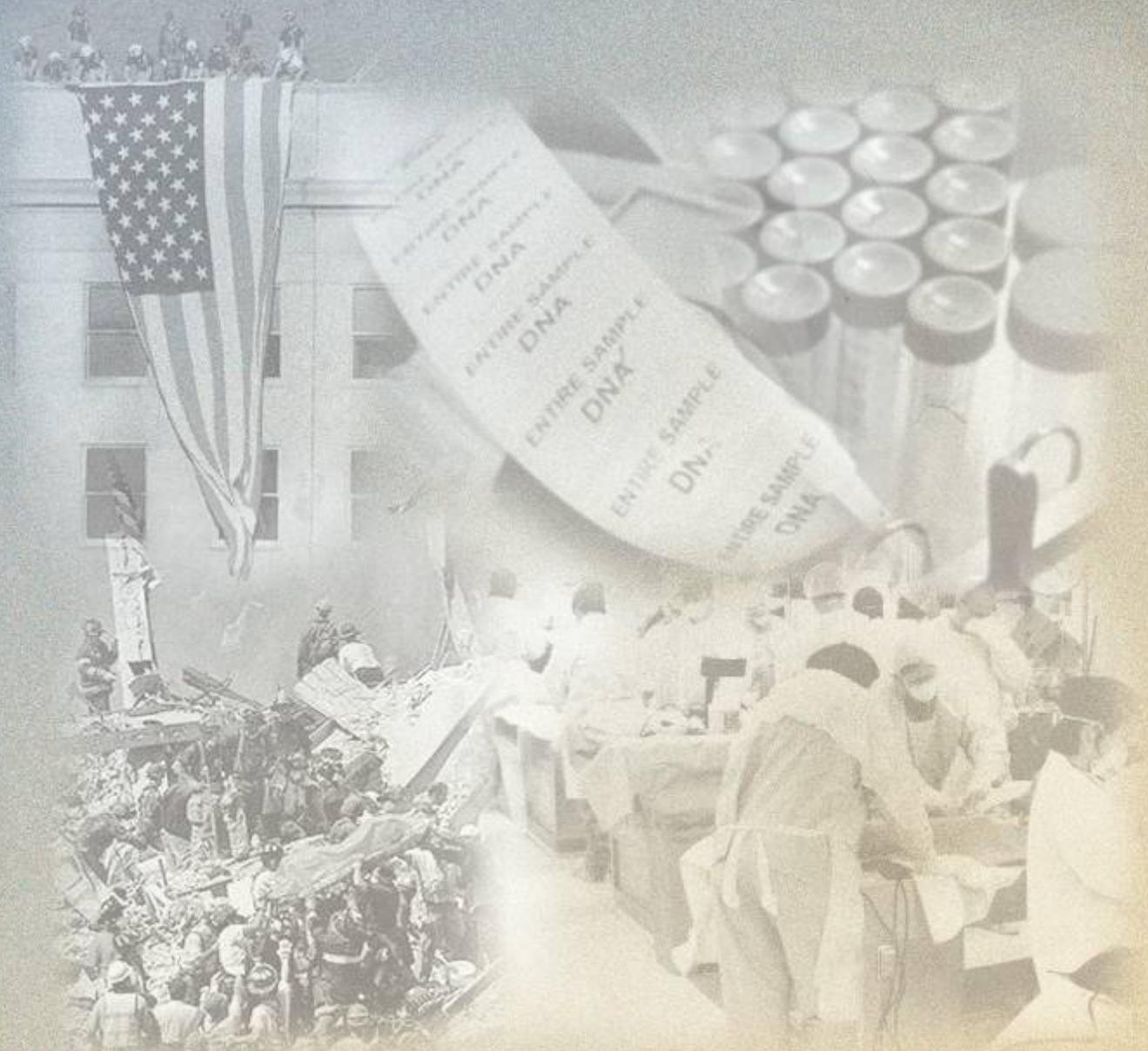


CAPSTONE DOCUMENT:

MASS FATALITY MANAGEMENT FOR INCIDENTS INVOLVING WEAPONS OF MASS DESTRUCTION



PREPARED BY:

U.S. ARMY RESEARCH DEVELOPMENT AND ENGINEERING COMMAND,
(FORMERLY KNOWN AS U.S. ARMY SOLDIER AND BIOLOGICAL CHEMICAL COMMAND),
MILITARY IMPROVED RESPONSE PROGRAM

AND

DEPARTMENT OF JUSTICE, OFFICE OF JUSTICE PROGRAMS,
OFFICE FOR DOMESTIC PREPAREDNESS

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AUGUST 2005

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PREFACE

The Fiscal Year 1997 Defense Authorization Bill (P.L. 104-201, Sept. 23, 1996), commonly called the Nunn-Lugar-Domenici legislation, established the U.S. Domestic Preparedness initiative. Under this initiative, and working in conjunction with the Department of Justice (DOJ), the Department of Defense (DoD) Research Development and Engineering Command (RDECOM) (formerly known as U.S. Army Soldier and Biological Chemical Command (SBCCOM)), Military Improved Response Program (MIRP) developed this Capstone Document. The mission of the MIRP is to enhance the response to chemical and biological weapons of mass destruction (WMD) incidents, particularly those that result from terrorist attacks.

This Capstone Document is to provide medical examiners and coroners (ME/Cs) and emergency managers guidance for responding to a mass fatality situation following a WMD terrorist incident. The findings and recommendations in this report mainly address managing chemically and biologically contaminated remains, and how the ME/C can develop incident-specific plans for managing catastrophic events. These guidelines are neither mandated nor required for State or local jurisdictions; rather, they are presented to provide technical and operational guidelines for communities and departments that are planning to respond to such events.

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- Casualty and Memorial Affairs Office, U.S. Army Personnel Command
- Central Joint Mortuary Affairs Office, Department of Defense
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- U.S. Army Medical Research Institute of Chemical Defense
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- Commonwealth of Virginia Office of the Chief Medical Examiner
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- District of Columbia Office of the Chief Medical Examiner
- National Funeral Directors Association, Maryland State Chapter

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INTRODUCTION

INTRODUCTION

As the twin towers of the World Trade Center found their way to earth, to many, the notion of emergency management seemed to be an oxymoron. The event unfolded live before the response community and all of America, first reflecting hundreds, then thousands, then tens of thousands, of potential casualties. Then came reports of similar disasters at the Pentagon and in Somerset County, PA. Medical assets from local, State, and Federal agencies began mobilizing until officials reported that there were only a few hundred casualties. New York City even stated that it would be able to manage its casualties with limited State and Federal support. It seemed like good news at the time, until preliminary reports for all three incidents indicated that the initial number of casualties were now the estimated number of fatalities.

The number of those who die in an incident is often tied to describing its magnitude. Disasters are emergencies of a severity resulting in deaths, injuries, illness and/or property damage that cannot be effectively managed by the application of routine procedures or resources; responding agencies require more assets than what they have to mitigate the effects of the incident. Recent disasters include the September 11, 2001 attacks and the 1995 bombing of the Alfred P. Murrah Building in Oklahoma City.

In contrast to disasters are catastrophic incidents, which range from extreme misfortune to utter ruin (Webster, 1996); the incident not only exceeds a local jurisdiction's assets, but also exceeds State and Federal assets. The 1918 Pandemic Flu fits into this category, as statistics reveal that somewhere between 20 and 40 million people died worldwide. A more intimate statistic is that approximately 675,000 people died in the United States, and more than 4,600 people died in one week in Philadelphia alone.

As awareness of the dangers of the 21st century

increases and we contemplate the potential for future terrorist incidents, other horrific possibilities don't seem farfetched. Weapons of mass destruction (WMD), like chemical, biological, radiological, nuclear, or high-yield explosives (CBRNE), make a catastrophe more likely. Highly virulent, genetically engineered biological agents could produce a catastrophic incident with death tolls far exceeding those of 1918.

Medical examiners and coroners (ME/Cs) must prepare not only to respond to disasters, but also to manage the catastrophic incident. Formulating disaster plans that address all types of disasters may not be enough, unless these plans provide critical guidance for dealing with the unique aspects WMD impose. Unfortunately, there are only a few resources that ME/Cs can use to help formulate plans.

The intent of this document is to aid ME/Cs in establishing a uniform mass fatality management strategy that mutually supports and integrates key agencies in the response effort. The general principles and best practices for managing large numbers of fatalities are addressed. This document also directs the reader to those agencies and documents that have more detailed information on specific areas of fatality management. This document focuses on the following topics:

- The role of ME/Cs and how to manage a catastrophic event
- How to mobilize local, State, and Federal resources by identifying requirements
- The use of a basic mass fatality management strategy
- Identification of critical variables that influence the fatality management strategy, specifically when remains are chemically or biologically contaminated
- The work of other agencies that have addressed various aspects of fatality management
- Current training opportunities for ME/Cs

When it comes to disaster response, planning prepares ME/Cs and local agencies to respond to catastrophic events. Though the management of remains does not elicit the same hope within America's citizens as caring for casualties, how we care for the dead has come to reflect the American spirit, values of compassion for the living, and respect for the deceased. The September 11, 2001 attacks exemplified the great need for ME/Cs and local, State, and Federal authorities to allocate significant resources toward remains management. Though no one wants to consider the catastrophic ramifications of a WMD incident, managing the fallen may be the only response with which we are tasked. This response can become the cornerstone for ministering to our Nation's grief and can bring hope for our future. ■

"Show me the manner in which a nation cares for its dead, and I will measure with mathematical exactness, the tender mercies of its people, their loyalty to high ideals, and their regard for the laws of the land."

William Ewart Gladstone

AGENCIES WITH A MISSION IN MASS FATALITY MANAGEMENT

AGENCIES WITH A MISSION IN MASS FATALITY MANAGEMENT

When disaster situations cause large numbers of fatalities, most local jurisdictions will not have the necessary resources and personnel to process all remains. Often the local medical examiners and coroners (ME/Cs) should tap into one, if not all three, echelons (local, State, and Federal) of disaster resources.

The local ME/C may need resources not traditionally used for fatality management tasks. To obtain additional resources, the ME/C must identify the requirements for specific assets, and then relay those requirements through the appropriate channels. Once requested assets arrive, the ME/C coordinates, integrates, and manages them.



MEDICAL EXAMINERS AND CORONERS

Medical examiners and coroners (ME/Cs) have State statutory authority to investigate deaths that are sudden, suspicious, violent, unattended, and/or unexplained. Medical examiners are physicians (generally pathologists or forensic pathologists) who are appointed for an unspecified term and who serve a county, a group of counties, or a State. Coroners are usually elected lay individuals who serve a county for a specified term.

Despite the arrival of State and Federal assets, local officials are generally responsible for incident management. There are exceptions, however, particularly when a suspected terrorist incident involving weapons of mass destruction (WMD) occurs. In such instances, the Department of Homeland Security (DHS) will coordinate the government's response and determine to what extent Federal agencies are responsible for managing the incident.¹

This section will outline agencies with a direct and supporting role in fatality management, as well as agencies that may provide supplemental resources.

LOCAL PRIMARY AGENCIES

The local primary agencies with a role in mass fatality management (MFM) are the office of the local ME/C and the Office of Emergency Management (OEM).

Office of the Local Medical Examiner and Coroner

The office of the local ME/C needs to develop an operation that can process large numbers of remains and accommodate the integration of support assets. Having primary death investigation responsibilities, the local ME/C must sign all death certificates for cause and manner, and retain all MFM decision-making authority. He or she must understand the circumstances of the disaster, identify what is required to process remains in a dignified manner, and relay the requirements to personnel, the State ME/C, and the local emergency manager. Typically, local ME/C agencies do not have all the necessary resources on hand to process large numbers of remains and must request support from outside sources.

When requesting support assets, the local ME/C needs to outline the type of task, identify where the

task will be performed, relay any complicating environmental factors (such as chemical contamination), estimate the magnitude of the work effort, and specify what equipment is necessary, including whether or not additional personal protective equipment (PPE) is needed.

ROLE OF LOCAL MEDICAL EXAMINERS AND CORONERS

- Retains all mass fatality management (MFM) decision-making authority
- Signs all death certificates for cause and manner
- Identifies assets required to process remains
- Relays requirements to State medical examiner and coroner (ME/C) and local emergency manager
- Coordinates, integrates, and manages arriving asset

By defining the requirements, the ME/C will understand what is needed to coordinate the activities of supporting agencies and where to direct assets once they arrive. This gives the emergency manager more flexibility and options when assigning resources to identified tasks, rather than waiting for specific assets to mobilize.

Local Office of Emergency Management

The role of the local OEM is to support the local ME/C. The emergency manager should identify local assets that can support the MFM effort, obtain assets required to process remains, help coordinate other agencies, and function as the main contact for each asset.

LOCAL SUPPORTING AGENCIES

To manage large numbers of remains, the office of the local ME/C requires the support of other local agencies (e.g., local law enforcement, the public health department, the fire department (FD), hazardous materials (HazMat) units, the Department of the Environment, and the Department of Public Works (DPW). Although these agencies do not have direct MFM responsibilities, they provide direct support within the jurisdiction as public assets.

Local Law Enforcement

Law enforcement agencies serve and protect the community. Law enforcement will be needed to

secure all areas where remains are held or processed, including the scene itself; any temporary morgue sites, holding, or storage locations; and the Family Assistance Center (FAC).

Depending on the size of the incident, local law enforcement may also be needed to secure evidence gathered from remains, as well as to participate in the investigation. In some cases, officers from the department of corrections may be able to provide this kind of support, since other law enforcement agencies may be encumbered with efforts immediately surrounding the incident site.

At the World Trade Center (WTC) incident of September 11, 2001, officers from New York City's Department of Corrections provided perimeter security and often helped unload and escort remains.

Public Health Department

The public health department's role is to protect the health, safety, and well being of its citizens.² Although normally not involved in ME/C efforts, the health department will likely be involved in evaluating whether remains pose a public health emergency. If remains do pose a public health emergency, or a potential health emergency, the public health department will play a larger role in prevention, detection, management, and containment.³

In some jurisdictions, the public health department may have a direct role in human remains management, but fatality management is usually left for the local ME/C. The ME/C should consider requesting the support of another agency, such as the public health department, the emergency management office, or the American Red Cross, to establish an FAC, a secure, controlled, central location where grieving families can submit information, and the ME/C can gather ante-mortem data, confirm victim identity, and outline final disposition options with the families. Although the local ME/C has a role in supporting the FAC operation, it is unlikely that he or she will have the personnel to establish all services that an FAC may provide.

Fire Departments and Hazardous Materials Units

FDs primarily focus on lifesaving operations and protecting property from fire and fire hazards. It is unlikely that local FDs will have enough assets to

support fatality management efforts, but they may be able to support the local ME/C by performing other limited tasks. Remains should be washed or rinsed as they are recovered from the incident site, and ME/C personnel are usually ill-equipped to perform decontamination. In these cases, local ME/Cs may request guidance from FDs or HazMat units regarding hazards at the incident site and consultation on decontamination. In some cases, the FDs may be able to help with recovery of remains and with setting up wash/rinse/decontamination stations.

Department of the Environment

The Department of the Environment protects and restores the quality of air, land, and water resources.⁴ Although generally not used during the primary response phase of a disaster, this asset may be useful to help contain contaminated water runoff, to establish a decontamination station, to supply PPE, and to provide consultation on chemical agents.

Department of Public Works

The DPW provides public services, including collecting and disposing of solid waste; recycling; and cleaning streets, alleys, and waterways.⁵ It also monitors and secures high-quality drinking water, operates storm and wastewater treatment systems, maintains city-owned buildings and vehicles, and

performs engineering tasks. Typically, the DPW does not support disaster sites, but it may have assets that can support specific tasks during the recovery phase of the disaster or specialized teams accustomed to dealing with hazardous waste or decontamination.

Local Health Care Facilities

IDENTIFY REQUIREMENTS

- Outline the type of task
- Indicate where personnel must perform task
- Relay complicating environmental factors
- Specify equipment required
- Note if additional personal protective equipment (PPE) is required
- Estimate magnitude of work effort
- Identify point of contact (POC)

Health care facilities focus their efforts on providing medical care to the living but are accustomed to some aspects of fatality management. They may be able to provide morgue space, human remains pouches (HRPs), and personnel accustomed to handling human remains.

The local ME/C should consider networking its fatality management efforts with health care

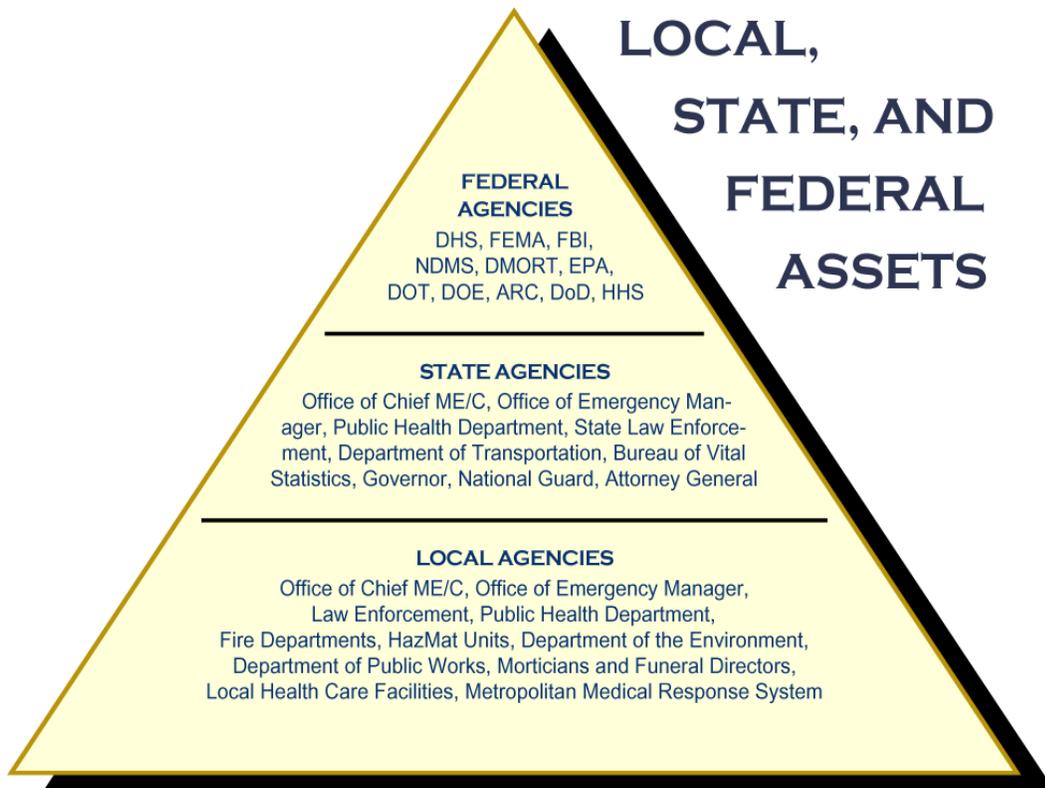


Figure # 1

facilities. Not only may health care providers be able to perform limited fatality management tasks, but it is also likely that the ME/C should coordinate his or her efforts with them, as many casualties will die in health care settings, such as hospitals, clinics, doctors' offices, and treatment centers.

Metropolitan Medical Response System

Many jurisdictions/regions within the United States have developed a Metropolitan Medical Response System (MMRS). These MMRS areas are highly prepared to manage the effects of a public health crisis; they have robust response assets and enhanced medical assets capable of responding to mass casualty incidents (MCIs).⁶ In the event of a public health crisis, each MMRS jurisdiction is required to plan and prepare for mass fatalities.

If the local ME/C's jurisdiction has an MMRS, he or she should consider becoming involved, since it is likely that the additional local resources that can support specific MMRS will have aspects of fatality management.

Local Supplemental Agencies

Some jurisdictions may have private sector assets that could supplement the local area in a disaster. These assets are generally overlooked, as they are not designated public assets. The local ME/C should consider establishing a rapport or an official memorandum of agreement (MOA) with private industries for specific resources; for example, private corporation chemical plants may have HazMat units that could provide the local ME/C with decontamination equipment. Another example may include private trucking companies that can provide refrigerated trucks. Additionally, construction companies may be able to support the ME/C by constructing parking lots or roads, or by expanding a building site. Medical schools may be able to assign medical students to specific tasks at the morgue. Medical students make excellent scribes, as they understand medical terminology and medical report writing.

Morticians and Funeral Directors

Morticians and funeral directors are private assets that may have more direct involvement in fatality management efforts due to the nature of their business. Morticians and funeral directors are trusted local civic leaders who may be willing to perform limited fatality management duties.⁷

The ME/C should consider asking morticians and funeral directors, through their affiliation with larger associations, to provide support in a disaster. Some tasks may involve working in the morgue to transcribe case file data, collecting ante-mortem data, discussing final disposition options with the family, or escorting bodies and their case files from station to station. Additionally, these professionals have experience with managing grieving family members and may be an excellent asset for staffing the FAC until more permanent staff can support the operation. It is recommended that the parties establish a memorandum of understanding (MOU) for the types of services and supplies that will contribute during a disaster.

STATE PRIMARY AGENCIES

The State primary agencies with a role in MFM include the office of the State ME/C, the State OEM, and the State Department of Health (DOH).

Office of the State Medical Examiner and Coroner

The role of the office of the State ME/C will be similar to that of the local ME/C, although the State office will likely have more assets. The chief ME/C may not necessarily process the entire mass fatality incident on his/her own, but rather will create an infrastructure that can process large numbers of remains, as well as accommodate the integration of support assets into the response effort. Because some ME/C systems are automatically State governed rather than locally governed (such as Maryland), the ME/C responsible for signing all death certificates for cause and manner retains primary death investigation responsibilities and all decision-making authority.⁸

State Office of Emergency Management

The State Office of Emergency Management (OEM) assists the ME/C by obtaining requested assets for processing remains and by coordinating State assets that may support fatality management operations.

State Department of Health

The State Department of Health (DOH) must develop and advocate public policies designed to

AGENCIES INVOLVED IN FATALITY MANAGEMENT EFFORTS: THE PENTAGON EXPERIENCE

On September 11, 2001, at approximately 0943, American Airlines Flight 77 crashed into the Pentagon, a Federal building that is part of the Military District of Washington, located in Northern Virginia. In the Pentagon incident, 95 United States citizens died—65 in the aircraft and 30 on the ground. This incident was part of a coordinated terrorist attack using airline jets as projectile missiles to strike several locations simultaneously.

The Armed Forces Medical Examiner (AFME) has jurisdiction over deaths that occur on Federal property and assumed jurisdiction for those who died at the Pentagon. The AFME examined all recovered remains, including military personnel, civilians, and terrorists. The remains were processed and identified per standard procedures at the Dover Port Mortuary at Dover Air Force Base. Since the victims died in the Commonwealth of Virginia, the Office of the AFME signed green border Virginia Death Certificates certifying the cause and manner of death.

After processing those remains that were identified, the AFME released them to the families. Approximately five persons known to have been in the Pentagon were not found. A few others that were found did not match anyone known to be at the incident site; those were presumed to be the remains of the terrorists.

In this case, the Commonwealth of Virginia's Office of the Chief Medical Examiner (OCME), the Department of Vital Records, the Attorney General, and the Virginia General Assembly work together to issue death certificates. Current Virginia law, Code of Virginia Title 64.1-105. Presumption of Death from Absence or Disappearance: in cases wherein death comes in question, states that a person must be missing for seven years before a court will declare that person dead. The General Assembly enacted an exception on February 28, 2002, to this statute, The Presumption of Death Exception of Chapter 58 (64.1-105et seq) of Title 64.1. The exception states that any person in the plane or Pentagon missing since September 11, 2001, who had not been heard from in three or more months since the attack, whose body has not been found, or



whose remains had not been identified through scientific testing, shall be presumed dead in any instance or case in which his or her death shall be a question. The act of the Assembly provided a mechanism for families to settle estates, satisfy insurance claim requirements, and provide documentation of death by petition of the Circuit Court of Arlington County for an order declaring the missing person dead.

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Chief Medical Examiner
OCME, Commonwealth of Virginia

reduce the public health impact of potential disasters. In addition, the secretary of health is to communicate the potential of a public health emergency to government officials. In mass fatality situations, a public health hazard is more likely to exist and the State ME/C may need to work in conjunction with this agency to mitigate a public health emergency.

STATE SUPPORTING AGENCIES

State agencies and assets that support the ME/C in managing remains include the State Department of the Environment, the State law enforcement agency, the State Department of Corrections, the State Attorney General, the Bureau of Vital Statistics, the Department of Transportation (DOT), the Governor, and the State's National Guard assets.

State Department of the Environment

Like the local Department of the Environment, the State Department of the Environment may also be able to support the ME/C in limited ways. If the ME/C requires assistance with decontamination efforts, the State Department of the Environment may be able to provide decontamination assets, PPE, and/or a means to contain contaminated water runoff. Since the State Department of the Environment is not considered a first-responding resource, it is more likely to be available to support the ME/C.

State Law Enforcement

The ME/C may request the State law enforcement agency to support the MFM investigation, to secure evidence gathered from remains, and to limit access to morgue areas and/or the FAC.

State Department of Corrections

The State Department of Corrections may be able to secure specific areas, such as the incident or holding morgue, as well as escort remains through the morgue operation.

State Attorney General

The ME/C will probably work in conjunction with the State Attorney General. To prosecute a crime, the attorney general will need evidence gathered from remains. The Attorney General may request the ME/C to hold personal effects found on remains for an extensive period of time, or he or she may request

that remains not be released to family until all possible evidence is gathered. Moreover, the ME/C may need the support of the State Attorney General when issuing death certificates in certain circumstances, particularly when a positive identification has not been made. These two agencies should support each other in fraud cases.

Bureau of Vital Statistics

The State ME/C may also need to coordinate death certificates with the Bureau of Vital Statistics. This agency is responsible for recording all births, deaths, marriages, and divorces, and may also maintain information on public health topics. In disasters, the Bureau of Vital Statistics, the State Attorney General, and the ME/C should address the best means of issuing death certificates for deceased individuals who have not been identified.⁹ These agencies should work together so that fraud cases are not accepted as actual.

State Department of Transportation

The State Department of Transportation (DOT) may need to provide storage and transportation assets to support a jurisdiction's disaster response. ME/Cs and funeral directors typically coordinate or provide the transportation of remains; however, catastrophic incidents may require the use of larger transportation units to facilitate moving large numbers of remains from the incident location, to the morgue, and to the final disposition location.

Governor

The State ME/C office may also require the support of the Governor. In disaster situations, the Governor may be able to obtain resources from surrounding States via a governor's compact. For the ME/C, this may mean obtaining more death investigator personnel, remains handlers, or forensic pathologists. Licensing requirements may also be waived for personnel who are licensed in surrounding States.

National Guard Assets

The Governor also has access to National Guard assets that may be able to support specific fatality management tasks. In 2000, Congress authorized 32 WMD-Civil Support Teams (CSTs), whose mission is to assist civil authorities that respond to a domestic WMD incident.¹⁰ WMD-CSTs possess specific skills, training, and equipment to help mitigate the effects of a WMD incident. Typically,

National Guard assets belong to the State; however, if needed, WMD-CSTs can also be used as a Federal asset. Other National Guard assets include personnel accustomed to performing simple tasks while wearing a basic level of mission-oriented protective posture (MOPP) equipment, as well as transportation assets and medical teams.

STATE SUPPLEMENTAL AGENCIES

The State ME/C should consider establishing an MOA with private industries for specific assets, such as HazMat units, transportation assets, construction corporations, private contractors, or regional stress management teams.

The ME/C should also be prepared to incorporate agencies that provide less direct support. Often private citizens, and both large and small proprietors, wish to contribute essential and non-essential assets (e.g., food, water, drinking bottles, and sweatshirts). One industry provided ME/C personnel with a particularly helpful service during the WTC incident—massage therapists set up tents near the morgue so personnel could unwind at the end of long shifts. Though such a service is not fundamental to fatality management efforts, the service did support stressed personnel.

FEDERAL PRIMARY AGENCIES

The Federal primary agencies include the DHS Emergency Preparedness and Response (EP&R) Directorate and its response elements, the National Disaster Medical System (NDMS), the Disaster Mortuary Operational Response Team (DMORT),

and the DMORT WMD team, as well as the Department of Justice (DOJ) Federal Bureau of Investigation (FBI).

Department of Homeland Security

In the aftermath of September 11, 2001, and for the purpose of protecting the Nation against future terrorist attacks, President George W. Bush formed the Department of Homeland Security (DHS) by bringing together 22 previously disparate domestic agencies.¹¹ Instead of many agencies and offices addressing terrorist incidents independently, they work together under a directorate that includes Border and Transportation Security, EP&R, Science and Technology, Information Analysis and Infrastructure Protection, and Management. DHS also houses several other critical agencies, such as the U.S. Coast Guard, the U.S. Secret Service, the Bureau of Citizenship and Immigration, the Office of State and Local Government Coordination, the Office of Private Sector Liaison, and the Office of the Inspector General.

Within these directorates, the component agencies are better able to analyze threats and intelligence, to guard our borders and airports, to protect our critical infrastructure, and to coordinate the response of our Nation in future emergencies.¹ The DHS will manage and coordinate Federal entities that support local and State emergency response efforts during natural or terrorist-related disasters.

The DHS will work with Federal, State, and local public safety organizations to build a comprehensive National Incident Management System (NIMS) upon the existing disaster management system outlined by the Federal Emergency Management

DEPARTMENT OF HOMELAND SECURITY

The Department of Homeland Security (DHS) will coordinate the involvement of Federal response assets in the event of a major incident. DHS will lead the national response to a biological attack, direct the Nuclear Emergency Search Teams (NESTs), the Radiological Emergency Response Team, the Radiological Assistance Program, the Domestic Emergency Support Team (DEST), the Strategic National Stockpile (SNS) (formerly the National Pharmaceutical Stockpile), and the National Disaster Medical System (NDMS), and manage the Metropolitan Medical Response System (MMRS).

For more information regarding the DHS,
visit its Web site at <http://www.dhs.gov/dhspublic/>

Agency (FEMA), and will clarify and streamline Federal incident management procedures, eliminating the artificial distinction between “crisis management” and “consequence management.” The DHS will continue FEMA’s efforts to reduce loss of life and property and to protect our Nation’s institutions from all types of hazards by maintaining a comprehensive, risk-based emergency management program of preparedness, prevention, response, and recovery.¹

To achieve NIMS, DHS will consolidate existing Federal government emergency response plans, namely, the Federal Response Plan (FRP), the National Contingency Plan, the U.S. Government Interagency Domestic Terrorism Concept of Operations Plan, and the Federal Radiological Emergency Response Plan, into one all-hazard plan.¹ Until the national response plan is released, all plans, including the FRP (1999, Public Law 9230.1), will remain in effect.

Although all DHS directorates have a particular role in mitigating the effects of a disaster, the ME/C will primarily interact with the EP&R Directorate, as DHS will work through this directorate to coordinate the government’s response.¹ Not only will EP&R coordinate with first responders, but it will also oversee the Federal government’s national response and recovery strategy.

Emergency Preparedness and Response Directorate

The EP&R Directorate is comprised of FEMA, the Strategic National Stockpile (SNS) (formerly the National Pharmaceutical Stockpile), the NDMS, the Federal MMRS administrative program, the Department of Energy’s (DOE’s) Nuclear Incident Response Team, and DOJ’s National Domestic Preparedness Office. FEMA and NDMS are the primary agencies within the EP&R Directorate involved in fatality management efforts.¹ The EP&R Directorate will continue to build on the foundation and successes developed by FEMA.

The EP&R’s FEMA, formed in 1979 by executive order of the President, coordinates the efforts of 28 Federal agencies in response to a disaster, aiming to reduce loss of life and property, as well as to minimize suffering and disruption. The mission of FEMA is to lead American efforts to prepare for, prevent, respond to, and recover from disasters.¹ In

response to large emergencies, FEMA:

- Coordinates the delivery of Federal assistance and resources to augment efforts of State and local governments overwhelmed by a major disaster or emergency
- Supports implementation of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended (42 U.S.C. 5121), as well as individual agency statutory authorities
- Supplements other Federal emergency operation plans (EOPs) developed to address specific hazards

At present, FEMA uses the FRP to coordinate Federal assets in response to a disaster. (**Note: The DHS will create a national disaster response plan that will incorporate many of the existing FRP concepts and operations.) The FRP uses a functional approach that outlines 12 types of Federal assistance a State is most likely to need, called Emergency Support Functions (ESFs).¹ Each ESF addresses multiple tasks and is headed by a primary agency, which has been selected based on its authority, resources, and capability in a particular functional area. Victim Identification and Mortuary Services is one task listed within ESF #8 – Health and Medical Services.

