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FOR: JONATHAN WOODSON, M.D., ASSISTANT SECRETARY OF DEFENSE (HEALTH AFFAIRS)

SUBJECT: Defense Health Board Review of the U.S. Army and Joint Mortuary Affairs Center Report "Categorizing Weapons of Mass Destruction Biological Agents into Postmortem Risk Groups" 2012-07

Executive Summary

The United States (U.S.) military trains for the threat of chemical, biological, radiological, and nuclear (CBRN) attacks. This training includes the search for and recovery of contaminated remains, contamination mitigation techniques and operational guidelines for personnel. However, the U.S. military currently lacks policy governing the safe transport of contaminated human remains (CHR) into the U.S. Given the real chance that Service members may be exposed to biological agents of concern, it is essential to address identified gaps in scientific knowledge. Policy and guidance must be developed using the best scientific guidance available in order for the Department of Defense to professionally care for Fallen Service members in a manner that is commensurate with their sacrifice. However, DoD has not yet faced a CHR case and has not yet had to address the issue of CHR transport. Preparedness for such an event is of utmost importance to mitigate potential risk to personnel and reassure family members that their loved ones will be returned home for a proper burial., To address this gap, the U.S. Army Logistics Branch (G-4), under the Office of the Deputy Chief of Staff of the Army and the Joint Mortuary Affairs Center, developed a report to categorize biological agents into postmortem risk groups, which would then be used to develop policy for transporting contaminated remains. This Defense Health Board (DHB) recommendation is based on a comprehensive review of that report, including the risk categorization and ranking methodology, definitions used, and recommendations made in the report. Along with several concrete recommendations outlined in section III, the findings of the Board include that this report provides credible scientific support for the transportation of CHR and provides a basis for final guidance on the issue. The Board recommends that the concepts described in the report be used by the Executive Agent as interim guidance. Final guidance should be developed with the assistance of the subject matter experts (SMEs) at the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID). Given the importance of this issue the Board recommends that this be completed in a timely manner

I. Background and Introduction

The U.S. military prepares for the full range of military operations in varying environments, including the threat of a CBRN attack or CBRN events. This training

includes mortuary processes including decontamination. Although guidelines exist for decontamination of CHR outside of the Continental U.S. (OCONUS), there is currently no comprehensive policy for the transport of CHR for final disposition. In order to address this gap, the U.S. Army G-4 Mortuary Affairs Task Force (MATF) convened a panel of mortuary SMEs designated as the Mortuary Affairs (MA) Science and Technology Working Group (STWG) with the task of developing postmortem biological classification and transportation guidelines. This working group examined available evidence and found that current policies, including those within DoD, other government agencies and the private sector, do not directly address CHR. Where CHR is discussed, it is generally assumed that exposure to contaminated decedents poses the same risk as exposure to live contaminated tissue, despite a lack of scientific evidence confirming this assumption. In light of this gap, the group proposed a framework to assess exposure risk associated with the handling of decedents infected with biological agents of concern. The working group presented their findings in the report "Categorizing Biological Agents of Concern to Assist Mortuary Affairs Operations," (Attachment A) and requested that the report be presented to the DHB to obtain the Board's concurrence on their individual findings, specifically the:

- Definition of exposure risk postmortem.
- Categorization of postmortem risk groups
- Use of specific non-weapons of mass destruction (WMD) biological agents as comparative and benchmark agents regarding exposure risk to those handling decedents.
- Prioritization of future postmortem research involving bio agents.
- Recommendation that biological agents scoring lower than all the benchmark agents for transporters do not require any additional packaging to safely transport decedents to and through the U.S.
- Recommendation that biological agents categorized as Risk Group three for transporters do not require any additional packaging to safely transport decedents to and through the US.
- Transporters that handle biologically contaminated decedents that are packaged are not required to wear anything additional than Standard Precautions for contact hazards.

The STWG presented the report to the Army G4 in July 2009. In a memorandum dated January 31, 2011, the Surgeon General of the U.S. Army recommended that the DHB review the report for endorsement. On April 20, 2012, the Acting Under Secretary of Defense for Personnel and Readiness (USD(P&R)) formally tasked the Board to conduct this review.

The Department of Defense (DoD) Joint Publication 4-06 entitled *Mortuary Affairs in Joint Operations* (2006) cites that the Joint Mortuary Affairs Program, as the broadly based military program providing for the care and disposition of missing and deceased personnel, provides guidance to the Combatant Commands and the Services based on the guidance of the Secretary of Defense and the Chairman of the Joint Chiefs of Staff.[1]

While the Services are independently responsible for mortuary support, the Secretary of the Army serves as the Executive Agent for MA for DoD. The DoD MA mission is defined as the search, recovery, evacuation, identification, and processing and/or temporary internment of human remains. [1] However, current DoD policy and procedures do not explicitly address the transport of CBRN CHR or the differences between biological contaminated living and deceased. As such, the currently perceived level of risk precludes traditional transportation methods back to the United States. [2] Additionally, in the case of a CBRN event, DoD may be asked to provide support to other agencies such as the Department of Homeland Security or the Department of State. Because of this role in supporting civilian and other Federal government organizations, DoD should develop a comprehensive policy regarding CHR transport.

II. Methodology

The DHB received the request to review the report from the USD(P&R) on April 20, 2012. Recognizing the importance of addressing this issue, the Board immediately convened a subset of four DHB members, led by Dr. George Anderson, to lead the Board's review of the STWG's report. The group first developed Terms of Reference (TOR) (Attachment B) to outline the scope and guide the review process. They met on June 26, 2012 to review and approve the TOR, discuss the report and plan the way forward. On August 20, 2012, the members met to discuss the report findings, and determined that they needed additional information from the Joint Mortuary Affairs Center (JMAC) and the report authors.

On September 26, 2012, DHB members met at Fort Lee, received briefings on the report and conferred with several MA SMEs. The group received briefings from:

- JMAC leadership, training, and report authors
- U.S. Army Institute of Public Health
- USAMRIID
- Joint Requirements Office (JRO)

The members discussed the report's findings and recommendations, the evidence base supporting the report and methodology used to determine the risk groups with the SMEs. On November 27, 2012, Dr. Anderson presented the members' findings and proposed options to the DHB in a public forum.

Deliberations

During the DHB meeting held on November 27, 2012 the Board deliberated the findings and proposed options for addressing these findings. The deliberation included a consensus regarding the need for a timely review of the report by the SMEs at USAMRIID. As the Department is currently functioning without established guidance on the issue of CHR, it is essential that final guidance be established as soon as possible. The Board also discussed the need for the Executive Agent to institute a periodic review

of the biological agents of concern referenced in the final guidance to integrate scientific developments in a timely manner. Members also acknowledged the Department's ability to internally address the issue of post mortem research, citing the existing medical resources currently residing within the Department, such as USAMRIID, and noting that these are capable of addressing postmortem research. Following their deliberations, Board members voted unanimously to forward the selected courses of action as recommendations to the ASD(HA).

III. Findings and Recommendations

Report Development Process/Methodology

The STWG hypothesized that biological agents of concern do not all necessarily and inherently pose a significant level of risk to those handling CHR.

To obtain concurrence on this hypothesis from the mortuary community, the STWG was comprised of SMEs representing the following entities:

- United States Department of Health and Human Services' Centers for Disease Control and Prevention (CDC)
- U.S. Central Command, Joint Chiefs of Staff Logistics (J4)
- Department of Defense (DoD) Liaison to CDC
- JRO on Chemical Biological Radiological and Nuclear Defense
- U.S. Army Proponency Office of Preventive Medicine
- Office of the Assistant Secretary of Army for Manpower and Reserve Affairs
- JMAC
- US Army Center for Health Promotion and Preventive Medicine (CHPPM) (now the U.S. Army Institute of Public Health)
- Joint Program Executive Office for Chemical Biological Defense

The STWG SMEs sought to develop a framework for categorizing biological agents into post mortem risk groups, and thereby define the risk to CHR handlers. Members used the Delphi technique to reach consensus on postmortem risk categorization.* To frame their hypothesis, the authors made numerous underlying assumptions including staff immunization status, that embalming would not take place, compliance with personal protective equipment policy and regulatory requirements, and insignificant postmortem aerosol transmission.

The process undertaken by the STWG to compose the report used the best available, (although highly limited) scientific research. The STWG made a concerted effort to

* The Delphi technique is a forecasting or decision-making technique that uses written questionnaires to eliminate the influence of personal relationships and the domination of committees by strong personalities. [8]

bring together key stakeholders to gain a holistic perspective of the issue of contaminated remains. The report is a credible scientific report that, once updated, will provide support for guidance on the issue of transporting contaminated remains. The body of information within the report will provide a high level of confidence regarding the basis for the guidance. In order to mitigate the current deficit regarding guidance on this topic the Board feels that the report may serve as the basis for interim guidance while final guidance is being developed.

Finding: The report provides credible scientific support for CHR transportation and provides a basis for final guidance on the issue. Once a SME review is completed, determining whether the underpinning science has or has not evolved since the report was issued, this will provide a high level of confidence that the final guidance is scientifically valid.

Recommendation 1: The Board recommends that the concepts provided by the report be used by the Executive Agent as interim guidance while final guidance is developed with the assistance of USAMRIID.

Biological Agents of Concern Postmortem

The STWG assessed WMD biological agents identified within the DoD's 2001 Medical Risk Assessment of the Biological Warfare Threat List[†]. This list, already vetted through the DoD medical community, identified biological agents of concern in conjunction with other established biological agent lists, such as the CDC Centers for Disease Control and Prevention (CDC) Category A, B, and C lists. The report was later expanded to include biological agents identified within the U.S. Department of Health and Human Services' Select Bio Agents and Toxins List. Report authors selected these benchmark agents because mortuary personnel are accustomed to contact with these agents.

Finding: The report defines exposure risk postmortem using environmental persistence and living casualty transmission data, which was extrapolated for use in decedents. SMEs also assumed that personal protective equipment (PPE) was worn properly and appropriate to the risk of each agent.

Recommendation 2: The Board recommends that the ASD(HA) task USAMRIID to review the definition of exposure risk postmortem and the underlying assumptions used in the report and provide any updates or additions based on the current evidence base.

Biological Agent Categorization

[†] The Medical Risk Assessment was a product of the Office of the Surgeon General, within the Department of the Army. This assessment has been phased out and is no longer being produced by the Army.

The SMEs designed an objective risk matrix for calculating individual risk scores, based on disease and treatment characteristics and modeled in part after the CDC's 1999 Biological Agent Categorization effort. To develop these scores, the STWG generated various definitions and criteria pertaining to these biological agents and mortuary tasks (see the report at Attachment A for a full description of scoring parameters). The report defined exposure risk postmortem according to the Occupational Safety and Health Administration requirements associated with ensuring worker health and safety and the need for medical care should a person become infected with the agent in question. Evaluations of each agent and related risk were completed using the best available scientific research, peer reviewed articles, and worst-case scenarios. The report created postmortem risk groups by considering five different parameters: complexity of care or treatment, transmission hazard, need for N95 or greater respiratory protection, persistence of the agent in the environment, and CDC Biosafety Lab requirements.

The report used specific non-WMD biological agents as comparative and benchmark agents regarding exposure risk to those handling decedents: human immunodeficiency virus, the coronavirus causing severe acute respiratory syndrome, and variant Creutzfeldt-Jakob disease. The STWG chose these specific agents as benchmarks because mortuary personnel are familiar with these agents in decedents. However, there may have been new benchmark-type biological agents or treatments developed since the publication of the report. A review by SMEs would be able to provide any updates to these agents or treatments as necessary.

As postmortem biological agent persistence is not well studied or understood, the STWG used environmental persistence and live tissue transmission data in these evaluations. The report acknowledges this lack of information and proposes that additional studies be undertaken to improve the available knowledge base. The document suggests that at a minimum, postmortem studies should focus on the agents with the greatest exposure risk and include bacteria, viruses and prions. The report also proposes a more sophisticated quantitative approach, such as process-based risk models based on individual tasks.

Finding: The report categorized biological agents into postmortem risk groups by considering five different parameters: complexity of care or treatment, transmission hazard, need for N95 or greater respiratory protection, persistence of the agent in the environment, and CDC Biosafety Level categorization. These parameters were evaluated using risks from live tissue, which were extrapolated to postmortem decedents.

Recommendation 3: The Board recommends that the ASD(HA) task USAMRIID to review the biological parameters and categorization scheme used to classify the biological agents.

Finding: In order to provide context for the biological agents of concern, the report used specific non-WMD biological agents as comparative and benchmark agents regarding exposure risk to those handling decedents. Two of the agents chosen were viruses while the third was a prion. Mortuary personnel should be familiar with these agents post

mortem, which should provide a knowledge and comfort base when interacting with additional agents of concern.

Recommendation 4: The Board recommends that the ASD(HA) task USAMRIID to review the benchmark agents used in the report and provide any updates as needed for inclusion in guidance on the issue.

Finding: Although the report does not prioritize future post mortem research involving biological agents, it suggests that future studies should focus on agents with the greatest exposure risk and should include bacteria, viruses and prions. The report also suggests a more sophisticated quantitative approach, such as process-based risk models based on individual tasks. A process-based model would allow risk to be individualized according to specific tasks, focusing on those that may generate the highest risk.

Recommendation 5: The Board recommends that the ASD(HA) task USAMRIID to work with DoD to develop exploratory studies of biological agents of concern postmortem.

