = REM (for our purposes)
mREM = millirem = 1/1,000 of a REM

Natural background radiation - 1-year dose	300 mREM
Flight from LA to Paris	4.8 mREM
Barium enema	8,000 mREM
Smoking 1.5 packs per day - 1-year dose	8,000 mREM
Heart catheterization	45,000 mREM
Mild Acute Radiation Syndrome	200,000 mREM
LD_{50} for irradiation	450,000 mREM

4B-4

Slide 4b-5

Acute Radiation Syndrome (ARS)

- Effects of radiation
  - Blood effects starting at 150 REM
  - Gastrointestinal effects starting at 500 REM
  - CNS effects starting at 1,000 REM
- Personal protection
  - Time, Distance & Shielding
  - Use of personal protective equipment

4B-5

Slide 4b-6

Physiological Effects

B - Biological
N - Nuclear
I - Incendiary
C - Chemical
E - Explosives

4B-6

Slide 4b-7

Incendiary Devices

- Consider materials used
  - Fuels
  - Phosphorus
  - Hypergolic mixtures
- Thermal burn treatment
  - Maintain body temperature
  - Follow local burn treatment protocols

4B-7

Slide 4b-8

Physiological Effects

B - Biological
N - Nuclear
I - Incendiary
C - Chemical
E - Explosives

4B-8

Slide 4b-9

Chemical Agents

Overview

- Classifications
  - Choking agents
  - Vesicating agents
  - Cyanides (blood agents)
  - Nerve agents

4B-9

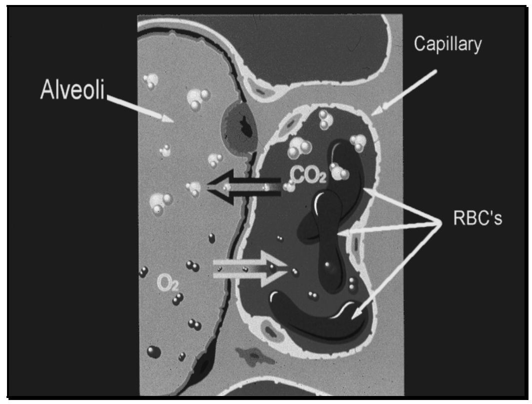
Slide 4b-10

Choking Agents: Physiological Effects

- Respiratory structure
- Particulate disposition
- Respiratory irritants
- Respiratory irritation
- Non-cardiogenic pulmonary edema

4B-10

Slide 4b-11



Slide 4b-12

Vesicating Agents

- Vesicles
- Oldest chem warfare agent
- Signs & symptoms
- Clinical effects
- Personal protection
- Treatment
- Triage considerations

4B-12

Slide 4b-13

Cyanides

- Description
- Clinical effects
- Symptoms
- Protection
- Treatment

4B-13

Slide 4b-14

Nerve Agents

- Very toxic relatives of pesticides
- Disrupt nerve impulses to muscles, glands & nerves
- Not gases; generally oily liquids
- Effect function of material used and method of dissemination related to whether victim is in enclosed or open space

4B-14

Slide 4b-15

Nerve Agent Vapor Pressure

GA	Tabun	0.07 mm/Hg
GB	Sarin	2.9 mm/Hg
GD	Soman	<0.01 mm/Hg
VX	V-Agents	0.0007 mm/Hg

4B-15

Slide 4b-16

Nerve Agent Considerations

- Tokyo sarin experience
- Clinical effects
- Protection
- Signs & symptoms
- Treatment

4B-16

Slide 4b-17

Activity 4.3

Determining Patient Care Considerations

4B-17

Slide 4b-18

Physiological Effects

B - Biological
N - Nuclear
I - Incendiary
C - Chemical
E - Explosives

4B-18

Slide 4b-19

Explosive Weapons

- The most commonly used
- Types: high & low
- Pressure effects
- Primary & secondary injury effects
- Crush syndrome
- Treatment modalities
- In-the-rubble management
- Controversial interventions

4B-19

Slide 4b-20

Mass Patient Decontamination

"Cleaning in Numbers"

4B-20

Slide 4b-21

Primary Considerations

- Basic steps remain the same
  - Gross
  - Secondary
  - Tertiary
  - Patient care
- Runoff control is of limited concern

4B-21

Slide 4b-22

Extent of Decontamination

- Factors to secondary contamination risks
  - Physical state of agent
  - Water solubility
  - Vapor pressure
- Mass decontamination systems

4B-22

Slide 4b-23

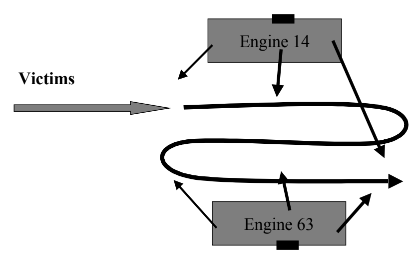
Crowd Emergency Decon

- Various examples
  - 2-engine
  - 3-engine

4B-23

Slide 4b-24

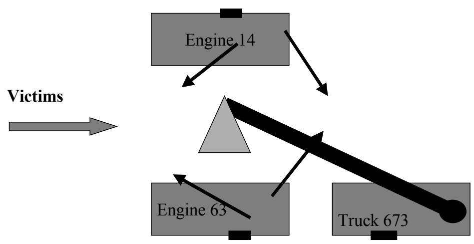
Crowd Emergency Decon



4B-24

Slide 4b-25

Crowd Emergency Decon



4B-25

Slide 4b-26

Two-Corridor Mass Decon

4B-26

Slide 4b-27

Three-Corridor Mass Decon

- Trailer positioned in center for non-ambulatory patients
- Shower heads off both sides of trailer
  - Shower areas have privacy curtains
  - Males to one side
  - Females to other side