Department of Homeland Security, National Disaster Medical System, Disaster Mortuary Operational Response Team

DHS draws resources to support ESF #8 from the NDMS, a Nationwide medical mutual-aid network between the Federal and non-Federal sectors. Within NDMS is the Disaster Mortuary Operational Response Team (DMORT), an organized team with the experience and expertise to manage large numbers of fatalities. There is one team for each of the 10 Federal regions in the United States. The teams are comprised of private citizens with expertise in victim identification and mortuary procedures. When they are activated for a disaster, the teams respond as a Federal asset. Under the authority of the local jurisdiction, DMORT does the following:

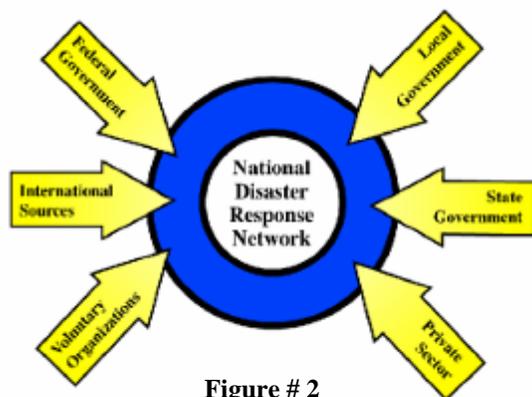


Figure # 2

- Provides a mobile morgue
- Performs autopsies
- Performs identification of remains by fingerprint, forensic dental and/or forensic pathology/anthropology methods
- Performs tracking of remains
- Assists in DNA retrieval
- Establishes and assists in operating an FAC
- Provides ante-mortem data collection
- Prepares remains for final disposition (with the exception of cremation)

DMORT does not establish command and control over the fatality management operation; the ME/C maintains responsibility to recover remains, as well as determine cause and manner of death and sign all

To locate the appropriate Disaster Mortuary Operational Response Teams (DMORT) Regional Commander for each of the 10 Federal regions, visit the DMORT Web site at www.dmort.org.

death certificates. Each jurisdiction should have a system that is flexible enough to effectively incorporate DMORT's personnel and resources, but should not rely on DMORT as the sole asset for managing a disaster.

DMORT has one WMD team for the Nation that is capable of decontaminating chemically contaminated remains and monitoring the remains' level of contamination. Once remains have been decontaminated, they can be transferred to the traditional DMORT team for further processing if necessary.

The local ME/C should consider consulting with his or her DMORT leadership to understand how DMORT can best fit into his or her jurisdiction's response plan. The DMORT Regional Commander is familiar with how resources can be used and how efforts can be funded.

ACTIVATING DISASTER MORTUARY OPERATIONAL RESPONSE TEAM

- The President declares the incident a disaster, providing immediate access to support and disaster relief monies
- The National Transportation Safety Board's (NTSB's) Office of Transportation Disaster Assistance has an memorandum of understanding (MOU) with the Disaster Mortuary Operational Response Team (DMORT), through the Department of Homeland Security (DHS), for providing victim identification, morgue operations, and family assistance center (FAC) support
- A State can request DMORT's support directly; however, the State must pay for DMORT expenses
- An agency can develop a special MOU with DMORT to perform specific tasks

Department of Justice Federal Bureau of Investigation

The Federal Bureau of Investigation (FBI) is the lead investigating agency for any credible threat or other situation that could potentially threaten the public. It is likely that the FBI will investigate all WMD incidents to determine if a situation involves domestic terrorism.¹²

In WMD incidents, the FBI should obtain as much evidence as possible, including evidence gathered from remains. The ME/C and the FBI should consider working together, as one agency processes remains for evidence and the other processes the scene for evidence. In certain incidents, ME/C and FBI personnel may need to share the same location to perform their tasks. Cooperation between these two agencies will enhance their ability to process remains and gather evidence.

FEDERAL SUPPORTING AGENCIES

Department of Homeland Security's National Disaster Medical System's Disaster Medical Assistance Teams

The NDMS's Disaster Medical Assistance Team (DMAT) is another asset within DHS. There are over 40 DMATs located in the 10 U.S. Federal regions.¹³ DMATs deploy to disaster sites with sufficient supplies to sustain themselves for 72 hours while providing medical care at a fixed or temporary medical site. In MCIs, their responsibilities include triaging patients, providing basic medical care, and preparing patients for evacuation. In other situations, DMATs may provide primary health care and/or augment overburdened local health care staffs.



Under the rare circumstance that disaster victims are evacuated to a different locale to receive definitive medical care, DMATs may be activated to support patient reception and disposition of patients to hospitals. DMATs are a rapid-response element to supplement local medical care until other Federal or contract resources can be mobilized.

Though these teams are primarily intended to medically support casualties, they may also be able to support ME/Cs in other ways; for example, if a DMAT is available, it could help evaluate ME/C personnel who enter and exit the disaster incident site. DMATs accustomed to decontaminating non-ambulatory casualties may be able to help the ME/C prepare for decontaminating chemically

contaminated remains by providing decontamination equipment and consultation.

Department of Homeland Security Nuclear Incident Support Teams

Though this document does not directly focus on the response measures associated with radiological material or nuclear devices, the ME/C may require the assistance of the DHS Nuclear Incident Support Teams: the Nuclear Emergency Search Team (NEST), the Radiological Emergency Response Team, and/or the Radiological Assistance Program. As part of the DHS, these teams provide advice and assistance in handling and disposing of radiologically contaminated remains.¹

Department of Health and Human Services Centers for Disease Control and Prevention

The Centers for Disease Control and Prevention (CDC), an agency within the Department of Health and Human Services (HHS), can provide consultation regarding disease epidemiology.¹⁴ The local ME/C may need the CDC's assistance in cases involving biologically contaminated remains. The CDC can help the local jurisdiction diagnose biological agents and provide bio-safety and infection control information. It may also be able to provide laboratory assistance for evidence analysis.

The CDC also houses the Medical Examiner and Coroner Information Sharing Program (MECISP).⁸ The MECISP was developed to improve the quality of death investigations in the United States and to promote the use of standardized policies for conducting investigations. The program primarily serves to facilitate communication among death investigators and interested groups, improve dissemination of information on investigated deaths, and promote sharing and use of ME/C death investigation data.⁸

Environmental Protection Agency

The Environmental Protection Agency (EPA) may assist Federal health and medical response operations by providing technical assistance and environmental information. The ME/C may need EPA's assistance to perform environmental assessments when processing chemically contaminated remains.

Department of Transportation

The ME/C may need the Department of

Transportation (DOT) to identify and arrange for all types of transportation (air, rail, marine, and motor vehicle). The DOT may also have refrigerated transportation assets that can be used as temporary storage units; however, it may not have access to an unlimited supply.

American Red Cross

The American Red Cross is a non-governmental organization (NGO) included in the FRP. Traditionally, the American Red Cross contributes to an event by providing general support, such as food, shelter, and first aid to victims and disaster relief workers.

The American Red Cross is the only NGO designated as the lead Primary Agency under the FRP for ESF #6 – Mass Care. This involves coordination of Federal resources in support of mass care activities at the State and local level during major disasters. These services include shelter, food, and bulk distribution of needed items, among other activities. The American Red Cross is a designated Support Agency under the FRP to ESF #8. It provides basic first aid; referral to appropriate medical care facilities; augmentation of medical staff; supportive counseling to victims, their families, and emergency responders; and organization of blood services/products in coordination with the American Association of Blood Banks and the HHS. Local American Red Cross capabilities focus primarily on mass care activities; however, chapters may also be able to provide local disaster volunteers to perform administrative duties. Chapters may also take the lead in establishing FACs. The ME/C should consider developing a plan with his or her local American Red Cross chapter to determine specific areas where it can support fatality management operations.

Agency for International Development, Office of Foreign Disaster Assistance

In mass fatality situations, the ME/C may need to process numerous foreign nationals. The Agency for International Development may be able to assist in contacting a deceased foreigner's family through the appropriate embassy.

Urban Search & Rescue Response System

FEMA is the primary agency that oversees the Urban Search and Rescue (US&R) Response

System. The US&R system provides specialized lifesaving assistance to State and local authorities in a major disaster or emergency.¹ The national system is made up of more than 5,000 individuals in 27 task forces. Each task force is composed of 62 individuals and can be broken into five teams. These teams maintain 24-hour operations to search for living casualties. Though the mission of the US&R teams is to rescue the living, often its work involves recovering the deceased.

The ME/C should consider coordinating recovery efforts with this team's rescue efforts, since the team will likely know of the environmental hazards associated with the disaster site. Additionally, US&R may be able to provide some support during the recovery of remains, as well as consultation regarding probable locations of remains.

Department of Veterans Affairs

The Department of Veterans Affairs (VA) provides assistance in managing human remains, including victim identification and disposition. The VA may be able to provide a small contingent of non-mortuary affairs specific assets, such as dentists, radiological technicians, and some medical supplies through its medical centers. Though the mission of the VA is to provide for the needs of veterans, it may be able to provide mortuary assistance with the use of VA cemeteries, or help to prepare new areas as cemeteries.

Department of Justice, Office of Justice Programs, Office for Victim Assistance

The Office for Victim Assistance (OVA) in the FBI coordinates assistance to victims of terrorism, criminal aviation disasters, and other mass casualty

OFFICE FOR VICTIM ASSISTANCE

The ME/C may incorporate the support of OVA into the response as victims often need a level of support that goes beyond what the ME/C can generally offer. Contact: Office for Victim Assistance, FBI Headquarters, 935 Pennsylvania Avenue, NW, Room 10151, Washington, DC, 20535, phone: 202-324-1339, fax: 202-324-1311, email: victimassistance@ic.fbi.gov.

federal crimes on behalf of the FBI. The OVA can send a rapid deployment team of specially trained Victim Specialists to coordinate or assist with victim assistance. Through its Terrorism and International

Victims Unit, the program supports victims of terrorism both in the United States and abroad and responds to the challenges WMD incidents pose for victims of such terrorist attacks.

Department of Defense

The DoD will provide military support to civil authorities during all aspects of a disaster (as specified in the FRP, DoD Directives 3025.15 and 2000.12, and the Chairman Joint Chiefs of Staff CONPLAN 0300-97). Upon the approval of the secretary of defense, the DoD will support the Lead Federal Agency (LFA) and/or the primary agencies as appropriate.

Under ESF #8, the DoD is to specifically assist civil authorities with victim identification and mortuary service. The DoD's Director of Military Support (DOMS) and the Joint Task Force-Civil Support (JTF-CS) coordinate military support to civil authorities.

DOMS represents the DoD's executive agent, the Secretary of the Army, for providing military assistance to civil authorities. Based on the magnitude and type of disaster, and the anticipated level of resource involvement, DOMS may establish a Joint Task Force (JTF) or a Response Task Force to consolidate and manage military activities.¹⁵ Both task forces are temporary, multi-service organizations created to support consequence management response efforts to a major natural or manmade disaster or emergency.

In 1999, the Commander in Chief of the U.S. Joint Forces Command activated JTF-CS to manage military assets in civil disasters and to establish command of designated DoD forces. JTF-CS focuses on CBRNE incidents and will deploy a command and control element to support the LFA.¹⁶ Management of human remains is one of JTF-CS's primary tasks when called upon to coordinate military assets in a WMD incident.

The DoD's 54th, 311th, and 246th Quartermaster Companies; the Armed Forces Institute of Pathology; the Office of the Armed Forces Medical Examiner; the Dover Port Mortuary; and the Armed Forces DNA Identification Laboratory have a key role in mortuary affairs. The 54th Quartermaster Company is the only active mortuary affairs unit; one of its primary missions is supporting mass

fatality operations. The two other Army mortuary affairs units, the 246th and 311th, are also capable of performing fatality management operations; however, since they are both reserve units, they require sufficient time to mobilize and travel.

The Armed Forces Institute of Pathology (AFIP) is a tri-service agency (Army, Navy, and Air Force) with a threefold mission of consultation, education, and research.¹⁷ Within AFIP are 22 subspecialty departments with more than 120 pathologists and odontologists. The Office of the Armed Forces Medical Examiner (OAFME) and the Armed Forces DNA Identification Laboratory (AFDIL) specifically support fatality management efforts.

Congress established the OAFME in 1988 to investigate the deaths of military personnel. In 1991, the OAFME was further authorized to investigate all deaths that occurred on Federal property, to hold secondary investigations of military personnel and dependents, and to support requests for assistance by other Federal agencies (10 U.S. Code 1471).

The OAFME has a mobile team equipped with enough disposable resources to process 1,000 remains; however, it must rely on local assets for support staff and other accommodations, as it does not have a mobile morgue.¹⁸

The OAFME identified the remains from the Pentagon and supported identifying remains from United Airlines Flight 93, which crashed near Shanksville in Somerset County PA, after the September 11, 2001, attacks.¹⁸

When there are large numbers of remains, the Armed Forces Medical Examiner (AFME) processes them at the Dover Port Mortuary at Dover Air Force Base (AFB), DE. This mortuary has the capacity to process hundreds of remains and has a surge capacity to accommodate even larger numbers. There are limitations; personnel assigned to Dover are not fully prepared to manage contaminated remains.

Also within AFIP is the DoD's AFDIL. In 1991, the DoD established policies for the use of DNA analysis in the identification of remains, particularly when traditional identification methods were not possible. AFDIL has extensive experience identifying decomposed remains and has supported

many efforts to identify service members from the Vietnam War, the Korean War, and World War II.¹⁸

Other military assets that can support limited aspects of fatality management include the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID), the U.S. Army Medical Research Institute of Chemical Defense (USAMRICD), the U.S. Army Technical Escort Unit (TEU), and the U.S. Marine Corps' Chemical Biological Incident Response Force (CBIRF).

USAMRIID is the DoD's lead laboratory for medical aspects of biological warfare defense. In addition to developing vaccines, drugs, and diagnostics for laboratory and field use, USAMRIID formulates strategies, information, procedures, and training programs for medical defense against biological threats.¹⁹ Within the USAMRIID is one of the Nation's two Bio-Safety Level 4 (BSL 4) laboratories, where scientists study the most infectious diseases. It is the only laboratory capable of accommodating autopsies in a BSL 4 environment. Currently it is used to study human primates. Although USAMRIID does not have a specific role in fatality management, it does provide consultation for other agencies/departments when a situation involves biological warfare agents.

USAMRICD focuses on chemical agents; its mission is to develop medical countermeasures to chemical warfare agents and to train medical personnel in the medical management of chemical casualties.²⁰ USAMRICD can trace its origin to World War I, when the United States first encountered chemical agent warfare. Although USAMRICD is a research institute without a response team, when an incident involves the use of chemical weapons, USAMRICD can provide information regarding chemical agents and the inherent risks associated with exposure to them.

In addition to consultation, the DoD has technical assistance teams with chemical and biological expertise, like the TEU, which provides worldwide response for mitigating hazards and identifying weaponized and non-weaponized chemical and biological HazMat.²¹ TEU is capable of escorting, packaging, detecting, monitoring, rendering-safe, disposing of, and sampling chemical and biological agents. TEU may be able to provide consultation and perform limited tasks that support fatality

management operations.

CBIRF is a task-organized, self-sustaining unit consisting of approximately 375 marines and sailors from a variety of military occupational specialties.²² CBIRF elements provide chemical/biological agent detection and identification, hazard prediction, advanced lifesaving and triage, evacuation of victims from contaminated areas, decontamination, incident site management, and security as authorized.²² CBIRF is a consequence management force highly trained for short-notice response to terrorist-initiated chemical and biological incidents; however, CBIRF is most effective when it is deployed to events that are considered possible targets before an incident occurs. Although the mission of CBIRF is to assist the living, it may be able to support local ME/C efforts with managing chemical, biological, radioactive, nuclear and high-yield explosives (CBRNE) contaminated human remains.

Even though military fatality management assets are limited, other military resources would be available to provide general support (e.g., personnel to handle remains, non-refrigeration transportation assets, HRP, hoses, and caskets). In WMD cases, the military is also able to assist civilians in some contaminated environments, as its personnel are accustomed to performing tasks while wearing Mission-Oriented Protective Posture (MOPP)

KEY DEPARTMENT OF DEFENSE ASSETS

- Northern Command
- Joint Task Force-Civil Support (JTF-CS)
- The 54th Quartermaster Company
- The 311th Quartermaster Company
- The 246th Quartermaster Company
- Armed Forces Institute of Pathology
- Office of the Armed Forces Medical Examiner (OAFME)
- U.S. Army Medical Research Institute of Infectious Disease (USAMRIID)
- U.S. Army Medical Research Institute of Chemical Defense (USAMRICD)
- US Army Technical Escort Unit (TEU)
- US Marine Corps Chemical Biological Incident Response Force (CBIRF)

ensembles. Although this PPE differs from what civilians use and from what the Occupational and Safety Health Administration (OSHA) endorses, MOPP 4 is similar to Level C PPE. The military also

has resources that can accommodate situations requiring Level A or B PPE; however, these resources may be allocated for other aspects of the response effort.

SUPPORTING AGENCIES OTHER THAN THOSE LISTED IN THE FEDERAL RESPONSE PLAN

In addition to the government agencies outlined in the FRP, ME/Cs can look for general support in other government organizations designed to assist disaster relief efforts, such as the Office of Transportation Disaster Assistance (OTDA), Interpol, the Salvation Army, and the International Critical Incident Stress Foundation (ICISF). Many other national and international professional organizations may also be able to aid fatality management efforts.

National Transportation Safety Board's Office of Transportation Disaster Assistance

The National Transportation Safety Board (NTSB) is an independent Federal agency charged by Congress with investigating every civil aviation accident in the United States, as well as any significant railroad, highway, marine, or pipeline accidents (49 Code of Federal Regulations [CFR] Chapter VIII). The Board issues safety recommendations aimed at preventing future accidents.

One component of the NTSB is the OTDA, formerly known as the Office of Family Affairs. In 1996, this office was assigned the role of integrating the resources of the Federal government with those of the local and State authorities and airlines to meet the needs of aviation disaster victims and their families.²³ In July 2002, NTSB changed the name to better reflect the broad range of the office's duties and the extension of its services to all modes of transportation. During a major transportation disaster, the OTDA would provide family/victim support coordination, FACs, forensic services, communication with foreign governments, and interagency coordination between communities and commercial carriers. The ME/C should include the services of OTDA in his or her disaster plans involving transportation carriers.

Interpol

The mission of Interpol is to ensure and promote the

widest possible mutual assistance between all criminal police authorities within the limits of the laws existing in different countries and in the spirit of the Universal Declaration of Human Rights.²⁴

During an MCI, Interpol can provide assistance by identifying victims and their loved ones around the world. It has developed a Disaster Victim Identification Guide to assist law enforcement and ME/Cs in identifying live victims and the deceased. The guide provides forms and recommends what information an agency should gather, particularly when data concerning a known missing person or an unknown deceased person is to be forwarded to another country.

Interpol maintains many international databases, including an international fingerprint database. These databases may be able to assist personnel in matching ante-mortem and post-mortem data. During the WTC incident of September 11, 2001, with the use of Interpol's database, New York City authorities were able to identify the remains of many foreign nationals who worked at the WTC, as well as identify fraudulent death certificates for persons living outside the country.

The Salvation Army

The purpose of the Salvation Army is to care for the poor, feed the hungry, clothe the naked, love the unlovable, and befriend the friendless.²⁵ This dedication has produced an international network of helpful ministries. Among its many ministries, the Salvation Army is able to provide disaster relief services, such as shelter for the homeless, mobile and congregate distribution of food and basic commodities, identification/registration of families, financial assistance, and spiritual counseling.

The Salvation Army has disaster response teams managed by commissioned officers and trained personnel. Additional volunteers are on call to serve at all types of disasters.²⁵

The Salvation Army typically focuses its disaster relief efforts on aiding emergency response workers and those most directly affected by an incident; for example, throughout the Columbia Space Shuttle disaster, the Salvation Army dispatched personnel and canteen vehicles to provide counseling and relief to those directly involved in searching for debris from the spacecraft.

During the WTC incident of September 11, 2001, the Salvation Army named its response effort “Operation: Compassion Under Fire.” The Salvation Army provided support at Ground Zero until May 30, when authorities officially concluded the recovery operation. The Salvation Army continued to support personnel assigned to the New York City Office of Chief Medical Examiner (NYCOCME) office and the Staten Island Fresh Kill landfill operation through June 2002. Although relief operations throughout New York City ended in June 2002, the Salvation Army, through its Family Assistance Program, continues to help families directly impacted by the disaster.

Overall, the Salvation Army served 3,231,681 meals, which required the efforts of 7,149 officers and trained personnel and 32,275 volunteers; working for nearly nine months, they provided a total of almost one million volunteer hours.

OTHER PROFESSIONAL ASSOCIATIONS THAT MAY PROVIDE SUPPORT

Include (but are not limited to) the Following:

- National Association of Medical Examiners
- National or State Funeral Directors Association
- American Society of Forensic Odontology
- Forensic Science Society
- Northeastern Association of Forensic Scientists
- Southern Association of Forensic Scientists
- Southwestern Association of Forensic Scientists
- International Association of Coroners and Medical Examiners
- International Association of Bloodstain Pattern Analysts
- International Association of Forensic Toxicologists
- International Association for Identification

The International Critical Incident Stress Foundation, Inc.

The International Critical Incident Stress Foundation, Inc. (ICISF) is a nonprofit, open-membership foundation dedicated to the prevention and mitigation of disabling stress. ICISF focuses on Critical Incident Stress Management (CISM), crisis intervention, suicide prevention, and the treatment of trauma-related syndromes. With on-scene consultations to first responders and consultations post-deployment, ICISF provides CISM training to emergency planners before an incident occurs. Though ICISF concentrates on first responders, it can assist other mental health professionals who seek to help victims and their families. The ICISF has volunteer CISM teams located worldwide with 501 U.S. teams and 66 international teams.²⁶

During the WTC incident of September 11, 2001, the New York City Police Department (NYPD) requested the support of ICISF’s CISM teams. The ICISF responded and coordinated more than 150 teams to dedicate support for several months after rescue efforts had ceased. Three teams were assigned to provide continual support to responders at the incident site. Members were rotated during their deployment, spending five days on scene and two days at other locations.

If an incident is so large that the local CISM team is unable to handle the response, that team should call the ICISF for support. ■

INTERAGENCY COORDINATION

INTERAGENCY COORDINATION

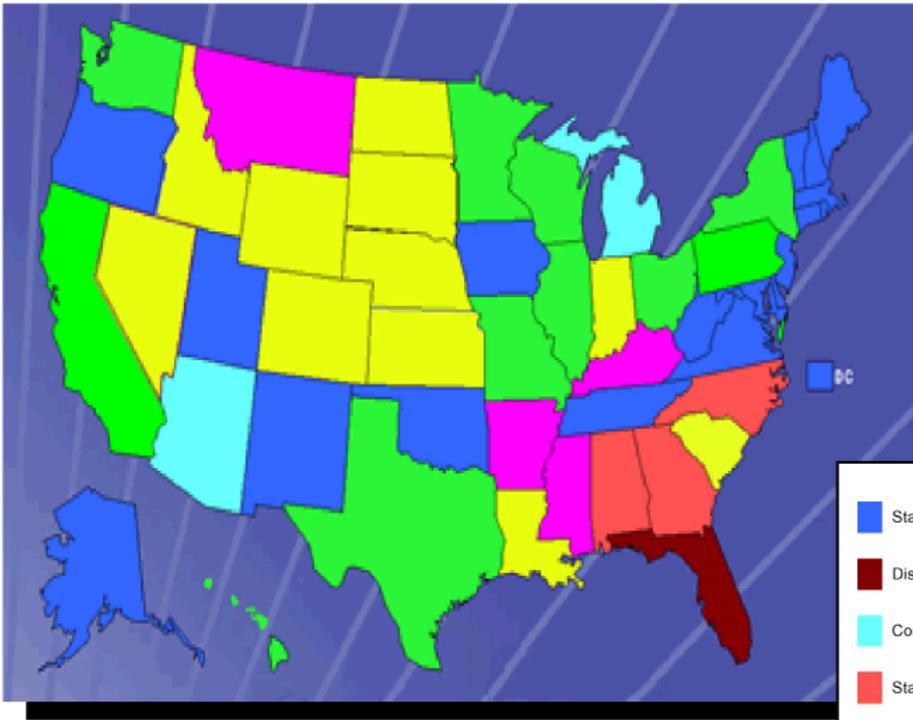
Synchronizing the efforts of multiple agencies can be difficult, because each agency must integrate its organization with other agencies. Agencies must communicate within their own organizations, as well as among several others; a number of agencies may share the same task, which requires each agency to know how the labor will be divided; and agencies must also determine how their responsibilities overlap or affect the responsibilities of their counterparts.

For the medical examiner and coroner (ME/C) systems, interagency coordination is more intricate, as there are no uniform medicolegal death

investigative systems in the United States.⁸ Some ME/C offices are part of the public health department, others are their own department, and still others are part of the safety department. Moreover, death investigative systems can be coroner-based, medical examiner-based, or reflect a combination of medical examiners and coroners. Some ME/C systems are Statewide and can be centralized or decentralized. Some States may also have county-level autonomous offices that perform their own autopsies and manage their own data.

Although these diverse systems challenge interagency coordination, ME/Cs should coordinate their office's efforts with those of other relevant agencies. ME/Cs should proactively identify appropriate resources and build a rapport with local community agencies, such as emergency response

MEDICAL EXAMINER AND CORONER JURISDICTIONS



MEDICAL EXAMINER AND CORONER JURISDICTIONS

Death investigation systems vary depending on State and/or county. As of 2003, there are 22 Medical Examiner Systems, 18 mixed Medical Examiner/Coroner Systems, and 11 Coroner Systems.

- State ME, no Coroners
- District ME, no Coroners
- County ME, no Coroners
- State ME, mixed county ME and Coroners
- State ME, Coroners in every county or district
- Mixed ME and Coroners
- Coroners in every county or district

Provided by the CDC Medical Examiner Coroner Information Sharing Program Figure # 3

agencies, health care facilities, and law enforcement agencies, so they can mutually support one another. Having a rapport will facilitate sharing relevant information; for instance, the ME/C may function as an arm of public health surveillance by recognizing infectious disease deaths that are potentially due to terrorism.²⁷ Conversely, public health agencies may seek to inform ME/Cs of infectious disease outbreaks occurring in their jurisdictions more immediately so that ME/Cs might be better able to recognize potentially related fatalities and confirm suspected terrorist-related cases.

Since fatalities from weapons of mass destruction (WMD) terrorist incidents are homicides and automatically fall under the ME/Cs' statutory jurisdictions, ME/Cs should combine procedures with relevant agencies in greater detail, as well as rely on Federal agencies for support; for example, the health care community may require greater support from the ME/C, as it may need the ME/C to coordinate assets to expand its limited morgue capacity or establish more specific autopsy criteria when thousands of people die from a suspected biological agent.²⁷ Because terrorist acts are a Federal crime, the ME/C must integrate Federal law enforcement agencies into the response effort. In addition, the ME/C may need to bring unfamiliar Federal chemical/biological specialty teams into the response operation.

To simplify the command of multiple assets, the local ME/C must understand the framework for obtaining local, State, and Federal assets during a disaster, as well as how such assets integrate into the response effort.

OBTAINING LOCAL ASSETS

Because it is unlikely that the ME/C will have the resources to manage contaminated remains internally, the support of other agencies must be integrated into the response operation. The ME/C must not only coordinate the response effort through his or her local office, but also through the first responder Incident Command System (ICS), the local Emergency Operations Center (EOC) or the Joint Emergency Operations Center (JOC), and the office of the State ME/C.

Any time ME/C personnel enter an incident scene, they must establish a similar method of organizing

their staff and operation that fits ICS. ME/Cs must appoint leaders, develop teams, identify tasks, and delegate responsibilities to team members who operate at the incident site. Though the ME/C may not speak with the Incident Commander (IC) directly, he or she must make certain that the IC has approved ME/C personnel to enter the incident site, as the IC is responsible for coordinating all operations that take place at the incident site. Responders, such as fire fighters, hazardous materials (HazMat) teams, law enforcement officers, search and rescue teams, and Emergency Medical Services (EMS) personnel, may still be operating at the incident site and may have already designated a specific morgue location. ME/C personnel must know the rules for entering and exiting the scene, to

INCIDENT COMMAND SYSTEM

- Provides an important framework from which all agencies can work together
- Addresses the use of common terminology, span of control, organizational flexibility, personnel accountability, comprehensive resource management, unified command, and incident action plans
- Focuses on managing five key elements to any disaster: safety, planning, operations, logistics, and finances

whom they are to report, where the staging area is, where the morgue area is, who the safety officer is, how they are to communicate with others, and how they are identified by other agencies.

It is likely that the ME/C will need additional assets to process remains. The ME/C should identify the types of assets he or she needs and make that request known to the emergency manager (who works within the local EOC/JOC), as well as the State ME/C. It is important that requests for assets are coordinated through official channels so that existing resources are allocated appropriately and personnel avoid processing duplicate requests.

OBTAINING STATE ASSETS

When the ME/C is not able to manage the incident with local assets, the response effort escalates to the State Emergency Management Agency (EMA). To obtain State assets, the local emergency manager verifies that local assets are overwhelmed and that surrounding mutual-aid assets are either nonexistent

INTERAGENCY COORDINATION DISASTER MORTUARY OPERATIONAL RESPONSE TEAM SUPPORT AT THE SOMERSET COUNTY, PA, INCIDENT

While several Disaster Mortuary Operational Response Team (DMORT) groups were deployed to New York City to assist in the World Trade Center (WTC) collapse response, the members of DMORT III traveled to Somerset, PA, to provide victim identification services for the crash of United Airlines Flight 93. The flight, which crashed in nearby Shanksville, carried 38 passengers and six crew. Among the passengers were four terrorists.

The Pennsylvania Team

In addition to two new DMORT specialty groups, the response was augmented by personnel from several other DMORT regions. Local responders and members of the State Funeral Director Association also provided assistance. The team arrived on September 13, 2001, at the Somerset County National Guard Armory, where the morgue had been organized. After meeting with local and Federal authorities, the team went to work on setting up the morgue operation. The local jurisdiction did a superb job of providing basic equipment for the facility.

The response of the Pennsylvania team marked several firsts (all of note because of their importance for future responses): the deployment of the DNA team, the establishment of protocols documenting the operation of each morgue section, the response executed under a memorandum of understanding (MOU) with the Federal Bureau of Investigation (FBI), the response of the Family Assistance Center (FAC) team, the collection of family blood reference samples, the inclusion of a formal triage station as the first morgue station, and the first use of the Kenyon International Emergency Services, Inc's., (Kenyon's) mobile morgue.

The FBI was the lead authority in the investigation because of the criminal nature of the crash. Although victim identification responsibilities resided with the local coroner, his capabilities were severely taxed. Attempts to have the site declared a Federal disaster through the State proved unsuccessful. The FBI stepped in to establish an MOU with the Department of Health and Human Services (HHS) that allowed DMORT to respond. During the activation, the crash site was under the control of the FBI; the DMORT operation focused on the morgue and the FAC.

Since the DMORT morgue was deployed to New York City, Kenyon's mobile morgue was used. Kenyon did an outstanding job of outfitting the morgue and providing supplies for the operation. The Kenyon team served as the "red shirts," locating supplies through local channels, tracking down unique equipment, and supporting the morgue operation to the fullest.

Pennsylvania Morgue Site

In its first response, the DMORT DNA team, headed by Dr. Joyce DeJong, worked closely with personnel from the Armed Forces DNA Identification Lab (AFDIL). Given the particulars of the crash, DNA identification played a primary role in this response. The DNA team had trained earlier in 2001 at AFDIL, and the coordinated response with AFDIL proved beneficial.