Packaging for Transport

The report recommends that bio agents scoring lower than all benchmark agents or as Risk Group three for Transporters not require additional packaging or containment for safe transport to and through the U.S. DoD policy stipulates that CBRN personnel clear remains for transport prior to evacuation. [1] However, there are currently no identified standards for clearing CHR for transport. The United States Transportation Command (TRANSCOM) does not allow contaminated remains on TRANSCOM assets prior to decontamination though exceptions may be possible in rare cases, when essential to preserve life or continue critical missions.[‡] [4] Transportation regulation has been created by the World Health Organization (WHO) and the Air Transport Association for live samples of biological agents of concern, but these shipping regulations do not account for the size or nature of human remains. The WHO's *Guidance on Regulations for the Transport of Infectious Substances* set a maximum quantity per air transport package of 50 grams for passenger aircraft and 4 kilograms for cargo aircraft. These regulations pertain to cultures of biological agents of concern rather than samples or large tissues. [5,6]

The report also uses non-WMD biological agents as benchmark agents, asserting that mortuary personnel are familiar with these agents. By showing that the biological agents of concern do not pose a significantly higher level of risk than these benchmark agents, the report alleviates some of the concern associated with the agents in question.

[‡] USTRANSCOM coordinates missions using both military and commercial transportation resources. Its charter makes USTRANSCOM the manager for transportation, other than service-unique and theater assigned assets.

Finding: The report concludes that biological agents scoring lower than all the benchmark agents for transporters do not require any additional packaging to safely transport decedents to and through the U.S.

Recommendation 6: The Board recommends that the finalized guidance on packaging specify what should be used, rather than what packaging should not be used. The responsible authority should review the feedback provided by USAMRIID and provide guidance on packaging that is a conservative estimate of what equipment is necessary.

Finding: The report concludes that biological agents categorized as Risk Group three for Transporters do not require any additional packaging to safely transport decedents to and through the U.S.

Recommendation 7: With respect to Transporters, Members recommend that the finalized guidance on packaging should specify what should be used, rather than what packaging should not be used. The responsible authority should review the feedback provided by USAMRIID and provide guidance on packaging that is a conservative estimate of what equipment is necessary.

Operational Implications and PPE

Within each military unit, Commanders are responsible for the recovery and evacuation of human remains of assigned and attached personnel to the nearest MA facility. Trained CBRN personnel should be able to provide verification of the degree of contamination present and identification of specific agents of concern to determine appropriate precautions to be taken during handling. [1] Each Service trains their MA specialists independently. [1] The Air Force, Marine Corps, and Army have trained MA specialists and have the capability to establish and operate MA collection points (MACPs). Individuals who come into contact with decedents either at Military Treatment Facilities or at MACPs are referred to as General Handlers. MACPS represent the first stage in the mortuary process, where decedents are received, refrigerated, processed and preliminarily identified. This is the location where General Handlers prepare the remains by removing clothing, washing the exterior of the body and/or human remains pouch, and attempt to obtain a DNA sample. Once packaged, the remains are turned over to Transporters, who handle clean biologically leak-proof human remains pouches. [1] The Army provides collection and evacuation support to the other Services because it is the only Service that maintains an active and dedicated MA force structure. [1] The Air Force, in coordination with TRANSCOM, physically transports the deceased back to CONUS, specifically the Dover Port Mortuary (DPM) at Dover Air Force Base. Once at DPM, remains, including decedent's external and internal body/organs, are processed by Prosectors. These medical examiners are likely to invasively handle remains and are at the highest risk for disease exposure. [1] This long and complex chain of responsibility, which often involves personnel with varying levels of MA training, raises two key operational concerns:

1. Risk of infecting the many personnel who have contact with the CHR; and,

2. Unintended effects on high value physical assets (i.e., aircraft) such as contaminating surfaces and exposing additional personnel/equipment.

Using the categorization scheme described above, SMEs identified the highest and lowest scores which reflect the highest and lowest risks. From this range of scores three groups were identified, with level three representing the highest risk agents. Taking into account the PPE required for each level of personnel and respective tasks, the STWG generated risk categories according to each level of personnel: General Handler, Transporter, and Prosectors.

Finding: The report reaches several conclusions regarding PPE including that transporters who handle packaged biologically contaminated decedents do not need to wear any PPE in addition to that already required by CDC Standard Precautions for contact hazards. [9]

Recommendation 8: The Board recommends that the finalized guidance on PPE specify the level of PPE that handlers and transporters should wear, rather than what they should not wear. The responsible authority should review the feedback provided by USAMRIID and provide guidance on PPE that is a conservative estimate of what equipment is necessary.

Risk/Likelihood of an Event

DHB members also discussed the current political climate and the potential risk of an attack on the US military using a biological weapon of mass destruction. Because these weapons are relatively easy to obtain and have low production costs, there is a real possibility that these types of weapons will be used against the U.S. Therefore, DoD must be proactive in developing policies focused on postmortem CHR in order to deal with the consequences of biological warfare. [7] The DHB echoes the findings and recommendations contained within its final report of the DPM Independent Review Subcommittee, and posits that additional CBRN issues may be forthcoming from the DoD. Recommendation ten from the DPM report states that "Planning should occur, instituted at high levels within the command and control structure, to prepare for the possibility of large number of decedents arriving at DPM , whether from military or non-military causes (such as natural disasters)." [3] The DHB felt that this recommendation relates to the issue of CHR. As DoD provides contingency support to government entities and individual cities in the event of a CBRN incident and this report is operationalized, there may be wide-reaching implications. [1]

Mass Casualty Concerns

As the entity responsible for protecting the nation and its citizens, especially in a time of crisis, DoD must be prepared to provide comprehensive disaster management, including for CBRN events. In a mass casualty event, DoD support will be essential, as the majority of organizations, both government and civilian, have limited plans and resources in place to deal with a contaminated mass casualty event

IV. Conclusion

The Board commends the Departments efforts in closing the policy/guidance gap regarding the transportation of CHR. Adoption of this interim report and final guidance as is, or as modified after being vetted by USAMRIID, will help to provide important protection for personnel transporting CHR and ensure that this issue will not be a limiting factor for returning the remains of the Fallen to U.S. soil and their families. The Board applauds JMAC for its leadership in taking the first step in the preparedness process for the Department on this challenging issue, and acknowledges the hard work and contributions of all report authors. The Board recommends that DoD further review this report, implement the recommendations contained herein, and take all possible steps to expedite the development of policy that addresses the transportation of potentially contaminated remains of Fallen Service members.

FOR THE DEFENSE HEALTH BOARD:

Nancy W. Dickey MD

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DHB President

ATTACHMENTS:

A. U.S. Army Joint Mortuary Affairs Center Report "Categorizing Weapons of Mass Destruction Biological Agents into Postmortem Risk Groups"

B. Terms of Reference

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Attachment A

JULY
2009

Categorizing Weapons of Mass Destruction Biological Agents into Postmortem Risk Groups

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- **Major Shawn Campbell,** US Central Command, J4

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EXECUTIVE SUMMARY

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Based on the findings of this study, many casualties who die from a biological weapon of mass destruction (WMD) agent infection are no more hazardous than those who die from non-WMD agents/conditions like severe acute respiratory syndrome (SARS), human immunodeficiency virus (HIV), or variant Creutzfeldt-Jakob disease (vCJD). Thus, the ability to safely handle such decedents and return them to the Continental United States (CONUS) for final disposition can be achieved when applying no more additional precautions than what we currently take when managing other decedents.

Introduction. This study was conducted by the United States (US) Army G4 and Joint Mortuary Affairs Center JMAC) as an urgent need to address one of the myriad of issues hindering Department of Defense's (DoD's) ability to safely manage and return all fallen service members to the US for final disposition, especially those contaminated with chemical, biological, radiological, nuclear and high-yield explosive (CBRNE) agents or materials.

Purpose. This study is designed to provide DoD with a rational framework to categorize exposure risk associated with the handling of decedents previously infected with biological (bio) agents of concern. It is being presented to the Defense Health Board (DHB) to obtain the Board's concurrence with the authors' (1) definition of exposure risk postmortem, (2) categorization of postmortem risk groups, (3) use of specific non-weapons of mass destruction (WMD) bio agents as comparative and benchmark agents regarding exposure risk to those handling decedents, (4) prioritization of future postmortem research involving bio agents, (5) recommendation that bio agents scoring lower than all the benchmark agents for transporters do not require any additional packaging to safely transport decedents to and through the US, (6) recommendation that bio agents categorized as Risk Group 3 for Transporters do not require any additional packaging to safely transport decedents to and through the US, and (7) transporters that handle biologically contaminated decedents that are packaged are not required to wear anything additional than Standard Precautions for contact hazards.

Problem. To date, many civilian and DoD entities have assumed living casualties and decedents infected with bio agents of concern present a similar hazard and, therefore, a similar level of exposure risk to others. Perhaps many have made this assumption, because no other appropriate postmortem definition of risk exists that thoroughly accounts for the unique aspects of bio agents as they relate to postmortem handling.

Hypothesis. In response to this issue, the authors, herein referred to as subject matter experts (SMEs), hypothesized that bio agents of concern do not all necessarily and inherently pose a significant level of exposure risk to those handling decedents' physical remains. As such, the SMEs conducted a risk matrix analysis to assess postmortem exposure risk and categorize bio agents into postmortem risk groups to identify bio agents rendering the greatest risk to specific end users.

Method. To ensure a non-arbitrary assessment, the SMEs identified an objective means of categorizing exposure risk postmortem, modeled in part after the Centers for Disease Control and Prevention's (CDC) 1999 Biological Agent Categorization effort. An evaluative criteria and scoring practice was developed to assess exposure risk for three specific groups of persons—general handlers, transporters, and prosectors (i.e., those who perform internal decedent exams). Method activities included defining study assumptions; identifying bio agents for study; defining risk postmortem; defining evaluative criteria and identification of scoring parameters for each evaluative criterion; defining scoring practices for each parameter; and identifying tasks performed by general handlers, transporters, and prosectors. Once method activities were developed, the study was conducted and the findings were analyzed and interpreted.

Biological Agents Studied. The SMEs assessed WMD bio agents identified within the DoD's Medical Risk Assessment (2001). This list, already vetted through the DoD medical community, more comprehensively identified bio agents of concern in comparison to other bio agent lists, such as the CDC Category A, B, and C lists. The SMEs also assessed three non-WMD bio conditions—severe acute respiratory syndrome (SARS), human immunodeficiency virus (HIV) infection, and variant Creutzfeldt-Jakob disease (vCJD), to serve as exposure risk benchmarks, since general handlers, transporters, and prosectors are accustomed to coming in contact with decedents afflicted with these concerning conditions.

Results. Biological agents scoring the highest (presenting the greatest exposure risk for all personnel categories) were Ebola, Lassa fever, and Marburg. For general handlers and transporters, these agents having the highest ranking score, however, did not achieve a Risk Group 1 (highest risk category) score but rather a Risk Group 2 score. Only for prosectors did these bio agents rank within the Risk Group 1 category.

Conclusion. To date, no study has addressed the implications associated with handling bio WMD-infected decedents by placing bio agents of concern into postmortem exposure risk groups. Based on the findings of this study, however, many of the biologically infected decedents are no more hazardous than SARS, HIV, or vCJD. Thus, safely handling many WMD bio-infected decedents can be achieved by applying the same infection control practices established for non-WMD infected decedents, thereby rendering them safe enough to return to the continental United States (CONUS) for final disposition.

***NOTE:** This study was later expanded to include bio agents identified within the US Department of Health and Human Services' Select Bio Agents and Toxins List (see Annex 1). The purpose of this annex is to support the US Army G4's Mortuary Affairs Task Force's effort to address issues associated with the safe transport and importation of deceased service members infected with all agents requiring special handling as identified by the US Department of Transportation and the Centers for Disease Control and Prevention.*

1. Introduction

This study explores risk determination in an area that has not received any meaningful attention in the past. It was conducted by the United States (US) Army G4 and Joint Mortuary Affairs Center to urgently address one of the myriad of issues hindering the Department of Defense's (DoD's) ability to safely manage and return all fallen service members to the US for final disposition, especially those contaminated with chemical, biological, radiological, nuclear, and high-yield explosive (CBRNE) agents or materials. As a preliminary effort, this study has limited scope and goals. It is intended to focus on biologically contaminated decedents, with the goal of categorizing exposure risk for specific DoD end users. It used a pilot parametric risk model based on worst-case events to elucidate the conduct of future postmortem studies.

2. Purpose

The purpose of this study is to provide DoD with a rational framework to categorize exposure risk associated with the handling of decedents previously infected with biological agents of concern. As such we present this report to the Defense Health Board (DHB) to obtain the Board's concurrence with the authors' (1) definition of exposure risk postmortem, (2) categorization of postmortem risk groups, (3) use of specific non-weapons of mass destruction (WMD) biological (bio) agents as benchmark agents presenting exposure risk to those handling decedents, (4) prioritization of future postmortem research involving bio agents, (5) recommendation that bio agents scoring lower than all the benchmark agents for transporters do not require any additional packaging to safely transport decedents to and through the US, (6) recommendation that bio agents categorized as Risk Group 3 for Transporters do not require any additional packaging to safely transport decedents to and through the US, and (7) transporters that handle biologically contaminated decedents that are packaged are not required to wear anything additional than Standard Precautions for contact hazards.

3. Problem

To date, many civilian and DoD entities have assumed living casualties and decedents infected with bio agents of concern present a similar hazard and, therefore, a similar level of exposure risk to others. Perhaps many have made this assumption, because no other appropriate postmortem definition of exposure risk exists that thoroughly accounts for the unique aspects of bio agents as they relate to postmortem handling.

