

## Just the Facts...

### Management of Human Remains from CBRN Environments

**1. PURPOSE.** The purpose of this fact sheet is to clarify terminology and provide some general guidance to those who may have to make decisions regarding the management and disposition of human remains that are associated with a CBRN incident. Hazard- and incident-specific guidance can be obtained directly from CHPPM subject matter experts (SMEs) or from CHPPM documents cited below.

**2. BACKGROUND.** There are established procedures to return human remains from military operations overseas to the United States through facilities at Dover Air Force Base for ultimate release to family. This includes situations where, despite pre-transport screening- remains may contain previously undetected explosive devices that are then identified and removed at the Dover facilities. Numerous questions have been raised about handling/management and transport of remains that may be contaminated by chemical, biological, radiological, or nuclear (CBRN) hazards. In general, an appropriate medical authority, such as the Theater Mortuary Affairs Officer or medical examiner, possibly in coordination with the Joint Security Coordinator, will determine the degree of hazards and appropriate disposition of human remains. All remains that are classified as contaminated are to be processed through the Mortuary Affairs Decontamination Point (MADCP). Post decontamination, preventive medicine (PVNTMD) personnel, in conjunction with dedicated chemical or decontamination units, should be prepared to assist with verifying that the CBRN hazard is mitigated or eliminated to acceptable levels prior to transport. Specific procedures and applicable clearance criteria will depend on the *type and form of agent, conditions of the release, and available monitoring equipment*. Personnel should go through established military channels for PVNTMD subject matter expert to ascertain the most current guidance and criteria.

**3. TERMINOLOGY.** Human remains inherently pose some level of risk that established standard precautions and personal protective equipment (PPE) are designed to mitigate. This does not mean they are “contaminated.” **Human remains are considered contaminated if a residual CBRN agent is present and poses a known or plausible hazard to personnel beyond those addressed by routine precautions used to handle human remains.** There are two types of contamination associated with human remains: *external contamination* refers to hazardous residual agent/contamination on the skin/hair/clothing; *internal contamination* refers to agent/residual hazard contained inside the body or body fluids. In general, chemical and radiation hazards are only from external contamination while biological agents are primarily internal hazards.

**4. KEY CONSIDERATIONS.** Joint Publication 3-11 and USACHPPM TG 244: *The Medical NBC (CBRN) Battlebook* describes key CBRN agents which include various military “warfare” agents as well as certain toxic industrial chemicals (TICs). **For many of these CBRN agents and the threat/release scenarios described by these and other doctrinal and military guidance documents, it will actually not be necessary to classify remains as “contaminated.”** However, the determination of whether remains are contaminated and associated procedures to follow will depend on many factors to include the type of CBRN agent, its characteristics, and the conditions of the release and its environment. Hazard-specific considerations are provided below:

#### → Chemical hazards.

The hazards associated with chemical releases are primarily associated with the potential for residual *external* contamination (e.g., on clothing, skin, hair). This is primarily a concern for chemicals that are considered persistent (e.g., have low volatility and can remain present at hazardous levels for several hours or days). Examples include blister agent sulfur mustard (HD) and nerve agent VX. Non-persistent agents are typically released as a vapor and dissipate/volatilize quickly so the hazard is mitigated without the need for decontamination or verification. Examples include many volatile toxic industrial chemicals (TICs) of military concern (e.g., chlorine gas) as well as highly volatile chemical warfare agents such as Sarin (GB). Remains removed from a CBRN environment involved in the release of non-persistent chemical release generally should not be considered “contaminated” unless unique circumstances warrant specific precautions (such as extremely concentrated exposures including liquid contact, and/or cold temperatures that may slow down the volatilization processes). Table 1 summarizes types of chemical hazards and human remains decontamination considerations.

Non-persistent Chemicals		Persistent Chemicals	
TICs	CWA	CWA	
<ul style="list-style-type: none"> <li>• arsine</li> <li>• ammonia</li> <li>• chlorine</li> <li>• fluorine</li> </ul>	<ul style="list-style-type: none"> <li>• hydrogen sulfide</li> <li>• phosgene</li> <li>• sulfur dioxide</li> </ul>	<ul style="list-style-type: none"> <li>• GB</li> <li>• GA</li> </ul>	<ul style="list-style-type: none"> <li>• VX</li> <li>• HD</li> </ul>
<p><i>Non persistent chemicals</i>– for TICs and vapor-released CWA, human remains require no decontamination as residual will have degraded in minutes. If liquid/droplet CWA was present, may require decontamination decon (soapy water preferred, dilute bleach solution alternative) and/or monitoring to non-detect with available field equipment.</p> <p><i>Persistent chemicals</i> – hazard from vapor-only release should be mitigated by removal of external clothing/PPE. Aerosol/liquid contamination will require decon (soapy water preferred, dilute bleach solution alternative) followed by monitoring to non-detect with field equipment (i.e. ICAM). VX requires use of specialized instrumentation to 'clear' to safe levels (criteria available from USACHPPM).</p>			