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The DMORT FAC team, which had just completed training a few weeks before September 11, had its first chance to deploy to Pennsylvania and New York City. In Pennsylvania, the team was headed by Cindy Arnold. The FAC team worked out of the Seven Springs Mountain resort, the site of the FAC established by United Airlines. They worked closely with United, the American Red Cross, and the National Transportation Safety Board (NTSB) to collect victim information. The national travel restrictions posed some problems in obtaining records, and some families chose not to travel to the FAC. Collecting family reference blood samples for DNA analysis was established. A Disaster Medical Assistance Team (DMAT) nurse collected and documented the samples from family members and helped to collect direct reference samples.

Due to the legal investigative aspects of the crash, a decision was made to produce written protocols for each section of the morgue operation. Under the direction of Marilyn London, each section of the morgue operation produced a written protocol explaining how the section worked. These protocols, describing the United 93 morgue operation specifics, were compiled into one document that would be instrumental in the event of legal proceedings.

Given some of the concerns involving the numbering and processing of remains at previous responses, a triage station was established. Staffed by a pathologist, an anthropologist, and a dentist, the triage team sorted through remains, first separating personal effects from remains. Once the personal effects were transferred to the FBI, remains were examined to ascertain their potential for identification. Potentially identifiable remains were assigned a sequential number, a file was created, and the specimen was carried through the morgue operation. Unidentifiable remains were stored in containers, weighed, and detained in a separate area of the refrigerated truck. The triage process enabled the team to focus on remains that would most likely lead to identification, to eliminate unidentifiable remains from the morgue flow (reducing unnecessary paperwork), and to simplify the numbering system.

The DMORT response began on September 13 and concluded on September 25. While on site, 10 positive identifications were made through dental and fingerprint examinations. As of December 2001, 40 of the passengers and crew had been positively identified. Four unique DNA profiles, representing the terrorists, had also been isolated. Thus, all passengers and crew had been identified to the extent possible.

DMORT III and its colleagues from Regions IV, V, IX, and X are honored to have served the brave passengers and crew of United 93, the flight of heroes. The support and camaraderie between the local officials, the FBI, and DMORT proved invaluable to team morale. While isolated from the events in New York City and Washington D.C., the team focused intently its on work. Each team member held a deep understanding of the importance of his or her role in providing the highest level of care to these victims.

Paul Sledzik
Anthropologist
DMORT Commander Region III, 2002

EMERGENCY OPERATIONS CENTER

- Provides a central location for all agencies to coordinate emergency response efforts
- Optimizes communication between all agencies involved in mitigating the effects of a disaster
- Aims to fulfill any requirements that have been identified in the field

for a specific capability or are already a part of the response effort. The local emergency manager communicates the needs for specific capabilities to the State emergency manager.

The State ME/C will provide direct fatality management support and coordinate further support. If the disaster is widespread, the State emergency manager will activate the State EOC and, regardless of whether the incident will require Federal assets, will notify the regional Federal Emergency Management Agency (FEMA), which is part of the Department of Homeland Security (DHS) Emergency Preparedness and Response (EP&R) Directorate.¹

With the activation of the State EOC, the State emergency manager helps coordinate State assets that could support mass fatality management (MFM) efforts. If the State does not have enough appropriate assets, the State emergency manager may request that the governor seek support from the State's surrounding region. Some States have a Governor's compact in place, whereby particular support is

provided during times of disasters. These types of agreements are particularly helpful, as they usually waive legal requirements associated with professional certification or licenses specific to a State.

OBTAINING FEDERAL ASSETS

The Federal government will be called upon to provide supplemental assistance when the consequences of a disaster exceed local and State capabilities. Once an incident is declared a disaster, the Federal government can mobilize an array of resources to support State and local efforts and States can receive Federal financial assistance through the Robert T. Stafford Disaster Relief and Assistance Act.¹ In some cases, however, a State may only require the support of a limited number of Federal assets and may not require an incident to be declared a disaster. In those instances, some Federal assets may respond either through their own authority, such as the Federal Bureau of Investigation (FBI) Identification Team, or upon a State's request. When an incident has not been declared a Federal disaster, the State should cover the expenses associated with those Federal assets' response.

There are two means for declaring a disaster. The first way occurs when the Governor requests the President to declare a major disaster if an event is beyond the combined response capabilities of the State and the affected local governments. Based on



the findings of the joint Federal-State-local Preliminary Damage Assessment, which indicates if the damage warrants assistance under the Robert T. Stafford Act, the President would declare the incident a major disaster. The second means occurs in particularly devastating disasters, when the destruction is obvious and the President defers the assessment process until after the declaration.

DEFENSE COORDINATING OFFICER

- Coordinates and validates the use of military assets to support civil authorities in accordance with Department of Defense (DoD) directive 3025.1, reference (c)
- Assigns military organizations and military liaison officers to provide technical assistance to applicable Emergency Support Functions (ESF)

Upon a President's declaration of a disaster, the director of FEMA will process the Governor's request for disaster assistance, coordinate Federal operations under a disaster declaration, and appoint a Federal Coordination Officer (FCO) for each declared State. More specifically, the director of FEMA will contact the regional FEMA director, who activates and leads the Regional Operations Center (ROC) based on the level of response required. Staff for the center consists of members from FEMA, Emergency Support Function (ESF) representatives, and a Regional Emergency Preparedness Liaison Officer who assists in coordinating requests for military support. The ROC establishes communication with each affected State's EMA through the State Coordinating Officer (SCO), who is appointed by the Governor. The ROC staff coordinates the Federal response effort until an Emergency Response Team (ERT) and an FCO are established in the field and assume coordination responsibilities. The ERT-Advanced Element deploys to field locations, assesses damage information, develops situation reports, and issues mission assignments. Part of the ERT-Advanced Element deploys to the State EOC, while other members deploy directly to the incident to establish field facilities and set up operations.

When managing a disaster that requires the support of military assets, the FCO coordinates these requests with the Department of Defense (DoD). The DoD maintains resources that may be made available to support the Federal response to a major disaster. These assets will normally be provided only

when other resources are unavailable, and only if such support does not interfere with the DoD's primary mission or ability to respond to other operational contingencies. The Director of Military Support (DOMS) designates the Defense Coordinating Officer (DCO), who acts as the single point of contact (POC) in the field for coordinating and validating the use of DoD resources with the FCO. The DCO is a designated member of the EP&R/FEMA ERT.

The DCO determines if the military could and should support the request, assigns the appropriate military organizations, and assigns military liaison officers to provide technical assistance to applicable ESFs.¹⁵ A Defense Coordinating Element is placed on scene to help coordinate military assets and provide staff support.

Depending on the requirements and magnitude of the disaster, the DoD may designate a Joint Task Force (JTF) to consolidate and manage supporting operational military activities. The JTF commander will exercise operational control of all allocated DoD assets (except the U.S. Army Corps of Engineers and the Joint Special Operations Task Forces). Units under the direction of the JTF commander will integrate activities with their civilian counterparts.

OBTAINING ASSETS IN WEAPONS OF MASS DESTRUCTION INCIDENTS

In WMD incidents that appear to be acts of terrorism, the process for obtaining assets may immediately escalate to a Federal level, as was exemplified in the September 11, 2001, attacks. The DHS will initiate a Federal response effort to mitigate the effects of the disaster.¹ Hence, all three echelons (local, State, and Federal) of disaster resources will respond simultaneously.

In a WMD incident, much of the disaster framework will have already been established before remains can be recovered from the incident site. Therefore, ME/Cs should anticipate working within all three echelons of the response effort when identifying their requirements to process mass fatalities and when communicating their needs through the appropriate channels. ■

GENERAL PLANNING CONSIDERATIONS: BASIC MASS FATALITY MANAGEMENT STRATEGY

GENERAL PLANNING CONSIDERATIONS: BASIC MASS FATALITY MANAGEMENT STRATEGY

When processing remains from a catastrophic incident, medical examiners and coroners (ME/Cs) must consider implementing a basic strategy that can accommodate all types of hazards. Variables that may influence how remains are managed include the size of the event, the geographic location, the difficulty of excavation, the type of chemical/biological agent (if used), the availability of assets, whether or not there are fragmented remains, and the required time to safely process remains. No plan will ever be able to capture all contingencies, but having a basic mass fatality management (MFM) strategy will provide a framework from which the ME/C can design an incident-specific plan.

A basic MFM strategy for the ME/C should involve managing the incident-specific caseload, establishing a personal effects (PE) depot, providing a Family Assistance Center (FAC), and handling the daily caseload.

INCIDENT-SPECIFIC CASELOAD MANAGEMENT

In a disaster situation, there are eight phases of incident-specific caseload management: (1) notification, (2) evaluation and incident-specific

planning, (3) remains recovery, (4) holding morgue operations, (5) Level 1 transportation and temporary storage, (6) morgue operations, (7) Level 2 transportation and temporary storage, and (8) final disposition.

Notification Phase

The actual disaster may identify the way that the ME/C is notified; for instance, in a chemical weapons of mass destruction (WMD) or explosion incident, the ME/C may be notified through normal emergency channels, but in a biological WMD incident, the ME/C may identify initially unsuspected cases and inform the public health system.

However the ME/C is notified, he or she should gather as much information as possible about the incident and its overall management. Particularly, the ME/C should know where the incident command post is established, to what extent the emergency management system has been enacted, and if the disaster is automatically considered a local or State emergency. The ME/C must be able to identify the Incident Commander (IC) and the level of involvement of other agencies, so that the magnitude of the incident can be ascertained.

Evaluation and Incident-Specific Planning Phase

In everyday instances, the scope of the situation is clear to the ME/C and may only require the input of a death investigator. In disasters, however, the ME/C may need to establish an evaluation team, which may work in conjunction with other agencies if the incident is a crime or an accident, or if the incident

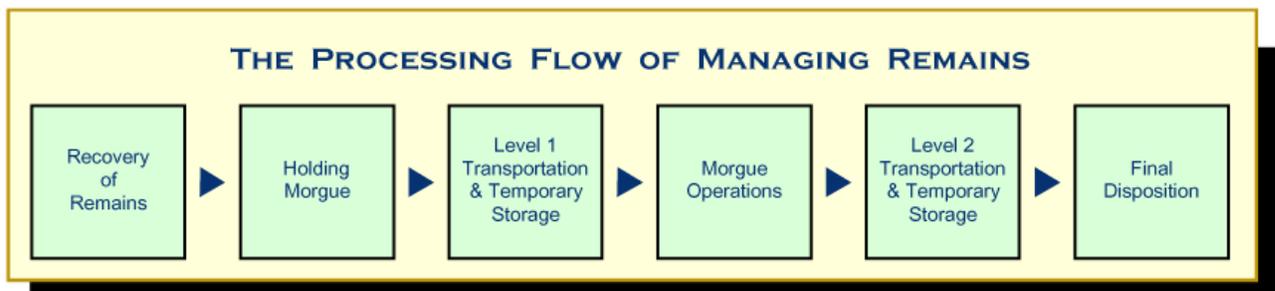


Figure # 4

extends beyond one jurisdiction. Members of the evaluation team should be selected based on their overall mission to collect evidence and to determine the cause and manner of the victims' death. Team members might include an ME/C investigator, a Federal Bureau of Investigation (FBI) investigator, a law enforcement evidence collection technician, and a forensic anthropologist.

ESTABLISH MULTIDISCIPLINED TEAM TO EVALUATE THE SPECIFIC INCIDENT

- Include death investigator personnel, law enforcement, hazardous materials (HazMat), and any other relevant agencies
- Check required level of personal protective equipment (PPE)
- Determine complicating factors (e.g., fragmentation, difficult excavation)
- Take initial pictures of site
- Determine approximate number of remains and their location
- Identify locations of atypical cases

During the evaluation of the incident, the team should gather information about the number and location of remains, the preliminary number of remains for autopsy, and any extenuating circumstances that could make recovery of remains difficult, such as complicated excavation due to a building collapse.

It is the primary role of the ME/C to determine the best approach for managing remains; however, the information gathered by this initial evaluation team will serve as the basis from which the ME/C and other agencies can collectively agree on an organized approach to processing the incident site.

The ME/C must address how each phase of the operation will be carried out by identifying who is performing which tasks and by determining where and in what order the tasks may be performed. These details must be addressed for each phase of the operation (recovery, holding morgue, transportation and storage, morgue operations, and final disposition) so that the ME/C can establish requirements for personnel and resources.

Recovery Phase

Depending on the incident, the ME/C may recover

remains from a distinct geographic location, or remains may need to be recovered from a larger, less distinguishable geographic location, as may occur in a biological WMD incident.

The recovery of remains involves tracking and relocating bodies to the incident or holding morgue. It also includes taking pictures of remains in the location they were found, determining if additional bodies require an autopsy, and separating remains identified for autopsy from those only requiring an external examination. Additionally, the recovery of remains entails keeping them from public view.

When implementing a tracking system for recovery, the ME/C should consider where remains are found, how fragmented portions are tracked, how case numbers are correlated, and how ante-mortem data (obtained from family members) can be cross-referenced with other case numbers assigned to recovered remains. The tracking system should include a means for distinguishing disaster cases from other caseloads, and should also enable the cross-leveling of data between several operational areas, such as the morgue, the FAC, and the incident site, or any location where case data is entered. During the recovery phase of the September 11, 2001, attacks, case numbers with multiple number prefixes were not used; instead personnel started with 1 to avoid confusion. Although tracking starts at the point of recovery, it is better if an official case number is assigned at the location where remains are actually processed, rather than at the recovery point, as commingled remains need to be separated and treated as multiple cases.

Remains are considered evidence in criminal incidents; therefore, if additional personnel are required during the recovery phase, non-ME/C personnel should not be granted unrestricted access. Instead, those recovering remains should be arranged in teams with a law enforcement representative and an ME/C representative who oversee all activity.

Recovery of remains is a crucial phase that can affect other phases of the operation; consequently, the ME/C should consider allocating more resources for the recovery process, especially when decomposition is an issue or when overall resources are limited. If remains are recovered and placed in cold storage in a time-critical manner, the ME/C can



process remains at a rate that coincides with available resources and personnel.

Holding/Incident Morgue Phase

When remains are recovered, ME/C personnel usually perform an initial physical evaluation at the scene and then transfer remains to the morgue, where personnel perform a more extensive evaluation or autopsy. In some circumstances, personnel may need to gather evidence, and remove and track personal effects before remains are transferred for autopsy or identification. The type of disaster will determine the extent of the holding/incident morgue operation.

Level 1 Transportation and Temporary Storage Phase

The average ME/C does not have robust transportation or storage capabilities. There are only a few morgues that are prepared to accommodate 100 to 200 cases in a disaster. To expand their capabilities, ME/Cs should incorporate the use of refrigerated trucks as an alternative resource to accommodate cases that exceed their normal transportation and storage capacity. Another option

is to cool an area to 37°F with an industrial air conditioning unit.

During the transporting and storing process, remains should not be stacked unless shelving units are used. If shelving units are used, personnel should not stack remains higher than waist level to prevent injury to those handling remains.

The transportation and storage plan should minimize the number of times remains are moved. Each time remains are moved, logistical support must be in place, including transportation vehicles, personnel to move remains, and law enforcement agencies to oversee movement because remains are considered evidence. Moreover, contaminated remains might need to be packaged in a particular manner to safely transport them from one location to another. (See Transportation and Temporary Storage Phase, p. 51 & p. 65, for further information on packaging and safe transportation.)

Morgue Operations Phase

Establishing morgue operations during a disaster requires the ME/C to consider many variables, such

as the most appropriate location for processing remains, how remains should move from one station to another, how cases will be identified for autopsy from those requiring an evaluation, how post-mortem and ante-mortem data will be cross-linked,

ESTABLISHING MORGUE OPERATIONS

The following publications provide further information about establishing morgue operations:

- "Mass Fatality Incidents: A Planning Guide for Human Forensic Identification," the National Center for Forensic Science, under the National Institute of Justice, Office of Justice Programs
- "Disaster Mortuary Operational Response Team Field Operations Guide," the National Disaster Medical System, Disaster Medical Operational Response Team (DMORT), under the Department of Health and Human Services (HHS)

and what procedures must take place to issue death certificates and release remains. Though it may be difficult to plan the specific order of events to process remains, the ME/C should consider how each part of the operation may affect the overall ability to return remains to family members.

Location

The ME/C must determine if remains should be processed at the headquarters (HQ) building or at an off-site location. Such a decision is based on the magnitude of the incident, the rate of recovery of remains, the potential for the ME/C HQ to become a target of attack, and space in the morgue to accommodate the additional caseload. In some cases, the ME/C may be able to expand the morgue's existing capability. During the morgue operations phase of the September 11, 2001, World Trade Center (WTC) incident, the chief ME/C was able to expand the morgue capacity by adding refrigerated trucks and tents, by closing off a street, and by paving a dirt parking lot.

There are pros and cons to establishing morgue operations for disasters at HQ. One of the benefits of expanding HQ capacity is that personnel have a sense of normalcy while working in a familiar environment. Being able to maintain a sense of order in a disaster provides personnel solidarity despite working under extremely emotional and difficult conditions. In the September 11, 2001, WTC experience, where the existing morgue was expanded, the chief ME/C reported that personnel

were able to focus on other aspects of their jobs while they waited for WTC cases to arrive; their time was not completely saturated with the disaster.

For some ME/Cs, there may not be enough room to keep disaster caseloads separate from daily caseloads at HQ, or a disaster may occur in a remote location, precipitating the need to establish an off-site morgue close to the incident site. In the Georgia crematorium case of 2002, investigators chose to process hundreds of cases near the location site instead of transporting remains to their distant HQ building. Authorities cleared a 5-acre wooded area and set up a cold tent for storage and a warm tent to process remains.

When establishing an off-site morgue, ME/Cs should consider using alternative sites identified in their standard evacuation plan. ME/Cs should be familiar with these sites and the equipment and supplies necessary to make them operational. Depending on how robust the evacuation plans are, they may only need to be supplemented with a resource list identifying items needed to process remains for various hazards.

If the number of fatalities exceeds the capacity of the morgue and the planned alternative locations, the ME/C may need to establish multiple temporary morgues. Additional locations can include empty warehouses, airplane hangars, and tents.

Ideally, to reduce the need to transfer remains between locations, each alternative facility should enable personnel to perform all critical functions required to process remains.

ALTERNATIVE LOCATIONS SHOULD HAVE:

- Large open floor space
- Electrical power (although large generators can supplement this need)
- Water supply and waste water containment
- Ventilation, air conditioning, and heating
- Drainage and medical waste holding tank
- Provisions for staff (e.g., restrooms, recovery area)

Morgue Stations

The ME/C must determine what stations should be established as part of the morgue operation during a disaster. Generally, a well-organized morgue operation entails triage, anthropology, odontology,

fingerprinting, photography, radiology, pathology/toxicology, DNA analysis, evidence, personal effects, intake/admitting, holding/record audit, and release/final records audit.²⁸ By establishing an effective morgue operation, the ME/C can ensure that remains undergo the proper investigation and identification.

Autopsy and External Evaluations

For large numbers of fatalities, the ME/C should perform autopsies on as many cases as possible given the overall case volume, as well as any other working constraints (e.g., bio-safety constraints).²⁹

In situations where the ME/C is not able to perform an autopsy on every case, he or she should determine those cases that would help establish evidentiary findings for the majority of cases which are part of the same incident, in addition to performing autopsies on atypical cases. The ME/C, in lieu of performing an autopsy, may decide to gather additional samples for evidence purposes, such as skin swabs or tissue for culture, needle aspiration of blood or other bodily fluids, or biopsies of a particular tissue or organ for histologic diagnostic tests (Nolte et al., 2003).²⁹ The ME/C should gather external evidence, perform an identification check, and examine the physical body for all cases that will not undergo an autopsy.

When the ME/C is not able to execute his or her standard practice to perform autopsies, he or she should relay this intention to the lead law enforcement agency and the U.S. Attorney General. The ME/C must be prepared to outline the modified approach, as each of these agencies has its own requirements for using autopsy information to support the criminal investigation.

Authorization of Release

Once remains have been identified and are ready for release, the ME/C should issue a death certificate commensurate with cause and manner of death statements; for instance, in the case of a biological or chemical terrorist incident, the manner of death should be classified as homicide and the “how injury occurred” section of the death certificate should be completed to reflect how the infectious agent or chemical substance was delivered to the victim (victim of chemical terrorism, inhalation of phosgene gas from explosion) (Nolte et al., 2003).²⁹ Once the death certificate is issued, the family is

MORGUE STATIONS

- Triage
- Anthropology
- Odontology
- Fingerprinting
- Photography
- Radiology
- Pathology/Toxicology
- DNA Analysis
- Evidence
- Personal Effects
- Intake/Admitting
- Holding/Record Audit
- Release/Final Records Audit

notified and typically the funeral home picks up the remains.

In disaster situations where there are no remains to recover for identification, or where scientific efforts to obtain identification fail, a death certificate must be legally ordered by the county, State, or territory in which the disaster occurred.



AUTHORIZATION FOR RELEASE

The New York City Office of Chief Medical Examiner (NYCOCME) developed a Release Authorization document. This document allows families to customize notification procedures in the event that additional remains of their loved one are identified.

During the September 11, 2001, World Trade Center (WTC) disaster response, families had to choose whether or not to be notified of and receive additional remains linked to their loved ones' primary remains. In its first iteration, the Release Authorization provided families with two choices: (1) notify the family each time additional remains are identified, and (2) never notify the family.

After being notified 14 times in a 3-week period of additional remains, one family called to ask if there was another notification alternative. The Release Authorization was altered to include an option allowing families to be notified one additional time after all identification work was concluded. The NYCOCME would hold all accumulating remains until the families wished to collect them.

Other changes to the document during the course of the disaster included an option allowing families to appoint a proxy for notification.

Shiya Ribowsky, PA-C
Deputy Director, Investigations
New York City Office of Chief Medical Examiner (NYCOCME)

Level 2 Transportation and Temporary Storage

Until the final disposition of remains is known, the ME/C cannot determine to what extent this phase of the operation must function. For instance, when remains are going to be returned to family members, personnel may only need to establish a holding area for funeral home directors to retrieve remains. In some cases, it may be possible to hold remains at funeral homes until they are released, thereby enhancing the ME/C's storage capacity.

In instances when final disposition requires State-sponsored burial, ME/C personnel must arrange for transportation and additional handling of remains. The ME/C should consider using the same transportation assets that were previously used or establishing a holding area within the morgue until final disposition has been determined.

Despite the conditions under which remains are released, the ME/C may still need to enhance the morgue's storage capacity. Law enforcement and investigative agencies may request that some or all remains be held for purposes of gathering additional

evidence, or that ME/C personnel store unidentifiable portions of remains until a ceremony is arranged.

Final Disposition Phase

Final disposition options include individual burial, State-sponsored individual burial, entombment, mass burial, voluntary cremation, and involuntary cremation.

In general, human remains cannot be disposed of as the State chooses; State laws require that remains be given to family members upon request. The exception is if a public health hazard exists, in which case the Governor can issue an emergency declaration negating current law, which may affect how final disposition is managed.

Several other factors may also influence the final disposition of remains. The ME/C should know whether his or her State has adopted an Emergency Health Powers Act (EHP), which may automatically identify particular mass fatality incidents as public health hazards, and should review his or her State's laws regarding acts of terrorism. The ME/C should

be familiar with the characteristics of biological and chemical WMD agents and the characteristics of a public health hazard. Moreover, the ME/C should determine if he or she could identify, mobilize, and coordinate large amounts of resources in a time-critical manner to prevent a public health hazard from occurring. It is likely that the ME/C will participate in discussions with the health department, whereby the State's secretary of health will determine if a public health emergency exists and to what extent the emergency involves human remains.

ESTABLISHING A PERSONAL EFFECTS DEPOT

In a mass fatality incident, death is usually sudden, unexpected, and violent. Due to the tragedy and unexpected timing of a disaster, personal items become more significant to the families (Jensen, 2000).³⁰ More often than not, remains are not viewable, and in some cases, like those of the WTC, the Pentagon, and Somerset County, PA, very few fragments are recovered and, therefore, very few personal effects (PE) can be returned to the families.

The ME/C should consider establishing a team to manage PE from the incident. This team will search and recover PE, establish a PE warehouse, attempt to associate PE with persons eligible to receive it, and, in some instances, decontaminate PE. Managing PE can become complicated, as it can be recovered from remains at the incident site by both officials and civilians. It is often difficult to associate PE with the right victim, making it all the more difficult to return such items to the families.

ESTABLISHING A PERSONAL EFFECTS DEPOT

"Mass Fatality and Casualty Incidents: A Field Guide," by Robert Jensen, 2000, provides further information about establishing a PE Depot.

PE operations may take a long time to resolve. In some instances, PE may require long-term storage, as some State laws currently mandate that unclaimed PE must be retained for a minimum of 18 months.³⁰ Regardless of the amount of time it takes to process PE, the ME/C must allocate personnel, equipment, and resources to this operation.

ESTABLISHING A FAMILY ASSISTANCE CENTER

The ME/C should be prepared to participate in the establishment of an FAC in conjunction with incident management. Establishing an FAC at the outset of an incident demonstrates to the public that there is some semblance of order, despite the disaster circumstances. The FAC provides family members a place to register their loved ones as missing, to wait and prepare themselves to receive difficult news, and to provide data for identification purposes.³¹ The FAC also assists ME/Cs with positively identifying remains and coordinating final disposition.

The ME/C may establish and manage the FAC or the ME/C may only manage remains identification. Depending on the range of services offered to families at the FAC, another agency, such as the public health department or the American Red Cross, may be better suited to manage the overall operation.

ESTABLISHING A FAMILY ASSISTANCE CENTER OR A BEREAVEMENT CENTER

For more information on establishing a Family Assistance Center (FAC) or a Bereavement Center, medical examiners and coroners (ME/Cs) can read the report, "Providing Relief to Families After a Mass Fatality: Roles of the Medical Examiner's Office and the Family Assistance Center," Department of Justice's Office of Justice Programs, the Office for Victims of Crime. This report may be retrieved via the Web at <http://www.ojp.usdoj.gov/ovc>, or read about the FAC model employed by the NTSB, which is based upon the requirements of the Aviation Disaster Family Assistance Act of 1996. This report may be retrieved via the Web at <http://www.nts.gov>.

For airline disasters, the FAC will automatically be established by the airline industry per the 1996 Federal Family Assistance Act for Aviation Disasters.²³ This act assigns and describes airline and Federal response guidelines in regard to an aviation crash involving a significant number of passenger fatalities and/or injuries. Many components of the FAC are simplified for airlines, as the airlines would have a manifest of passengers confirmed on flights, including each passenger's name and emergency contact information.

In disasters not involving airlines, the ME/C must determine who will organize the FAC. Prior to the 1995 Oklahoma City Bombing, there were no formal guidelines describing how a jurisdiction should support grieving family members. Since that incident, the Department of Justice's (DOJ's) Office for Victims of Crime (OVC) collaborated with the Oklahoma State Medical Examiner's Office, and the National Transportation Safety Board (NTSB) to establish FAC guidelines.³¹ These guidelines emphasize that an FAC must be part of standard operation when managing multiple fatalities, whether the cause is a terrorist incident or a natural disaster.

MANAGING THE DAILY CASELOAD

Despite the fact that the ME/C may be overwhelmed with organizing the incident and mobilizing resources, he or she should consider a few basic principles regarding how to manage the typical influx of remains during a disaster.

The ME/C should try to keep the daily caseload separate from the disaster caseload so that personnel can focus on their assigned tasks. In some jurisdictions, the ME/C may be able to keep caseloads separate while using different areas within the same building, as was the case in the September 11, 2001, WTC incident. Moreover, when New York City had to process further additional remains from a second disaster, the American Airlines Flight 587 crash, the chief ME/C decided to process those remains at HQ too, as there was enough room to accommodate all three caseloads without getting them mixed up.

The ME/C should avoid scheduling 24-hour operations, particularly when this will fatigue personnel or imply that personnel should not rest until all remains have been processed.³² Personnel must rest and maintain a work schedule that is as close to normal as possible. Usually this can be accomplished by extending shift hours from 8 to 12 hours, or by adding a second shift of personnel to address the disaster caseload.

When adding additional shifts, it is important that all disaster cases are governed by the same set of protocols, and that there is no deviation as to how those protocols are executed between shifts. ■

FEDERAL FAMILY ASSISTANCE ACT OF 1996

Title 49, United States Code, requires the National Transportation Safety Board (NTSB) and individual air carriers to take actions to address the needs of families of passengers involved in aircraft accidents.

The NTSB shall have primary Federal responsibility for facilitating the recovery and identification of fatally injured passengers involved in an accident. The NTSB is specifically responsible for the following:

- To provide mental health and counseling services, in coordination with the air carrier involved
- To provide an environment in which the families may grieve in private
- To meet with the families who have traveled to the accident location and to contact the families unable to travel to such location
- To contact affected families periodically thereafter
- To communicate with the families as to the roles of the organization, the government agencies, and the air carrier involved with respect to the accident and the post-accident activities
- To arrange a suitable memorial service, in consultation with the families

For further information regarding the Federal Family Assistance Plan for Aviation Disasters, visit the NTSB Web site at <http://www.nts.gov/Family/family.htm>.

DETAILED PLANNING CONSIDERATIONS: ISSUES THAT INFLUENCE THE MASS FATALITY MANAGEMENT STRATEGY

DETAILED PLANNING CONSIDERATIONS: ISSUES THAT INFLUENCE THE MASS FATALITY MANAGEMENT STRATEGY

Using a basic mass fatality management (MFM) strategy provides a framework from which the medical examiner and coroner (ME/C) can build an incident-specific plan. Each incident may pose significant challenges that affect overall strategy. ME/Cs should consider the following issues during the planning process, as they may influence how an incident is managed: legal aspects, classification of remains, final disposition options, operational constraints, and decision-making priorities.

LEGAL ASPECTS THAT INFLUENCE THE MASS FATALITY MANAGEMENT STRATEGY

When managing remains from a disaster, there are three legal areas of concern: (1) the jurisdiction where the incident occurred, (2) identification issues for death certificates, and (3) mitigation of any public health hazards resulting from remains.

Determining the Jurisdiction

By determining the jurisdiction, the ME/C should be able to clearly identify the lead and supporting agencies; however, determining where a disaster has taken place and the ownership of that property may not be an easy task. Many buildings and properties, such as Federal buildings, military installations, and embassies, are not locally owned property. In some cases, it is possible that the property is jointly owned by local, State and/or Federal authorities, or the property may be located in two jurisdictions, such as a military installation with Interstate roadways running through the property.

The ME/C should identify which buildings and areas within his or her jurisdiction are owned by other entities and what their response effort would be. For

those areas that are within the ME/C's jurisdiction, the ME/C has the primary role of managing remains. For those areas that are not technically part of his or her jurisdiction, but reside jointly within his or her jurisdiction, the ME/C should establish a memorandum of agreement (MOA) regarding how the ME/C office may support a mass fatality incident. It is quite likely that the immediate property owner will not possess all required resources to manage a disaster, and therefore, the local jurisdiction will become part of the response effort.

Another aspect of jurisdiction involves jurisdictional parameters for processing the scene for evidence. Though the ME/C does not process the scene, he or she recovers remains from the incident site and gathers evidence. Often, the scene provides clues or evidence that supports establishing the cause and manner of death. The ME/C should consider processing remains in a unified manner with law enforcement agents so that each agency can mutually support the collection of evidence for purposes of prosecuting the criminal case.

Identification Issues and Death Certificates

The local ME/C is responsible for signing death certificates, which requires determination of the cause and manner of death, and identification of the deceased. Often in disasters, the causes, manner, time, and location of death is apparent for all fatalities. Establishing the identity of the remains may be more difficult; disasters that leave remains fragmented or dissolved pose an even greater challenge.

The ME/C may need to determine to what extent he or she is capable of supporting identification procedures. Identification goals are either to account for all persons, such as in plane as crashes where there is sufficient knowledge of who on board; or to account for all fragments and/or portions, where there is not sufficient knowledge of those who were

DETERMINING THE JURISDICTION: THE PENTAGON EXPERIENCE

We, the 54th Quartermaster Co., Mortuary Affairs, left for the Pentagon on September 11, 2001, and arrived at the Pentagon on the morning of September 12, 2001. Since there were numerous civilian and government agencies present on the site, integrating into the scheme of events was the first obstacle. Agencies and units appeared to be just showing up, while a defined chain of command was not identified. The real questions for me were, "Who is in charge of the overall operation?" and "What is my military chain of command?" As the commander of the Mortuary Affairs company, my first job was to find a job for my company. In between briefing every general and colonel that showed interest in the company and its capabilities, I honed in on the way in which the operation was being conducted and how we could assist.