Despite the reasoning, the outcome associated with applying similar definitions of risk for the living and decedents is a misclassification wherein both groups pose similar and substantial risks to others. Such risk classifications often demand the institution of extensive safety measures when handling, packaging, and transporting decedents, which in many instances overburdens personnel's ability to perform their tasks but, more importantly, has hindered DoD's ability to develop safe, non-materiel and materiel solutions necessary to return remains to the Continental US (CONUS) for final disposition.

4. Hypothesis

In response to this issue, the authors, herein referred to as subject matter experts (SMEs), hypothesized that bio agents of concern do not necessarily and inherently pose a significant level of exposure risk to those handling decedents' physical remains. As such, the SMEs conducted a

risk matrix analysis to assess postmortem exposure risk and categorize bio agents into postmortem risk groups to identify bio agents rendering the greatest risk to specific end users.

5. Method

To ensure a non-arbitrary assessment, the SMEs designed a risk matrix for calculating each bio agent's total risk score, modeled in part after the Centers for Disease Control and Prevention's (CDC) 1999 Biological Agent Categorization effort.[140] The SMEs identified an objective means of categorizing exposure risk postmortem by establishing applicable evaluative criteria for three specific groups of persons—general handlers, transporters, and prosectors (i.e., those who perform internal decedent exams) and by developing criteria to ensure a standardized scoring practice was implemented.

Method activities included defining study assumptions (Section 5.1); identifying bio agents for study (Section 5.2); defining risk postmortem (Section 5.3); defining evaluative criteria and identification of scoring parameters for each evaluative criterion (Section 5.4); defining scoring practices for each parameter (Section 5.5); and identifying tasks performed by general handlers, transporters, and prosectors (Section 5.6). Once method activities were conducted, bio agent assessments were conducted (Appendix A and B), and findings were analyzed and interpreted (Section 7).

5.1. Study Assumptions

- All DoD personnel have received appropriate Food and Drug Administration (FDA) approved immunizations. Investigational new drugs (INDs) to treat specific biological infections were not considered valid treatment modalities for the purpose of this study.
- Authors did not identify or assess bio agents of concern based on their public health threat potential.
- The greatest level of risk associated with bio agents postmortem exists for those performing invasive procedures, such as prosectors.
- Embalmers are not included among the three groups of Mortuary Affairs (MA) personnel, as embalming is not a required task, and in most instances is not recommended for decedents infected with biological WMD agents.[144]
- Although external contamination is possible (e.g., powered anthrax dispersed via a plane over a battlefield), the SMEs assumed DoD personnel who succumbed to such attacks would do so in medical treatment facilities (MTFs) rather than on the battlefield. Therefore, this study only focused on biologically contaminated decedents dying at MTFs, versus a battlefield location.
- All DoD MA personnel considered "general handlers" are required to wear either: (1) the equivalent of Occupational Health and Safety Administration (OSHA) Level C Personal Protective Equipment (PPE) ensemble (see Table 4— EPA/OSHA Levels of Personal Protective Equipment—for more information), or; (2) Mission Oriented Protective Posture (MOPP) IV gear, depending on their assignment. Both

ensembles provide a basic level of respiratory, droplet, and contact hazard protection.

- All DoD personnel directed to wear PPE (i.e., general handlers, transporters, and prosectors) will be compliant with wearing the directed level of PPE and will wear it appropriately.
- Mortality rates associated with bio agents assume patients did not receive any treatment.
- Since decedents do not move or breathe, postmortem transmission hazards are based on task-induced hazards generated by general handlers, transporters, and prosectors when coming into contact with decedents.
- Release of the decedent's residual lung volume, as a result of lifting, jarring, and/or movement of the body, does not present a significant enough aerosol transmission hazard to warrant inclusion in this analysis.
- When multiple research findings identified conflicting data pertinent to assigning a bio agent parametric score, scoring decisions were based on the worst-case finding.

5.2. Identifying Biological Agents for Study

The SMEs assessed WMD bio agents identified within DoD's Medical Risk Assessment report (2001).[141] This list, already vetted through the DoD medical community, more comprehensively identifies bio agents of concern in comparison to other bio agent lists, such as the CDC Category A, B, and C lists. Three non-WMD bio conditions—severe acute respiratory syndrome (SARS), human immunodeficiency virus (HIV) infection, and variant Creutzfeldt-Jakob disease (vCJD), were also assessed to serve as risk benchmarks, since general handlers, transporters, and prosectors are accustomed to contacting decedents afflicted with such concerning conditions. The bio agents found in the Medical Risk Assessment are provided in Table 1.

Table 1. DoD Bio Agent Identified in the 2001 Medical Risk Assessment

•Anthrax	•Lassa fever	•Shigellosis
•Botulinum toxin	•Marburg	•Smallpox
•Brucellosis	•Melioidosis	•Staphylococcal Entertoxin B (SEB)
•Chikungunya	•Mycotoxins	•Tularemia
•Cholera	•Pneumonic plague	•Typhus (louse–borne)
•Ebola	•Q fever	•Venezuelan Equine Encephalitis (VEE)
•Eastern Equine Encephalitis (EEE)	•Ricin	•Western Equine Encephalitis (WEE)
•Glanders	•Rift Valley Fever	
•Junin/Marchupo	•Saxitoxin	

5.3. Definition of Exposure Risk Postmortem

Definitions for exposure risk groups were also determined in the following manner:

5.3.1 Risk Group 1: Agents posing the greatest risk to those coming in contact with decedents because of the increased requirements associated with ensuring worker health and safety and the need for extensive medical care should a person become infected.

5.3.2 Risk Group 2: Agents posing a moderate risk to those coming in contact with decedents. In the case of this risk group, mechanisms exist to ensure worker health and safety, as well as measures to mitigate against contracting the disease. Should infection occur, however, hospitalization or medical care would be likely.

5.3.3 Risk Group 3: Agents posing some risk to those coming in contact with decedents. Existing health and safety measures exist and can mitigate against exposure. Should the person become infected, minimal medical care would likely be required.

5.4. Definition of Evaluative Criteria & Identification of Scoring Parameters for Each Evaluative Criterion

Postmortem risk was based on a compilation of five parameters. To determine scoring for each evaluative criterion, the SMEs further defined each evaluative criterion in the following objective and measurable terms:

5.4.1 Complexity of care or treatment—refers to those who become infected when handling and processing contaminated physical remains. This required assessing the level of care needed if one became infected with disease, the mortality associated with the disease in untreated casualties, and the availability of FDA-approved chemoprophylaxis pre- or post-exposure. These individual scores were assessed and then averaged to obtain a single "Complexity of Care/Treatment" score.

5.4.2 Transmission hazard—refers to the hazards associated with performing specific tasks. This required evaluating each MA personnel category and assessing if an airborne, droplet, and/or contact hazard existed based on the most hazardous task performed. This was a single score.

5.4.3 Need for persons to wear N95 or greater respiratory protection—refers to the need to wear a greater level of respiratory protection than a basic surgical mask. If MA personnel, while conducting their tasks created an aerosol transmission hazard, then wearing an N95 respiratory protection or greater was measured. This was a single score.

5.4.4 Persistence of the agent in the environment—refers to a bio agent's ability to survive for hours to days, several weeks, or up to a year in any type of soil, water and/or on a hard surface. Currently, no postmortem persistence data exists. This was a single score.

5.4.5 CDC Biosafety Lab (BSL) requirements [142] [11]—refers to BSL level requirements established for each bio agent and the activities associated with evaluating specimens. This criterion not only supports the overall exposure

risk score but also allows prosectors to easily assess their exposure risk based on a single parameter, if desired. This was a single score.

5.5. Definition of Scoring Practices for Each Parameter

To be consistent when scoring each criterion, the SMEs applied three principles. First, past research findings were used to establish each score possible. Second, in all cases, when past research presented different findings, SMEs evaluated the parameter based on the worst-case scenario, and third, in the few instances whereby research did not exist, the SME having the most experience with the bio agent would recommend a parameter score. This individual parameter score would be discussed and an actual score would be formulated based on SME consensus. Table 2 (below) identifies the scoring parameters and measurements used to evaluate each criterion.

Table 2. Evaluative Criterion Scoring Parameters

I.Complexity of care/treatment if exposed: to obtain this score, hospitalization, mortality of the disease, and availability of chemoprophylaxis were each assessed and averaged together to formulate one overall score for this criterion.

- Hospitalization requiring:
  - –Critical care: (3)
  - –General hospital care: (2)
  - –Outpatient treatment: (1)
- Mortality of the disease in untreated casualties:
  - –>50% (3)
  - –21–49% (2)
  - –<20% (1)
- Availability of chemoprophylaxis pre- or post-exposure:
  - –No (1)
  - –Yes (0)
- Availability of chemotherapeutics in addition to symptomatic and supportive care:
  - –No (1)
  - –Yes (0)

II.Transmission hazard associated with tasks performed by the one coming in contact with infected decedents: single score.

- Airborne hazard: (3)
- Droplet hazard: (2)
- Contact hazard: (1)

III.Need for N95 or greater respiratory protection based on the type of imposed transmission hazard created by contact with infected decedents: single score.

- N95 or greater with Standard Precautions: (1)
- Standard Precautions: (0)

IV.Persistence of the agent in the environment: single score. [**Note: This score is not based on postmortem science but based on environmental findings.]*

- High Persistence ≥Year: (3)
- Medium Persistence=Months: (2)
- Low Persistence=Hours to days: (1)

V.BSL requirements: single score.

- BSL 4: (3)
- BSL 3: (2)
- BSL 2 or less (1)

5.6. Identification and Evaluation of Tasks Performed by General Handlers, Transporters, and Prosectors

To determine the transmission hazard for each personnel category, the SMEs identified the most hazardous task performed by each end user. All tasks were identified for each end user, and the most hazardous tasks were assessed based on the end user's potential for creating any type of contact, droplet, or airborne transmission hazard (see Table 3—Definitions of Transmission Precautions--for further information regarding these transmission hazards and the standardized precautions established to mitigate each hazard type).

The information below identifies a definition of each end user and the most hazardous activity each would likely perform when handling decedents. It also identifies the type of PPE each end user is assigned to wear (see Table 4 for further information regarding PPE).

5.6.1 General Handlers—refers to DoD personnel who come in contact with decedents in the field, at MTFs and/or at the Mortuary Affairs Decontamination Collection Point (MADCP). These personnel handle the decedent's body, remove clothing, wash the exterior of the body and/or human remains pouch (HRP), and obtain a deoxyribonucleic acid (DNA) sample, when applicable. As such, it is likely they will come in contact with blood and body fluids and create droplet and contact transmission hazards, particularly when obtaining a DNA specimen. Personnel in the field do wear MOPP IV gear, MTF personnel adhere to Standard Precautions, [32] and MADCP personnel wear OSHA Level C PPE.

5.6.2 Transporters—refers to DoD personnel who come in contact with decedents after the decedent has been placed inside a clean bio leakproof HRP that has been externally cleaned. These decedents will likely be placed in cold storage units to retard decomposition; however, cold storage may not be available in all theaters during all phases of military occupation. As such, transporters will not likely come in contact with blood and body fluids while performing their tasks; however, if they did, only a contact transmission hazard would exist. These personnel wear OSHA Level D PPE (military uniform) and practice Standard Precautions.

5.6.3 Prosectors—refers to DoD personnel who come in contact with decedent's external and internal body/organs. These personnel are likely to handle the decedent and invasively cut into the body, using both manual and oscillating tools, which are capable of aerosolizing particles. As such, prosectors will come in contact with blood and body fluids while performing their tasks and be subject to airborne, droplet, and contact transmission hazards. Prosectors adhere to Standard Precautions with added airborne protection using a N95 mask or greater and employ facility biosafety precautions.[137]

Table 3. Definitions of Transmission Precautions

Standard Precautions: (CDC, 2009) Standard Precautions are types of PPE and procedures used to reduce the transmission of all pathogens. They combine the major features of Universal Precautions (UP) and Body Substance Isolation (BSI) efforts in addition to mitigating hazards based on the principle that all blood, body fluids, secretions, excretions (except sweat), non-intact skin, and mucous membranes, may contain transmissible infectious agents. They employ prevention practices that apply to all patients, regardless of suspected or confirmed infection status, in any setting in which healthcare is delivered. Standard Precautions specifically include the following and are applied based on the likelihood of the exposure hazard:

- Utilization of meticulous hand hygiene
- Use of gloves, gown, mask, eye protection, and/or mouth, nose, and eye protection
  - Use of a face shield that fully covers the front sides of the face
  - Use of masks having an attached shield
  - Use of a mask and goggles (in addition to gloves and gown)
- Safe injection practices

Contact Precautions: (CDC, 2009) Contact Precautions are used to prevent transmission of infectious agents, including epidemiologically important microorganisms, which are spread by direct or indirect contact with the patient or the patient's environment. It is the most common mode of transmission. Contact Precautions employ all aspects of Standard Precautions, in addition to:

- Donning of gowns and gloves before room entry
- Doffing and discarding items containing pathogens before exiting the patient's room, especially items that have become infected through environmental contamination (e.g., particular pathogens like Vancomycin-Resistant Enterococci, Respiratory Syncytial Virus, Clostridium Difficile, noroviruses and other intestinal tract pathogens that are easily transmitted through contact transmission).