4B-27

Slide 4b-28

Accessories - Tents

4B-28

Slide 4b-29

Accessories - Stretchers

4B-29

Slide 4b-30

Accessories - Systems

4B-30

Slide 4b-31

Activity 4.4

Post Office Scenario (Part 2)

4B-31

Slide 4b-32

Post Office: Phase 1

- 1000 hours MONDAY
- Your agency is dispatched to the local post office on an EMS call for a female with shortness of breath. The local police department also responds with 1 police car. While you are responding, your dispatcher notifies you that there are additional calls. Some of the callers are reporting a male victim.

4B-32

Slide 4b-33

Post Office: Phase 2

- 1005 hours MONDAY
- Upon arrival you see approx. 15 people outside the main door to the post office coughing, tearing, & calling for help. Several are on their knees. As you put the vehicle in park, 5 people start running toward you calling for help.
- The people report that there was a white cloud in the lobby & their eyes & skin started burning.

4B-33

Slide 4b-34

Post Office: Phase 3

- 1010 hours MONDAY
- Law enforcement units are arriving to secure the outer perimeter and the high ground around the post office. Your EMS director has arrived and has formed a unified command with law enforcement and the fire department command officer.

4B-34

Slide 4b-35

Post Office: Phase 3 (cont.)

- 1015 hours MONDAY (cont.)
- Two additional ambulances have arrived and your EMS supervisor is currently serving as the Mass Casualty Branch director and has ordered you to assume position of treatment group leader. You are still presented with 15 patients generally complaining of burning eyes, respiratory irritation and coughing

4B-35

Slide 4b-36

Summary

- Mainstays of patient care
  - Rescuer self-protection
  - Prevention of further exposure
  - Provide supportive care
  - Decon
  - BLS & ALS treatment
  - Transport
  - Transfer
- Key recognition of terrorist event
- Weapons present with specific patient injuries & system impacts: B-NICE

4B-36

Slide 5-1

Emergency Response to Terrorism
TC: Emergency Medical Services

Unit 5: Conclusion

Slide 5-2

Terminal Objective

- Given a simulated terrorist event, identify standard response equipment and specialized detection equipment and its application in the response to a terrorist event.

5-2

Slide 5-3

Activity 5.1

Post Office Scenario (Part 3)

5-3

Slide 5-4

Post Office: Phase 1

- 1000 hours MONDAY
- Your agency is dispatched to the local post office on an EMS call for a female with shortness of breath. The local police department also responds with 1 police car. While you are responding, your dispatcher notifies you that there are additional calls. Some of the callers are reporting a male victim.

5-4

Slide 5-5

Post Office: Phase 2

- 1005 hours MONDAY
- Upon arrival you see approx. 15 people outside the main door to the post office coughing, tearing, & calling for help. Several are on their knees. As you put the vehicle in park, 5 people start running toward you calling for help.
- The people report that there was a white cloud in the lobby & their eyes & skin started burning.

5-5

Slide 5-6

Post Office: Phase 3

- 1010 hours MONDAY
- Law enforcement units are arriving to secure the outer perimeter and the high ground around the post office. Your EMS director has arrived and has formed a unified command with law enforcement and the fire department command officer.

5-6

Slide 5-7

Post Office: Phase 3 (cont.)

- 1015 hours MONDAY (cont.)
- Two additional ambulances have arrived and your EMS supervisor is currently serving as the Mass Casualty Branch director and has ordered you to assume command as treatment group leader. You are still presented with 15 patients generally complaining of burning eyes, respiratory irritation and coughing.

5-7

Slide 5-8

Post Office: Phase 4

- 1020 hours MONDAY
- Searches for additional victims are being conducted with negative results. A letter has been found along with a spray-type device attached to a timer. The letter says:
- "This was to get your attention. When you see the results of my further wrath, you will never dismiss me again."

5-8

Slide 5-9

Post Office: Phase 4 (cont.)

- 1020 hours MONDAY (cont.)
- The letter was signed "A Citizen."
- The patients are starting to experience relief of their symptoms, which include burning throat, tearing, burning skin, & a dry cough. Two of the patients are getting worse; they have expiratory wheezes & are cyanotic in the nail beds.

5-9

Slide 5-10

Post Office: Resources on Scene

- 2 engine companies
- 1 ladder company
- 1 battalion chief
- 3 ambulances (including yours)
- 1 EMS supervisor
- 3 two-officer police units
- 1 police sergeant

5-10

Slide 5-11

Post Office: Phase 5

- 1030 hours MONDAY (cont.)
- A second device has been discovered in a postal truck in the parking lot. It is an unmarked cylinder approximately 18 inches long with a pressure gauge attached & an air line that goes into a spray head with a relay & a timer. The timer has reached 00:00 and there is still pressure on the gauge and the device did not operate.

5-11

Slide 5-12

Summary

- Safety
  - Prevent contamination
  - ID safety issues
  - Use decon
- Security, response & scene
- Patient care & symptom recognition
- Planning

5-12