As soon as I discovered that the Federal Bureau of Investigation (FBI) had total jurisdiction over the operation, and that the Military District of Washington, under the command of Major General Jackson, had command and control over all military units working the Pentagon recovery, the next step was integrating the 54th into the operation. This was not an easy task. The Old Guard soldiers were initially recovering the remains from the Pentagon. The 54th soldiers began their part of the operation by retrieving the remains from the Old Guard soldiers and storing and transporting the remains from the recovery site. Initially, the FBI placed remains in a 40-foot Giant Food refrigeration truck. When the determination was made as to where the remains would be sent (Dover Air Force Base (AFB)), the 54th got involved with the transfer of remains from the refrigeration truck to the helicopters.

The first group of remains left in the Giant Food truck. The FBI would not allow the 54th to transfer the remains into our refrigeration vans for storage and transportation. After the first shipment of remains, the FBI began using the 54th's refrigeration vans for storage and transportation.

On September 13, 2001, the Old Guard transferred the mission of recovering remains from within the Pentagon. It was at this point that the mission began to take shape. The 54th had four-soldier litter teams that went into the Pentagon to recover bagged remains and portions. The 54th soldiers were not permitted to enter the Pentagon until the FBI called for a litter team. At that time, litter teams would enter the Pentagon, and recover only those remains or portions that the FBI designated. The soldiers took the remains or portions to an unmarked white civilian refrigeration truck outside the Pentagon. Once the truck was full, or the recovery ceased for awhile, the 54th soldiers transported the remains or portions to the temporary morgue site at the loading dock of the Pentagon. There, FBI agents supervised the removal of remains for collecting evidence and documentation. Once the FBI finished this step, the agents supervised the 54th soldiers carrying the remains or loading portions onto the 54th's refrigeration vans. Once the remains or portions were loaded onto the 54th's refrigeration vans, an FBI agent locked the refrigeration vans and maintained the keys.

Twice a day the soldiers from the 54th transported the remains and portions to Davidson Army Airfield. One FBI agent rode in each of the 5-ton trucks with the soldiers to ensure the chain of custody was maintained. Once the remains and portions arrived at Davidson Army Airfield, the FBI agents supervised the 54th soldiers off-loading the refrigeration vans and loading the helicopters. After the helicopters were loaded, the FBI agents rode on the helicopters with the remains and portions to Dover AFB.

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About two weeks after September 11, 2001, the FBI released the crime scene at the Pentagon to the Military District of Washington commander. At this point the 54th went from recovering remains to the recovery of personal effects. After doing a leader's reconnaissance, the determination was made to have the 54th recover only personal effects (PE) in the E ring of the Pentagon, the most affected part. Once all PE were removed from the E ring, we scheduled times for each of the agencies to be escorted into the Pentagon to recover the remaining PE from the C and D rings.

All PE removed by 54th soldiers were secured and locked in black, heavy-duty plastic containers, then locked in a white civilian truck. When the civilian truck was almost full, the 54th soldiers removed the PE from the civilian truck and placed them into a military 5-ton truck and transported everything to the PE depot at Fort Myers, operated by soldiers from the 311th QM Co., Mortuary Affairs.

CPT. Cory Boyer
54th Quartermaster Company
U.S. Army Mortuary Affairs Center

present. In the latter situation, the ME/C must establish specific tissue sample criterion for DNA analysis. Limited resources should focus on processing tissue samples that are likely to identify remains; for example, an intact femur is a better

sample than a bone fragment. Additionally, the ME/C must determine if there are enough resources to cross-link multiple data points to positively identify remains by two methods.

IDENTIFICATION ISSUES: THE WORLD TRADE CENTER EXPERIENCE

The body of an adult man was sent to x-ray for full body radiographs. He had dental and finger prints available, as well as a wedding band on his left hand. Upon examination of the x-rays, two more wedding bands were discovered. One was on a traumatically amputated finger, the other was on a finger attached to an entire hand; both were lodged deep in the man's chest cavity. It was then that we were really able to grasp the magnitude of the destruction, commingling, and utter devastation inflicted upon these victims. The force of the two collapses was so tremendous that people were actually blown into each other. Additionally, the excavation process, using large grapplers and other types of heavy machinery, and the decomposition that occurred over the eight months of digging also contributed to the extensive mixtures of human remains.

At the morgue, the first stage along the assembly line for identification was triage. At this table, the bags from Ground Zero were opened and their contents sorted. Anything not attached by soft or hard tissue, or which did not articulate with another bone, was given its own case number. Even if everything within the bag appeared to be from the same individual, one small muscle fragment might be from someone else, and that was not a chance we were willing to take. This was to ensure that every piece of human tissue larger than a thumbnail was sampled for DNA, in the likelihood that a single 1-inch bone might be the only recovered remains of an individual. Indeed there have been identifications made by DNA where that is the case. If multiple items appeared to be from the same person, an attempt was made to rearticulate them. This was often the case with skull fragments, with which we were often successful. The fragmentation was so severe that very few intact bones were recovered. Many long bone shards, rib fragments, and aggregates of muscle and tissue were recovered that could not be reassociated to each other without the science of DNA.

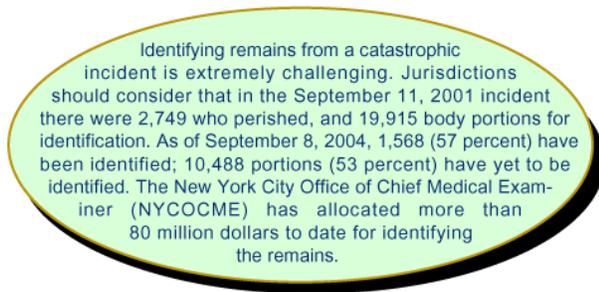
When the excavations at Ground Zero were complete, and the landfill had finished screening the 1.7 million tons of debris sent there by barge, just fewer than 20,000 fragments had been catalogued. Of the 2,795 individuals reported missing, 292 whole bodies have been recovered; the other 19,640 cases are fragments. Many case-to-case links have been made with the help of DNA. At this point, we have one individual who already has 198 pieces associated, and we are not finished.

Amy Zelson-Mundorff, MA
Anthropologist
New York City Office of Chief Medical Examiner (NYCOCME)

Before establishing an incident-specific identification practice, the ME/C may need to weigh the condition of remains, the time it takes to employ all identification methods, and the availability of resources. For example, the September 11, 2001, World Trade Center (WTC) incident resulted in approximately 3,000 deaths, and approximately 20,000 body portions. The New York City Office of Chief Medical Examiner (NYCOCME) believes that it will take several years to process 40 percent of the

remains. The other 60 percent of existing body portions cannot be identified using current methods and will be stored indefinitely until technology is developed to identify the remaining tissue samples. Though the September 11, 2001, incident has not overtaxed the ME/C's ability to identify remains, an incident 10 times the size of the WTC might. In such instances, the ME/C may not have the capability to identify all remains, as current technology may be limited or there may not be enough available

resources to dedicate toward extensive identification efforts.



In disasters for which there are no tissue samples to identify remains, the ME/C must establish different criteria for issuing death certificates. Such criteria may include confirmation of an individual's location at the time of the disaster, confirmation that relatives have not seen the individual since the disaster, and a certain length of time. (Most States require a period of seven years to pass before declaring an individual dead and issuing a death certificate.) Fraudulent death cases may occur without exact identification; however, for the most part, using these criteria will help bring the victims' families emotional closure.

Recognizing a Public Health Hazard

Due to the magnitude of a weapon of mass destruction (WMD) incident, the ME/C needs to consider to what extent contaminated remains may contribute to a public health hazard. In general, a public health hazard may involve communicable diseases or environmental sanitation. Disposal of human remains falls within environmental sanitation in a limited manner, as depositing human remains can significantly compromise the public's health.² Some States have passed an Emergency Health Powers (EHP) Act that identifies specific mass fatality incidents as a public health hazard.³ Though authorities within the public health department are responsible for declaring a public health hazard, the role of the ME/C is to identify potential cases that could be deemed hazardous, with regard to human remains, and to report such cases to public health officials.

In chemical WMD incidents, a public health hazard could exist if decontamination efforts do not reverse the contamination or if the jurisdiction is not able to verify that its decontamination efforts have mitigated the contamination. Agencies such as the National Guard Civil Support Teams (CSTs) and Disaster

Mortuary Operational Response Teams (DMORTs) WMD, have the ability to monitor the level of chemical contamination via chemical agent monitoring.

In biological WMD incidents, identifying a public health hazard is more complex. Biological agents that create a public health hazard for the living may not pose the same level of risk in human remains. The ME/C needs to consider to what extent biologically contaminated human remains are communicable.

Communicability in human remains primarily depends on the type of biological agent, and to what extent someone could be exposed to contaminated blood, body fluids, or tissues. Those performing autopsies, laboratory analysis, or embalming have a higher risk of exposure than those handling the external portions of the body, or those who observe the body without touching it (such as family members), as they are more likely to come in contact with infected blood, body fluids, or tissue.

STATE EMERGENCY HEALTH POWERS ACT

Some States across America have passed legislation that grants emergency powers to State governors and public health authorities. Each State is responsible for safeguarding the health, security, and well being of its people. The Centers for Disease Control and Prevention (CDC) sponsored the development of a Model State Emergency Health Powers Act (EHP) to assist State authorities with developing an appropriate response to a public health emergency in light of possible bioterrorist attacks and naturally occurring epidemics. The model identifies a public health emergency as an occurrence or imminent threat of an illness or health condition, or an incident that results in a large number of deaths in an affected population. The model outlines the following instances in regard to a public health emergency: bioterrorism, a chemical attack or accidental release, and a nuclear attack or accidental release.

Some State EHPs specifically address the duties of medical examiners and coroners (ME/Cs) and their ability to waive licensing requirements, permits, or fees required by the State code. Some also allow the ME/C to make emergency personnel appointments. Some outline safe parameters for the disposal of human remains. The model reads, "to order the disposal of any human remains of a person who died of a contagious disease through burial or cremation within 24 hours after death."

Another factor that warrants public health concern in biological incidents is the ME/C's ability to process remains in a time-critical manner. The ME/C should consider reporting the potential for a public health hazard if the rate of those dying surpasses the ability of the ME/C agency to process remains and prevent the decomposition of hundreds or thousands of bodies. Such was the case during the Pandemic Flu of 1918, when the disease was no longer communicable in remains, but the number of those who died on a daily basis exceeded the ability of the Nation's resources to process them, which in turn created a public health hazard.³³ Regardless of the type of contamination or the origin of a public health hazard, the ME/C may find himself or herself in a precarious situation regarding human remains contributing to a public health hazard. In some instances it may seem that the public health hazard is mitigated (e.g., through special handling procedures, body fluid containment packaging, or vaccinations), but the ME/C should report that the hazard is contingent upon particular factors. Once remains are released to families for final disposition, there is no way to safeguard individuals or the public from cross-contamination.

CLASSIFICATION OF REMAINS

For disasters that involve the death of foreign nationals or military personnel, additional coordination may be required. When processing military personnel, the ME/C should coordinate final disposition efforts with not only the family, but also with the military service (Army, Navy, Air Force, National Guard, or Coast Guard). When disasters are within the local civilian jurisdiction and service members have died, the ME/C may request that the Department of Defense (DoD) provide casualty assistance. A Casualty Assistance Officer can help coordinate victim DNA identification, as well as become a liaison to families or the Family Assistance Center (FAC) to simplify the final disposition process.³⁴

When managing foreign nationals, the ME/C may require the support of the Department of State or the International Affairs Department for contacting family members abroad. Foreign nationals may be difficult to identify, as some countries have multiple surnames and the same individual may be listed under several names. Additionally, foreign governments may also need to perform their own

investigation when a disaster involves their citizens. The ME/C must be prepared to engage in cooperative efforts with other county law enforcement agencies and/or with Interpol.

FINAL DISPOSITION OPTIONS THAT INFLUENCE THE MASS FATALITY MANAGEMENT STRATEGY

Returning remains to families governs the entire MFM strategy. The ME/C should consider the precise means of final disposition, as this decision will clarify resource and personnel requirements. If the ME/C knows that remains will only be returned under closed-casket conditions, then the strategy may not need to incorporate certain tasks, such as embalming. The ME/C must manage final disposition efforts, which memorialize death, in balance with the requirements for protecting life. The ME/C should consider the following options regarding final disposition:

- Return remains in whole or in part to family for final disposition.
- Burial at a State-sponsored cemetery using individual caskets. This option may entail using individual sealed caskets or vaults.
- State-sponsored voluntary cremation, with remains returned to family.
- State-sponsored mass interment (group burial) with individual caskets but not independent burial plots. This option is generally executed by the military; it is not a common civilian practice.
- State-sponsored mass interment with no individual caskets. Although not a highly favored option, remains that are commingled, unclaimed, unidentifiable, or fragmented are generally mass interred. Often remains from the same incident, such as an airline crash, will be kept together.
- Involuntary cremation. An option when ME/C personnel are not able to safely handle chemically contaminated or biologically contaminated with a highly infectious disease.

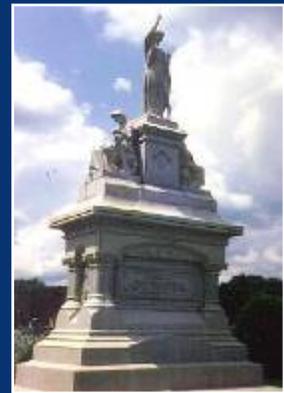
FINAL DISPOSITION

One consideration in a large life-loss incident involving weapons of mass destruction (WMD) is disposition of remains. Remains are customarily handled by a funeral home of the family's choosing and are interred or cremated in strict accordance with the cultural, religious, and social dictates of that family. In any discussion of mass fatalities involving WMD agents, it may not be possible to accommodate traditional American funeral practices. Some biological agents may be deemed too dangerous to allow standard burial, and there is a potential for mass burial or mass cremation. The process will be driven by the dictates of the public health authorities and is both socially and scientifically controversial.

The use of mass graves and even mass cremation has been documented in natural disasters and endemic incidents in the United States for well over 100 years. Historically, they are employed when victims have been largely unidentified and/or unclaimed. Though not a routine disposition, the following paragraphs outline cases from 1871 through 1997 that exemplify situations where these final disposition options have been employed.

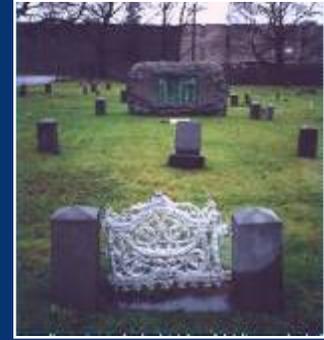
On October 8, 1871, a fire swept through Peshtigo, WI, resulting in the death of 1,125 people. It still stands as the largest life-loss fire in American history, but the memory of the event is overshadowed by the fact that it occurred on the same day as the Great Chicago Fire. Of the victims of the Peshtigo fire, 350 unidentified remains are buried in a mass grave.

On Friday, May 31, 1889, the South Fork Dam near Johnstown, PA, gave way under the pressure of relentless heavy rains, and released 20 million tons of water from Lake Conemaugh, destroying several towns and killing over 2,000 people. The 40-foot tall, 1/2 mile-wide wall of water and wreckage reduced the town of 30,000 residents to a pile of rubble tangled with the bodies of animals and people and burning debris in just 15 minutes. The Johnstown flood officially claimed 2,207 lives, but witnesses to the event believe the count was much higher. A section of the Grandview Cemetery in Cambria County, PA, was dedicated two years later and contains the remains of 777 flood victims who could not be identified. This Unknown Plot is a mass burial site with a monument to the victims and individual markers for every grave.



On September 8, 1900, residents of the Texas city of Galveston gathered at the beach to watch huge waves breaking at the end of the pier. When the pier collapsed, the first of over 6,000 people died from the effects of a hurricane that lasted 18 hours and swept through the entire city. Recovered from wrecked structures were 3,000 bodies. Another 1,000 were found in the streets, and 500 more on the beaches; hundreds more were estimated to have been swept out to sea. Galveston was built on a barrier island only 10 feet above sea level, and there was no place for all of the needed graves. Bodies were stacked like cordwood on a barge and taken out to sea. Chain and scrap iron were used to weight the bodies, sometimes two or three together, and they were thrown overboard in a mass burial at sea. Seven hundred were disposed. Others were loaded into carts for common burial, and eventually the tangled debris of buildings containing human remains was burned in lieu of removing the bodies.

On Monday, March 11, 1918, a soldier at Fort Riley, KS, came down with what appeared to be a bad cold. By noon there were 100 sick men in the infirmary. By July, tens of thousands of people worldwide had been stricken with a virulent strain of influenza and many had died, but the disease had not yet reached its peak. Through the summer, the numbers of victims dropped, and the attention of the United States and the world was focused on World War I. In September, U.S. troops returning home brought the virus with them, and to the civilian population of Boston. It spread quickly, killing people between 20 and 40 years old. In September, 12,000 Americans died; in October, 195,000. Caskets were in short



supply. Bodies were stacked like cordwood in the gutter, and funeral homes couldn't keep up with the burials because their own employees were dying. By the time the pandemic subsided that winter, approximately 675,000 Americans had died, and the number of deaths worldwide approached 40 million. Today, Prospect Cemetery in Cambria County, PA, is one of the sites where the mass burials that took place in 1918 are memorialized. A marker stands in memory of the 108 unidentified bodies buried in a mass grave.



A hurricane made landfall on the shores of Palm Beach, FL, on September 16, 1928, and moved inland along Lake Okeechobee. It had already killed 1,000 people in Puerto Rico and, in a matter of 6 hours, would kill 2,000 more in the south Florida glades. Burial was difficult because of the high water table, and bodies

without caskets were piled up on docks and high ground. After 5 days of heat and humidity, a steam shovel was used to dig a mass grave for at least 700 bodies in West Palm Beach. Another 1,600 were hauled to Port Mayaca and higher ground, where they were cremated with diesel fuel to prevent the spread of disease and placed in a mass grave.

In more recent times, the heat wave of 1997 that killed hundreds in Chicago, IL, resulted in a mass grave for 78 of the unclaimed victims. For the authorities in Cook County this practice is employed as a customary disposition for unclaimed remains.

New York City's Potter's Field on Hart Island is the largest cemetery in the United States, with over 750,000 graves. The use of the site for mass burial of unclaimed remains is an ongoing practice.

These are a few of the documented instances of mass burial, mass cremation, and the use of mass graves in the American experience. In some cases, other burial sites exist with less obvious markings or documentation. The concept of common disposition is neither new nor unique in the United States. Laws relative to public health quarantine in some States have been strengthened in the past year. It remains to be seen as to what degree, and under what circumstances, the American public will accept mandatory mass disposition.

Dennis McGowan, B.A.
Fatality Management Solutions

If the ME/C does not have enough resources to process and accommodate the return of remains to contaminated or biologically contaminated with a highly infectious disease.

If the ME/C does not have enough resources to process and accommodate the return of remains to families, a different final disposition option should be considered. When remains are chemically contaminated, the ME/C must coordinate assets to decontaminate remains, supply personnel with personal protective equipment (PPE), and verify that remains are free of contamination with chemical agent monitors. These resources are limited and may be needed to protect the living. In such situations, it may not be possible for the ME/C to decontaminate remains; consequently, the remains cannot be returned to families. If the ME/C is not able to obtain needed resources, he or she must develop a strategy that works with existing resources.

Another component regarding resources entails the number of remains that the ME/C must manage. When the ME/C must process large numbers of remains, final disposition options may be limited to State-sponsored mass interment because of the time involved to process the remains or because of the lack of cemetery space. Processing large numbers of remains is time consuming, and the ME/C must choose an option that does not extend the final disposition process. In a smallpox situation, where cremation is the best option because of the infectious nature of the disease, cremation may extend the amount of time it takes to process remains, particularly if an area does not have a sufficient number of crematoriums. In circumstances where there are thousands of remains to process, cremation may not be the best incident-specific option.

In other instances, there may not be enough space to bury remains. Cemeteries may only have a limited surge capacity, and it is likely that they may not have the space to accommodate thousands of deaths at one time. In these situations, the State may choose to open a cemetery to accommodate the influx. Authorities must determine if the location is suitable for burial (cemeteries must meet specific water table constraints) and is able to accommodate remains under traditional burial plot size, or if remains must be mass interred. For instance, to bury 120,000 remains in mass interment conditions, 3,336,000 square feet is required; more if there are individual

plots (figure based on mass interment calculation in DoD Joint Publication 4-06, 199634). Despite knowing which final disposition option is the most favorable, the number of remains may strongly influence which option is the best incident-specific option.

OPERATIONAL ISSUES THAT INFLUENCE THE MASS FATALITY MANAGEMENT STRATEGY

Operational constraints, such as resource and personnel availability, environmental factors, the length of workdays, and the rate of recovery, may influence how the ME/C manages remains.

Resource Availability

The availability of resources will strongly influence how remains are managed. Of particular concern is the acquisition of morgue supplies and the availability of cold storage, and personnel to perform chemical agent monitoring, and who can operate in Level A, B, or C PPE.

Cold storage is pivotal for the management of remains, as it prevents remains from decomposing, thereby reducing the requirement to process remains at a particular rate. If enough cold storage resources exist, the lack of availability of other resources will not hinder the operation; if decontamination resources are limited, placing remains in cold storage upon recovery will not require personnel to maintain the same operation rate for decontamination as those recovering remains.

When the ME/C uses cold storage, he or she must coordinate the appropriate use of these resources. Remains may need to be stored in refrigerated units upon recovery, after morgue processing, and any time one part of the operation is unable to maintain the same processing rate as other parts. To put the magnitude of the issue in perspective, if the ME/C had to process 120,000 remains, he or she would need over 3,000 refrigerated vans strategically located at different points of the process.³⁴

Another resource of concern is chemical agent monitoring. If the ME/C has an agency to perform chemical agent monitoring (for example, National Guard CSTs), then he or she must decide when this will occur, as personnel must continue to wear PPE

until remains are verified clean. The DMORT WMD and the U.S. Army 54th Quartermaster Company advocate performing detailed decontamination and chemical agent monitoring as close to the incident site as possible. Immediately verifying that remains are free from contamination alleviates the need for other requirements, such as establishing a detailed decontamination station at the morgue, or requiring personnel to wear additional levels of PPE while performing morgue operations or any time remains are moved.

When an incident is large, or affects more than one city, it may be difficult to obtain supplies. Local, State, and Federal assets rely on the same vendors for mortuary affairs supplies. In some cases, vendors may be able to redirect some of their product to help those mitigating the effects of a disaster. The ME/C should be aware of his or her vendor's surge capacity, as this may influence certain details when managing remains.

Personnel Availability

Physically moving and handling remains requires additional personnel. When personnel are limited, the rate at which remains can be processed is slowed. Moreover, processing remains for positive identification requires personnel with particular skill levels.

Often the disaster will dictate the type of skilled personnel needed to process remains; if a building collapses, personnel with expertise in assessing building safety and shoring up buildings are needed. In a radiological, biological, or chemically contaminated environment, personnel who are trained to wear Level A, B, or C PPE are needed. In such a situation, the entire incident operation strategy would change, as there are limited trained responders with the ability to perform tasks while wearing these levels of PPE. Those civilian responders who are trained are usually dedicated to monitoring or identifying the chemical agent at the scene, and are not generally prepared to manage remains. Likewise, there is a shortage of military personnel accustomed to wearing Level A or B PPE. Though the military has personnel accustomed to wearing Mission-Oriented Protective Posture (MOPP) Level 4 PPE, which is similar to Level C PPE, technically the two PPEs are not the same. The entire fatality management operation strategy can be influenced based on whether or not there are enough

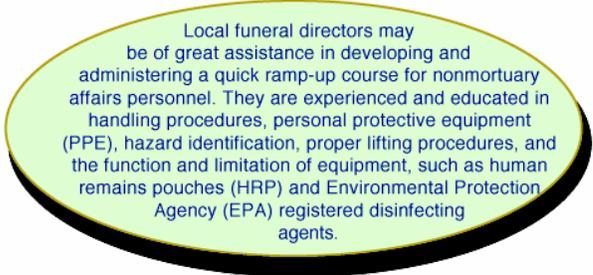
personnel cross-trained to perform their tasks while wearing PPE.

When contamination is not an issue and there is a shortage of personnel, the ME/C may require non-mortuary affairs personnel to help perform some tasks. The ME/C should consider developing a quick ramp-up course on handling remains. ME/C personnel can quickly train volunteers and prepare them for the type of tasks they may be asked to perform.

Another aspect that affects personnel availability is stress. Disasters are laden with stressful activities; when mitigating the effects of a disaster lasts for weeks and/or months it is likely that personnel will become overwhelmed. When the stress of managing remains takes a greater toll on the staff than the value of the task itself (i.e., establishing the cause and manner of death and treating remains with dignity and respect), the ME/C should consider modifying the operation so it is better suited for his or her personnel.

Environmental Factors

The outside temperature may greatly influence how the ME/C will manage the operation. Cold environments may actually help the ME/C when processing remains from an incident site, as colder temperatures slow decomposition; however, in colder environments, personnel may process remains more slowly.



Local funeral directors may be of great assistance in developing and administering a quick ramp-up course for nonmortuary affairs personnel. They are experienced and educated in handling procedures, personal protective equipment (PPE), hazard identification, proper lifting procedures, and the function and limitation of equipment, such as human remains pouches (HRP) and Environmental Protection Agency (EPA) registered disinfecting agents.

Warm environments hasten decomposition of remains, which also influences where most of the manpower and equipment will be needed. In warm environments, the ME/C must perform recovery operations more quickly and possibly provide a cold storage holding point before remains are further processed.

A warm environment during a disaster in which

EXPECTING THE UNEXPECTED

Medical examiners and coroners (ME/Cs) should expect a few circumstances they are not prepared to manage. One type of situation is interacting with the next of kin:

- Adoptive parents versus natural parents
- Rights of fiancé or fiancées
- Identification discrepancy with maternal and/or paternal DNA
- Foreign countries that observe common-law marriages
- Conflict regarding the management of the deceased between the deceased's parents and spouse
- Illegal immigrants
- Fraudulently listed missing persons

personnel must wear PPE will greatly hinder the length of time personnel can work. The 54th Quartermaster Company set up a decontamination facility to process remains for a functional disaster exercise held in June 2001. The temperature that day was approximately 86°F. Personnel worked about 20 minutes and needed to rest for more than 40 minutes due to the excessive heat. The processing rate is greatly slowed in hot, humid environments and there is a higher chance of personnel experiencing heat exhaustion.

Length of Workday

The length of workday should avoid overtaxing personnel. Generally, the ME/C should avoid establishing 24-hour shifts, but may choose to establish 12-hour day and night shifts.

Rate of Recovery

If remains are recovered over a long period of time, the workload should be divided among many personnel so that no one is overworked; for example, when supporting a disaster incident, DMORT members rotate approximately every two weeks to avoid fatiguing personnel.³²

If it takes a few days to recover and process remains, work shifts usually increase from 8 to 12 hours, and personnel does not need to be rotated. When American Airlines Flight 587 crashed on November 12, 2001, the NYCOCME personnel were able to recover all remains within 16 hours, process them within 8 days, and identify all remains within 31 days. Even though it took several more months to

process all fragments from the incident, personnel did not need to rotate out, as all time-critical aspects of the incident (recovery and identification) were managed within a short time.

OTHER ISSUES THAT INFLUENCE THE MASS FATALITY MANAGEMENT STRATEGY

With the introduction of WMD and heightened terrorist activity, it is possible that one day the United States will face circumstances in which ME/Cs are unable to manage the dead to the degree that citizens have come to expect. It is difficult for the ME/C to consider an event so catastrophic that no operations other than recovery and mass burial can be performed. In such an event, the ME/C must balance his or her requirement to investigate all criminal deaths with securing personnel and equipment resources to protect the living, and with establishing a system that provides dignity and respect for the deceased. Before deciding to focus all MFM efforts on recovery and mass burial, the ME/C needs to consider six key factors: (1) resource availability and safety, (2) time constraints, (3) religious factors, (4) political aspects, (5) public influence, and (6) financial aspects.

In catastrophic incidents, the medical examiner and coroner (ME/C) must balance honoring the dead (according to the current established practice) and securing personnel and resources for the protection of the living.

Resource Availability and Safety

The ME/C must assess if there are enough personnel and resources to safely manage all required aspects of fatality management without putting personnel at risk.

Time

The ME/C should consider if personnel must work within a constrained time frame and, if so, if it is too difficult to meet.

Religious Factors

Different religious groups, such as the Jewish and Muslim religions, may have specific standards regarding the management of remains. During a

disaster, the ME/C needs to determine to what extent he or she is able to accommodate various religious standards.

Political Aspects

Often governmental agency perspectives influence particular outcomes. At times, the ME/C may need to adopt the best procedure for the present situation instead of following specific protocol; for instance, the political issue of Members of Service (firefighters, police officers, emergency medical providers), who died in the WTC influenced the management of remains from recovery through final disposition. The NYCOCME had to make the choice to incorporate personnel from other agencies (who usually would not perform mortuary affairs tasks) to support managing remains.

Public Influence

Often the public's support influences when and how the ME/C makes and presents a decision; for example, the search and rescue mission at the WTC continued for three weeks before it was deemed a search and recovery mission. Though there was not



much change in the operation, it is possible that city officials, including the ME/C, were not prepared to make this transition formal until they knew that citizens were ready to accept this change in status.

Financial Aspects

Decisions regarding fatality management generally are not governed by financial constraints; however, it is possible in a catastrophic situation that our Nation may require all assets to support protecting the living or defending our Nation. In such a situation, the ME/C may not be able to manage the dead in the same manner in which society is accustomed.

No one factor or combination of factors will automatically reduce fatality management efforts to the bare minimum. If, however, circumstances are such that several factors are present and hinder processing remains in the traditional manner, then ME/C may deduce more quickly the best manner to manage remains based on the incident-specific circumstances. ■

SPECIAL PLANNING CONSIDERATIONS: MANAGING CHEMICALLY CONTAMINATED REMAINS

SPECIAL PLANNING CONSIDERATIONS: MANAGING CHEMICALLY CONTAMINATED REMAINS

When remains are chemically contaminated, personnel should perform additional tasks and will require specialized resources to accomplish several phases of the fatality management operation. Medical examiners and coroners (ME/Cs) need to know the size of the event, the geographic location, whether remains are fragmented, what type of chemical agent was present at the incident site, and the extent of the contamination. The following summarizes the additional steps the ME/C must take in each phase of the operation.

NOTIFICATION PHASE

A chemical weapon of mass destruction (WMD) incident will most likely occur without warning and will take place within a definable geographic location. Once the ME/C receives notification through his or her normal channels, he or she must report to a command post and follow the established command structure. The command structure may be complex, as many more agencies will be present,

CHEMICAL AGENTS

Nerve Agents
GA GB GD GF VX
Mustard
HD H
Lewisite
L
Phosgene Oxime
CX
Cyanide
AC CK
Pulmonary Agents
CG
Riot Control Agents
CS CN

including the Federal Bureau of Investigation (FBI) and the Federal Emergency Management Agency (FEMA), the lead agencies in crisis and consequence management for suspected acts of terrorism.

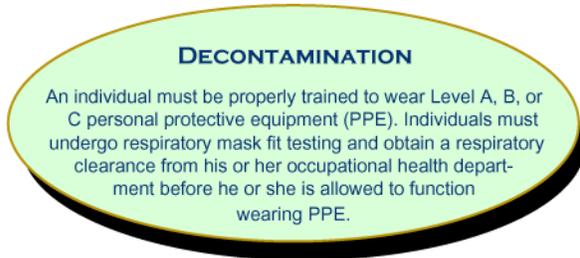
EVALUATION PHASE

Before evaluating a chemically contaminated incident, the ME/C should consider the best approach for processing chemically contaminated remains with other agencies that are processing the scene, and with those personnel who can enter a Hot or Warm Zone in additional personal protective equipment (PPE), such as Level A, B, or C. If the ME/C's staff is not able to operate in additional PPE, then the ME/C must be able to designate other personnel who can operate in contaminated areas and perform the evaluation.