Droplet Precautions: (CDC, 2009) Droplet Precautions are used to prevent transmission of pathogens spread through close respiratory or mucous membrane contact with respiratory secretions (e.g., from a sneeze or cough). These pathogens, however, do not remain infectious over long distances. Droplet Precautions employ the use of Standard Precautions in addition to:

- Wearing a mask (a respirator is not necessary) for close contact
- Placing a surgical mask over the decedent's face
- Changing one's protective attire
- Performing hand hygiene after coming in contact with patients

Airborne Precautions: (CDC, 2009) Airborne Precautions are used to prevent airborne transmission of infectious agents in the form of droplet nuclei. These nuclei are in the respirable size range containing infectious agents that can be dispersed over long distances by air currents and may be inhaled by susceptible individuals who have not had face-to-face contact with infected casualties. Airborne Precautions employ the use of Standard Precautions in addition to:

- Use of Airborne Infection Isolation Rooms (AIIR)
- Use of respirators that meet National Institute of Safety and Health (NIOSH) fit testing and are certified as a N95 masks or higher

Table 4. EPA/OSHA Levels of Personal Protective Equipment

Level A: Is used when the hazards are unknown or unquantifiable or when the greatest level of skin, respiratory, and eye protection is required. The following constitute Level A equipment:

- Positive pressure, full-face mask, self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA, approved by the NIOSH
- Total encapsulating chemical-protective suit
- Coveralls
- Long underwear
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, chemical-resistant, steel toe and shank
- Hard hat (under suit) (optional)
- Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally encapsulating suit)

Level B: Is used when the highest level of respiratory protection is necessary, but a lesser level of skin protection is required. Level B is used when the type and atmospheric concentration of substances have been identified. The following constitute Level B equipment:

- Positive pressure, full-face mask, SCBA, or positive pressure supplied air respirator with escape SCBA (NIOSH approved)
- Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one- or two-piece chemical-splash suit; disposable chemical-resistant overalls)
- Coveralls (optional)
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, outer, chemical-resistant steel toe and shank
- Boot covers, outer, chemical-resistant (disposable) (optional)
- Hard hat (optional)
- Face shield (optional)

Level C: Is required when the concentration and type of airborne substance is known, and the criteria for only using air-purifying respirators are required. A lesser level of skin protection is required, because liquid splashes or other direct contact will not adversely affect or be absorbed through any exposed skin. The following constitute Level C equipment:

- Full-face or half-mask, air-purifying respirators (NIOSH approved)
- Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls)
- Coveralls (optional)
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, outer, chemical-resistant steel toe and shank (optional)
- Boot covers, outer, chemical-resistant (disposable) (optional)
- Face shield (optional)
- Hard hat (optional)
- Escape mask (optional)

Level D: Is the minimum protection required. Level D protection may be sufficient when no contaminants are present or work operations preclude splashes, immersion, or the potential for unexpected inhalation or contact with hazardous levels of chemicals. It offers protection from nuisance contamination only. It requires only coveralls and safety shoes/boots. Other PPE is based upon the situation (e.g., types of gloves, etc.). It should not be worn on any site where respiratory or skin hazards exist. The following constitute Level D gear:

- Work uniform
- Coveralls
- Gloves (optional)
- Safety boots/shoes, chemical-resistant steel toe and shank
- Boots, outer, chemical-resistant (disposable) (optional)
- Safety glasses or chemical splash goggles (optional)
- Hard hat (optional)
- Escape mask (optional)
- Face shield (optional)

6. Results

To interpret bio agent scores, the SMEs identified the greatest (highest risk) and least (lowest risk) score possible and divided the range into three groups. The ranges of risk level scores were 9.17-12.0 for Risk Level 1; 6.33-9.16 for Risk Level 2; and 3.5-6.32 for Risk Level 3 respectively. Although not a highly sophisticated means of interpreting the bio agent results, the SMEs concurred with the relative nature of the numeric values versus their absolute numeric values as an indicator of risk.

Biological agents scoring the highest (presenting the greatest hazard for all personnel categories) were Ebola, Lassa fever, and Marburg. For general handlers and transporters, these highest ranking agents did not fall into the highest risk group, Risk Group 1, but rather fell into Risk Group 2. For prosectors, however, these bio agents did rank as Risk Group 1.

Below, Tables 5, 6, and 7 identify each end user and the bio agents scores associated with each exposure risk group. Non-WMD benchmark bio agents are identified in blue/bold lettering to visually delineate WMD agents scoring higher or lower than non-WMD agents.

For further information regarding bio agent scoring, see Appendix A to review the basis for each parameter scored for each bio agent. Refer to Appendix B to see the actual scores and their associated references for all bio agents identified within the matrix tool.

Table 5. General Handler Risk Group Levels

Risk Level 1 (9.17–12.0)	**Risk Level 2 (6.33–9.16)**	**Risk Level 3 (3.5–6.32)**
None	Ebola, 9.0	**SARS, 6.25**
	Marburg, 9.0	Saxitoxin, 6.25
	Lassa fever, 8.75	VEE, 6.0
	vCJD, 8.75	WEE, 6.0
	Smallpox, 8.5	Tularemia, 6.0
	Botulinum toxin, 7.75	Junin/Marchupo, 6.0
	Glanders, 7.5	**HIV, 6.0**
	Typhus, 7.25	Ricin, 5.75
	SEB, 7.25	Q fever, 5.75
	Melioidosis, 7.25	Rift Valley Fever, 5.75
	Cholera, 7.25	Mycotoxins, 5.5
	Anthrax, 7.25	Chikungunya, 5.0
	EEE, 6.75	Shigellosis, 4.75
	Brucellosis, 6.75	
	Pneumonic plague, 6.75	

Table 6. Transporter Risk Group Levels		
Risk Level 1 (9.17–12.0)	**Risk Level 2 (6.33–9.16)**	**Risk Level 3 (3.5–6.32)**
None	Ebola, 8.0	SEB, 6.25
	Marburg, 8.0	Melioidosis, 6.25
	Lassa Fever, 7.75	Cholera, 6.25
	Smallpox, 7.5	Anthrax, 6.25
	vCJD, 6.75	Typhus, 6.25
	Botulinum Toxin, 6.75	Pneumonic Plague, 5.75
	Glanders 6.5	Brucellosis, 5.75
		EEE, 5.75
		HIV, 5.0
		Saxitoxin, 5.25
		SARS, 5.25
		WEE, 5.0
		VEE, 5.0
		Tularemia, 5.0
		Junin/Marchupo, 5.0
		Ricin, 4.75
		Q fever, 4.75
		Rift Valley Fever, 4.75
		Mycotoxins, 4.5
		Chikungunya, 4.0
		Shigellosis, 3.75

Table 7. Prosector Risk Group Levels		
Risk Level 1 (9.17–12.0)	**Risk Level 2 (6.33–9.16)**	**Risk Level 3 (3.5–6.32)**
Ebola, 11.0	Brucellosis, 8.75	None
Marburg, 11.0	EEE, 8.75	
Lassa Fever,10.75	Pneumonic Plague, 8.75	
Smallpox, 10.5	**vCJD, 8.75**	
Botulinum Toxin, 9.75	**SARS, 8.25**	
Glanders, 9.5	Saxitoxin, 8.25	
SEB, 9.25	WEE, 8.0	
Melioidosis, 9.25	VEE, 8.0	
Typhus, 9.25	Tularemia, 8.0	
Cholera, 9.25	Junin/Marchupo, 8.0	
Anthrax, 9.25	**HIV, 8.0**	
	Ricin, 7.75	
	Q Fever, 7.75	
	Rift Valley Fever, 7.75	
	Mycotoxins, 7.5	
	Chikungunya, 7.0	
	Shigellosis, 6.75	

7. Analysis

Analysis focused on two key areas: (1) using the non-WMD bio agent scores as a benchmark to identify WMD bio agents as more or less hazardous and (2) determining relevancy of bio agent risk groups.

7.1. Using Non-WMD Bio Agent Scores as a Benchmark

The SMEs reviewed the scores of the three non-WMD bio agents of concern as a benchmark to identify WMD agents scoring higher or lower than non-WMD agents to establish a reference point. Out of 25 WMD bio agents, most agents scored lowered than the highest scored non-WMD bio agent, which was vCJD. Three bio agents (i.e., Ebola, Marburg, and Lassa fever) for the general handler scored higher than vCJD; four bio agents scored higher than vCJD for the transporter (i.e., Ebola, Marburg, Lassa fever, and smallpox); and 14 bio agents scored higher (i.e., Ebola, Marburg, Lassa fever, smallpox, botulinum toxin, glanders, SEB, melioidosis, typhus, cholera, anthrax, brucellosis, EEE, and pneumonic plague) than vCJD for the prosector.

7.2. Determining Relevancy of Bio Agent Risk Groups

In determining the relevancy of bio agent risk groups, the SMEs analyzed the quantifiable values in two ways to determine if scores naturally clustered into three risk groups. First, the established scores were plotted on an X, Y axis for each personnel category, where X represents the total risk score and Y represents the respiratory PPE score. The results denoted a linear progression (see Figures 1, 2, and 3), indicating no natural grouping of exposure risk scores.