→ **Biological hazards.**

As previously stated, biological agents tend to present primarily an *internal contamination* hazard.\* All human remains inherently pose some risk of transmission of biological disease agents that have been *internalized* in a viable form in blood, body fluids, feces, or gastrointestinal contents. These risks can include common transmissible disease (e.g. influenza) or endemic disease (e.g., HIV). Established safety procedures (e.g., standard precaution/barrier nursing techniques) and personnel protective equipment (PPE) are designed to mitigate such risks. Standard procedures/precautions will mitigate the risks associated with some of the biological agents identified as CBRN agents of concern. However, additional safety precautions and PPE are required for certain highly infectious, easily transmissible pathogens, especially those for which effective treatment and preventive measures are not available.

Table 2 summarizes safety/PPE precautions that are recommended for medical personnel working in environments/treating living persons with diseases caused by key agents. The use of these same techniques for persons managing *human remains* of persons infected by such agents is considered a conservative (protective) approach since the agents should become less viable in a non-living host. However, final determination of specific precautions and/or containment/quarantine will be made by the Theater Mortuary Affairs Officer or medical examiner in coordination with PVNTMD personnel.

Standard Precautions		Contact Precautions	Droplet Precautions	Airborne & Contact Precautions
<ul style="list-style-type: none"> <li>• Anthrax</li> <li>• Cholera</li> <li>• Q fever</li> <li>• Shigellosis</li> <li>• Tularemia</li> </ul>	<ul style="list-style-type: none"> <li>• Typhoid fever</li> <li>• Typhus</li> <li>• Toxins</li> </ul>	<ul style="list-style-type: none"> <li>• Brucellosis (if draining lesions)</li> <li>• Melioidosis</li> </ul>	<ul style="list-style-type: none"> <li>• Glanders</li> <li>• Influenza</li> <li>• Viral encephalitides</li> <li>• Plague (Pneumonic) (until patient treated for 3 days)</li> </ul>	<ul style="list-style-type: none"> <li>• Smallpox</li> <li>• Viral hemorrhagic fevers (VHFs) (e.g. Ebola, Marburg)*</li> </ul>
<p>Standard = Gloves, frequent hand washing, splash protection ( gown, mask, eye )            Contact = Standard + isolation/cohorting of patients; dedicated equipment            Droplet = Standard + isolation/cohorting, surgical/HEPA filter/N-95 mask            Airborne = Standard + isolation, monitoring and negative pressure room, HEPA filter/N-95 mask</p> <p>Sources: List includes <i>CDC Category A as well as certain Category B agents</i> <a href="http://www.bt.cdc.gov/agent/agentlist-category.asp">http://www.bt.cdc.gov/agent/agentlist-category.asp</a> and other agents of military operational concern (<i>USACHPPM Technical guide (TG244) The Medical NBC (CBRN) Battlebook</i>), Precautions Reference: <i>USAMRIID's Medical Management of Biological Casualties handbook "The Bluebook."</i> and <i>The Control of Communicable Disease manual (2004) (formerly FM 4-02.33).</i></p> <p><i>*it is recommended that human remains be sealed and buried in leak proof container -embalming not recommended.</i></p>				

\* Remains removed from an area where there was a known aerosol release that deposited persistent agent (e.g., *bacillus anthracis* (anthrax) or toxins) should be externally decontaminated using same procedures as for patients to minimize the possibility of re-aerosolization.

→ **Radiological hazards.**

Determination of the degree of contamination risk, appropriate personal protective measures, and other control measures depend on radiation type, dose and dose rates. *Internal* radiation exposure (generally caused by inhalation or ingestion) will likely pose little health risk to persons exposed to the remains. *External* contamination can be mitigated by removing clothing and washing the skin following normal decontamination procedures. MADCP should perform an external radiation survey to determine decon effectiveness as part of their post-decon survey. (As with chemicals, USACHPPM can provide the quantitative 'levels' for clearance.)