Evaluating a chemically contaminated scene requires a team. Those entering the scene should have a distinct objective for evaluating the scene and should be selected based on the overall mission to collect evidence and to determine the cause and manner of death. A team of four individuals may be comprised of: (1) the ME/C, (2) a law enforcement/hazardous material (HazMat) technician, (3) an evidence collection technician, and (4) a forensic anthropologist or an individual accustomed to sorting human tissue.

Depending on the level of chemical contamination, the team should be able to conduct the evaluation wearing Level A, B, or C PPE. When additional PPE is required, there should be enough evaluators to rotate, as Level A and B PPE only allows a 20- to 30-minute air supply, and wearing Level C PPE can easily fatigue personnel after 40 minutes. Rotating three teams generally works the best, as one team rests, one team prepares, and the third team enters the incident scene. Upon completing the evaluation, the ME/C and the other agencies will be better able

to formulate an incident-specific plan that mutually supports each agency's objective to process the scene.



INCIDENT-SPECIFIC PLANNING PHASE

Due to the chemical contamination, the ME/C must consider addressing additional aspects of the operation, such as PPE requirements, available personnel who can perform tasks while wearing PPE, decontamination, verification that chemical contamination has been mitigated, establishing an off-site morgue, and obtaining additional cold storage.

Personal Protective Equipment Requirements

To protect staff, all personnel should be able to perform their jobs while wearing PPE. The specialized evaluation team of four should be able to operate in Level A, B, or C PPE. All other personnel handling remains should be able to operate in Level C PPE.

INFORMATION AND PLANNING GUIDANCE FOR MASS FATALITY MANAGEMENT IN REGARD TO CHEMICALLY CONTAMINATED REMAINS

For further information and planning guidance, read "Guidelines for Mass Fatality Management During Terrorist Incidents Involving Chemical Agents," U.S. Army Soldier and Biological Chemical Command Improved Response Program. November 2001, on the Web at <http://www.edgewood.army.mil/hld/ip/reports.htm>.

Decontamination

The ME/C should establish a decontamination station at the incident site, or as close as possible to the incident site, as this minimizes cross-contamination and helps to provide a safer

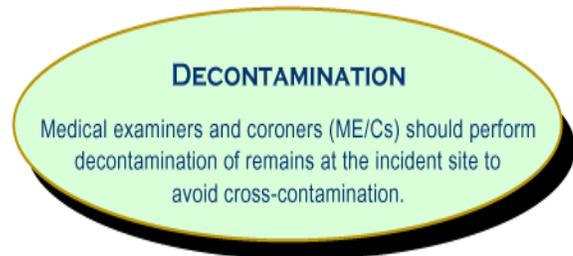
environment to process remains. Also, if remains are cleaned before they are transferred to the morgue, this will reduce the need to establish a detailed decontamination station at the morgue.

The ME/C must decide if remains will undergo a gross or detailed level decontamination at the scene and what type of decontamination solution to use. A gross decontamination provides a general washing with a decontamination solution, such as bleach and water.³⁵ Bleach solutions help neutralize chemical agents but can be caustic to the skin and toxic to the environment.³⁵ Soap and water solutions are helpful for removing persistent chemical agents, but they do not neutralize the chemical agent.³⁵ There are many decontamination solutions on the market, but before selecting any solution, the ME/C should understand the limitations and benefits associated with each solution, particularly as it applies to the incident-specific operation.

A detailed decontamination involves scrubbing and cleansing all body orifices completely. The solutions are the same as the gross decontamination solutions. All remains should undergo a detailed decontamination before any extensive morgue procedures are conducted. Depending on the type of chemical and the level of contamination, and if remains are fragmented or have open body orifices, remains may need to be decontaminated a few times before contamination is mitigated. In some cases, it may not be possible to decontaminate the body completely.

Verification of Clean

Despite decontaminating remains, the ME/C must verify that the remains are free from contamination before personnel can safely handle them without wearing additional PPE and before remains can be



PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) specifically addresses respiratory protection and protective clothing ensembles intended to resist inward leakage of chemical and biological contamination.

Two agencies establish the appropriate standards for these types of protection, namely, the National Institute for Occupational Safety and Health (NIOSH) and the National Fire Protection Agency (NFPA). NIOSH outlines the appropriate respiratory protection standards that equipment must meet so that it can be used in chemical, biological, radiological, nuclear, or high-yield explosive (CBRNE) environments, and NFPA outlines clothing ensemble classification standards for chemical and/or biological (C/B) environments (1994 Standard).

Whereas NIOSH and NFPA outline the requirements that specialized equipment must meet, the Occupational Safety and Health Administration (OSHA) regulates the type of protection that workers must wear when working in hazardous environments.

OSHA specifically defines four levels of protection:

Level A is required for the greatest level of skin, respiratory and eye protection based on either the measured (or potential for) high concentrations of atmospheric vapors, gases, or particulates; or if the site operations and work functions involve a high potential for splash, immersions, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin. The picture on the right demonstrates one type of Level A configuration: positive pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respiratory with escape SCBA; totally encapsulating chemical protective suit; outer chemical resistant gloves, inner chemical resistant gloves; and chemical resistant steel toe/shank boots.



Level B is required for the greatest level of respiratory protection but a lesser level of skin protection. The atmosphere may contain less than 19.5 percent oxygen or if a detection instrument indicates (or incompletely identifies) the presence of vapors or gases. The picture on the right demonstrates one type of Level B configuration: positive pressure, full face-piece SCBA, or positive pressure supplied-air respiratory with escape SCBA; hooded chemical resistant clothing, chemical resistant outer gloves; chemical resistant inner gloves; and chemical resistant outer boot covers.



Level C is required when the concentration and types of airborne substances are known and the criteria for using air-purifying respirators are indicated, and if the agent should not come in direct contact with exposed skin. The picture on the right demonstrates one type of Level C configuration: full-face or half-mask, air-purifying respirators; hooded chemical resistant clothing, such as overalls or a two-piece chemical splash suit; chemical resistant outer and inner gloves; and chemical resistant outer boot covers.



Level D is required when the atmosphere contains no known hazard, yet work functions preclude contact with hazardous levels of any chemical. Level D configurations may include coveralls, gloves, boots or shoes, disposable boot covers, safety glasses or splash goggles, and face shield.

released to the family for final disposition. The ME/C must request specialized State and/or Federal teams to perform chemical agent monitoring and must determine to what extent they will perform chemical agent monitoring.

Chemical agent monitoring is a time consuming, expensive, and labor-intensive process. Whether it is performed at a gross or low level, it requires specialized monitoring equipment and personnel familiar with the sensitivities and limitations of the equipment; for example, most chemical agent sampling must be performed at 60°F or above and must be performed in a confined location.^{36, 37} The equipment may monitor the amount of chemical agent that is off-gassing, but may not assess if the item is still a contact hazard (meaning that the chemical agent is still on the item even though it is not off-gassing). Gross level monitoring will assess whether a chemical agent is present, but such equipment can only assess the amount of off-gassing if the contamination is above a certain level; just because the sensor does not indicate that there is contamination does not mean that a harmful level of contamination is not present.^{37, 38, 39} Low level monitoring provides more data, as it can measure off-gassing concentrations at lower levels of contamination and can provide a reading that can be compared to pre-established worker airborne exposure limits for certain agents. (See figure 5 for actual airborne exposure levels.) The ME/C should take note that Department of Defense (DoD) stipulates different airborne exposure limits for the general population.⁴⁰ To date, the chemical agent monitoring equipment that exists is unable to assess contamination levels much below the worker airborne exposure limits.

The ME/C, in conjunction with State and Federal agencies that perform this monitoring, should decide if each body will be monitored individually, or if the airspace within each human remains pouch (HRP) will be monitored, or if only the airspace within each storage container will be monitored. Factors, such as the number of remains that must be monitored, the extent of contamination, and the availability of resources will determine which level of monitoring the ME/C implements.

Acquiring the resources to perform chemical agent monitoring and establishing an acceptable level of clean is paramount. Some agencies state that there is

no acceptable level of clean when it comes to chemical WMD other than exposing the chemical agent to 1,500°F for 15 minutes; remains would be cremated.³⁷ Other agencies are willing to accept some level of contamination as long as remains are monitored with a low-level device and such readings are not above the airborne exposure limits established for workers. Other agencies require that the chemical agent must be generally mitigated or contained so that it no longer poses a hazard to those who must handle the remains; decontaminated remains are wrapped, placed in leakproof containers, and the outside packaging is grossly monitored for chemical contamination. Other agencies require that remains be grossly monitored and reveal that their contamination levels are below half the lethal concentration (LC50) or below the quarter lethal dose (LD25), providing personnel continue to wear additional PPE at all times.

Determining to what extent a chemical agent has been successfully mitigated is difficult, as there is no standard of clean for human remains. Existing DoD standards for chemical cleanliness apply to equipment, not human corpses; however, DoD guidance regarding cleanliness does make a distinction between circumstances that are clean enough for personnel to discontinue wearing additional PPE and those in which personnel must always wear additional PPE.³⁷ Also, DoD guidance makes a distinction between those items that are clean enough to be released from government control and those items that should not be released from government control.

MITIGATING CONTAMINATION

- Determine what type of chemical agent monitoring devices will be used
- Determine what monitor reading will signify that remains are “clean”
- Determine what level of personal protective equipment (PPE) personnel must wear for each phase of the operation
- Determine under what conditions, if any, remains can be safely released to the family

In a situation where chemically contaminated remains have been decontaminated, the ME/C, the department of health, and any technical advisors employed may need to determine to what extent the

LOW-LEVEL MONITORING AIRBORNE EXPOSURE LIMITS, DEPARTMENT OF THE ARMY REGULATIONS 385-61, OCTOBER 12, 2001

Media - AIR	Standard Name	Population	Exposure Scenario	H/HD/HT	GA (Tabun)	GB (Sarin)	GD/GF	VX	Lewisite**
Airborne Exposure Limits (AELs) mg/m ³	IDLH - Immediate Danger to Life/Health	Civilian/Department of Defense (DoD) Worker	One-Time Exposure	***	0.2	0.2	0.06	0.02	N/A
	WPL - Worker Population Limit	Civilian/DoD Worker	8-hour/daily 30-year Time-Weighted Average	0.003	0.0001	0.0001	0.00003	0.00001	0.003
	GPL - General Population Limit	Civilian Population	24-hour/daily Lifetime Time-Weighted Average	0.0001	0.000003	0.000003	0.000001	0.000001	0.003

Low-level monitoring is generally performed using a Gas Chromatography/Mass Spectrometry (GS/MS).
 **Lewisite values are all based on detection; no true immediate danger to life/health (IDLH) exists (AR 385-61, Table 2-2, 2-3).
 ***Since IDLH values are used solely for the purpose of establishing the concentrations at which self-contained breathing apparatus (SCBA) or supplied-air respirators are required, it is not necessary to formally establish IDLH values for H and L, because workers will already be required to wear these types of respiratory protection at concentrations much lower than what is considered IDLH for H and L because of concerns over carcinogenicity.

Figure # 5

References for Chart:
 Department of the Army, Headquarters, *The Army Chemical Agent Safety Program Army Regulation, Safety* (2001).
 Department of the Army, Headquarters, *Pamphlet No. 385-61, Toxic Chemical Agent Safety Standards* (2002).
 Department of the Army, Medical Services, *Pamphlet No. 40-173, Occupational Health Guidelines for the Evaluation and Control of Exposure to Nerve Agents GA, GB, GD, and VX* (Draft REV January 2003).
 Department of the Army, Medical Services, *Pamphlet No. 40-8, Occupational Health Guidelines for the Evaluation and Control of Exposure to Mustard Agents H, HD, and HT* (Draft REV January 2003).
 R. J. Mioduszewski, S. A. Reutter, L. L. Miller, E. J. Olajos, & S.A. Thomson. 1998; 2000 Errata Summary. *Evaluation of Airborne Exposure Limits for G-Agents: Occupational and General Population Exposure Criteria*, Aberdeen Proving Ground, MD: Edgewood Research, Development, and Engineering Center, U.S. Army Chemical and Biological Defense Command no. ERDEC-TR-489.

chemical agent has been successfully mitigated or to what extent they are willing to risk exposing personnel and the public to chemical contamination. ME/C personnel can mitigate chemical agents by performing chemical agent removal, by containing the chemical agent on the remains with specific packaging, by containing contamination by protecting personnel with additional PPE, or by some combination of the three. Local funeral directors may be of great assistance in developing and administering a quick ramp-up course for non-mortuary affairs personnel. They are experienced and educated in handling procedures, personal protective equipment (PPE), hazard identification, proper lifting procedures, and the function and limitation of equipment, such as HRP and EPA registered disinfecting three factors. To what extent the contamination is successfully mitigated will influence how personnel will process remains, as well as under what conditions, if any, the ME/C is comfortable releasing remains to the family.

Additional Personnel

The ME/C should plan on having extra personnel available who can work in various levels of PPE, as wearing PPE fatigues personnel and requires longer rest periods. Work cycles will not only be shorter, but overall processing will be slower. The ME/C may want to have several teams that can rotate to support those phases of the operation that require wearing additional PPE.

To avoid undue stress on team members, and to keep the process flowing without error, the ME/C should have a small group of medical providers to evaluate the team for fatigue. Medical staff should evaluate each team member regularly in the work area, as they rotate from the work area to the rest area, and again before they reenter the work area. The medical staff should also have the authority to direct a team member to rotate to the rest area at any time, as well as to prevent a team member from reentering the work area.

Holding Morgue

The ME/C should establish a holding morgue when remains are chemically contaminated. Such remains should be decontaminated as close to the incident site as possible. Cleaning remains early in the process helps mitigate cross-contamination and may eliminate the need for staff members to wear additional PPE during other phases of the operation.

Additional Equipment

When remains are chemically contaminated, the ME/C may need to place refrigerated storage containers close to the holding morgue, because it is likely that those performing decontamination tasks will not be able to maintain the same processing rate as those who are recovering remains. By placing remains in cold storage, personnel will not be rushed to maintain the same rate.

Once remains undergo decontamination, they may again need to be placed in refrigeration before they can be transferred to the next phase of operation. The ME/C should acquire two separate cold storage units, one for contaminated remains and one for decontaminated remains.

The ME/C may also need to procure additional equipment to handle remains; for example, the ME/C may want to place contaminated remains in a tub to soak in a solution before personnel scrub remains. Other types of equipment may include devices that help minimize the amount of lifting or carrying personnel need to perform (e.g., skid

The medical examiner and coroner (ME/C) should note that any item that is used to transport or store contaminated remains may become contaminated. Before transport items are rendered clean they will need to be decontaminated and monitored. Also, depending on how and where the ME/C chooses to perform chemical agent monitoring, personnel should consider background contamination associated with the use of such items. Monitoring such devices before personnel obtain official readings will ensure accuracy.

systems, gurney devices appropriate for rough terrain, or golf carts).

The ME/C should realize that any equipment that is used for handling contaminated remains may also become contaminated. Some types of equipment can be decontaminated, but other types of equipment, such as bar code systems or computers, may become irreversibly contaminated, as such items cannot function after undergoing decontamination.

Managing Personal Effects Depot

The ME/C should determine to what extent he or she is able to support managing chemically contaminated personal effects (PE). Often family members request their loved one's personal items, however, when the items are contaminated, it may

not be possible to return them. Should the ME/C determine to return PE, those items should undergo decontamination and monitoring before they can be safely released. One recommendation is to only attempt to decontaminate sentimental PE that can withstand water based decontamination, such as wedding rings or jewelry. The ME/C should apply the same decontamination method for PE as for body decontamination. Items that cannot withstand water-based decontamination can be safely incinerated.



Establish an Off-Site Morgue

Because of chemical contamination, the ME/C should consider establishing a temporary morgue at an off-site location. Even if a headquarters (HQ) building is large enough to accommodate the extra workload, the ME/C should not subject personnel to the possibility of cross-contamination or subject the building to irreversible contamination.

TRACKING REMAINS

Although initial tracking of remains starts during the recovery phase, those who have processed remains from disaster incidents recommend that personnel refrain from assigning the official case number until remains enter the morgue phase. Often commingled remains are recovered from the incident site that are initially given the same tracking number, but require several case numbers. These remains must be separated, tracked, and assigned their own case number so that personnel can properly identify them, gather evidence, and reassociate such portions at a later time.

RECOVERY PHASE

Personnel should wear the appropriate PPE when handling and recovering remains. The ME/C may want to arrange personnel into teams so that while some team members are working, others are resting.

When remains are chemically contaminated, tracking them requires waterproof tags and a simplified recordkeeping system. Since personnel wearing additional PPE do not have fine motor dexterity, one option is for personnel to tag remains with a durable waterproof tag that has a bar code on it and then use a portable scanner to record information.

HOLDING/INCIDENT MORGUE OPERATIONS PHASE

The ME/C should establish a holding/incident morgue, so that staff can perform certain tasks before remains undergo decontamination and evidence is lost. Such tasks may include performing a preliminary identification check, performing an external evaluation, removing clothing, gathering evidence, removing and containing PE, taking photographs, initiating a case file or maintaining remains tracking, and monitoring remains for chemical contamination.

TEMPORARY STORAGE AND TRANSPORTATION PHASE

The ME/C should consider the following regarding storage and transportation of remains:

- Chemically contaminated remains should be stored away from other cases
- Using the same units to transfer remains and store remains is more practical
- Processing chemically contaminated remains is time consuming, creating a greater need for cold storage
- Once remains have been decontaminated, they should not be placed in storage or transportation assets designated for contaminated remains

In addition to these points, the ME/C must consider the best way to package decontaminated remains to

NEW YORK CITY MEDICAL EXAMINER SPECIAL OPERATIONS RESPONSE TEAM

The effective management of a mass fatality incident, particularly one involving chemical, biological, or radiological contamination will pose significant challenges to the local medical examiner and coroner (ME/C). In response to this challenge, the New York City Office of Chief Medical Examiner (NYCOCME) began an initiative in the autumn of 2002 to identify and address issues vital to the management of a mass fatality incident involving contaminated remains. A major part of this initiative was the development of a multidisciplinary, forensic-based, Medical Examiner Special Operations Response Team (MESORT). This team, initially modeled after the U.S. Army's Mortuary Affairs Decontamination Collection Point (MADCP) operation and the Disaster Medical Operational Response Team Weapons of Mass Destruction (DMORT WMD) asset, has evolved over a period of two years to become a critical component of the NYCOCME's mass fatality incident response capability.

The MESORT is specifically comprised of forensic pathologists, forensic biologists, a forensic anthropologist, medicolegal investigators (MLIs), evidence examiners, and mortuary personnel. It is part of the city's larger operation (which presently includes specially trained members of the New York City Police Department (NYPD) crime scene unit, NYPD Emergency Services WMD response team, and the New York City Department of Environmental Protection (DEP) Hazardous Materials (HazMat) response team) that is equipped to enter contaminated crime scenes.

The MESORT, in cooperation with the NYPD and DEP, is prepared to perform essential operations (usually performed at the morgue) at the incident site, as well as to perform additional tasks that aid in the safe handling of the deceased and the return of the deceased to the next of kin when possible. Figure #6 displays an overview of the MESORT's approach to managing chemically contaminated remains.

FATALITY PROCESSING (CHEMICAL INCIDENT) OVERRIDING PRINCIPLES

Fatality processing following a chemical incident is performed in phases. Each phase of the process should occur independently of the other. The purpose of a phased operation is to avoid having personnel in personal protective equipment (PPE) wait for a long time before personnel complete tasks in the former phases; for example, evidence and personal effects (PE) collection may take up to 30 minutes per remain, resulting in a significant bottleneck. A second principle is placing remains in refrigeration until they can be thoroughly processed or moved to the next phase of the operation. Decontaminating remains may take hours or days versus minutes to hours (for decontaminating living casualties). Overall, refrigeration has little negative impact on NYCOCME personnel's ability to obtain victim identity and secure evidence. The operation should be conducted as close to the incident site as possible to avoid spreading contamination. The MESORT must take every precaution to avoid exposing additional personnel or the primary ME/C facility to contamination. Most importantly, MESORT team members must not take unnecessary risks when processing contaminated remains. Following the customary process for handling the deceased should never outweigh securing the safety of the living.

Command & Control: The NYCOCME establishes an early command presence at the incident command center during the initial response phase of the disaster. It is important for the ME/C to receive early notification of the incident for this purpose. While fatality processing does not start until life safety operations have been concluded and the incident has been fully characterized, the ME/C must be engaged in decisions that might affect his or her ability to conduct an investigation or interfere with the integrity of obtaining victim identification.

Joint Agency Fatality Evaluation Team: The purpose of the joint agency fatality evaluation team (JAFET) is to gather information that will be used to develop the mass fatality management (MFM) operational plan. The JAFET will determine the number of fatalities, the potential for additional fatalities, and any special requirements for human remains recovery and processing. The JAFET is composed of personnel from the MESORT, NYPD, the Fire Department of New York City (FDNY), Federal Bureau of Investigation (FBI), DEP, the National Transportation Safety Board (NTSB) and others as determined by the Incident Commander (IC).

Recovery: The mortuary recovery team is composed of personnel from the city's emergency service agencies and members of MESORT. Personnel involved in the recovery operation may be required to perform this labor-intensive function while wearing PPE.

Body Collection Point: The Body Collection Point (BCP) is a designated location where remains will be collected and temporarily stored. In the event of a large scale or city-wide mass fatality incident, the NYCOCME may need to establish multiple body collection points.

Triage/Sorting Station: This is the location where the sorting and triage of human remains occurs when an incident involves fragmentation. When possible, an anthropologist should man this station.

Crime Scene/Evidence/Personal Effects Collection Station: This is the location where personnel recover and process evidence and personal effects (PE). Processing includes photographing and packaging each item recovered and then decontaminating each package to avoid cross-contamination. Medicolegal and chain of custody issues must be considered.

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Forensic Exam/Photo: This is the location where the external forensic exam is performed. When possible, an MLI or a forensic pathologist should man this station.

Decontamination: The NYCOCME has the primary responsibility to determine the best process for decontaminating human remains. The decontamination solution will be selected using a scientific approach once the contaminant has been fully characterized.

Quality Assurance Station: This is the location where the remains are monitored for contamination after they have undergone decontamination. The Department of Environment Protection (DEP), using a field deployable gas chromatograph mass spectrometer, obtains headspace air samples from human remains pouches (HRPs) and evaluates body swipes for the presence of residual low level contamination. If contamination is present, the remains are returned to the decontamination station before they are moved forward to the next phase.

Identification Station: This is the location where the identification process begins. This process may involve fingerprinting, DNA sampling, and forensic odontology.

Refrigerated Cold Storage: Once remains have been processed, they are held in refrigerated storage units until they can be safely released to the next of kin.

Frank DePaolo, RPA-C, MLI
 Assistant Deputy Director, Disaster Preparedness Coordinator
 New York City Office of Chief Medical Examiner (NYCOCM)

THE MEDICAL EXAMINER SPECIAL OPERATIONS RESPONSE TEAM APPROACH TO MANAGING CHEMICALLY CONTAMINATED REMAINS

FATALITY PROCESSING (CHEM)

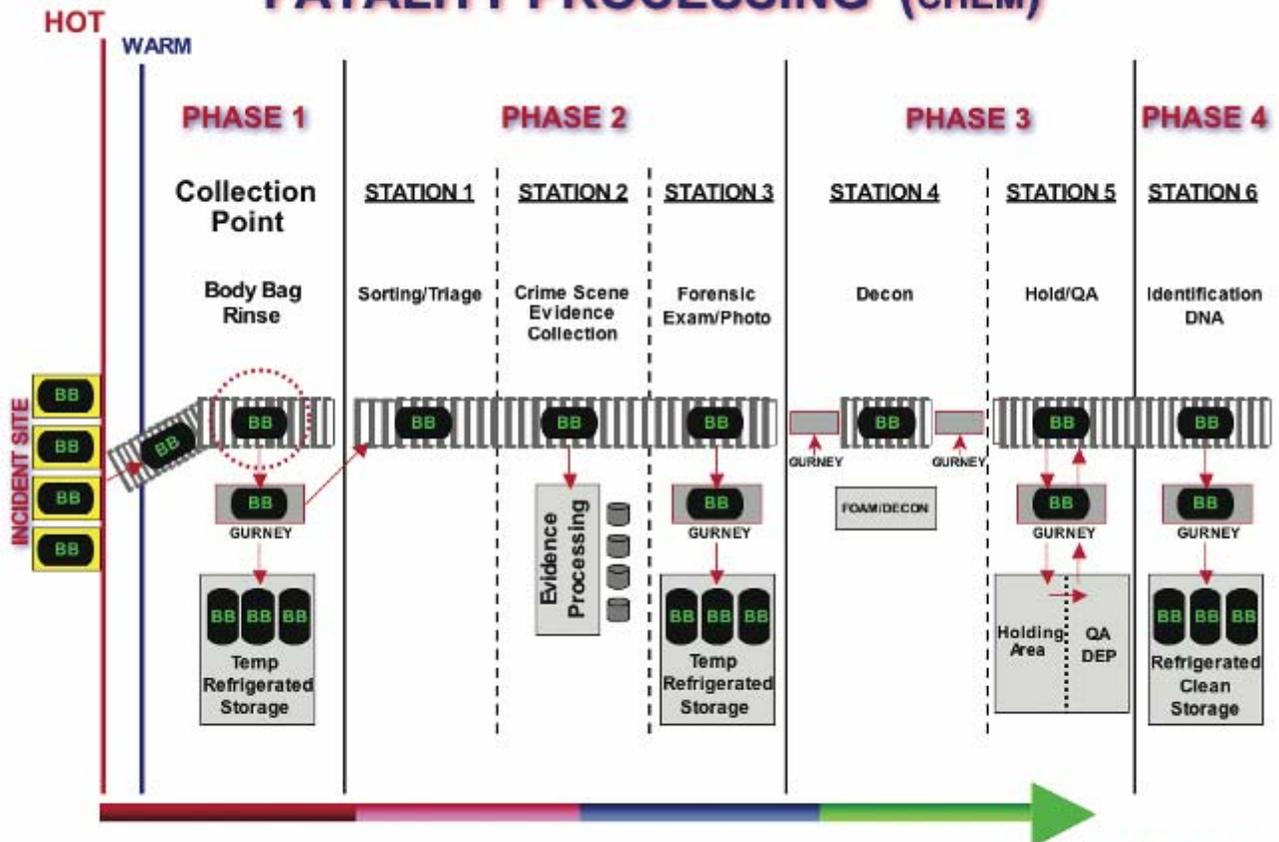


Figure # 6

Carole Meyers
 NYC OCME 10.15.03

protect the health and safety of those handling them, as well as to protect the health and safety of the public. As mentioned earlier, it is possible that remains may not be 100 percent free from contamination, and in order to keep others safe, must be contained or placed in additional packaging. All commercial off-the-shelf products have benefits and limitations. ME/Cs should determine what products to use and how to use them. Overall, products that retain blood, body fluids, and body gases, provide more safety to those handling remains.

It is paramount that the ME/C protect the health and safety of personnel and establish a protocol for handling and packaging remains. Such handling instructions may recommend that once the body is packaged, the outside of the package is decontaminated and labeled. Personnel may still need to wear additional PPE, but the risk of cross-contamination is greatly mitigated. Also, when packaging chemically contaminated remains, a redundant packaging method should be used, meaning that the body is contained within two or more packaging devices.

The ME/C should also be aware of additional concerns when transporting chemically contaminated or decontaminated remains. Under 49 Code of Federal Regulations (CFR), all HazMat transported by land, sea, or air are to be labeled and packaged according to the type of hazard they present. The Department of Transportation (DOT) identifies more stringent packaging requirements when air transportation is involved, as an item is subjected to many altitude changes which can negatively affect the cargo. Although the DOT has not established any packaging requirements for human remains, it might be necessary for the ME/C to classify them according to the original contamination class since the remains may not be 100 percent free of contamination. The DOT hazardous transportation classification for all chemical WMD agents is 6.1 poison. If human remains are classified as such, the appropriate packaging and handling requirements for that class must be adhered to.

MORGUE OPERATIONS PHASE

The ME/C should establish an off-site morgue to keep contaminated remains separate from other cases. Personnel should consider the following

aspects when handling chemically contaminated remains.

Identification

Chemical agent exposure does not specifically interfere with the usual processes used for identification, except if the remains have not been verified clean, in which case personnel performing identification tasks may need to wear additional PPE. Otherwise, the ME/C should be able to perform fingerprinting, dental, and radiological exams, as well as obtain DNA tissue samples, according to standard operating procedures.

Autopsies

With the exception of ingested cyanide pills, scientists believe that chemical WMD agents pose little threat of chemical off-gassing when performing an internal examination.²⁹ Chemical WMD agents are metabolized, hydrolyzed, or tightly bound in the body's tissues internally.⁴¹ Though there is little risk of exposing personnel to internal contamination, the ME/C must realize that surface contamination poses a greater risk. Depending on the type of monitoring performed, contact evaluation or airborne evaluation, personnel may still need to wear additional PPE, particularly if remains have not previously been verified clean, or if chemical agent monitoring methods were directed toward airborne contamination versus surface contamination.

For circumstances in which it is not practical to perform an autopsy on every case, the ME/C should consider limiting the number of cases, so that he or she can verify that the cause and manner of death were due to chemical agent exposure for all remains, and autopsy atypical cases.⁴¹ The ME/C may choose to add certain procedures or tests, such as body skin swabs or toxicology blood draws, as part of the external or internal evaluation. For some chemical WMD agents, chemical contaminants or residual metabolites can be found in the blood.⁴¹

Embalming

In general, embalming is performed to preserve the body and slow decomposition.^{42, 43} In some instances, depending on how embalming is

One option is to seek advice directly from the embalming chemical supply company. These companies have chemists and scientists on staff that can quickly determine if there will be an adverse reaction.

performed, it can not only limit the release of blood and body fluids, but also can contain blood and body fluids. When remains have been chemically contaminated, the ME/C may decide that the remains should not be embalmed.

There is little information regarding how chemical agents in the body interact with embalming fluid. The embalming process may force cells of the body to release some of the chemical agent that was tightly bound within the cells. Others believe that chemical contamination is purely on the surface of the body and that once it is removed, the body is safe for normal handling. Others recommend that once the chemical contaminate is identified, embalmers should use the specific embalming fluid's material safety data sheet to determine if there will be an adverse reaction with the chemical contaminant.

In addition to these concerns, the ME/C must determine if remains are clean enough to be released to funeral home personnel for embalming. The basic principle for handling contaminated remains, or previously contaminated remains, is to handle them as little as possible. The ME/C may determine that it is more prudent to avoid embalming entirely, so as not to put personnel at risk for cross-contamination.^{42,43}

FINAL DISPOSITION PHASE

When remains are chemically contaminated, the length of time it takes to recover the deceased, inability to mobilize and coordinate large numbers of additional resources, and inability to perform many tasks in a time-critical manner while wearing PPE may indirectly influence final disposition. Inability to perform decontamination or to verify that remains are clean directly affects the decision not to release remains to the family. The ME/C should keep the following in mind when determining how he or she should manage final disposition.

Burial

The ME/C and the public health department should determine if they can effectively mitigate the contamination before releasing remains to families or funeral homes. In some instances, the ME/C may choose to place conditions on the release of remains, such as a closed casket or the use of a particular type of container or packaging (e.g., Ziegler case) to mitigate any existing threat of cross-contamination.

Many believe, however, that a sealed casket is never truly sealed, and that there is no way to ensure that families will not open the casket or packaging once remains have been released from the ME/C's authority; in such cases, the ME/C may choose to oversee all aspects of burial.

If the ME/C chooses to implement a State-sponsored burial option or place conditions on the release of remains, then he or she must also consider documenting the reason for such constraints on the burial permit. Families may attempt to get a court order to have the body exhumed, as they often want to have an independent agency confirm the identity of the remains and perform a second analysis of cause and manner of death. Should families seek a court order to exhume the remains at a later time, it is unlikely that a judge will grant the request if the burial permit specifies that remains are or were chemically contaminated and pose a public health hazard.

Many agencies have yet to confirm if burying previously contaminated remains poses an environmental hazard. Cemetery owners may require their jurisdictions' authorities to provide them limited indemnity from future citations for burying hazardous substances associated with the remains. The ME/C should build a rapport with local cemeteries and the EPA to determine if it would require any additional permission before chemically contaminated remains are buried.