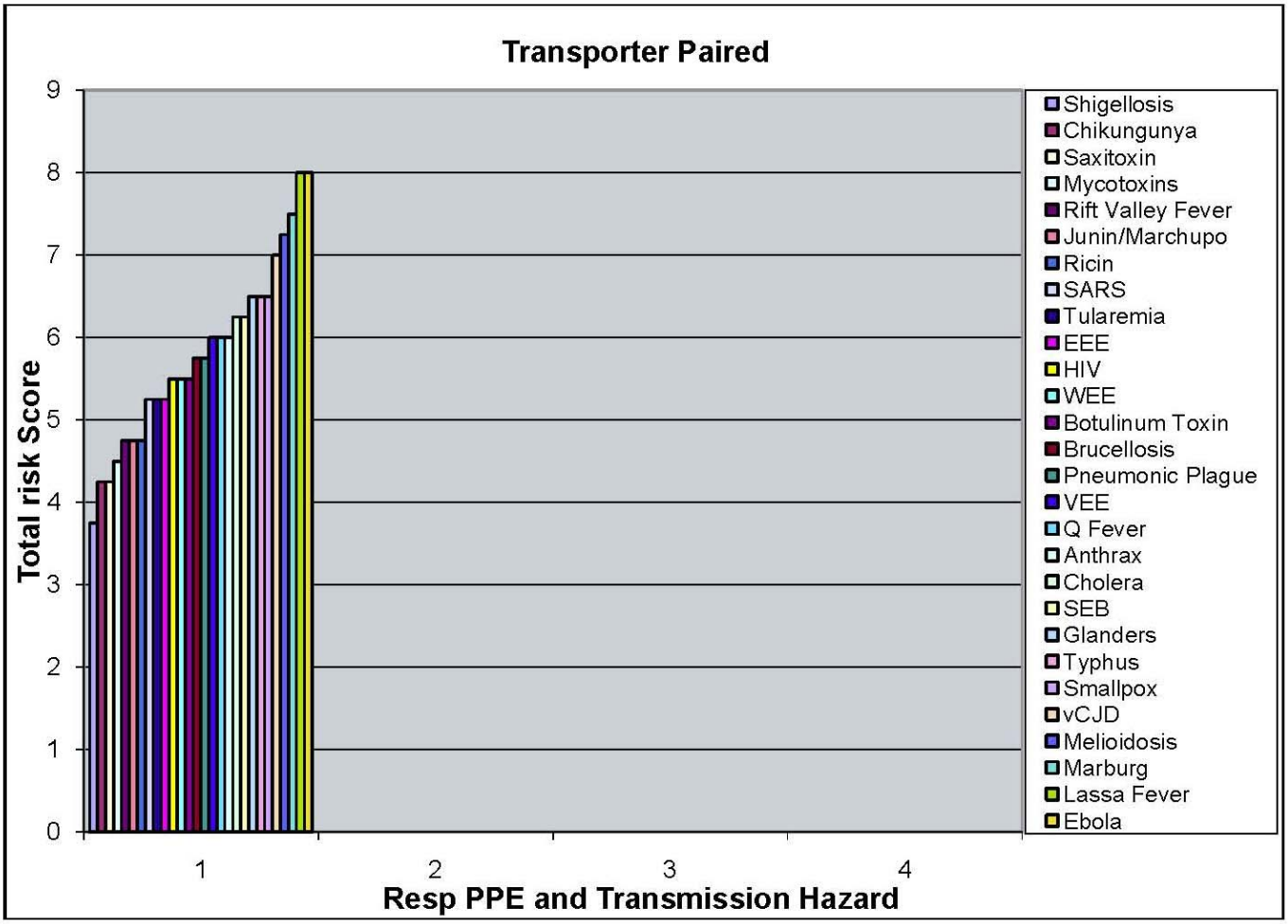

Figure 1. Transporter Paired

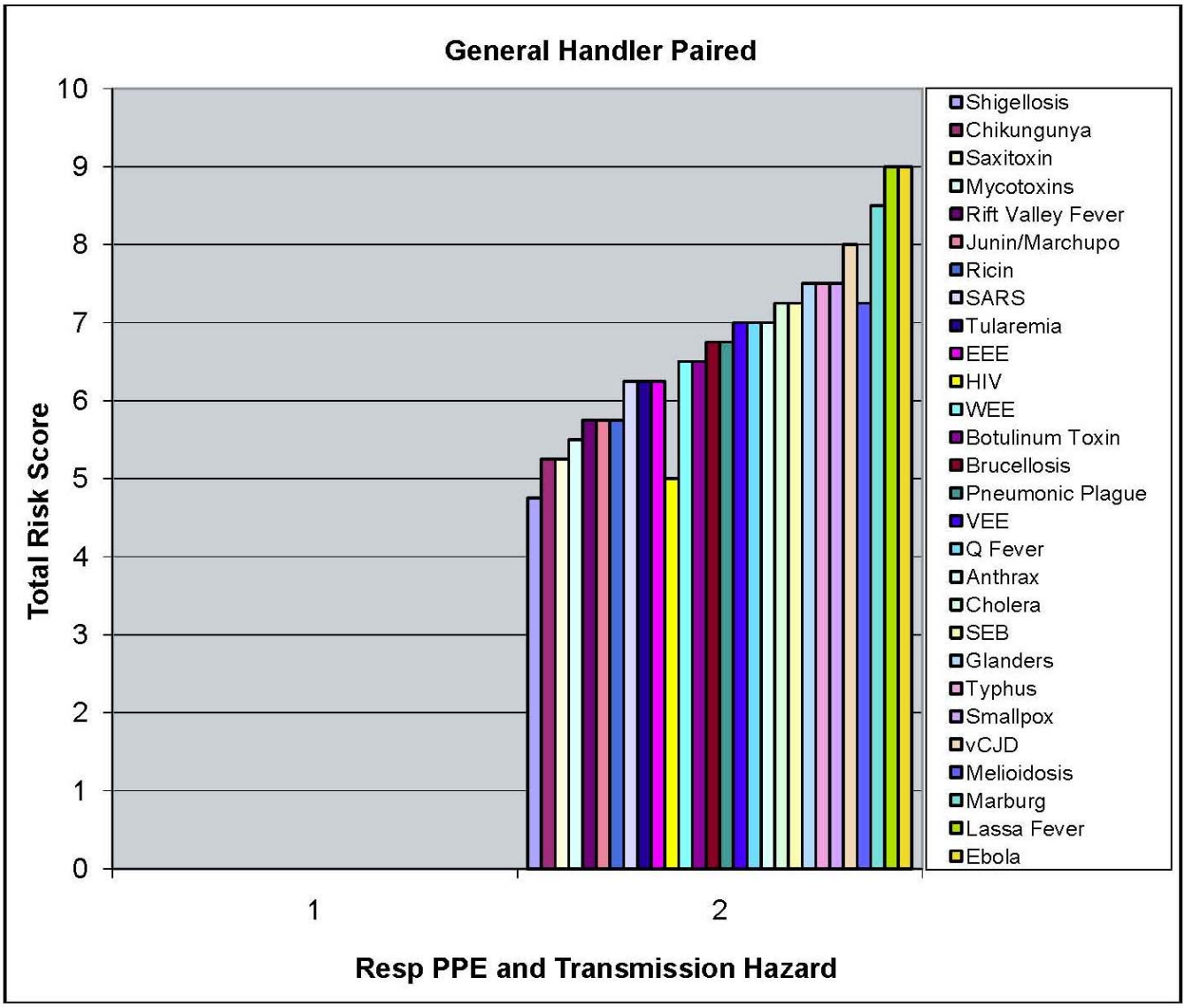

Figure 2. General Handler Paired

Second, SMEs examined whether the pairing of risk evaluative criteria—transmission hazard and respiratory PPE requirements—significantly affected overall scores thereby affecting the finding of the linear progression. Since the original design paired the two criterions (i.e., bio agents deemed a contact and droplet hazard directly determined the respiratory PPE score, as N95 masks are not needed for contact and droplet hazards), SMEs conducted a second assessment whereby the two criteria were not paired. In the second assessment, respiratory PPE scores were based on recommendations cited from other works.

In both situations, bio agent scores did not naturally form into clusters, but denoted a smooth curve. Scoring results for the prosector remained unchanged from the paired results. See Figures 4 and 5 for the unpaired rankings for the transporter and general handler.

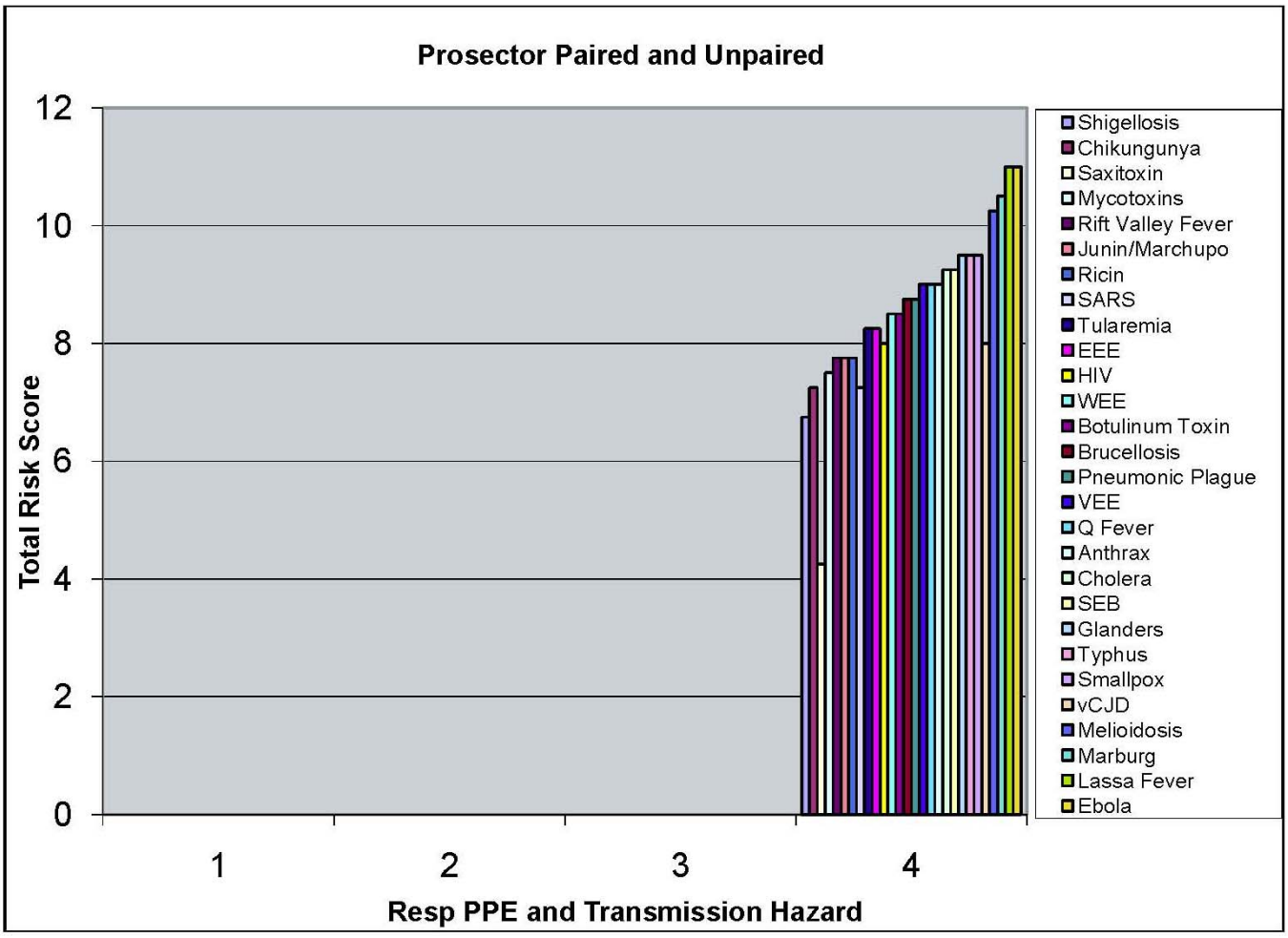

Figure 3. Prosector Paired and Unpaired*

***Note:** Figure 3 represents scoring results for the prosector, which remained unchanged from the paired results depicted above.

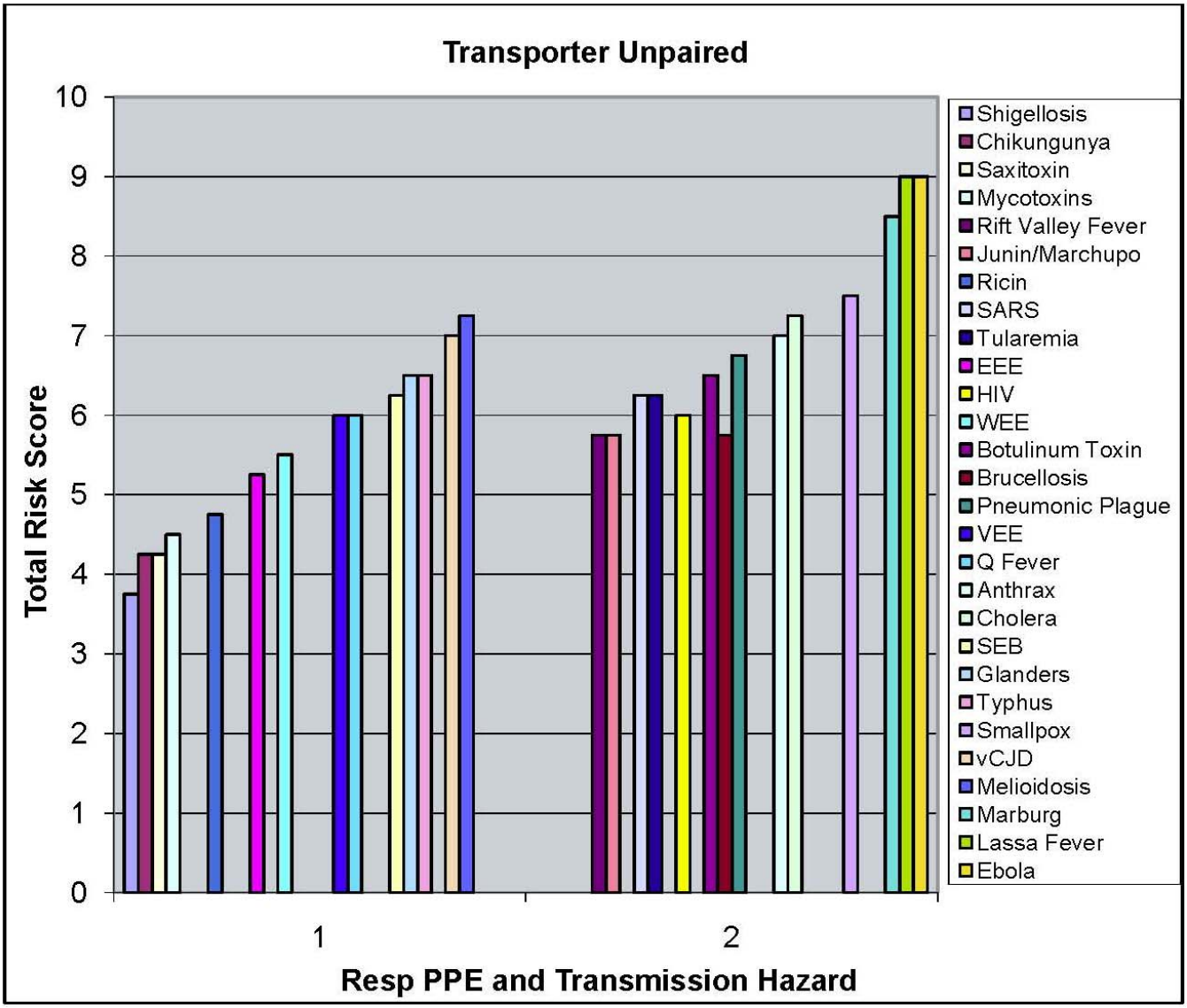

Figure 4. Transporter Unpaired

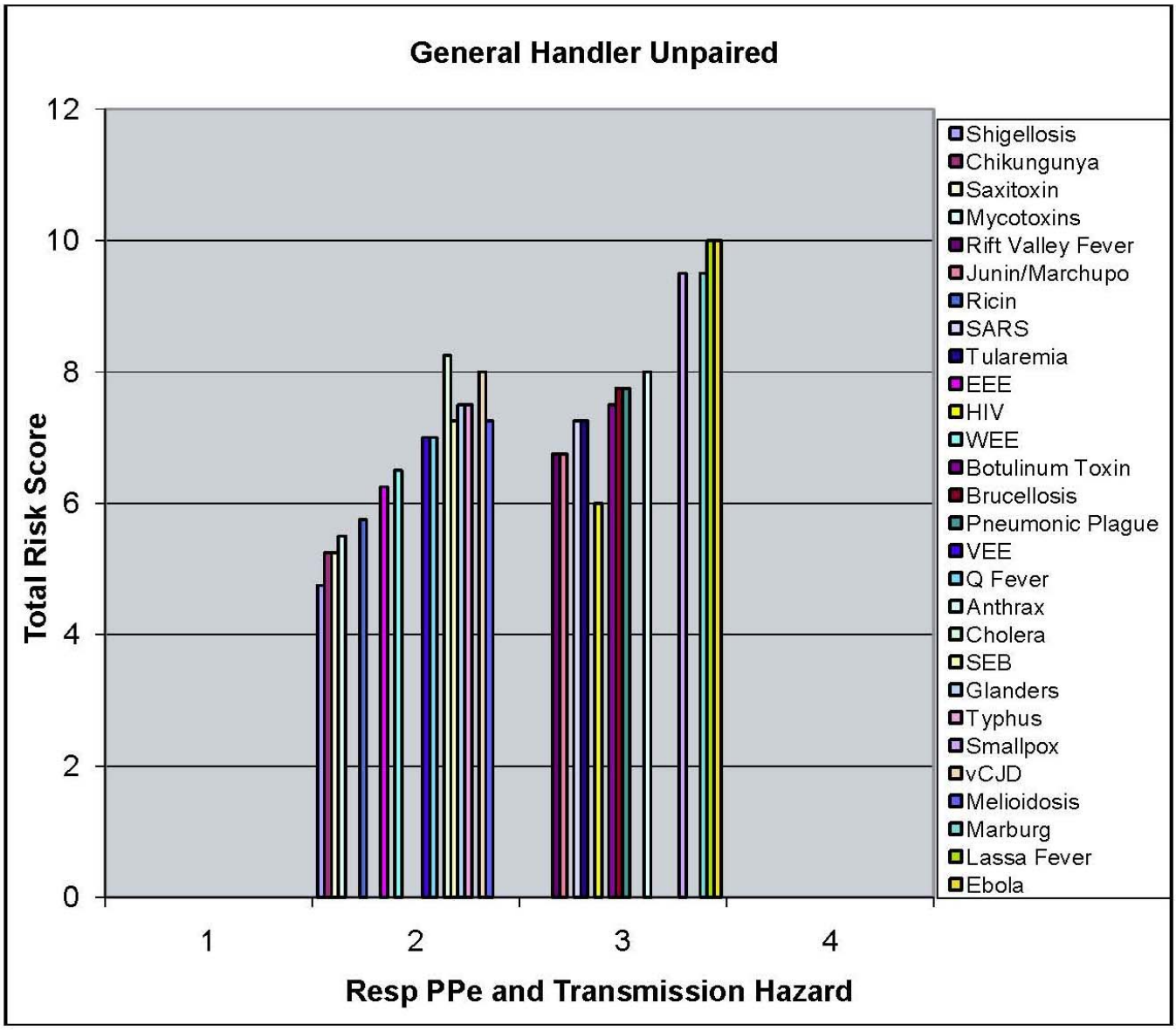

Figure 5. General Handler Unpaired

8. Points of Discussion

The primary benefit of this study, given the lack of scientific study in this area and the need for actionable knowledge, is it demonstrates that all WMD biological agents of concern do not pose the same level of exposure risk for all persons coming in contact with decedents infected with such agents. Exposure risk is rather more closely linked to the task-induced hazards created by the person coming in contact with the body, as well as the persistence of the bio agent, the medical treatment required, if the end user is exposed, and the required level of respiratory PPE.

Additionally, this study can be used as a reference to assist DoD in the development of safe handling guidance, which supports DoD's ability to return bio-contaminated fallen service members to CONUS. Whereas certain agents of concern may require the employment of extensive safety practices, most do not share this requirement. As such, advocating only one grade/step higher than what science supports (e.g., if science identifies the need for a surgical mask, then the application of a N95 masks is one step higher versus the application of negative pressure masks or SCBA) is more than sufficient to safeguard those handling bio-contaminated decedents.

This study had the following limitations:

- The study incorporated environmental persistence data for each bio agent rather than using postmortem persistence data, as such data does not exist.[143]

- The study required the SMEs to contrive four percent (i.e., 27 out of 600) of the individual parametric scores, as past research did not address particular bio agent characteristics. Twenty-four of the derived scores were established for bio agent persistence, and three scores were derived for bio agent mortality.

- Bio agent scores did not naturally cluster into three risk groups—top, bottom, and middle—but rather when plotted revealed a smooth curve from lowest to highest ranking scores. Perhaps the failure of risk values to neatly fit into three risk groups supports a more appropriate exposure risk discriminator—the use of non-WMD bio agents. Bio agents having greater scores than non-WMD agents should be considered as those agents posing the greatest risk postmortem to general handlers, transporters, and prosectors, and those agents having a lower score should be considered no more dangerous than non-WMD agents. Furthermore, considering end users are somewhat comfortable coming in contact with these very concerning but non-WMD conditions, and limited research identifies very low percentages (<3%) of instances whereby pathologists and embalmers have experienced occupational exposure since 1988, [144] discriminating WMD bio agents against non-WMD bio agents may mitigate end users from having irrational fears regarding the need to employ excessive levels of PPE and/or safety measures.

- The application of the "worst-case scenario" not only generates a small range of risk scores (as would be expected from the worst-case approach) but also overstates end user exposure risk.

- It is clear from these results that a more sophisticated quantitative approach to assess risk is required to more confidently identify risk management strategies to effectively mitigate exposure. Process-based risk models that specifically assess risk associated with each end user's performed tasks cross-leveled with each bio agent of concern would more effectively assess occupational risk.

9. Future Studies

This study identifies the need to conduct MA science to assess the actual danger to end users. First, this study identifies a significant gap regarding bio agent persistence in general and specific to decedents during different states of decomposition. One recommendation for future studies is to focus on agents posing the greatest exposure risk, perhaps as identified within this report. At a minimum, such studies should include a representative from several bio agent categories—one viral agent (i.e., Ebola, Lassa fever or Marburg), one bacterial agent (i.e., glanders), and one prion agent (i.e., vCFD), for example, as these were the highest scoring bio agents of concern identified in this study.

Second, the study can be replicated weighting specific parameters identified within the matrix tool so as to more directly determine exposure risk for each end user. For example, general handlers and transporters are not concerned with BSL scores, and as such this can be weighted with less significance; resolutely, prosectors may choose to weight this parameter with more significance, as it directly affects exposure risk in their occupational environment.

Lastly, it is clear from the results that a more sophisticated quantitative approach for assessing occupational exposure risk is required. Process-based risk models can be used to assess a greater level of specificity based on each task performed by the end user particular to each bio agent. Additionally, sophisticated risk models can be used to generate semi-quantitative or order-of-magnitude risk assessments. In either instance, performing operational risk management analyses on bio agents of greatest concern (e.g., those bio agents that generated in the greatest score as identified in this study) lend to the development of effective risk management strategies to mitigate end user risk of exposure.

10. Conclusion

To date, no study has addressed the implications associated with handling bio WMD-infected decedents. Past efforts have utilized a public health definition of risk for postmortem circumstances; the consequence of which is an inaccurate perspective that has filtered through all levels of doctrine, policy, and procedure. Based on the findings of this study, however, many of the biologically infected decedents are no more hazardous than bio agents medical examiners/coroners and funeral directors are accustomed to handling regularly (i.e., SARS, HIV, or vCJD).

As such, the SMEs recommend (1) DoD expeditiously address, through directed research, the knowledge gaps that will quantitatively assess risk for the highest-risk agents identified, and (2) change doctrine so as to allow repatriation of as many biologically contaminated fallen service members as possible, under the guise of present practices.

DoD, today, can safely handle many WMD bio-infected decedents—by applying the practices established for non-WMD infected decedents—thereby allowing for the safe return of many of these fallen service members to CONUS for final disposition.

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ACRONYM LIST

AIIR ..... Airborne Infection Isolation Room
ASA ..... Assistant Secretary of the US Army
BSI ..... Body Substance Isolation
BSL ..... Biosafety Lab
CASCOM ..... Combined Arms Support Command
CBRNE ..... Chemical, Biological, Radiological, Nuclear, High-Yield Explosive
CDC ..... Centers for Disease Control and Prevention
CENTCOM ..... Central Command
CHPPM ..... Center for Health Promotion and Preventive Medicine
CONUS ..... Continental United States
DHB ..... Defense Health Board
DNA ..... Deoxyribonucleic Acid
EEE ..... Eastern Equine Encephalitis
DoD ..... Department of Defense
FDA ..... Food and Drug Administration
HHS ..... Health and Human Services
HIV ..... Human Immunodeficiency Virus
HRP ..... Human Remains Pouch
IND ..... Investigational New Drug
JMAC ..... Joint Mortuary Affairs Center
JPEO-CB ..... Joint Program Executive Office for Chemical and Biological Defense
JRO-CBRND Joint Requirements Office – Chemical, Biological, Radiological, Nuclear Defense
LNO ..... Liaison Officer
M&RA ..... Manpower and Reserve Affairs
MA ..... Mortuary Affairs
MADCP ..... Mortuary Affairs Decontamination Collection Point
MOPP ..... Mission Oriented Protective Posture
MTF ..... Medical Treatment Facility
NIOSH ..... National Institute of Safety and Health
OSHA ..... Occupational Health and Safety Administration
POPM-SA ..... Proponency Office of Preventive Medicine – San Antonio
PPE ..... Personal Protective Equipment
SARS ..... Severe Acute Respiratory Syndrome
SCBA ..... Self-Contained Breathing Apparatus
SEB ..... Staphylococcal Entertoxin B
SME ..... Subject Matter Expert
UP ..... Universal Precautions
US ..... United States
USDA ..... United States Department of Agriculture
vCJD ..... variant Creutzfeldt-Jakob Disease
VEE ..... Venezuelan Equine Encephalitis
WEE ..... Western Equine Encephalitis
WMD ..... Weapon of Mass Destruction

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Appendix A. Agents and Associated Scores for the General Handler, Transporter, and Prosector

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Appendix A. Agents and Associated Scores for the General Handler, Transporter, and Prosector

Tables 8, 9, and 10 represent a listing of the criteria and scoring results for each bio agent. Each score presents a worst-case scenario.

Table 8. Agents and Associated Scores for the General Handler	
Anthrax	
Complexity of Care	▪Level of care-Hospitalization **(2)** ▪Mortality 30% **(3)** ▪Chemoprophylaxis- yes **(0)** ▪Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪>1 year **(3)**
BSL Level for the Prosector	▪BSL 2 **(1)**
Botulinum Toxin	
Complexity of Care	▪Level of care-Hospitalization **(2)** ▪Mortality 60% **(3)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence months **(2)**
BSL Level for the Prosector	▪BSL 2 **(1)**
Brucellosis	
Complexity of Care	▪Level of care-Hospitalization **(1)** ▪Mortality 2% **(1)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence > year **(3)**
BSL Level for the Prosector	▪BSL 2 **(1)**
Chikungunya	
Complexity of Care	▪Level of care-Hospitalization (1) ▪Mortality 0% (1) ▪Chemoprophylaxis- no (1) ▪Chemotherapeutics- no (1)
Transmission Hazard of the Agent	▪Droplet (2)
Need for Additional Respiratory Protection	▪No N95 mask (0)
Persistence of the Agent	▪Persistence hours (1)
BSL Level for the Prosector	▪BSL 2 (1)

Table 8. Agents and Associated Scores for the General Handler	
Cholera	
Complexity of Care	▪Level of care-Hospitalization **(2)** ▪Mortality 100% **(3)** ▪Chemoprophylaxis- yes **(0)** ▪Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence >months **(3)**
BSL Level for the Prosector	▪BSL 2 **(1)**
Ebola	
Complexity of Care	▪Level of care-Hospitalization **(3)** ▪Mortality 90% **(3)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence >months **(2)**
BSL Level for the Prosector	▪BSL 4 **(3)**
EEE	
Complexity of Care	▪Level of care-Hospitalization **(2)** ▪Mortality 50–70% **(3)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence hours **(1)**
BSL Level for the Prosector	▪BSL 3 **(2)**
Glanders	
Complexity of Care	▪Level of care-Hospitalization (2) ▪Mortality >50% (3) ▪Chemoprophylaxis- no (1) ▪Chemotherapeutics- yes (0)
Transmission Hazard of the Agent	▪Droplet (2)
Need for Additional Respiratory Protection	▪No N95 mask (0)
Persistence of the Agent	▪Persistence months (2)
BSL Level for the Prosector	▪BSL 3 (2)

Table 8. Agents and Associated Scores for the General Handler	
Junin/Marchupo	
Complexity of Care	▪Level of care-Hospitalization **(3)** ▪Mortality >50% **(3)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence hours **(1)**
BSL Level for the Prosector	▪BSL 2 **(1)**
Lassa Fever	
Complexity of Care	▪Level of care-Hospitalization **(3)** ▪Mortality 90% **(3)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence months **(2)**
BSL Level for the Prosector	▪BSL 4 **(3)**
Marburg	
Complexity of Care	▪Level of care-Hospitalization **(3)** ▪Mortality 90% **(3)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence months **(2)**
BSL Level for the Prosector	▪BSL 4 **(3)**
Melioidosis	
Complexity of Care	▪Level of care-Hospitalization (2) ▪Mortality 20–50% (2) ▪Chemoprophylaxis- no (1) ▪Chemotherapeutics- yes (0)
Transmission Hazard of the Agent	▪Droplet (2)
Need for Additional Respiratory Protection	▪No N95 mask (0)
Persistence of the Agent	▪Persistence months (2)
BSL Level for the Prosector	▪BSL 3 (2)

Table 8. Agents and Associated Scores for the General Handler	
Mycotoxins	
Complexity of Care	▪Level of care-Hospitalization **(2)** ▪Mortality 20–40% **(2)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence hours **(1)**
BSL Level for the Prosector	▪BSL 2 **(1)**
Pneumonic Plague	
Complexity of Care	▪Level of care-Hospitalization **(3)** ▪Mortality 60–90% **(3)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪N95 mask No **(0)**
Persistence of the Agent	▪Hours to days **(2)**
BSL Level for the Prosector	▪BSL 2 **(1)**
Q Fever	
Complexity of Care	▪Level of care-Hospitalization **(1)** ▪Mortality <50% **(1)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(1)**
Persistence of the Agent	▪Persistence stable **(2)**
BSL Level for the Prosector	▪BSL 2 **(1)**
Ricin	
Complexity of Care	▪Level of care-Hospitalization (2) ▪Mortality 50% (3) ▪Chemoprophylaxis- no (1) ▪Chemotherapeutics- no (1)
Transmission Hazard of the Agent	▪Droplet (2)
Need for Additional Respiratory Protection	▪No N95 mask (0)
Persistence of the Agent	▪Persistence hours (1)
BSL Level for the Prosector	▪BSL 2 (1)