Cremation

There are no concerns with cremating chemically contaminated or previously contaminated remains. U.S. Army Regulation specifies that all chemical warfare agents are nullified when exposed to temperatures of 1,000°F for 15 minutes.^{36, 37} Since all U.S. crematoriums burn at a higher temperature than 1,000°F (most are set for 1,600°F) and since cremation takes longer than 15 minutes, all chemical WMD agents are destroyed. Cremation is the only option whereby remains are truly considered free from contamination and can be safely returned to the family with no additional constraints. ■

SPECIAL PLANNING CONSIDERATIONS: MANAGING BIOLOGICALLY CONTAMINATED REMAINS

SPECIAL PLANNING CONSIDERATIONS: MANAGING BIOLOGICALLY CONTAMINATED REMAINS

Biological terrorism is defined as the use of, or threatened use of, biological agents against a person, group, or larger population to create fear or illness for purposes of intimidation, gaining an advantage, interruption of normal activities, or ideologic activities.²⁹ Due to the potential of biological agents to affect millions of people and to result in death tolls similar to that of the 1918 Pandemic Flu, medical examiners and coroners (ME/Cs) become essential partners in a jurisdiction's bioterrorism preparedness and response effort.

ME/C personnel must perform their usual tasks a bit differently when managing biologically contaminated remains because of the hazards and challenges the remains pose for those who must handle them; for example, the recovery of remains in a biological incident may require more coordination, as personnel may have to recover remains from a large geographic location instead of a specific incident site. The following is a synopsis of the critical variables ME/Cs should consider when managing human remains as a result of a biological incident.

NOTIFICATION PHASE

Notification of a biological incident will vary. The incident may be an overt or covert terrorist attack or believed to be a naturally occurring incident. Unlike chemical incidents that occur at a particular time and in a particular location, the biological incident is less distinct and is revealed within the larger healthcare community. For this reason, ME/Cs, affected health care facilities, public health agencies, and emergency management agencies (EMAs) must seek to keep each other informed of activities that are

abnormal or suggestive of a potential biological incident.

If there were a covert release of a biological agent, it is likely that ME/Cs will be in a unique position to identify or confirm suspected biological terrorist incidents, as they have the statutory authority to investigate deaths that are sudden, suspicious, violent, unattended, and/or unexplained.²⁹ Although the ME/C usually is not thought of as a notifier, the ME/C identified the sentinel cases in the 1979 Sverdlovsk, Russia, anthrax outbreak.²⁹ In such instances, the ME/C needs to initiate the notification process of a suspected biological incident by informing the public health agency, the immediate healthcare community, law enforcement agencies, and perhaps the Office of Emergency Management (OEM).

BIO AGENTS

Category A Biological Agents

- *Variola major* (smallpox)
- *Bacillus anthracis* (anthrax)
- *Yersinia pestis* (plague)
- *Clostridium botulinum* toxin (botulism)
- *Francisella tularensis* (tularemia)
- Viral Hemorrhagic Fevers (VHF): Including Filoviruses (Ebola and Marburg), Arenaviruses (Lassa fever), and Junin (Argentine VHF)

Category B Biological Agents

- Brucellosis
- Q fever
- Ricin Toxin
- Glanders
- Salmonella species, Escherichia, Shigella
- Staphylococcal enterotoxin B
- Viral encephalitis
- *Vibrio cholerae*, *Cryptosporidium parvum*
- Melioidosis
- *Chlamydia psittaci*

Category C Biological Agents

- Nipah virus
- Hanta virus

In other instances, when a release of a biological agent is overt or believed to be a naturally occurring incident, the ME/C may be notified by public health agencies, particularly if an infectious disease results in many casualties. The 2003 Severe Acute Respiratory Syndrome (SARS) epidemic, which produced many casualties, is a situation in which some public health agencies began informing all agencies, including the ME/C, that might be affected by such a suspicious outbreak. Once notified, ME/Cs can plan how their agencies will confirm suspicious deaths, as well as determine if their personnel must follow any unique handling procedures.

ME/Cs may also receive general notification regarding worldwide public health concerns. Often the Centers for Disease Control and Prevention (CDC) send out notifications regarding new and existing infectious cases, including their associated mortality rates.

ME/Cs are in a unique position to recognize infectious disease deaths that are potentially caused by terrorism, as well as to confirm diagnoses and evidence in deaths that result from biological terrorism.²⁷ ME/Cs must look at the notification of a biological incident as more of a process of multiple questionable events rather than one phone call identifying that a biological incident has just occurred; ME/Cs must be proactive in monitoring known suspicious infectious health care concerns.

EVALUATION PHASE

In chemical incidents, personnel evaluate the scope of the incident at a particular location, but in biological incidents there is no one location where personnel can collect data. Instead, ME/Cs, along with other key agencies, must survey their functional areas for pertinent data and proactively cross-level that information between specific agencies. Some States or cities, like New York City, have developed and implemented surveillance systems that track multiple indicators, which, when evaluated collectively, can help identify a suspected biological incident. When practitioners evaluate several indicators, such as an increase in the purchase of over-the-counter cold and flu medicines, an increase in hospital emergency department visits, an increase in ambulance calls for generally sick persons, or an increase in deaths, and then compare such numbers

Medical examiners and coroners (ME/Cs) should consider seeking the input from funeral directors on developing a stronger surveillance system. Often people die at home with only their family present and are never seen by their physician. It is also likely that a biological outbreak will initially affect those who have a weakened health condition (e.g., the elderly or infirm), thereby masking the presence of the biological outbreak with the individual's chronic state of health. Funeral directors trained to look for particular physical signs on the body can help identify those deaths that may be associated with a biological outbreak and report such information to the local ME/C.

to seasonal highs and lows, officials can determine if their community is experiencing an abnormal phenomenon.

A surveillance team requires representatives from the department of health, the office of the chief ME/C, law enforcement, laboratories, surrounding health care facilities, and the OEM. This team must be proactive in gathering and disseminating its evaluation, not only with each other, but also with contiguous regions, as biological incidents typically extend beyond the immediate jurisdiction. This characteristic makes it difficult for public health entities to properly survey the situation as it grows and changes; for example, it was difficult to determine the extent of the contamination for the fall 2001 anthrax incidents, as there were cases in Washington, D.C.; Maryland; New Jersey; New York; Connecticut; and Florida. The outbreak's affect on people in five States and one district required all agencies to keep each other informed, as well as their counterpart agencies in the other States.

The ME/C is an important component of the surveillance team in evaluating a suspected biological incident. ME/C personnel can take a general approach to infectious disease diagnoses by gathering particular specimens during a complete autopsy; for example, histologic samples of multiple organs will help determine the distribution of bacteria of a suspected biological agent.²⁹

SURVEILLANCE AND CASE MANAGEMENT

For more information on the types of diagnostic specimens that the medical examiner and coroner (ME/C) should collect and the diagnostic tests that laboratories should perform for many of the biological weapons of mass destruction (WMD) agents, read "Medical Examiners, Coroners, and Bioterrorism - A Guidebook for Surveillance and Case Management." Editor: Kurt B. Nolte, M.D.

SVERDLOVSK

“People began to die around the fifth or sixth of April,” says Dr. Marguerita Ilyenko, a hospital director in Sverdlovsk, Russia. “Before that, the doctors had noticed that animals were dying: sheep, pigs, and cows. The sick began pouring into hospitals all around the city. Some were vomiting blood, many complained their lungs were on fire.” Most of the patients died within 48 hours as doctors frantically searched for the cause.

Sverdlovsk, (renamed Yekaterinburg as a result of the accident), bears silent witness to one of the Soviet Union’s darkest secrets. For years, there was very little information to explain why, how, and even how many people died. The cause of death was explained away by the State with lies to conceal one of the most frightening developments of the Cold War: the world had been witness to a biological warfare production laboratory accident. The results of the accident revealed the effects of weapons grade anthrax released on a civilian population, and exposed the existence of a massive biological weapons program in the former Soviet Union, which some fear still exists.

This horrifying biological accident happened at a secretive military base called Compound 19. Behind imposing walls, a deadly production line turned out tons of anthrax powder for the Soviet Union’s biological arsenal. In April 1979, a small amount of biological agent was accidentally released through the lab’s ventilation system. The invisible plume blew over a nearby working class neighborhood and started the mysterious illness.

The Russian military tried to convince doctors that the illness came from tainted meat. They said that somewhere outside the city an entire herd of cattle had fallen ill and that the anthrax had come from the cattle. Doctors knew that this explanation didn’t make sense, but it wasn’t until after the first autopsies had been completed that they were able to conclude death was preempted by exposure to the inhalation form of anthrax. One experienced pathologist identified an infection in the lymph nodes and lungs, and a significant amount of hemorrhaging in the small blood vessels of the brain. It was the consistent presence of the bloodied brains that confirmed the exposure to anthrax.

Russian officials decided all the dead would be buried together in a single section of the city’s cemetery. Hospitals were ordered to look after many of the burials because families were too frightened to retrieve the bodies of their loved ones. “We were given instructions on how the corpse was to be wrapped in polyethylene sheets with a chlorine solution inside,” Dr. Ilyenko says. “Teams were formed around the city, mostly composed of police officers, but they wouldn’t get close to the coffins, they were afraid. They wouldn’t carry the corpses, so I had to get our own guys, carpenters, plumbers. I told them I’d give them a bottle of alcohol each. Just help us. That’s how, using our own cars, we buried these people.”

Some of the only records of the accident that still exist are documents Dr. Ilyenko managed to hide in a safe. They list the names of those who died in civilian hospitals; almost 70 people in all. Dr. Ilyenko says that the number of dead doesn’t include the many soldiers who also would have died.

This accident gives a stark illustration of the swift horrendous destruction that the release of even a small amount of biological agent can produce.

John Nesler, MS
Senior Planner
Joint Task Force-Civil Support (JTF-CS)

In general, laboratories fall within one of four categories, ranging from Level A, for those with a presumptive level diagnostic capability, through Level D, for those with a genetic sub-typing and confirmatory testing capability. Most hospital clinical laboratories are designated as Level A.

Additionally, samples drawn from enlarged soft hemorrhagic lymph nodes and the lungs will help determine if there was a primary or secondary infection. And although the ME/C may not perform the laboratory analysis, he or she should request that laboratory personnel perform specific diagnostic tests, such as microbiologic culture; visualizing tissues using H&E, Gram, silver impregnation, and Giemsa stains for *Y. Pestis*; and performing the IHC or DFA to identify the bacilli in tissues.²⁷

Laboratory agencies are also key members of the surveillance team. Laboratories not only analyze suspected specimens, but also may be networked to other key agencies that can help a local jurisdiction evaluate the magnitude of a biological incident. Many private and public laboratories are part of the national Laboratory Response Network (LRN), a system of laboratories that work in collaboration with the CDC and the Federal Bureau of Investigation (FBI).²⁷ The main components of the LRN are the public health laboratories for each of the 50 States. Although the ME/C may use labs that are not part of the LRN, or labs that may not be capable of performing specific types of analysis, each laboratory is able to perform rapid rule-out diagnosis and refer specimens to a lab where personnel can conduct more advanced tests.²⁷ Even if a laboratory is not officially part of the LRN, once questionable specimens are forwarded to the State public health laboratory, the specimens become part of the national LRN.²⁷ The ME/C should align his or her agency with laboratories that are part of this network.

Once the local team of public health officials, the relevant health care community representatives, the OEM, law enforcement, and the ME/C have confirmed a suspicious biological incident, they need to determine the characteristics of the biological agent – how is it transmitted, its potential to create a major impact on the public health, the morbidity and mortality rate for those who are

treated versus those who are not treated, the characteristics of the disease pathology, and what diagnostic tests will aid in determining a definitive organism-specific diagnosis. After these factors are determined, each agency can begin to develop its own incident-specific plan to mitigate the effects of the outbreak.

INCIDENT-SPECIFIC PLANNING

The ME/C must consider addressing additional aspects of the operation when managing biologically contaminated remains. The ME/C must coordinate his or her activities with several other key agencies, create a strategy to systematically manage certain phases of the operation that are established at multiple locations, determine how best to mitigate the biological hazard, obtain additional personnel to handle remains, and obtain specific additional assets to process remains.

Coordinating Agency Activities

Since a biological incident affects many agencies and is not confined to a particular geographic location, jurisdiction officials should coordinate multiple agency activities at a central location, such as the Emergency Operations Center (EOC). The ME/C should be part of this jurisdiction-wide effort to mitigate the effects of a biological incident

MEDICAL EXAMINERS AND CORONERS MUST BE PART OF A BIOTERRORISM SURVEILLANCE SYSTEM

- Medical Examiners and Coroners (ME/Cs) are essential public health partners for bioterrorism preparedness and response
- These medicolegal investigators (MLIs) support both public health and public safety functions and are uniquely positioned to investigate deaths that are sudden, suspicious, violent, unattended, and/or unexplained
- ME/Cs have a unique role in bioterrorism surveillance because they have standards in the collection analysis and dissemination of data
- ME/Cs, public health departments, Emergency Management Agencies (EMAs), local and State laboratories, and Emergency Operation Centers (EOCs) must be linked in order to perform effective bioterrorism surveillance.

“Medical Examiners, Coroners, and Bioterrorism - A Guidebook for Surveillance and Case Management.”
Editor: Kurt B. Nolte, M.D.

because the proper management of contaminated human remains is necessary to avoid a public health hazard.

When developing an incident-specific plan for managing biologically contaminated remains, the ME/C should coordinate his or her efforts with the public health department and law enforcement agencies. For the management of human remains, the department of health must determine if the incident creates or poses a public health hazard and/or requires ME/C personnel to mitigate a public health hazard from occurring or escalating. If a public health hazard is declared, the ME/C will be granted extended authority to manage remains, which in most cases will include managing final disposition.³

The ME/C will also need the lead investigating agency's input regarding how evidence should be managed and secured. It is likely that the ME/C should initiate a recovery plan that establishes multiple recovery teams, as personnel should recover remains from various locations, such as hospitals, clinics, other health care facilities, residential homes, and/or designated public building sites. A law enforcement representative should be assigned to each team to gather evidence from the scene and maintain the chain of evidence for any items found on the deceased.

Designing a Geographic Strategy to Manage Operations

Since a biological weapons of mass destruction (WMD) incident is not confined to a specific location, the ME/C must design a strategy that adequately addresses processing remains throughout an extensive geographic location. This strategy should identify the outer geographic boundaries of the region; whether the geographic region will be divided into smaller regions for the recovery phase of the operation; and whether any off-site morgues will be established to process remains.

The ME/C may want to establish particular geographic boundaries or smaller regions into more centralized locations to increase the efficiency of managing large numbers of remains. During the 2002 exercise "Dark Winter," a simulated smallpox epidemic produced over 1,000 fatalities per week. The exercise proved that the typical means of processing remains will not be effective in

adequately managing a large influx. Moreover, the ME/C should repeat recovering remains from the same geographic area, as a biological incident can unfold over a period of weeks or months and has characteristic peaks of incubation and infection. ME/C personnel should recover remains from the same hospitals, clinics, various other health care facilities, residential areas, and any established drop-off points.

Additionally, the ME/C may need or choose to establish a centralized off-site morgue to process biologically contaminated remains for each of the designated regions. An off-site morgue may be necessary if the remains are highly infectious and pose a cross-contamination threat to other staff members, or if the influx of remains extends beyond the capability of the area's morgue. An off-site morgue will allow personnel to process the daily caseload at the normal headquarters (HQ) location. Also, establishing an off-site morgue that processes all remains from a designated region and focuses on ruling-out contamination of the same biological agent will make processing hundreds to thousands of remains more efficient than trying to process all remains at a small county HQ.

The geographic strategy should also address how to separate cases that are not part of the biological WMD incident from those that are. This may be difficult, considering that people will continue to die in the hospital and in their residences from diseases or conditions other than the biological agent. Hospital morgues are generally small, and it is likely that those who die from something other than the biological incident will be stored in the same morgue as the biological WMD cases simply for lack of space. It may also be difficult for some agencies to determine if a deceased person is a suspected biological WMD case. The ME/C may need to establish protocols to help others determine those cases that are inclusive of a biological WMD incident. In such instances, it is better to have protocols that create more false positives, so that all potential biological WMD incidents are identified.

Mitigating the Contamination/Bio-Safety Considerations

As was the case for chemically contaminated remains, the ME/C should mitigate the spread of the biological agent. In general, pathogens may present an airborne, droplet, or surface contamination risk.²⁷

2001 ANTHRAX EXPERIENCE

David Fowler, M.D., chief medical examiner for the Office of the Chief Medical Examiner (OCME) of Maryland, describes how his office managed the Brentwood anthrax cases that occurred in the fall of 2001. “The biggest issue was allaying the staff’s fears, as the perception of anthrax was that it was highly contagious; however, this is not true.” Dr. Fowler reports.

To allay everyone’s concerns, Dr. Fowler had a staff meeting to address the anthrax cases, how they would be managed, and to answer questions before remains were autopsied. The plan was to autopsy the bodies on a designated day after normal business hours so that a limited number of staff would be in the building. There would be a specific team to perform the autopsies: two medical examiners, an autopsy technician, and another medical examiner to supervise, control the environment, and watch for spills that could later dry and become a source of spores. The team of four would wear standard personal protective equipment (PPE) with additional respiratory protection. Two wore N-95 masks and two elected to wear powered air-purifying respirators (PAPRs). The team elected not to use oscillating saws that could potentially re-aerosolize the biological agent; thus, they did not remove the cranium. When the autopsy was finished, the team scrubbed down the autopsy suite with bleach-water solution and then soaked the instruments in bleach overnight.

Once the remains were ready to be released, Dr. Fowler contacted the funeral home directors who were identified by the families to handle remains. He instructed them to keep the remains cold and to avoid embalming. If other inquiries were made, the office staff directed those questions to the Maryland Funeral Directors Association Occupational and Safety Health Administration representative.

“It must have worked,” Dr. Fowler stated regarding allaying the staff’s concerns. “They all reported to work the day after the anthrax cases were processed.”

Though infectious agents found within human cadavers cannot transmit biological agents through the respiratory tract as those in living patients can, the infectious agents are present in the body. ME/C personnel are still at risk for occupational infections as these biological agents spread into many of the tissues and will be present in body fluids, presenting the risk of both airborne and bloodborne pathogen cross-contamination (e.g., accidental inoculation or body fluid re-aerosolization).²⁷ To mitigate the spread of contamination, the ME/C needs to establish the appropriate level of personal protective equipment (PPE) for staff to wear, provide a means for staff to receive prophylactic vaccinations or medications to prevent infections, determine how remains will be packaged, and establish a procedure to decontaminate the external surface of the packaging material once the body is placed within it. In some rare instances, ME/C personnel may need to decontaminate the external body, as is recommended for chemical contamination. Because all biological agents are not equally infectious and all personnel will not be exposed to the biological agent in the same manner, the ME/C needs to determine to what

extent his or her agency must incorporate the aforementioned methods of mitigating the contamination.

One way to mitigate the spread of biologically infectious agents is by wrapping remains in redundant leak-proof packaging.⁴³ ME/Cs should understand the benefits and limitations of the packaging they wish to use. Generally, remains that are contaminated with any of the Category A agents (as specified by the CDC) should be placed in two leak-proof pouches and appropriately labeled.⁴⁴ Remains should be handled as little as possible; once they are packaged they should not be removed from their packaging unless it is for a specific purpose and takes place in a controlled setting.

Another means of mitigating the spread of biological agents, and to avoid surface contamination, is to decontaminate the exterior of all packaging used to wrap remains.⁴³ By decontaminating the outside of a human remains pouch (HRP) with a decon solution, similar to what is used for chemically contaminated remains, there is less chance that those handling

remains will come in contact with contaminated blood or body fluids.

A third means of mitigating the spread of biological agents is by decontaminating remains. Chemically contaminated remains undergo water decon to remove surface contamination, but biologically contaminated remains need to be decontaminated internally. One means of achieving internal decontamination is by using an experimental method called irradiation technology, which is being considered by the Armed Forces Radiobiological Research Institute. Initial research reveals that irradiation technology penetrates the body, killing the biological agent without inhibiting the ability to accurately identify the body using DNA. This technology has been regularly used over the past decade to sterilize medical equipment and to render food safe by eliminating dangerous foodborne bacteria. A specific application of this technology is irradiating DNA and laboratory specimens to render them safe so that personnel do not need to wear fully encapsulated protective suits with independent air sources.

Depending on the biological agent, the ME/C may institute prophylactic measures to protect his or her staff. To prevent cross-contamination, personnel should adhere to wearing standard precaution ensembles, including a surgical scrub suit, a surgical cap, an impervious gown or apron with full-sleeve coverage, eye protection (goggles or face shield), shoe covers, and double surgical gloves with an interposed layer of cut-proof synthetic mesh gloves.²⁷ Personnel should also wear respiratory protection that protects them from inhaling fine aerosols generated during the autopsy process; typical surgical masks do not provide enough protection. ME/C personnel must wear masks using a high efficiency particulate air (HEPA) filter (such as the N-95 respirators).⁴³ Personnel who cannot wear N-95 respirators because of facial hair or other fit limitations should wear powered air-purifying respirators (PAPRs).⁴³

Smallpox vaccinations are recommended for autopsy workers who are about to perform an autopsy on a potential smallpox case or who have completed such an examination, as administering this vaccination at the time of exposure will still protect the individual.

Besides PPE, the ME/C should arrange for personnel to receive vaccines if is a high risk of exposure to a particular biological agent for which a vaccine exists (e.g., anthrax, plague, tularemia, smallpox). However, vaccinations are not highly recommended for those who have a low risk of exposure. When there is no vaccine or no vaccine available, the ME/C should consider initiating a program whereby personnel are administered specific antibiotics to treat exposure to particular agents (e.g., anthrax, plague, tularemia). In addition to these protective measures, the ME/C may also wish to establish a fever watch, checking all personnel potentially exposed to the biological agent for signs and symptoms of exposure. Personnel can be screened as they begin and end each shift; supervisors should proactively follow up with any employee who does not report for his or her shift.

Additional Personnel

Although the ME/C may need personnel with varying skill sets, many additional personnel who can assist with handling bodies will be needed, as biological agents can result in many fatalities. The ME/C will need personnel to perform recovery operations, assist in morgue operations, and perform tasks while wearing specified PPE. If staff must continuously perform tasks, there must be enough personnel to rotate to avoid fatigue.

The ME/C may also need a small contingent of medical staff if a fever watch program is established. The ME/C may also need to assign medical providers to each designated work area so that personnel are evaluated on a daily basis.

Additional Assets

When processing remains from a biological WMD incident, the ME/C should obtain additional assets, including off-site facilities that meet particular requirements, additional cold storage units that serve as storage and transportation, a communication system, and a comprehensive data tracking system.

Managing Personal Effects Depot

The ME/C should determine to what extent his or her personnel are able to support managing biologically contaminated personal effects (PE). Often family members request their loved one's personal items; however, when they are biologically contaminated it may not be possible to return them.

Should the ME/C determine to return PE, those items should undergo decontamination and clean verification before they can be safely released. One recommendation is to only attempt to decontaminate and return sentimental PE that can withstand water-based decontamination (such as wedding rings or jewelry). The ME/C should use a decontamination solution suited for the specific biological agent (such as a 10 percent bleach solution, glutaraldehyde or formaldehyde-based disinfectant). Other biologically contaminated items can be safely incinerated.

Family Assistance Center

In a biological incident, authorities may need to establish isolation or quarantine measures to limit ingress and egress for particular geographic regions. Such measures can affect how a Family Assistance Center (FAC) is managed, as the ME/C may need to coordinate alternate means of communication with the families. Even if isolation is not officially sanctioned, family members may not be able to access particular areas should air travel or public transportation systems temporarily shut down.

During the U.S. Northern Command's 2003 exercise "Determined Promise," local and Department of Defense (DoD) authorities identified some issues associated with managing the FAC. It became clear that the ME/C would not be able to communicate easily with family members outside Nevada during a pneumonic plague incident. Moreover, because there was an extremely high number of tourists in Clark County, the ME/C needed to address coordinating communication with families throughout the United States and internationally. There were 1,529 deaths in 11 days. Some issues included establishing a missing persons list, locating next of kin, collecting ante-mortem data, and confirming identification by visualizing the body. Additionally, during the biological incident, public health officials recommended that people avoid gathering in large crowds, such as at the FAC. The ME/C may request the use of video-teleconferencing to address many particular aspects of his or her communication needs. Other recommendations include establishing call takers that talk family members through a process of obtaining and releasing information about the deceased.

In some instances, the ME/C may need to designate particular morgues or off-site morgues where personnel can perform autopsies on cases infected

with Category A biological agents (e.g., anthrax, plague, tularemia). In general, it is recommended that these morgues have an autopsy suite comparable to a Bio Safety Level (BSL) 3 laboratory.²⁷ BSL 3 autopsy suites must have a minimum of 12 air-exchanges per hour, the room should be a negative pressure room relative to adjacent passageways and office spaces, the air flow within the room should direct aerosols away from personnel, and the air within the room should be evacuated from the building via vents that are located away from gathering areas.²⁷ Most local ME/C personnel should be able to perform autopsies on cases that require a BSL 3 laboratory; however, not all ME/C buildings have this capability.

When the ME/C has to perform autopsies on infectious cases that require BSL 4 laboratories, such as smallpox, he or she should make special arrangements with the CDC and the U.S. Army Medical Research Institute of Infectious Disease (USAMRIID). Only these two agencies have access to BSL 4 laboratories, and only USAMRIID has a suite that can be modified to support performing an actual autopsy.

The ME/C must keep these facility designs in mind when designating a particular morgue or off-site morgue as the location for performing autopsies.

Along with the facility requirements, the ME/C may need additional cold storage containers set up at all area hospitals, clinics, and designated health care facilities. Morgue locations may also need additional cold storage units to separate remains ready to move to the final disposition phase from those entering the morgue. Personnel who recover remains from private residences will also require mobile cold storage units.

During the incident planning phase, the ME/C must also consider establishing a comprehensive communication system to stay in contact with recovery teams, regional off-site morgues, PE depots, and FACs. Personnel not assigned to a particular location, such as those who are part of the recovery operation, will also need mobile communication.

The ME/C should establish a comprehensive means of collecting, documenting, and electronically storing data. Since the scope of a biological incident

is vast and requires multiple agencies to share information, the data system must not only be able to compile and hold case-specific information, but must also be able to incorporate public health and law enforcement data for purposes of completing an accurate case-specific death investigation.

The ME/C must determine to what extent he or she needs to increase security measures during a biological incident. Some experts believe that all phases of human remains processing (recovery, transport, morgue operations, laboratory analysis, storage, disposal of PE or specimens, and final disposition of bodies), require additional security to prevent theft of the biological agent. Others are not as concerned about thieves harvesting biological agents from laboratory specimens, PE, or the body, and only recommend that the jurisdictions officially document where the deceased are buried.

RECOVERY PHASE

The ME/C must strategically plan for the recovery of remains. Personnel should recover remains from hospitals, clinics, ad-hoc field hospitals and clinics, and personal residences. The ME/C should consider creating recovery teams including death investigators, law enforcement officers, and additional personnel to help with lifting.

Personnel assigned to the recovery team must be able to perform their duties while wearing additional PPE. Because operating in PPE is fatiguing, the team may need to have extra personnel assigned so that personnel can rotate between work and rest.

Each team should recover remains from a geographically defined area. Personnel may need to recover remains from the same area on a routine basis until the incident is over.

HOLDING MORGUE OPERATIONS PHASE

In a biological incident, the holding morgue may be the site where remains are recovered or the vehicle where remains are temporarily placed, awaiting transport to the morgue. As remains are recovered, personnel may automatically perform an external evaluation, blood sample draws, removal of PE, and a preliminary identification check. Depending on the extent of the incident, the ME/C may determine that

personnel should perform as many of these tasks as possible upon recovery of remains so that not as many tasks have to be performed at the morgue.

TRANSPORTATION AND TEMPORARY STORAGE PHASE

To recover remains from a biological incident, the ME/C may need to acquire different types of vehicles than what he or she generally uses. Stationary locations like hospitals, clinics, and field hospitals may benefit from having pre-positioned refrigerated trucks at their locations. The ME/C should consider what measures are most practical for the circumstances. If the refrigerated units fill on a daily basis, replacing full units would be more practical; however, if the refrigerated units do not fill up, it would be more practical for personnel to transfer remains to the transportation vehicle. In either case, refrigerated units for storage and transportation are the best option.

The ME/C should be aware of added concerns when transporting biologically contaminated remains. Under 49 Code of Federal Regulations (CFR), infectious substances, whenever transported by land, sea, or air, are to be labeled and packaged according to the type of hazard they present. The Department of Transportation (DOT) considers infectious human remains a 6.2 hazard class. The DOT has established titles and packaging requirements for biological substances and biologically contaminated human remains. Quantity limits do not apply to body fluids or human body parts, or whole bodies or organs known to contain or suspected to contain an infectious substance; infected human remains are not considered to have the highest risk classification, which warrants more strict packaging. Infected human remains are considered infectious substances that must be packaged in accordance with section 173.196, which requires one or more inner packagings that are leak-tight, and an outer packaging that must contain absorbent material sufficient to absorb the entire contents of the inner packaging. The outer packaging must also be strong and secured against movement.

Additionally, all items must be marked with a biohazard marking conforming to 29 CFR 1910.1030. Transportation vehicles must be placarded (identifying that the items contained are a biohazard) and they must also have an infectious

substance label according to section 172.432. The ME/C should also be aware that packaging requirements established by the DOT are even more stringent when items are transported by air, as the items are subjected to altitude changes that can negatively affect the cargo and the surrounding environment.

MORGUE OPERATIONS PHASE

The ME/C should consider to what extent he or she is able to allocate resources for morgue operations. In a biological incident, tens of thousands of people may die, and ME/C personnel may not be able to manage processing remains to the extent they usually would, regarding identification and forensic pathology procedures.

The ME/C should consider if morgue operations would be centralized or decentralized. Though most personnel prefer a central location, recovering remains from a large geographic area and the number of remains may make it impractical for the ME/C to establish a central location to accommodate processing all remains. Instead, the ME/C may need to establish regional morgue sites. When establishing the type of morgue operation in either case, the ME/C should determine which morgue locations can adhere to appropriate bio-safety levels for the biological incident occurring.

Identification

For remains identification, the ME/C may need to establish strict parameters. It is likely that there will not be enough resources for personnel to identify remains using all the typical methods (e.g., fingerprints, dental, radiologic examination). It is also possible that remains will be badly decomposed if teams are not able to recover remains from obscure locations within a time-critical manner. The ME/C should consider establishing an incident-specific identification procedure that is commensurate with existing resources; for example, when ME/C personnel does not include someone who can perform fingerprinting or machinery to perform dental x-rays, the identification protocol may then stipulate personnel to note anatomical body markings, take photographs, and obtain a DNA specimen.

Although most people dying from infections will not necessarily require DNA technology for

identification, this procedure does provide one of the best means of securing identity in a disaster. DNA specimens can be stored until personnel are able to process them, or, if needed, until future technology enables the remains to be identified. When remains are biologically contaminated, personnel need only handle remains for a minimal period of time, minimizing the risk of exposure to blood and body fluids. Another benefit is that ad hoc personnel, such as medical students, can obtain DNA specimens instead of requiring pathologists to obtain specimens. If the ME/C determines to have personnel other than the pathologist extract DNA specimens, detailed specimen criteria should be created. Personnel should be required to follow specific procedures in order to obtain high quality specimens from which the victims are to be identified.

Autopsy

To mitigate the exposure to biologically contaminated remains, the ME/C should consider limiting the number of cases for autopsy, particularly when the disease is infectious, such as anthrax or smallpox. Instead of performing an autopsy on every case, the ME/C should arrange to have selected autopsies performed so that enough evidence is gathered to prove cause and manner of death for all cases.

The ME/C should consider refraining from using instruments during the autopsy procedure that contribute to splashing or splattering; for example, bone saws may create splashing and splattering, or even create fine airborne particles. During the 2001 anthrax outbreak, the Maryland Office of the Chief Medical Officer (OCME) refrained from using an oscillating saw to open the head, for the express purpose of minimizing exposure.