Table 8. Agents and Associated Scores for the General Handler	
Rift Valley Fever	
Complexity of Care	▪Level of care-Hospitalization (1) ▪Mortality 1% **(1)** ▪Chemoprophylaxis- **(0)** ▪Chemotherapeutics- **(1)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence relatively stable **(1)**
BSL Level for the Prosector	▪BSL 2 **(1)**
Saxitoxin	
Complexity of Care	▪Level of care-Hospitalization **(2)** ▪Mortality 0.1% **(1)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence very **(2)**
BSL Level for the Prosector	▪BSL 2 **(1)**
SEB	
Complexity of Care	▪Level of care-Hospitalization **(2)** ▪Mortality 10% **(1)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence year **(3)**
BSL Level for the Prosector	▪BSL 2 **(1)**
Shigellosis	
Complexity of Care	▪Level of care-Hospitalization (1) ▪Mortality 1% (1) ▪Chemoprophylaxis- no (1) ▪Chemotherapeutics- yes (0)
Transmission Hazard of the Agent	▪Droplet (2)
Need for Additional Respiratory Protection	▪No N95 mask (0)
Persistence of the Agent	▪Persistence somewhat (1)
BSL Level for the Prosector	▪BSL 2 (1)

Table 8. Agents and Associated Scores for the General Handler	
Smallpox	
Complexity of Care	▪Level of care-Hospitalization **(3)** ▪Mortality 21–44% **(2)** ▪Chemoprophylaxis- yes **(0)** ▪Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence stable **(2)**
BSL Level for the Prosector	▪BSL 4 **(3)**
Tularemia	
Complexity of Care	▪Level of care-Hospitalization **(2)** ▪Mortality 33% **(2)** ▪Chemoprophylaxis- yes **(0)** ▪Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence **(2)**
BSL Level for the Prosector	▪BSL 3 (**2**)
Typhus	
Complexity of Care	▪Level of care-Hospitalization (1) ▪Mortality 10–60% **(3)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪>1 year **(3)**
BSL Level for the Prosector	▪BSL 2 **(1)**
VEE	
Complexity of Care	▪Level of care-Hospitalization (1) ▪Mortality 1% (1) ▪Chemoprophylaxis- no (1) ▪Chemotherapeutics- no (1)
Transmission Hazard of the Agent	▪Droplet (2)
Need for Additional Respiratory Protection	▪No N95 mask (0)
Persistence of the Agent	▪Persistence relatively unstable (1)
BSL Level for the Prosector	▪BSL 3 (2)

Table 8. Agents and Associated Scores for the General Handler	
WEE	
Complexity of Care	▪Level of care-Hospitalization **(1)** ▪Mortality 10% **(1)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Persistence hours **(1)**
BSL Level for the Prosector	▪BSL 3 **(2)**
HIV	
Complexity of Care	▪Level of care-Outpatient **(1)** ▪Mortality <21% **(1)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask (**0)**
Persistence of the Agent	▪Persistence months **(2)**
BSL Level for the Prosector	▪BSL 2 **(1)**
SARS	
Complexity of Care	▪Level of care-Hospitalization AIIR **(3)** ▪Mortality <21% **(1)** ▪Chemoprophylaxis- yes **(0)** ▪Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪Droplet **(2)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪Days **(1)**
BSL Level for the Prosector	▪BSL 3 **(2)**
vCJD	
Complexity of Care	▪Level of care-Hospitalization (2) ▪Mortality >50% (3) ▪Chemoprophylaxis- no (1) ▪Chemotherapeutics- no (1)
Transmission Hazard of the Agent	▪Droplet (2)
Need for Additional Respiratory Protection	▪No N95 mask (0)
Persistence of the Agent	▪Persistence months (3)
BSL Level for the Prosector	▪BSL 2 (1)

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Table 9. Agents and Associated Scores for the Transporter	
Anthrax	
Complexity of Care	▪Level of care-Hospitalization **(2)** ▪Mortality 30% **(3)** ▪Chemoprophylaxis- yes **(0)** ▪Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪Contact **(1)**
Need for Additional Respiratory Protection	▪No N95 mask **(0)**
Persistence of the Agent	▪>1 year **(3)**
BSL Level for the Prosector	▪BSL 2 **(1)**
Botulinum Toxin	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 60% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence month **(2)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Brucellosis	
Complexity of Care	▪ Level of care-Hospitalization **(1)** ▪ Mortality 2% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence > year **(3)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Chikungunya	
Complexity of Care	▪ Level of care-Hospitalization **(1)** ▪ Mortality 0% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence hours **(1)**
BSL Level for the Prosector	▪ BSL 2 **(1)**

Table 9. Agents and Associated Scores for the Transporter	
Cholera	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 100% **(3)** ▪ Chemoprophylaxis- yes **(0)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence >months **(3)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Ebola	
Complexity of Care	▪ Level of care-Hospitalization **(3)** ▪ Mortality 90% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the agent	▪ Persistence >months **(2)**
BSL Level for the Prosector	▪ BSL 4 **(3)**
EEE	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 50–70% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence hours **(1)**
BSL Level for the Prosector	▪ BSL 3 **(2)**
Glanders	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality >50% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence months **(2)**
BSL Level for the Prosector	▪ BSL 3 **(2)**

Table 9. Agents and Associated Scores for the Transporter	
Junin/Marchupo	
Complexity of Care	▪ Level of care-Hospitalization **(3)** ▪ Mortality >50% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence hours **(1)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Lassa Fever	
Complexity of Care	▪ Level of care-Hospitalization **(3)** ▪ Mortality 90% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence months **(2)**
BSL Level for the Prosector	▪ BSL 4 **(3)**
Marburg	
Complexity of Care	▪ Level of care-Hospitalization **(3)** ▪ Mortality 90% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the agent	▪ Persistence months **(2)**
BSL Level for the Prosector	▪ BSL 4 **(3)**
Melioidosis	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 20–50% **(2)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence months **(2)**
BSL Level for the Prosector	▪ BSL 3 **(2)**

Table 9. Agents and Associated Scores for the Transporter	
Mycotoxins	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 20–40% **(2)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence hours **(1)**
BSL Level for the Prosector	▪ BSL 2 **(1)** ▪
Pneumonic Plague	
Complexity of Care	▪ Level of care-Hospitalization **(3)** ▪ Mortality 60–90% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ N95 mask No **(0)**
Persistence of the Agent	▪ Hours to days **(2)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Q Fever	
Complexity of Care	▪ Level of care-Hospitalization **(1)** ▪ Mortality <50% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(1)**
Persistence of the Agent	▪ Persistence stable **(2)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Ricin	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 50% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence hours **(1)**
BSL Level for the Prosector	▪ BSL 2 **(1)**

Table 9. Agents and Associated Scores for the Transporter	
Rift Valley Fever	
Complexity of Care	▪ Level of care-Hospitalization (1) ▪ Mortality 1% **(1)** ▪ Chemoprophylaxis- **(0)** ▪ Chemotherapeutics- **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence relatively stable **(1)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Saxitoxin	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 0.1% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence very **(2)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
SEB	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 10% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence year **(3)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Shigellosis	
Complexity of Care	▪ Level of care-Hospitalization **(1)** ▪ Mortality 1% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence somewhat **(1)**
BSL Level for the Prosector	▪ BSL 2 **(1)**

Table 9. Agents and Associated Scores for the Transporter	
Smallpox	
Complexity of Care	▪ Level of care-Hospitalization **(3)** ▪ Mortality 21–44% **(2)** ▪ Chemoprophylaxis- yes **(0)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence stable **(2)**
BSL Level for the Prosector	▪ BSL 4 **(3)**
Tularemia	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 33% **(2)** ▪ Chemoprophylaxis- yes **(0)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence **(2)**
BSL Level for the Prosector	▪ BSL 3 (**2**)
Typhus	
Complexity of Care	▪ Level of care-Hospitalization (1) ▪ Mortality 10–60% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ >1 year **(3)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
VEE	
Complexity of Care	▪ Level of care-Hospitalization **(1)** ▪ Mortality 1% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence relatively unstable **(1)**
BSL Level for the Prosector	▪ BSL 3 **(2)**

Table 9. Agents and Associated Scores for the Transporter	
WEE	
Complexity of Care	▪ Level of care-Hospitalization **(1)** ▪ Mortality 10% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence hours **(1)**
BSL Level for the Prosector	▪ BSL 3 **(2)**
HIV	
Complexity of Care	▪ Level of care-Outpatient **(1)** ▪ Mortality <21% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask (**0)**
Persistence of the Agent	▪ Persistence months **(2)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
SARS	
Complexity of Care	▪ Level of care-Hospitalization AIIR **(3)** ▪ Mortality <21% **(1)** ▪ Chemoprophylaxis- yes **(0)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Days **(1)**
BSL Level for the Prosector	▪ BSL 3 **(2)**
vCJD	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality >50% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Contact **(1)**
Need for Additional Respiratory Protection	▪ No N95 mask **(0)**
Persistence of the Agent	▪ Persistence months **(3)**
BSL Level for the Prosector	▪ BSL 2 **(1)**

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Table 10. Agents and Associated Scores for the Prosector	
Anthrax	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 30% **(3)** ▪ Chemoprophylaxis- yes **(0)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ >1 year **(3)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Botulinum Toxin	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 60% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence months **(2)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Brucellosis	
Complexity of Care	▪Level of care-Hospitalization **(1)** ▪Mortality 2% **(1)** ▪Chemoprophylaxis- no **(1)** ▪Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪Aerosol **(3)**
Need for Additional Respiratory Protection	▪Yes N95 mask **(1)**
Persistence of the Agent	▪Persistence > year **(3)**
BSL Level for the Prosector	▪BSL 2 **(1)**
Chikungunya	
Complexity of Care	▪ Level of care-Hospitalization **(1)** ▪ Mortality 0% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence hours **(1)**
BSL Level for the Prosector	▪ BSL 2 **(1)**

Table 10. Agents and Associated Scores for the Prosector	
Cholera	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 100% **(3)** ▪ Chemoprophylaxis- yes **(0)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence >months **(3)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Ebola	
Complexity of Care	▪ Level of care-Hospitalization **(3)** ▪ Mortality 90% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence >months **(2)**
BSL Level for the Prosector	▪ BSL 4 **(3)**
EEE	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 50–70% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence hours **(1)**
BSL Level for the Prosector	▪ BSL 3 **(2)**
Glanders	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality >50% **(3)** ▪ Chemoprophylaxis-no **(1)** ▪ Chemotherapeutics-yes **(0)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence months **(2)**
BSL Level for the Prosector	▪ BSL 3 **(2)**

Table 10. Agents and Associated Scores for the Prosector	
Junin/Marchupo	
Complexity of Care	▪ Level of care-Hospitalization **(3)** ▪ Mortality >50% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence hours **(1)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Lassa Fever	
Complexity of Care	▪ Level of care-Hospitalization **(3)** ▪ Mortality 90% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence months **(2)**
BSL Level for the Prosector	▪ BSL 4 **(3)**
Marburg	
Complexity of Care	▪ Level of care-Hospitalization **(3)** ▪ Mortality 90% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence months **(2)**
BSL Level for the Prosector	▪ BSL 4 **(3)**
Melioidosis	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 20-50 % **(2)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence months **(2)**
BSL Level for the Prosector	▪ BSL 3 **(2)**

Table 10. Agents and Associated Scores for the Prosector	
Mycotoxins	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 20–40% **(2)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence hours **(1)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Pneumonic Plague	
Complexity of Care	▪ Level of care-Hospitalization **(3)** ▪ Mortality 60–90% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Hours to days **(2)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Q fever	
Complexity of Care	▪ Level of care-Hospitalization **(1)** ▪ Mortality <50% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence stable **(2)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Ricin	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 50% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence hours **(1)**
BSL Level for the Prosector	▪ BSL 2 **(1)**

Table 10. Agents and Associated Scores for the Prosector	
Rift Valley Fever	
Complexity of Care	▪ Level of care-Hospitalization (1) ▪ Mortality 1% **(1)** ▪ Chemoprophylaxis- **(0)** ▪ Chemotherapeutics- **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence relatively stable **(1)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Saxitoxin	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 0.1% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence very **(2)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
SEB	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 10% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence year **(3)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
Shigellosis	
Complexity of Care	▪ Level of care-Hospitalization **(1)** ▪ Mortality 1% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence somewhat **(1)**
BSL Level for the Prosector	▪ BSL 2 **(1)**

Table 10. Agents and Associated Scores for the Prosector	
Smallpox	
Complexity of Care	▪ Level of care-Hospitalization **(3)** ▪ Mortality 21–44% **(2)** ▪ Chemoprophylaxis- yes **(0)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence stable **(2)**
BSL Level for the Prosector	▪ BSL 4 **(3)**
Tularemia	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality 33% **(2)** ▪ Chemoprophylaxis- yes **(0)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence **(2)**
BSL Level for the Prosector	▪ BSL 3 (**2**)
Typhus	
Complexity of Care	▪ Level of care-Hospitalization (1) ▪ Mortality 10–60% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- yes **(0)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ >1 year **(3)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
VEE	
Complexity of Care	▪ Level of care-Hospitalization **(1)** ▪ Mortality 1% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence relatively unstable **(1)**
BSL Level for the Prosector	▪ BSL 3 **(2)**

Table 10. Agents and Associated Scores for the Prosector	
WEE	
Complexity of Care	▪ Level of care-Hospitalization **(1)** ▪ Mortality 10% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence hours **(1)**
BSL Level for the Prosector	▪ BSL 3 **(2)**
HIV	
Complexity of Care	▪ Level of care-Outpatient **(1)** ▪ Mortality <21% **(1)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence months **(2)**
BSL Level for the Prosector	▪ BSL 2 **(1)**
SARS	
Complexity of Care	▪ Level of care-Hospitalization AIIR **(3)** ▪ Mortality <21% **(1)** ▪ Chemoprophylaxis- yes **(0)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Days **(1)**
BSL Level for the Prosector	▪ BSL 3 **(2)**
vCJD	
Complexity of Care	▪ Level of care-Hospitalization **(2)** ▪ Mortality >50% **(3)** ▪ Chemoprophylaxis- no **(1)** ▪ Chemotherapeutics- no **(1)**
Transmission Hazard of the Agent	▪ Aerosol **(3)**
Need for Additional Respiratory Protection	▪ Yes N95 mask **(1)**
Persistence of the Agent	▪ Persistence months **(3)**
BSL Level for the Prosector	▪ BSL 2 **(1)**

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Appendix B. General Handler, Transporter, and Prosector Matrix Scoring with Corresponding Reference Numbers

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Appendix B. General Handler, Transporter, and Prosector Matrix Scoring with Corresponding Reference Numbers

Tables 11, 12, and 13 represent the numerical scores identified in Appendix A, depicted within the matrix. Individual scores derived are also associated with corresponding references, and total scores are provided for each bio agent.