Although autopsies provide the best insight from which the ME/C can establish cause and manner of death, he or she can render a reasonably sound medical opinion without it. In some cases it may be enough to confirm the outbreak of a disease in general, identify the deceased, externally examine the body and photograph any lesions that the disease may have created, and obtain samples from the lesions for culture and/or electron microscopy.²⁷

BIOLOGICAL CONTAMINATION SAFETY AND HANDLING RECOMMENDATIONS

Bio Agent	General Handling	Autopsy	Burial	Cremation
Anthrax	<ul style="list-style-type: none"> Standard precautions Additional respiratory personal protective equipment (PPE) when performing activities that generate aerosols 	<ul style="list-style-type: none"> Wear additional respiratory PPE Bio-Safety Level (BSL) 3 practices when performing activities with high potential for aerosols Regulated by 42 Code of Federal Regulations (CFR) 	<ul style="list-style-type: none"> Contact with corpses should be limited to personnel wearing PPE Package in leak-proof containers Avoid embalming Bury without reopening 	<ul style="list-style-type: none"> Recommended
Botulinum Toxin	<ul style="list-style-type: none"> Standard precautions Additional respiratory PPE when performing activities that generate aerosols 	<ul style="list-style-type: none"> Wear additional respiratory PPE BSL 3 practices when performing activities with high potential for aerosols Regulated by 42 CFR 	<ul style="list-style-type: none"> Recommend no embalming 	<ul style="list-style-type: none"> No restrictions
Plague	<ul style="list-style-type: none"> Standard precautions Additional respiratory PPE when performing activities that generate aerosols 	<ul style="list-style-type: none"> Wear additional respiratory PPE BSL 3 practices required when performing activities with high potential for droplet or aerosols or working with antibiotic resistant strains Regulated by 42 CFR 	<ul style="list-style-type: none"> Contact with corpses should be limited to personnel wearing PPE Recommend no embalming 	<ul style="list-style-type: none"> No restrictions
Tularemia	<ul style="list-style-type: none"> Standard precautions Additional respiratory PPE when performing activities that generate aerosols 	<ul style="list-style-type: none"> Wear additional respiratory PPE BSL 3 practices when performing activities with high potential for aerosols Regulated by 42 CFR 	<ul style="list-style-type: none"> Contact with corpses should be limited to personnel wearing PPE Recommend no embalming 	<ul style="list-style-type: none"> No restrictions
Viral Hemorrhagic Fever	<ul style="list-style-type: none"> Standard precautions Additional respiratory PPE 	<ul style="list-style-type: none"> Wear additional respiratory PPE BSL 4 Negative pressure rooms Autopsies should be performed only if absolutely indicated Regulated by 42 CFR 	<ul style="list-style-type: none"> Minimize handling by all personnel, even in PPE Package in leak-proof containers Avoid embalming Bury without reopening 	<ul style="list-style-type: none"> Recommended
Smallpox	<ul style="list-style-type: none"> Standard precautions Additional respiratory PPE Personnel should be under a fever watch or vaccinated 	<ul style="list-style-type: none"> Wear additional respiratory PPE BSL 3 Autopsies should be performed only if absolutely indicated Regulated by 42 CFR Personnel should be vaccinated 	<ul style="list-style-type: none"> Minimize handling by all personnel, even in PPE Package in leak-proof containers Avoid embalming Bury without reopening 	<ul style="list-style-type: none"> Recommended

Figure #7

Chart information compiled from the following sources:

Centers for Infectious Disease Research and Policy (CIDRAP). 26 November 2002. "Bioterrorism Preparedness, Planning and Response." Bioterrorism/Planning, 1-18. Federal Initiatives; Local and State Planning; Hospital Preparedness; Protection of Building Environments, Etc. 18 June 2003 <http://www.cidrap.umn.edu/>

"Medical Examiners, Coroners, and Biologic Terrorism: A Guidebook for Surveillance and Case Management." MMWR 2004 Jun 11;53(RR08):1-36

A SAFE METHODOLOGY FOR HANDLING BIOLOGICALLY CONTAMINATED REMAINS OR EVIDENCE

Currently there are few viable alternatives for safely handling biologically or chemically contaminated human remains. Moreover, no protocols have been established that address safe handling of contaminated evidence that requires PCR DNA analysis for criminal investigation. In response to the challenge of protecting personnel safety as well as maintaining evidence, the New York City Office of Chief Medical Examiner (NYCOCME) Department of Forensic Biology has begun examining the efficacy of irradiation as a decontamination method, as this method is believed not to impede DNA analysis.

The Challenge

Most medical examiner and coroner (ME/C) morgues and forensic science laboratories across the country operate at Bio-Safety Level (BSL) 2; however, the Centers for Disease Control and Prevention (CDC) recommend that biologically contaminated human remains and evidence samples adhere to BSL 3 for most Category A biological agents. Since modifying operations to a BSL 3 would be costly and perhaps impractical, protocols must be designed to decontaminate human remains and/or evidence samples so that the majority of personnel need only adhere to the current BSL 2 standard.

There are two types of irradiation. Electron beam (e-beam) radiation refers to energy from accelerated electrons that pass through a material and ionize or disrupt molecules by breaking bonds. The second type is x-ray radiation, which is similar to e-beam, but is more penetrating. Irradiation has been successfully used to sterilize medical instruments and rid food of harmful bacteria for many years; however, implementing irradiation as a decontamination method for human remains and/or evidence will only be desirable if it maintains the integrity of the remains and/or evidence post irradiation.

Supporting Research

Initial studies on radiation from e-beam or x-ray sources, at doses adjusted to destroy the structure pathogen, have indicated that identifying DNA sequences do remain intact. In fact, studies by the Armed Forces DNA Identification Laboratory demonstrate that irradiation of human tissue at 51 kGy destroys *Bacillus subtilis*, a surrogate for *Bacillus anthracis*, but preserves segments of DNA for discrimination. Other initial studies have looked at breaking down chemical agents using irradiation; however, chemical contaminants potentially require much higher doses of radiation than what has been previously tested.

The Process

The Department of Forensic Biology at the NYCOCME, in conjunction with Titan Corporation, performed a dose response study using e-beam and x-ray radiation. Over 340 evidentiary items such as blood, semen, saliva stains, and fingerprints were exposed to e-beam radiation at 0 kGy, 15 kGy, 30 kGy, 45 kGy, 60 kGy, 75 kGy, and 90 kGy. An additional 400 samples were irradiated at 30 kGy with a high power x-ray. Sample sets from all doses were processed simultaneously.

Semen and mixed epithelial cell samples were extracted by differential lysis using Chelex beads. Using a modified DNA IQ[®] (Promega) protocol for degraded samples, blood and saliva samples were extracted on the Biomek 2000. Low level DNA samples (i.e., swabs of fingerprints and touched objects) were digested with 0.01% SDS and Proteinase K at 56°C for 4 hours, incubated at 100°C for 8 minutes following an addition of Poly A RNA, and were purified and concentrated with a microcon 100 (Millipore). Samples were quantitated with an ALU based real time PCR. One ng or 10 µL of each sample was amplified with Promega's PowerPlex[®]16 reagents at half their recommended volume for 32 or 35 cycles, as needed, and 4 µL were separated on an ABI 3100 Prism[®] Genetic Analyzer with injection at 3 kV 20 seconds.

Initial Results

This study demonstrates that irradiation may be effectively employed to decontaminate most forensic samples for PCR Nuclear DNA testing. Even at doses as high as 90 kGy, sufficient DNA to produce usable DNA profiles was recovered from the majority of samples including blood, semen, and saliva stains, although the absolute DNA yield of large fragments of DNA was reduced. Regarding small pieces of DNA usable for DNA analysis, irradiation had no effect, according to quantitative real time amplification results of 124 bp fragment.

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For degraded samples, amplification of the larger allelic fragments was compromised at doses above 75 kGy. Nevertheless, the amount of alleles correctly determined still produced DNA profiles that were suitable for comparison; however, only 60 percent of samples that had very low copies of DNA (i.e., fingerprint swabs) generated DNA profiles following irradiation, and only at levels below 30 kGy. This effect suggests that the degradation of DNA is not uniform, and that if sufficient quantities of DNA are present, templates for our current STR amplicons will remain unaffected by irradiation, and thus robust DNA profiles will result. Although low copy number DNA samples are not good candidates for STR analysis, alternative methodologies that employ smaller amplicons, such as SNPs, may be useful.

A Second Study: Can irradiation penetrate human remains and still achieve effective results?

In order to assess penetration through large tissue samples (such as those encountered with human remains), pork slabs simulating human tissue were irradiated at doses up to 120 kGy. Methodologies, including quantitative PCR and multiplex STR analysis, were adjusted and optimized to accommodate this porcine DNA. Dosimeters, used to measure radiation penetration, were inserted deep within a substantial piece of pork. With the effective irradiation dose known [the amount of radiation that is required to damage agent DNA for a particular sample and its packaging is determined through a mathematical model, and thus is hypothetically consistent regardless of the source], one could evaluate DNA testing results taken from a pork sample proximal to a dosimeters with certainty. Results from this study suggest that decontamination of human tissue by irradiation is a possible solution and would likely support the safe return of remains to families.

This experiment design could be used to study the efficacy of decontaminating porcine tissue inoculated with spore test strips for *Bacillus subtilis*. Moreover, the methodologies developed to accommodate porcine tissue have a broader application, as they provide an easily accessible model for examinations that require human tissue samples, which are often more difficult to obtain.

Verification of Decontamination

Although these experiments demonstrate that irradiation is an effective means of decontamination, in order to verify that the contaminant in question is truly destroyed by radiation, the appropriate laboratories equipped to handle the pathogen (either the local department of health or the CDC), should process a select number of samples from each irradiated batch. Using microbiological techniques, growth should be assessed, and batches producing positive cultures should be re-irradiated. Alternatively, if the irradiation decontamination method is used on chemical contaminants, an entity like the Department of Environmental Protection (DEP) should ascertain the safety risks of each batch of samples by using chemical agent monitors. Only when the samples are deemed "clean" should the forensic laboratory and/or the mortuary personnel process the associated batch.

Operational Considerations

Instituting irradiation decontamination requires the collaboration of multiple agencies that protect public health, the environment, and those processing remains and evidence. Moreover, the NYCOCME must coordinate with transportation assets that deliver the samples and/or human remains to the irradiation accelerator, as well as coordinate with those agencies that have the irradiation accelerator devices. Procedures must address how samples will be packaged so that personnel handling them are safe, Department of Transportation (DOT) regulations are met, and irradiation penetration is not compromised.

In Summary

Initial studies indicate that irradiation is effective at decontaminating biological agents without compromising the ability to discriminate DNA. Considering that there is a lack of viable alternatives for handling contaminated remains, further studies are needed to investigate irradiation as a decontamination method.

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Embalming

It may not be appropriate for personnel to embalm biologically contaminated remains. Embalming in general is meant to preserve the body and, to a certain extent, disinfect the body; however, it never truly disinfects the body internally, but rather minimizes the spread of a biological agent by containing the agent within the body for a specified period of time.⁴³

Although biologically contaminated remains can be embalmed, it places embalmers at risk, as they are exposed to contaminated blood and body fluids, much like those who perform autopsies.⁴³ ME/Cs must keep in mind that the general principle regarding the handling of infectious remains is to handle them as little as possible, which in most cases means the health benefit of embalming does not outweigh the associated risk of exposure.⁴³

The decision not to embalm may challenge existing laws. Some jurisdictions may have laws that stipulate embalming bodies that are infected with specific communicable diseases; this challenges the basic principle to handle such remains as little as possible.

FINAL DISPOSITION PHASE

Burial

Biological contamination does not prevent burial as a final disposition option, but it may limit how personnel should carry out burial procedures. Once remains are packaged, the packaging should not be opened. In terms of funeral services, this means that the family will not be able to view their loved ones. It may also mean that funeral services are modified and only performed at the gravesite.

Because biological agents have the potential to create numerous deaths, the ME/C must consider how hundreds, thousands, or tens of thousands of remains should be buried. In some cases, should the number of remains exceed the surge capacity of area cemeteries, authorities may need to designate appropriate land for a cemetery (that is, land commensurate with appropriate water tables). In other cases, when remains are contaminated with an infectious agent that lies dormant in human bodies, such as anthrax, it may be beneficial if authorities

designate specific cemeteries, or areas within specific cemeteries, as the location for burial.

Many agencies have yet to confirm if burying contaminated remains poses an environmental hazard. Cemetery owners may require their jurisdiction's authorities to provide them indemnity from future citation for burying infectious, hazardous substances. The ME/C should build a rapport with his or her local cemeteries to determine if any additional permission is required before biologically contaminated remains are buried.

Cremation

Cremation is the disposition of choice for bodies contaminated with highly infectious agents that can be spread by handling the body, such as smallpox and VHF viruses. For those bodies contaminated with B. anthracis, cremation is also recommended because these bodies can harbor long-lasting spores. In general, highly infectious remains should be handled as little as possible, packaged, and cremated, as cremation is the only option that completely mitigates any further spread of the biological agent.²⁷

When cremating biologically contaminated remains, ME/Cs should make certain that crematoriums have a retort system. The retort system captures and burns all particles in the smoke, before the smoke is released into the atmosphere. This retort system is needed to prevent inadvertently spreading the biological agent.

Cremation may not always be practical, as each jurisdiction has a limited number of crematoriums and the cremation process is lengthy. Traditional cremation requires approximately three hours. Even though cremation may be the safest answer, the number of remains to cremate, in addition to the influx of remains at any one time, may outweigh the combined capacity of local crematoriums. In such instances, the ME/C may need to revert to a burial option. ■

CONCLUSION

CONCLUSION

*M*anaging countless remains is difficult and may become daunting if remains are contaminated. The chief task of medical examiners and coroners (ME/Cs) is not to independently process all remains from a catastrophic incident, but to create an infrastructure for processing remains, so that when assets arrive, those assets can backfill and support the operation. The ME/C must know what assets are readily available, where to obtain other necessary assets, and how to integrate those assets into the response effort.

To achieve the goal of keeping handlers safe, respecting the deceased and returning remains to family members, the ME/C must create a comprehensive plan to process remains. Breaking down the operation into phases and addressing the critical variables that influence the operation will allow the local ME/C to better manage not only contaminated remains, but also remains resulting from other disasters. ■

GETTING STARTED

GETTING STARTED

When developing disaster plans, it is essential that medical examiners and coroners (ME/C) include not only internal staff, but also key agencies in the jurisdiction. The ME/C needs to engage in a planning process that crosses functional, interdisciplinary, and jurisdictional lines.

Having an established, practiced plan provides the direction and guidance needed when a disaster occurs. Plans must be flexible to expand or contract based on the needs of the situation. The ME/C must have a sufficient number of personnel, resources, and space to adapt to the requirements of the incident.

PERSONNEL

The local ME/C is responsible for managing the incident and should have enough personnel to establish an evaluation team and a basic infrastructure to process remains. The plan should take into account the need for additional staff that can be called upon for all areas, including administrative and computer networking personnel, logistics personnel, and personnel required to process remains.

For chemically or biologically contaminated incidents, the ME/C should have a plan that integrates personnel from outside resources and involves a strategy to avoid fatiguing personnel. Personnel will need to be capable of performing their duties while wearing additional personal protective equipment (PPE).

RESOURCES

One pivotal piece of disaster planning is an accurate resource management tool. The ME/C must know how to obtain additional resources, which vendor will supply them, and how long it will take the vendor to deliver the requested resources. The ME/C should develop a comprehensive resource tool that is accurate and maintained. When a disaster occurs, the ME/C will rely on that resource tool to develop an incident-specific plan.

SPACE

The ME/C must consider ahead of time how to expand the operation to accommodate the influx of cases. Options may include setting up alternate sites to process remains or expanding the capacity at headquarters (HQ). In either situation, the ME/C can identify appropriate locations and determine what resources personnel will need to process remains from a disaster. ■



Figure # 7

TRAINING OPPORTUNITIES

TRAINING OPPORTUNITIES

*M*edical examiners and coroners (ME/Cs) should consider attending courses that provide an overview of chemical and biological weapons of mass destruction (WMD), the National Incident Management System (NIMS), emergency management operations, and general disaster management of fatalities. These courses would benefit ME/Cs by preparing them to respond to WMD incidents resulting in mass fatalities. There are no specific mass fatality management (MFM) courses for WMD events; however, personnel can extrapolate information from related courses designed for other disciplines. For example, personnel who attend hazardous materials (HazMat) courses will learn about the basic principles of personal protective equipment (PPE), methods of decontamination, safety, and work-rest cycles.

In addition to courses, ME/C personnel should consider participating in local hospital, police, and fire department (FD) exercises. Hospitals are required to have a major exercise annually, which may include a tabletop or a functional exercise. By participating in such exercises, ME/C personnel can derive a more realistic perspective of their role and the overall response effort.

The following is a list of courses ME/Cs should consider attending for training purposes.

HAZARDOUS MATERIALS COURSES

Hazardous Materials First Responder Operational

This course is designed for Emergency Medical Services (EMS), law enforcement, and FD personnel who respond to releases or potential releases of hazardous substances. ME/Cs and personnel who attend this course would obtain general awareness of HazMat.

Hazardous Materials First Responder Decontamination

This course is designed for certified HazMat-First Responders with training for Level B decontamination. ME/C personnel who attend this course will learn the requirements in establishing a decontamination line, how to use PPE, and what Level A, B, and C PPE requires.

Hazardous Waste Operations and Emergency Response

This course fulfills the requirement for certification under 29 Code of Federal Regulations (CFR), Part 1910.120 (e) as an Occasional Site Worker. The Hazardous Waste Operations and Emergency Response (HazWoper) course provides the participant with information needed to work safely with HazMat, including handling, storage, transportation, and use of HazMat and wastes. Course objectives include understanding the various training regulations relating to HazMat handling and response; knowing which activities can be performed at what level of certification; demonstrating a knowledge of HazMat on the body and its effects; understanding PPE; demonstrating proper removal of wastes; and demonstrating decontamination.

THE CENTER FOR DOMESTIC PREPAREDNESS, SPONSORED BY THE DEPARTMENT OF HOMELAND SECURITY

The Center for Domestic Preparedness (CDP) provides direct training and technical assistance to State and local jurisdictions to enhance their capacity and preparedness to respond to domestic incidents. The CDP provides hands-on specialized training to emergency responders in the management and remediation of WMD incidents. Located at the former home of the U.S. Army Chemical School at Fort McClellan, AL, the CDP conducts live chemical agent training for the Nation's civilian emergency response community. All courses go

through a rigorous pilot and review process in which Federal, State, and local subject matter experts examine the course material to ensure accuracy and compliance with accepted policies and procedures. For more information, visit the Web site at <http://www.ojp.usdoj.gov/odp/ta/overview.htm>.

ME/C personnel attending this course will gain general knowledge regarding how terrorist incidents differ from other disasters and will gain an overview of WMD.

NOBLE TRAINING CENTER

The Noble Training Center is a U.S. Public Health Service initiative that focuses on providing courses for hospital and EMS providers. It is located in the former Noble Army Community Hospital at Ft. McClellan which was previously operated by the U.S. Army Medical Command until the Fort's closure on September 30, 1999. The facility, which was once a 100-bed hospital, has 166,000 square feet of clinical space and heliport, and is located on 20 acres. The Noble Training Center is the only hospital facility in the United States devoted entirely to medical training for WMD. It is co-located at Ft. McClellan with the CDP. For more information, visit the Web site at http://www.oep.dhhs.gov/CT_Program/Noble_Training_Center/noble_training_center.html.

THE FEDERAL EMERGENCY MANAGEMENT AGENCY COURSES, SPONSORED BY THE DEPARTMENT OF HOMELAND SECURITY

The Federal Emergency Management Agency (FEMA) offers many related courses that may benefit ME/C personnel. Courses on the NIMS, Emergency Operations in Disasters, and MFM might be of interest.

In May 2001, FEMA developed new terrorism preparedness planning guidance for State and local governments. The terrorism planning provides guidance to State and local emergency planners in two areas. The first area addresses information and a framework for developing supplemental Emergency Operations Plans (EOPs) to address the consequences of terrorist acts involving WMD. The second area addresses a consistent planning approach to help foster efficient integration of State,

local, and Federal terrorism consequences management activities. To obtain more information regarding FEMA courses and planning guides, visit the Web site at <http://www.usfa.fema.gov/pdf/cwmdc.pdf>.

NATIONAL MASS FATALITIES INSTITUTE

The Centers for Disease Control and Prevention (CDC) provided a grant program to support a National Mass Fatalities Institute at Kirkwood Community College in Iowa. The purpose of the program is to establish a national training center to prepare and support communities, businesses, industry, government and disaster response agencies nationwide for the proper handling of human remains, as well as to respond to the needs of families and communities in the aftermath of mass fatality incidents. To obtain more information, visit the Web site at <http://www.nmfi.org/>.

EVIDENCE COLLECTION COURSES

Awareness of inadequate death investigation operations in jurisdictions around the country resulted in a project supported by the National Institute of Justice (NIJ) that has produced new guidelines. These death investigation guidelines are comprehensive, flexible, and capable of being adapted to operations that use a variety of investigative officials, including police officers, sheriffs, justices of the peace, physicians, and pathologists. Visit <http://www.ojp.usdoj.gov/nij/pubs.htm> for further information regarding guidelines and related ME/C products offered by NIJ.

ME/Cs can attend Medicolegal Death Investigation courses and Police and ME/C Death Investigation courses at national ME/C conferences. Such courses present information regarding the recognition of standard guidelines for scene investigation. Although these courses do not specifically address MFM, ME/C personnel will have a better understanding of evidence collection, which is vital consideration in terrorist incidents that involve WMD.

WEAPONS OF MASS DESTRUCTION ADVANCED RADIATION/NUCLEAR COURSE

This course is sponsored by the Department of Energy (DOE) and the Department of Justice's (DOJ's) Office of Justice Programs. It is a five-day training course for experienced responder personnel. Students will learn about incident command operations and basic radiological protection. The course, taught by Bechtel Nevada at the Nevada Test Site, provides classroom instruction and practical exercises. All courses are conducted at no tuition cost to the student and the DOJ pays for travel and per diem expenses (in accordance with Federal Joint Travel Regulations). For additional information, visit the Web site at http://www.dis.anl.gov/ep/tr/ep_tr_courses.html, call (702) 295-3224, or write DOE, Nevada Operations Office, PO Box 98518, Las Vegas, NV 89193-8518.

RECOMMENDATION FOR FUTURE COURSES ON MASS FATALITY MANAGEMENT OF CONTAMINATED REMAINS

National forums, as well as local agency meetings, could easily support the topics of gathering evidence as it relates to disaster situations. Questions regarding how to investigate the scene and how to gather evidence from remains are not as clear when multiple agencies (such as the FBI, local law enforcement, the ME/C, and the Bureau of Alcohol, Tobacco & Firearms (ATF)) must work within the same geographic location. Such topics are further complicated when the incident is chemically or biologically contaminated. Though a course on the management of contaminated human remains does not exist, chief ME/Cs could form a panel with law enforcement officials in their area to discuss evidence collection, and have these discussions at monthly training sessions. Topics should address evaluating the scene, formulating an incident-specific plan, and how agencies should mutually support one another in disaster incidents. ■

ABBREVIATIONS AND ACRONYMS

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AFB	Air Force Base
AFDIL	Armed Forces DNA Identification Laboratory
AFIP	Armed Forces Institute of Pathology
AFME	Armed Forces Medical Examiner
AFEB	Armed Forces Epidemiological Board
ATF	Bureau of Alcohol, Tobacco & Firearms
B.anthraxis	Bacillus anthracis
BCP	Body Collection Point
BSL	Bio-Safety Level
CBIRF	Chemical Biological Incident Response Force
CBRNE	Chemical, Biological, Radiological, Nuclear, or High-Yield Explosive
CDC	Centers for Disease Control and Prevention
CDP	Center for Domestic Preparedness
CFR	Code of Federal Regulations
CIDRAP	Center for Infectious Disease Research and Policy
CISM	Critical Incident Stress Management
CME	Chief Medical Examiner
CST	Civil Support Team
DCO	Defense Coordinating Officer
DEP	Department of Environmental Protection
DHS	Department of Homeland Security
DMAT	Disaster Medical Assistance Team
DMORT	Disaster Mortuary Operational Response Team
DNA	Deoxyribonucleic Acid
DoD	Department of Defense
DOE	Department of Energy
DOH	Department of Health
DOJ	Department of Justice
DOMS	Director of Military Support
DOT	Department of Transportation
DPW	Department of Public Works
EHP	Emergency Health Powers Act
EM	Emergency Manager
EMA	Emergency Management Agency
EMS	Emergency Medical Services
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	Environmental Protection Agency
EP & R	Emergency Preparedness and Response (Directorate under DHS)
ERT	Emergency Response Team
ESF	Emergency Support Function
FAC	Family Assistance Center

FBI	Federal Bureau of Investigation
FCO	Federal Coordinating Officer
FD	Fire Department
FDNY	Fire Department New York City
FEMA	Federal Emergency Management Agency
FOG	Field Operations Guide
FRP	Federal Response Plan
GPL	General Population Limit
HazMat	Hazardous Materials
HazWoper	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HHS	Department of Health and Human Services
HQ	Headquarters
HRP	Human Remains Pouch
IC	Incident Commander
ICISF	International Critical Incident Stress Foundation, Inc.
ICS	Incident Command System
IDLH	Immediate Danger to Life/Health
IHC	Immunohistochemistry
IRP	Improved Response Program
JAFET	Joint Agency Fatality Evaluation Team
JOC	Joint Emergency Operations Center
JTF	Joint Task Force
JTF-CS	Joint Task Force-Civil Support
LC	Lethal Concentration
LE	Law Enforcement
LFA	Lead Federal Agency
LRN	Laboratory Response Network
MA	Mortuary Affairs
MAC	U.S. Army Mortuary Affairs Center
MADCP	Mortuary Affairs Decontamination Collection Point
MCI	Mass Casualty Incident
MDW	Military District of Washington (D.C.)
ME	Medical Examiner
ME/C	Medical Examiner and Coroner
MECISP	Medical Examiner and Coroner Information Sharing Program
MESORT	Medical Examiner Special Operations Response Team
MFM	Mass Fatality Management
MIRP	Military Improved Response Program
MLI	Medicolegal Investigator
MMRS	Metropolitan Medical Response System
MOA	Memorandum of Agreement
MOPP	Mission-Oriented Protective Posture
MOS	Members of Service
MOU	Memorandum Of Understanding
NAME	National Association of Medical Examiners
NDMS	National Disaster Medical System
NEST	Nuclear Emergency Search Team
NFPA	National Fire Protection Agency
NGO	Nongovernmental Organization
NIJ/NCFS	National Institute of Justice/National Center for Forensic Science
NIMS	National Incident Management System

NIOSH	National Institute for Occupational Safety and Health
NTSB	National Transportation Safety Board
NYC	New York City
NYCOCME	New York City Office of Chief Medical Examiner
NYPD	New York City Police Department
OAFME	Office of the Armed Forces Medical Examiner
OCME	Office of the Chief Medical Examiner
ODP	Office of Domestic Preparedness
OEM	Office of Emergency Management
OSHA	Occupational and Safety Health Administration
OTDA	Office of Transportation Disaster Assistance (a component of NTSB)
OVA	Office for Victim Assistance
OVC	Office for Victims of Crime
PAPR	Powered Air-Purifying Respirator
PCR	Polymerase Chain Reaction
PE	Personal Effects
POC	Point of Contact
PPE	Personal Protective Equipment
QA	Quality Assurance
QM	Quartermaster (U.S. Army Quartermaster Corps)
RDECOM	Research Development and Engineering Command
ROC	Regional Operation Center
SARS	Severe Acute Respiratory Syndrome
SBCCOM	U.S. Army Soldier and Biological Chemical Command
SCBA	Self-Contained Breathing Apparatus
SCO	State Coordinating Officer
SNP	Single-Nucleotide Polymorphism
SNS	Strategic National Stockpile
STR	Short Tandem Repeat
TEU	U.S. Army Technical Escort Unit
USAMRICD	U.S. Army Medical Research Institute of Chemical Defense
USAMRIID	U.S. Army Medical Research Institute of Infections Disease
US & R	Urban Search and Rescue System
VA	Department of Veterans Affairs
VHF	Viral Hemorrhagic Fevers
WMD	Weapons of Mass Destruction
WPL	Worker Population Limit
WTC	World Trade Center

SOURCE DOCUMENTS

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The following is a list of documents that address different aspects of mass fatality management. The findings and recommendations in these reports are neither mandated nor required for local or State jurisdictions; rather, they are presented to provide technical and operational guidance for communities and departments that are engaged in mass fatality incident planning. The ME/C should review the following information, understand the implications, and consciously decide which response procedures must be incorporated into his/her own response plan.

“Dangerous Goods Regulations (DGR) International Air Transport Association (IATA),” <http://www.iata.org> or <http://www.who.org>.

“Department of Transportation 49 CFR Part 171-178 Hazardous Materials Regulations,”

<http://www.dot.gov/role.html>.

“Disaster Mortuary Operational Response Team (DMORT) Field Operations Guide,”

U.S. Department of Health and Human Services, Office of Emergency Response, DMORT, August 2000: A compilation and summary of important general information, developed procedures, and reference material; the position description summaries and operational checklists are outlined for each of the positions that comprise a standard DMORT response; the position descriptions provide a formal method to document the basic duties of each position during a mission; the operational checklists represent general operating procedures and common actions that must be accomplished at each phase of deployment by all positions on mission assignment; describes DMORT preparedness, organization, and deployment. To obtain a copy of this report go to their Web site: <http://www.dmort.org/DNPages/DMORTDownloads.htm>.

To obtain information and view DMORT’s WMD equipment to decontaminate chemically contaminated remains, please go to the Web site listed above and find the following MS Power Point presentation: “DMORT WMD Overview by Dale Downey, WMD DMORT Team Leader.”

“Federal Family Assistance Plan for Aviation Disasters,”

National Transportation Safety Board (NTSB), August 2000: Assigns responsibilities and describes the airline and Federal response to an aviation crash involving a significant number of passenger fatalities or injuries (as stated within PL: 104-264, Title VII); the basic document for organizations, which are given responsibilities under this plan, to develop supporting plans and establish procedures.

The role of NTSB is to coordinate and integrate the resources of the Federal government and other organizations; to support the efforts of the local and State government; and to meet the needs of aviation disaster victims and their families. The NTSB assists in coordination of Federal resources for local authorities and the airlines. This report can be obtained from the following Web site: <http://www.nts.gov/Family/family.htm>.

“Guidelines for Mass Fatality Management During Terrorist Incidents Involving Chemical Agents,”

U.S. Army Soldier and Biological Chemical Command, November 2001: Assists ME/Cs and emergency managers to better prepare for and determine the best course of action for responding to mass fatality situations following a chemical WMD incident; addresses general planning considerations as well as identifies the additional steps personnel will need to perform for effective and safe management of chemically contaminated remains.

The document is written by the Improved Response Program under the FY 97 Defense Authorization Bill, (P.L. 104-201, Sept. 23, 1996), commonly called the Nunn-Lugar-Domenici legislation. The document is approved for public release and can be obtained from the following Web site: <http://www.ecbc.army.mil/hld/ip/reports.htm>.

“Joint Tactics, Techniques, and Procedures for Mortuary Affairs in Joint Operations,”

Department of Defense, Joint Publication 4-06, 1996: Establishes joint doctrine and provides joint tactics, techniques, and procedures for mortuary affairs in joint operations to a joint force commander and staff; outlines procedures for the search, recovery, evacuation (to include tracking remains), tentative identification, processing, and/or temporary interment of remains in theaters of operations. This report can be obtained from the following Web site: http://www.dtic.mil/doctrine/jel/new_pubs/jp4_06.pdf.

“Mass Fatality and Casualty Incidents: A Field Guide,”

Robert Jensen, 2000: A preparation guide for responders in managing a mass fatality incident; addresses strategies for senior leaders; identifies key points to consider when establishing a mass fatality response; discusses how to manage and cope with the realities of responding to a mass death incident; identifies ways to manage exposure to bloodborne pathogens and hazardous materials; addresses how to perform search and recovery; as well as how to manage a personal effects depot.

“Mass Fatality Incident: A Planning Guide for Human Forensic Identification (Project No. 19),”

National Institute for Justice, National Center for Forensic Science, Expected publication FY 2003: A reference tool for dealing with critical situations as they relate to the identification, collection, and preservation of victims, in mass fatality incidents. Those who contributed to the production of the planning guide consisted of coroners, DNA researchers, fingerprint analysts, medical examiners, odontologist, physical anthropologists, and radiologists from both the public and private sectors. This report can be obtained from the following Web site: <http://ncfs.ucf.edu>.

“Medical Examiners and Coroners & Bio-Terrorism - A Guidebook for Surveillance & Case Management,”

National Association of Medical Examiners (NAME) and the National Centers for Disease Control and Prevention’s Medical Examiner and Coroner Information Sharing Program (MECISP), expected publication FY 2003: Provides the ME/C information with a syndromic approach to managing biologically contaminated remains; information is listed by the biological agent and provides the ME/C with corresponding precautions to included time course for emergence and appearance of death, expected case fatality rates, personal protective equipment for investigative personnel, appropriate autopsy and facility precautions, specimens to collect, and handling procedures for diagnosis; also addresses incorporating ME/Cs in the public health surveillance system, as it is likely that they may identify the sentinel cases of a biological event. <<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5308a1.htm>>.

Occupational Health and Safety Administration (OSHA) 29 CFR Part 1910, 1030. Occupational Exposure to Bloodborne Pathogens, <http://osha.gov> 1031.

“Pocket Guide for Mass Fatality Management During Terrorist Incidents Involving Chemical Agents,”

U.S. Army Soldier and Biological Chemical Command, and the Department of Justice, Office of Justice Programs, Office of the State and Local Domestic Preparedness Program, May 2003: A pocket guide (a tri-fold brochure that can be laminated) that supports the “Guidelines for Mass Fatality Management During Terrorist Incidents Involving Chemical Agents” report; provides quick guidance regarding how chemically contaminated remains should be managed; the Pocket Guide can be obtained from the following Web site: <http://www2.sbccom.army.mil/hld/>.

“Providing Relief to Families After a Mass Fatality,”

Roles of the Medical Examiner’s Office and the Family Assistance Center, by Office of Justice Programs, The Office for Victims of Crime, Fall 2002: Offers information, guidance, resources and lessons learned about working with families of crime victims; provides information regarding how and where to set up an FAC, who should staff the center, and what types of resources are necessary. To obtain a copy of this report go to their Web site, http://www.ojp.usdoj.gov/ovc/publications/bulletins/prfmf_11_2001/welcome.html.

“Public Health Service 42 CFR Part 72: Interstate Transportation of Etiologic Agents, <http://www.cdc.gov/od/ohs>.

“Transportation Emergency Preparedness Program - Model Procedure for Medical Examiner/Coroner on the

Handling of a Body/Human Remains that are Potentially Radiologically Contaminated,”

Sponsored by the Department of Energy (DOE), September 2000: Outlines precautions and provides guidance to protect personnel involved in the recovery and disposition of potentially radiologically contaminated remains. (The precautions and guidance outlined in this report are general and should not be considered all-inclusive.) The ME/C should already have some general knowledge regarding precautions that are necessary when handling bodies that may have been or have been exposed to hazardous materials. For further information, please go to the DOE's Web site <http://www.em.doe.gov/otem/coronerv2.pdf>.

Additional topics include jurisdictional issues in matters of bioterrorism, procedures for final body disposition and funding sources for education, training, equipment, and laboratory reimbursements. This document is published by CDC in the MMWR Reports and Recommendations format and is available on the CDC Web site. For more information regarding the MECISP, visit their Web site at <http://www.cdc.gov/epo/dphsi/mecisp/index.htm>.

United States Postal Service 39 CFR Part 111 Mailability of Etiologic Agents, <http://www.access.gpo.gov>.

ENDNOTES

ENDNOTES

- ¹ U.S. Department of Homeland Security. "Department of Homeland Security (DHS) Organization." DHS Organization, 1-2. Who Will Be Part of the New Department. 7 July 2003 <www.dhs.gov/dhspublic/display!theme=13>.
- ² Linda Younge Landisman, DrPH, MSW. Public Health Management of Disasters: The Practice Guide. 2001. APHA
- ³ The Center for Law and the Public's Health, Georgetown and Johns Hopkins Universities, The Model State Emergency Health Powers Act Draft for Discussion (2001).
- ⁴ Maryland Department of the Environment. Baltimore, Maryland. [cited 10 September 2004] <<http://www.mde.state.md.us/>>.
- ⁵ Maryland Department of Public Works. Baltimore, Maryland. [cited February 2004] <<http://www.ci.baltimore.md.us/government/dpw/>>.
- ⁶ Metropolitan Medical Response System. Washington, District of Columbia [cited 2004] <<http://mmrs.fema.gov/>>.
- ⁷ J. McGuire. Embalming and its effects on contagious organisms. 2000.
- ⁸ Centers for Disease Control and Prevention (CDC). "Death Investigation Summaries." CDC/Division of Public Health Surveillance and Informatics, 1-4. Death Investigation Systems by State and by Type for the United States and Canada. 10 February 2003 <www.cdc.gov/epo/dphsi/mecisp/summaries.htm>.
- ⁹ Department of Vital Records and Statistics. Richmond, Virginia. [cited 2004] <<http://www.vdh.state.va.us/>>.
- ¹⁰ National Guard WMD-Civil Support Teams. Washington, District of Columbia. [cited August 2004] <<http://www.globalsecurity.org/military/agency/army/wmd-cst.htm>>.
- ¹¹ U.S. Department of Homeland Security (DHS), Department of Homeland Security Reorganization Plan (Pursuant to Section 1502 of the Department of Homeland Security Act of 2002) 1 (2002).
- ¹² Federal Bureau of Investigation. Washington, District of Columbia. [cited September 2004] <<http://www.fbi.gov/terrorinfo/terrorism.htm>>.
- ¹³ Disaster Medical Assistance Teams. Washington, District of Columbia. [cited 2004] <<http://www.medicom.org/public/tadmat/ndms/dmat.html>>.
- ¹⁴ Office of Victims of Crime. Washington, District of Columbia. [cited September 2004] <<http://www.ojp.usdoj.gov/ovc/>>.
- ¹⁵ Director of Military Support. Washington, District of Columbia. [cited 2004] <<http://www.globalsecurity.org/military/agency/army/doms.htm>>.
- ¹⁶ Joint Task Force Civil Support. Fort Monroe, Virginia. [cited 2004] <<http://www.jtfc.northcom.mil/pages/mission.html>>.
- ¹⁷ Armed Forces Institute of Pathology. Rockville, Maryland. [cited 2001] <<http://www.afip.org/>>.
- ¹⁸ Office of the Armed Forces Medical Examiner. Rockville, Maryland. [cited 2004] <<http://www.afip.org/Departments/oafme/>>.
- ¹⁹ U.S. Army Medical Research Institute of Infectious Disease. Fort Detrick, Maryland. [cited April 2004] <<http://www.usamriid.army.mil/aboutpage.htm>>.
- ²⁰ U.S. Army Medical Research Institute of Chemical Defense. Aberdeen Proving Ground, Maryland. [cited 2004] <<http://chemdef.apgea.army.mil/>>.

- ²¹ U.S. Army Technical Escort Unit. Aberdeen Proving Ground, Maryland. [cited 2002] <<http://www.globalsecurity.org/wmd/library/news/usa/2002/usa-021113-dod01.htm>>.
- ²² US Marine Corp Chemical Biological Incident Response Force. Washington, District of Columbia. [cited February 2004] <<http://www.cbirf.usmc.mil/mission.htm>>.
- ²³ National Transportation Safety Board Disaster Assistance. Washington, District of Columbia. [cited 2004] <<http://www.nts.gov/Family/family.htm>>.
- ²⁴ Interpol. Lyon, France. [cited September 2004] <<http://www.interpol.int/>>.
- ²⁵ Salvation Army. Alexandria, Virginia. [cited 2004] <<http://www.salvationarmyusa.org/>>.
- ²⁶ International Critical Incident Stress Foundation. Ellicott City, Maryland. [cited 2004] <<http://www.icisf.org/>>.
- ²⁷ Kurt B. Nolte, Stephen S. Yoon, & Carol and Pertowski. 2000. "Letters, Medical Examiners, Coroners, and Bioterrorism." *Emerging Infectious Diseases* 6, no. 5, September-October: 559-60. Letter to the Editor Explaining Why Medical Examiners and Coroners Should Be Included in Developing Federal, State, and Local Plans for Detecting and Responding to Bioterrorism <www.cdc.gov/ncidod/eid/v06no5/pdf/nolte_letter.pdf>.
- ²⁸ National Center for Forensic Science, National Institute of Justice, *Mass Fatality Incidents: A Guide for Human Forensic Identification* (2002).
- ²⁹ *Medical Examiners and Coroners & Bio-Terrorism- A Guidebook for Surveillance & Case Management*. Atlanta, GA. Retrieved June 2004 from <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5308a1.htm>.
- ³⁰ Robert Andrew Jensen. 2000. *Mass Fatality and Casualty Incidents: A Field Guide*. Boca Raton, FL: CRC Press.
- ³¹ The Office for Victims of Crime. Fall 2002. *Providing Relief to Families After a Mass Fatality*. Retrieved November 2002 from http://www.ojp.usdoj.gov/ovc/publications/bulletins/prfmf_11_2001/welcome.html.
- ³² U.S. Department of Health and Human Services, Office of Emergency Response, DMORT. August 2000. "Disaster Mortuary Operational Response Team (DMORT) Field Operations Guide." <<http://www.dmort.org/DNPages/DMORTDownloads.htm>>.
- ³³ The American Experience *Influenza 1918*. [cited 2004] <<http://www.pbs.org/wgbh/amex/influenza/filmmore/index.html>>.
- ³⁴ Chairman of the Joint Chiefs of Staff, Armed Forces of the United States, Joint Publication No. 4-06, *Joint Tactics, Techniques, and Procedures for Mortuary Affairs in Joint Operations* (2002).
- ³⁵ William A. Lake, Paul D. Fedele, & Stephen M. Marshall. U.S. Army Soldier and Biological Chemical Command (SBCCOM), Report No. ECBC-TR, *Guidelines for Mass Casualty Decontamination During a Terrorist Chemical Agent Incident* (2000).
- ³⁶ Department of the Army, Headquarters, *The Army Chemical Agent Safety Program Army Regulation, Safety* (2001).
- ³⁷ Department of the Army, Headquarters, Pamphlet No. 385-61, *Toxic Chemical Agent Safety Standards* (2002).
- ³⁸ Department of the Army, Medical Services, Pamphlet No. 40-173, *Occupational Health Guidelines for the Evaluation and Control of Exposure to Nerve Agents GA, GB, GD, and VX* (Draft REV January 2003).
- ³⁹ Department of the Army, Medical Services, Pamphlet No. 40-8, *Occupational Health Guidelines for the Evaluation and Control of Exposure to Mustard Agents H, HD, and HT* (Draft REV January 2003).
- ⁴⁰ R. J. Mioduszewski, S. A. Reutter, L. L. Miller, E. J. Olajos, & S.A. Thomson. 1998; 2000 Errata Summary. *Evaluation of Airborne Exposure Limits for G-Agents: Occupational and General Population Exposure Criteria*, Aberdeen Proving Ground, MD: Edgewood Research, Development, and Engineering Center, U.S. Army Chemical and Biological Defense Command no. ERDEC-TR-489.
- ⁴¹ *Medical Examiner Coroner Guide for Mass Fatality Management of Chemically Contaminated Remains*. Aberdeen Proving Ground, Maryland. [cited 2004] <<http://www.edgewood.army.mil/hld/ip/reports.htm>>.
- ⁴² Department of Defense, Armed Forces Epidemiological Board. 2003, Details the consideration of a request submitted by the Deputy Assistant Secretary of Defense for Clinical and Program Policy to review a proposed irradiation procedure for decontamination of anthrax contaminated human remains. *Disposition of Irradiated Remains - 2003 - 10*. Memo, trans. Health Affairs Assistant Secretary of Defense. Falls Church, VA.

⁴³ Department of Defense, Armed Forces Epidemiological Board (AFEB), Workgroup of AFEB to review issue of potentially infectious human remains. Re: Memo, 14 January 2003 from AFEB to the Health Affairs Assistant Secretary of Defense. Falls Church, VA.

⁴⁴ International Air Transport Association. 2001. Appendix A — Glossary. In *Dangerous Goods Regulations: 43rd Edition, Effective 1 January 2002*, 633. Montreal, Quebec, Canada: International Air Transport Association.

REFERENCES

REFERENCES

- Armed Forces Radiobiology Research Institute (AFRRI). To provide recommendations on the handling of human remains that may be contaminated with radioactive material. 2003. Re: Memo, 12 February 2003, from Deputy Assistant Secretary of Defense (HA) to the AFRRI Director in reference to the Disposition of Human Remains Contaminated by Radioactive Agents. Executive Summary.
- Ed Blackman, Research Planning, Inc., A reference list of various reports, technical guides, books, etc., for information research in response to request for information regarding the effects of embalming fluids as they pertain to neutralizing biological warfare agents. 2000. Fax. Chemical and Biological Information Analysis Center (CBIAC).
- Bureau of Justice Assistance and the Centers for Disease Control and Prevention, U.S. Department of Justice, Office of Justice Programs, National Institute of Justice, *Death Investigation: A Guide for the Scene Investigator Research Report* (1999).
- Center for Infectious Disease Research and Policy (CIDRAP). 26 November 2002. "*Bioterrorism Preparedness, Planning, and Response.*" Bioterrorism/Planning, 1-18. Federal Initiatives; Local and State Planning; Hospital Preparedness; Protection of Building Environments; Etc. 18 June 2003 <www.cidrap.umn.edu/cidrap/content/bt/bioprep/planning/bt-prep-planning.html>.
- Center for Infectious Disease Research and Policy (CIDRAP). 12 November 2002. "*History, Likely Agents, Perpetrators, and Dissemination.*" Bioterrorism/Overview, 1-7. Bio Preparedness; Historical Perspective; Most Likely Biological Agents; Potential Perpetrators; Means of Dissemination; Outbreaks of Weaponized Anthrax; Etc. 18 June 2003 <www.cidrap.umn.edu/cidrap/content/bt/bioprep/biofacts/bioterr-overview.html>.
- Center for Infectious Disease Research and Policy (CIDRAP). 13 March 2003. "*African Swine Fever.*" Biosecurity/Animal Diseases/African Swine Fever, 1-8. Agent; Hosts; Epidemiology; ASF as a Biological Weapon; Clinical Features; Differential Diagnosis; Treatment; Prevention; Outbreak Control; Etc. 18 June 2003 <www.cidrap.umn.edu/cidrap/content/biosecurity/agbiosec/animdisease/asf.html>.
- Center for Infectious Disease Research and Policy (CIDRAP). 25 February 2003. "*Anthrax: Current, Comprehensive Information on Pathogenesis, Microbiology, Epidemiology, Diagnosis, Treatment, and Prophylaxis.*" Bioterrorism/Anthrax/Overview, 1-51. Agent; Pathogenesis; Epidemiology; Clinical Features; Differential Diagnosis; Treatment Recommendations; Etc. 18 June 2003 <www.cidrap.umn.edu/cidrap/content/bt/anthrax/biofacts/anthraxfactsheet.html>.
- Center for Infectious Disease Research and Policy (CIDRAP). 27 May 2003. "*Botulism: Current, Comprehensive Information on Pathogenesis, Microbiology, Epidemiology, Diagnosis, and Treatment.*" Bioterrorism/Botulism/Overview, 1-28. Agent; Pathogenesis; Epidemiology; Clinical Features; Diagnosis; Treatment; Emergency Response; Issues Related to Autopsies and Burial; Etc. 18 June 2003 <www.cidrap.umn.edu/cidrap/content/bt/botulism/biofacts/botulismfactsheet.html>.
- Center for Infectious Disease Research and Policy (CIDRAP). 27 January 2003. "*Overview of Agricultural Biosecurity.*" Biosecurity/Agricultural Biosecurity/Overview, 1-13. Historical Perspective; the Agricultural Biosecurity Threat; Potential Economic Impact in the United States; Potential Perpetrators; Pathogens; Etc. 18 June 2003 <www.cidrap.umn.edu/cidrap/content/biosecurity/ag-biosec/biofacts/agbiooverview.html>.
- Center for Infectious Disease Research and Policy (CIDRAP). 26 August 2003. "*Plague: Current, Comprehensive Information on Pathogenesis, Microbiology, Epidemiology, Diagnosis, Treatment, and Prophylaxis.*" Bioterrorism/Plague/Overview, 1-45. Agent; Pathogenesis; Epidemiology; Clinical Syndromes; Pediatric Considerations; Differential Diagnosis; Postexposure Prophylaxis for Pneumonic Plague; Plague Vaccines; Etc. 1 October 2003 <www.cidrap.umn.edu/cidrap/content/bt/plague/biofacts/plaguefactsheet.html>.
- Center for Infectious Disease Research and Policy (CIDRAP). 11 June 2003. "*Smallpox: Current, Comprehensive Information on Pathogenesis, Microbiology, Epidemiology, Diagnosis, Treatment, and Prophylaxis.*" Bioterrorism/Smallpox/Overview, 1-52. Agent; Pathogenesis; Epidemiology; Clinical Features; Differential Diagnostic Issues; Treatment; Smallpox Vaccination; Infection Control; Etc. 18 June 2003 <www.cidrap.umn.edu/cidrap/content/bt/smallpox/biofacts/smlpxsummary.html>.
- Center for Infectious Disease Research and Policy (CIDRAP). 20 February 2003. "*Tularemia: Current, Comprehensive Information on Pathogenesis, Microbiology, Epidemiology, Diagnosis, and Treatment.*" Bioterrorism/Tularemia/Overview, 1-43. Agent; Pathogenesis; Epidemiology; Clinical Syndromes; Differential Diagnosis; Treatment; Tularemia Vaccination; Infection Control; Etc. 18 June 2003 <www.cidrap.umn.edu/cidrap/content/bt/tularemia/biofacts/tularemiafactsheet.html>.
- Center for Infectious Disease Research and Policy (CIDRAP). 24 February 2003. "*Viral Hemorrhagic Fever (VHF): Current, Comprehensive Information on Pathogenesis, Microbiology, Epidemiology, Diagnosis, Treatment, and Prophylaxis.*" Bioterrorism/Viral Hemorrhagic Fever/Overview, 1-52. Agent; Pathogenesis; Epidemiology; Clinical Characteristics; Laboratory Diagnosis; Treatment; Postexposure

- Prophylaxis; Vaccination; Infection Control; Etc. 18 June 2003 <www.cidrap.umn.edu/cidrap/content/bt/vhf/biofacts/vhffactsheet.html>.
- Center for Law and the Public's Health, Georgetown and Johns Hopkins Universities, The Model State Emergency Health Powers Act Draft for Discussion (2001).
- Centers for Disease Control and Prevention (CDC). "Death Investigation Summaries." CDC/Division of Public Health Surveillance and Informatics, 1-4. Death Investigation Systems by State and by Type for the United States and Canada. 10 February 2003 <www.cdc.gov/epo/dphsi/mecisp/summaries.htm>.
- Centers for Disease Control and Prevention (CDC), Federal Register No. 50, Recommendations for Protecting Human Health and Safety Against Potential Adverse Effects of Long-Term Exposure to Low-Doses of Agents GA, GB, VX, Mustard Agents (H, HT, HD) and Lewisite (L) (1988).
- Centers for Disease Control and Prevention (CDC). 30 June 1995. "Notice to Readers Update: Management of Patients with Suspected Viral Hemorrhagic Fever—United States." Morbidity and Mortality Weekly Report (MMWR) 44(25); 475-479; MMWR/1-5. This Notice Provides Interim Recommendations That Update the 1988 Guidelines for Health-Care Settings in the United States. 16 January 2003 <www.cdc.gov/mmwr/preview/mmwrhtml/00038033.htm>.
- Centers for Disease Control and Prevention (CDC). 2000. Biological and Chemical Terrorism: Strategic Plan for Preparedness and Response. Morbidity and Mortality Weekly Report (MMWR) 49, no. RR-4, 21 April.
- Centers for Disease Control and Prevention (CDC), NIOSH, the National Personal Protective Technology Laboratory (NPPTL). 15 October 2002. "Concept for CBRN Air-Purifying Escape Respirator Standard." CDC/NIOSH/NPPTL, 1-8. Presents Requirements That Must Be Met in Order to Develop a NIOSH Standard for Escape Only Air-Purifying Respirator That Addresses CBRN Materials Identified as Inhalation Hazards from Possible Terrorist Events for Use by the General Working Population. 2 July 2003 <www.cdc.gov/niosh/npptl/aperconoct15.html>.
- Centers for Disease Control and Prevention (CDC), Office of Health and Safety. "The 1, 2, 3's of Biosafety Levels." OHS, Biosafety, 1-7. Describes the Different Biosafety Levels and Current Safety Standards Developed for Microbiological and Biomedical Laboratories. 24 June 2003 <www.cdc.gov/od/ohs/symp5/jyrtxt.htm>.
- Centers for Disease Control and Prevention (CDC), Office of Health and Safety. 21 July 1980. "Interstate Shipment of Etiologic Agents." Vol. 45, No. 141, Part 72, 1-7. Requirements for the Transportation of Etiologic Agents in Interstate Traffic Prescribed to the Department of Transportation and Other Agencies of the Federal Government. 6 February 2003 <www.cdc.gov/od/ohs/biosfty/shipregs.htm>.
- Central Joint Mortuary Affairs Office (CJMAO), Recommend Interim Policy for Disposition of Contaminated Human Remains. Memo from Department of the Army, Office of the Assistant Secretary Manpower and Reserve Affairs to the Under Secretary of Defense (Personnel and Readiness). Washington, D.C.
- Chairman of the Joint Chiefs of Staff, Armed Forces of the United States, Joint Publication No. 4-06, Joint Tactics, Techniques, and Procedures for Mortuary Affairs in Joint Operations (2002).
- Chemical and Biological Defense Information Analysis Center, Draft. 2000. Biological Warfare Improved Response Program (BW IRP), CDC/DoD Smallpox, Workshop. Report, trans. Domestic Preparedness Program U.S. Army Soldier and Biological Chemical Command (SBCCOM), Contract No. SPO700-00-D-3180, Task No. 011, Delivery Order No. 015. Gunpowder, MD.
- Department of Defense, Armed Forces Epidemiological Board. 2003, Details the consideration of a request submitted by the Deputy Assistant Secretary of Defense for Clinical and Program Policy to review a proposed irradiation procedure for decontamination of anthrax contaminated human remains. Disposition of Irradiated Remains - 2003 - 10. Memo, trans. Health Affairs Assistant Secretary of Defense. Falls Church, VA.
- Department of Defense, Armed Forces Epidemiological Board (AFEB), Workgroup of AFEB to review issue of potentially infectious human remains. Re: Memo, 14 January 2003 from AFEB to the Health Affairs Assistant Secretary of Defense. Falls Church, VA.
- Department of the Army, Headquarters, The Army Chemical Agent Safety Program Army Regulation, Safety (2001).
- Department of the Army, Headquarters, Army Regulation No. 638-2, Deceased Personnel: Care and Disposition of Remains and Disposition of Personal Effects Unclassified (2000).
- Department of the Army, Headquarters, Marine Corps Warfighting Publication (MCWP) No. 3-37.3, NBC Decontamination Operations Field Manual FM 3-5 (2002).
- Department of the Army, Headquarters, Pamphlet No. 385-61, Toxic Chemical Agent Safety Standards (2002).
- Department of the Army, Medical Services, Pamphlet No. 40-8, Occupational Health Guidelines for the Evaluation and Control of Exposure to Mustard Agents H, HD, and HT (Draft REV January 2003).
- Department of the Army, Medical Services, Pamphlet No. 40-173, Occupational Health Guidelines for the Evaluation and Control of Exposure to Nerve Agents GA, GB, GD, and VX (Draft REV January 2003).

- Departments of the Army, Headquarters, Defense Logistics Agency, Department of the Air Force, Department of the Navy, Marine Corp Office, Packaging of Hazardous Material Army Regulation (1996).
- Deputy Assistant Secretary of the Army. 2002. Comments to Federal Register Request for Comments (67 FR: 894-901). Memo. Centers for Disease Control (CDC). Environment, Safety, and Occupational Health OASA (I&E).
- Deputy Secretary of Defense, Issues policy and assigns responsibility for mortuary affairs within the DOD. 2000. Mortuary Affairs Policy. Directive, trans. Department of Defense. Washington, D.C.
- Deputy Secretary of Defense, Memo establishes policy on disposition of contaminated human remains. 2003. Policy on Contaminated Human Remains. Memo, trans. Department of Defense. Washington, D.C.
- 49 Code of Federal Regulation
<<http://ecfrback.access.gpo.gov/otcgi/cfr/otfilter.cgi?DB=3&query=49000000172®ion=BIBSRT&action=view&SUBSET=SUBSET&ROM=1&SIZE=10&ITEM=1>>.
- JH Grotte, and LI Yang, Institute for Defense Analysis (IDA), IDA Document No. D-2176, Report of the Workshop on Chemical Agent Toxicity for Acute Effects (2001).
- Henneberry, M.S., Onnalee. 2001. *Bioterrorism Information Resources*. Atlanta, GA. Centers for Disease Control and Prevention.
- International Air Transport Association. 2001. Appendix A — Glossary. In *Dangerous Goods Regulations: 43rd Edition, Effective 1 January 2002*, 633. Montreal, Quebec, Canada: International Air Transport Association.
- International Air Transport Association. 2001. Section 4. Identification. In *Dangerous Goods Regulations: 43rd Edition, Effective 1 January 2002*, 175, 183. Montreal, Quebec, Canada: International Air Transport Association.
- International Air Transport Association. 2001. Section 5. Packing. In *Dangerous Goods Regulations: 43rd Edition, Effective 1 January 2002*, 307, 395. Montreal, Quebec, Canada: International Air Transport Association.
- International Air Transport Association. 2001. Section 6. Packing Specifications and Performance Tests. In *Dangerous Goods Regulations: 43rd Edition, Effective 1 January 2002*, 503, 517. Montreal, Quebec, Canada: International Air Transport Association.
- Jensen, Robert Andrew. 2000. *Mass Fatality and Casualty Incidents: A Field Guide*. Boca Raton, FL: CRC Press.
- Lake, William A., Fedele, Paul D., and Marshall, Stephen M., U.S. Army Soldier and Biological Chemical Command (SBCCOM), Report No. ECBC-TR, *Guidelines for Mass Casualty Decontamination During a Terrorist Chemical Agent Incident (2000)*.
- McGuire, J., Embalming and its effects on contagious organisms. 2000.
- Mioduszewski R.J., Reutter, S.A., Miller, L.L., Olajos, E.J., & Thomson, S.A. 1998; and 2000 Errata Summary. *Evaluation of Airborne Exposure Limits for G-Agents: Occupational and General Population Exposure Criteria*, Aberdeen Proving Ground, MD: Edgewood Research, Development, and Engineering Center, U.S. Army Chemical and Biological Defense Command no. ERDEC-TR-489.
- National Center for Forensic Science, National Institute of Justice, Mass Fatality Incidents: A Guide for Human Forensic Identification (2002).
- National Research Council (NRC), Acute Exposure Guidelines for Selected Airborne Chemicals (2003).
- Nolte, Kurt B., Stephen S. Yoon, and Carol and Pertowski. 2000. "Letters, Medical Examiners, Coroners, and Bioterrorism." *Emerging Infectious Diseases* 6, no. 5, September-October: 559-60. Letter to the Editor Explaining Why Medical Examiners and Coroners Should Be Included in Developing Federal, State, and Local Plans for Detecting and Responding to Bioterrorism <www.cdc.gov/ncidod/eid/vol6no5/pdf/nolte_letter.pdf>.
- Office of the Secretary of Defense-Chemical and Biological Defense (OASD-CBD), For general distribution from DoD Nuclear and Chemical and Biological Defense Programs. 2001. Interim Certification of Chemical and Biological Data. Memo, to Deputy for Chemical/Biological Defense. Washington, D.C.
- Reutter, S.A., Mioduszewski, R.J., & Thomson, S.A. 2000. *Evaluation of Airborne Exposure Limits for VX: Worker and General Population Exposure Criteria*, Aberdeen Proving Ground, MD: Edgewood Research, Development, and Engineering Center, U.S. Army Chemical and Biological Defense Command no. ECBC-TR-074.
- Riddle, James R. COL OTSG. February 5, 2003. "Disposition of Contaminated Remains." <Email: Response from Dr. Kim, Centers for Disease Control and Prevention, in regard to shipment of contaminated remains>.
- Safety, Department of the Army, Army Regulation No. 385-61, The Army Chemical Agent Safety Program (1997).
- Seigle, Greg. 24 January 2003. "Pentagon Eyes Mass Graves: Option Would Fight Contamination After Bioterror Deaths." *The Denver Post*: Special to The Denver Post. January 24, 2003 <<http://ebird.dtic.mil/Jan2003/e20030124148864.html>>.

- Steadman, Dawnie Wolfe, ed. 2003. *Hard Evidence: Case Studies in Forensic Anthropology*. Upper Saddle River, NJ: Prentice Hall, Pearson Education.
- Transportation of Emergency Preparedness Program (TEPP), U.S. Department of Energy, *Model Procedure for Medical Examiner/Coroner on the Handling of a Body/Human Remains that are Potentially Radiologically Contaminated (2002)*.
- U.S. Army Center for Health Promotion and Prevention Medicine, Technical Guide No. 275, *Personal Protective Equipment Guide for Military Treatment Facility Personnel Handling Casualties from Weapons of Mass Destruction and Terrorism Events (4th DRAFT July 30, 2002)*.
- U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), Technical Report No. 47-EM-3767-00, *Evaluation of Airborne Exposure Limits for Sulfur Mustard (HD): Occupational and General Population Exposure Criteria (2000)*.
- U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), Technical Guide No. 195, *Guidelines for Protecting Mortuary Affairs Personnel from Potentially Infectious Materials (2001)*.
- U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), Technical Guide No. 230, *Chemical Exposure Guidelines for Deployed Military Personnel, Jan 02/Update April 03 (Currently being reviewed by NRC, forthcoming 2004)*.
- U.S. Department of Homeland Security. "Department of Homeland Security (DHS) Organization." DHS Organization, 1-2. Who Will Be Part of the New Department. 7 July 2003 <www.dhs.gov/dhspublic/display!theme=13>.
- U.S. Department of Homeland Security (DHS), Department of Homeland Security Reorganization Plan (Pursuant to Section 1502 of the Department of Homeland Security Act of 2002) 1 (2002).
- U.S. Department of Justice. "Office for Domestic Preparedness." ODP, 1. About ODP; Training and Technical Assistance; Equipment Acquisition Grants; Exercise Development and Support; State-Based Needs Assessment; Library; WMD Training Course; Etc. 7 July 2003 <www.ojp.usdoj.gov/odp/>.
- U.S. Department of Labor, Occupational Safety and Health Administration. "General Description and Discussion of the Levels of Protection and Protective Gear 1910.120 App B." U.S. Department of Labor, OSHA, Regulations (Standards - 29 CFR), 1-6. Provides Information About Personal Protective Equipment (PPE) Protection Levels Which May Be Used to Assist Employers in Complying with the OSHA PPE Requirements. 2 July 2003 <www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARD&p_id=9767>.
- U.S. Department of Labor, Occupational Safety and Health Administration. "Personal Protective Equipment Test Methods 1910.120 App A." U.S. Department of Labor, OSHA, Regulations (Standards - 29 CFR), 1-8. Provides Non-Mandatory Examples of Tests Which May Be Used to Evaluate Compliance with Paragraphs 1910.120(g)(4)(i) and (ii). 2 July 2003 <www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARD&p_id=9766>.
- U.S. Marine Corps, Field Manual No. 3-5, Marine Corps Warfighting Publication (MCWP) 3-37.3 NBC Decontamination Operations (2002).
- Woods, Jon B. MAJ USAMRIID. January 29 2003. "Mortuary Affair Theater Options: Information SSS." <Email: "Cremation is probably the best way to ensure remains are not contaminated with BW or CW agents; however, there are problems with cremation">.