Table 11. General Handler Risk Matrix Scoring With Corresponding Reference Numbers

Disease	Complexity of care					Transmission	Resp	Persistence	BSL	Total
	Hosp	Mortality	Proph	Therap	Average					
Anthrax	**2** (3, 4, 6, 8, 9, 131, 133, 134, 135, 136, 137, 138)	**3** (1, 4, 13, 20, 132, 134, 135, 138)	**0** (3, 4, 7, 8, 9, 10, 12, 13, 131, 133, 134, 135, 138)	**0** (3, 4, 7, 8, 9, 10, 12, 13, 131, 133, 134, 138)	**1.25**	**2** (2, 3, 8, 13, 18, 131, 133, 136, 137, 138)	**0** (2, 3, 8, 13, 18, 131, 133, 136, 137, 138)	**3** (1, 2, 3, 4, 5, 18)	**1** (11)	**7.25**
Botulinum Toxin	**2** (4, 12, 13, 14, 16, 17, 131, 134, 136, 137, 138)	**3** (4, 15, 16, 20, 132, 134, 138)	**1** (4, 13, 14, 131, 134, 135, 138)	**1** (4, 12, 13, 14, 15, 13, 134, 138)	**1.75**	**2** (12, 13, 16, 17, 18, 131, 134, 136, 137, 138)	**0** (12, 13, 16, 17, 18, 131, 134, 136, 137, 138)	**2** (4, 14, 15, 17, 18, 19)	**2** (11, 15)	**7.75**
Brucellosis	**1** (4, 22, 134, 135, 137)	**1** (21, 22, 134, 135)	**1** (18, 4, 22, 134)	**0** (4, 22, 134)	**0.75**	**2** (21, 137)	**0** (21, 137)	**3** (18)	**1** (11)	**6.75**
Chikungunya	**1** (23, 24, 25, 137)	**1** (18, 23, 24)	**1** (18, 23, 24, 25)	**1** (18, 23, 24, 25)	**1**	**2** (18, 137)	**0** (18, 137)	**1** (18)	**1** (11)	**5.0**
Cholera	**2** (26, 27, 28, 134, 137)	**3** (4, 18, 27, 28, 132, 134)	**0** (4, 18, 27, 28, 134, 135)	**0** (18, 27, 28, 134)	**1.25**	**2** (4, 18, 27, 28, 137)	**0** (4, 18, 28, 137)	**3** (4, 18, 28)	**1** (11)	**7.25**
Ebola	**3** (29, 31, 32, 54, 56,	**3** (4, 30, 31 49, 54, 131, 13, 134,	**1** (18, 31, 131,	**1** (18, 31, 131,	**2**	**2** (29, 30, 31, 32, 54, 56, 131,	**0** (,29,31,32, 54, 56, 131,	**2** (4, 131)	**3** (4, 11, 56, 131)	**9.0**

Table 11. General Handler Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
	131, 133, 134, 136, 137, 138)	138)	133, 134, 138)	133, 134, 138)		133, 134, 136, 137, 138)	133, 134, 136, 137, 138)			
EEE	**2** (4, 33, 35, 36, 131, 134, 137)	**3** (4, 12, 33, 34, 35, 36, 134)	**1** (4, 12, 33, 35, 36, 131, 134)	**1** (4, 12, 33, 35, 36, 131, 134)	**1.75**	**2** (4, 12, 18, 32, 35, ,36, 131, 137)	**0** (4, 12, 18, 32 35, 36 131, 137)	**1** (4, 18)	**2** (11)	**6.75**
Glanders	**2** (4, 39, 40, 136, 137, 138)	**3** (4, 18, 37, 38, 39, 138)	**1** (4, 37, 39, 138)	**0** (4, 37, 138)	**1.5**	**2** (4, 37, 38, 39, 136, 137, 138)	**0** (37, 38, 39, 136, 137, 138)	**2** (4, 38)	**2** (4,11)	**7.5**
Junin/ Marchupo	**3** (4, 131, 133, 134, 136, 137, 138)	**3** (4, 45, 131, 133, 134, 138)	**1** (4, 45, 131, 133, 134, 138)	**1** (4, 45, 131, 133, 134, 138)	**2**	**2** (4, 44, 45, 131, 133, 134, 136, 137, 138)	**0** (4, 44, 45, 133, 134, 136, 137, 138)	**1** (4)	**1** (4, 11, 45, 131)	**6.0**
Lassa VHF Fever	**3** (4, 32, 46, 54, 56, 131, 133, 134, 136, 137, 138)	**3** (4, 46, 48, 49, 133, 134, 138)	**1** (4, 18, 47, 48, 49, 131, 133, 134, 138)	**0** (4, 18, 46, 47,48, 49, 131, 133, 134, 138)	**1.75**	**2** (4, 18, 44, 46, 47,48,49, 54, 56 131, 133, 134, 136, 137, 138)	**0** (4, 18, 44, 46, 47, 48, 49, 54, 56, 131, 133, 134, 136, 137, 138)	**2** (4, 18, 49)	**3** (4, 11, 56, 131)	**8.75**
Marburg	**3** (32, 54, 56, 131, 133, 134, 136, 137, 138)	**3** (4, 20 49, 50, 51,52, 53, 54, 55, 56, 134, 138)	**1** (4, 18, 20, 47, 50, 54, 55, 131, 133, 134, 138)	**1** (4, 18, 20, 47, 50, 54, 55, 131, 133, 134, 138)	**2.0**	**2** (4,32, 47, 50, 51,53, 54, 55, 56, 131, 133, 136, 137, 138)	**0** (4,32, 47, 50,51, 53, 54, 55, 56, 131, 133, 136, 137, 138)	**2** (4, 50)	**3** (4,11, 56)	**9.0**
Melioidosis	**2** (4, 32, 59, 137, 138)	**2** (4, 57, 59, 138)	**1** (4, 18, 47, 49, 57, 59, 131,	**0** (4, 18, 47, 49, 57, 59, 131,	**1.25**	**2** (4, 18, 47, 59, 137, 138)	**0** (4, 18, 47, 59, 137, 138)	**2** (18, 57, 59)	**2** (4, 11)	**7.25**

Table 11. General Handler Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
			138)	138)						
Mycotoxins	**2** (4, 18, 60, 134, 136, 137, 138)	**2** (4, 60, 134, 138)	**1** (4, 18, 60, 61, 133, 134, 138)	**1** (4, 18, 60, 61, 133, 134, 138)	**1.5**	**2** (4, 18, 60, 133, 134, 136, 137, 138)	**0** (4, 18, 60, 133, 134, 136, 137, 138)	**1** (4, 18, 60, 61, 134)	**1** (11)	**5.5**
Pneumonic Plague	**3** (4, 13, 47, 32, 64, 131, 133, 134, 136, 137, 138)	**3** (4, 13, 32, 47, 64, 132, 134, 138)	**1** (4, 13, 18, 32, 47, 131, 133, 134, 135, 138)	**0** (4, 13, 18, 32, 47, 131, 133, 134, 138)	**1.75**	**2** (4, 13, 18, 32, 43, 47, 64 131, 134, 136, 137, 138)	**0** (4, 13, 18, 32, 43, 47, 64, 131, 134, 136, 137, 138)	**2** (18, 47, 63, 131)	**1** (11, 13, 64,)	**6.75**
Q Fever	**1** (4, 32, 47, 65, 66, 134, 136, 137, 138)	**1** (4 47, ,66, 132, 134, 138)	**1** (4, 47, 65, 66, 134, 138)	**0** (4, 47, 65, 66, 134, 138)	**0.75**	**2** (4, 32, 47, 65, 66, 134, 136, 137, 138)	**0** (4, 32, 47, 65, 66, 136, 137, 138)	**2** (4, 47, 66)	**1** (11)	**5.75**
Ricin	**2** (4, 67, 71, 134, 136, 137, 138)	**3** (4, 69, 134, 138)	**1** (4, 67, 68, 70, 71, 73, 134, 138)	**1** (4, 67, 68, 70, 71, 73, 134, 138)	**1.75**	**2** (67, 68, 69, 71, 72, 73, 134, 136, 137, 138)	**0** (67, 68, 69, 71, 72, 73, 134, 136, 137, 138)	**1** (4, 67, 69, 71, 72, 73)	**1** (11, 73, 74)	**5.75**
Rift Valley Fever	**1** (32, 54, 75, 76, 134, 136, 137)	**1** (20, 49, 54, 75, 76, 134)	**0** (4, 18, 20, 47, 54, 75, 76, 134, 135)	**1** (4, 18, 20, 47, 54, 75, 76, 134)	**0.75**	**2** (4, 18, 54, 47, 75, 76, 136, 137)	**0** (4, 18, 47, 54, 75, 76, 136, 137)	**1** (18, 76)	**1** (11)	**5.75**
Saxitoxin	**2** (4, 19, 83, 84, 137)	**1** (83, 84)	**1** (4, 19, 83, 85,)	**1** (4, 19, 83, 85,)	**1.25**	**2** (4, 19, 83, 137)	**0** (4, 19, 83, 137)	**2** (4,18, 19, 83, 85)	**1** (11)	**6.25**

Table 11. General Handler Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
SEB	**2** (18, 19, 47, 86, 87, 88, 137, 138)	**1** (4, 18, 47, 19, 87, 88, 138)	**1** (4, 47, 18, 19, 87, 88, 138)	**1** (4, 18, 47, 19, 87, 88, 138)	**1.25**	**2** (4, 18, 32, 47, 86, 87, 88, 137 138)	**0** (4, 18, 32, 47, 86, 87, 88, 137, 138)	**3** (18, 19, 47, 87, 88)	**1** (11, 88)	**7.25**
Shigellosis	**1** (4, 90,137)	**1** (4, 89, 90)	**1** (4, 89, 90,	**0** (4, 89, 90,)	**0.75**	**2** (4, 11, 32, 89, 90, 137)	**0** (4, 11, 32, 89, 90, 137)	**1** (89)	**1** (11)	**4.75**
Smallpox	**3** (4, 13, 18, 32, 47, 96, 131, 133, 134, 137, 138)	**2** (4, 12, 13, 18 32, 47, 96, 133, 134, 135, 136, 138)	**0** (4, 12, 13, 18, 32, 47, 91, 92, 94, 96, 131, 133, 134, 135, 136, 138)	**1** (4, 12, 13, 18, 32,47, 92, 96, 131, 133, 134, 138)	**1.5**	**2** (4, 13, 18,32,47, 95, 131, 136, 137, 138)	**0** (4, 13, 18, 32, 47, 95, 96, 131, 136, 137, 138)	**2** (4, 13, 18, 32, 47, 93, 96, 131)	**3** (11, 13, 18, 47, 96)	**8.5**
Tularemia	**2** (32, 47, 98, 99,131, 133, 134, 137, 138)	**2** (4, 97, 99, 132, 134, 138)	**0** (4, 47, 18, 99, 131, 133, 134, 138)	**0** (4, 18, 47, 99, 131, 133, 134 138)	**1.0**	**2** (4, 32, 47, 18, 99, 131, 133, 134, 137, 138)	**0** (4, 18, 32, 47, 99, 131, 133, 134, 137, 138)	**2** (4, 18)	**2** (11)	**6.0**
Typhus	**1** (100, 101, 102, 103, 105, 137)	**3** (100, 101, 102, 103, 104)	**1** (18, 100, 101, 102, 103, 104, 105, 106)	**0** (18, 100, 101, 103, 104, 105)	**1.25**	**2** (18, 32, 103, 105, 137)	**0** (18, 32, 103, 105, 137)	**3** (18)	**1** (11)	**7.25**
VEE	**1** (4, 47, 107, 111, 134, 137, 138)	**1** (47, 107, 111, 132, 134, 135, 136, 138)	**1** (4, 18, 47, 107, 108, 109, 110, 111, 134, 13)	**1** (4, 18, 47, 107, 108, 109, 110, 111, 134, 138)	**1.0**	**2** (18, 32, 47, 107, 109, 110, 111, 137, 138)	**0** (18, 32, 47, 107, 109, 110, 111, 137, 138)	**1** (18, 109)	**2** (11, 110)	**6.0**

Table 11. General Handler Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
WEE	**1** (4, 115, 116, 134, 137)	**1** (4, 115, 116, 134)	**1** (4, 18, 114, 115, 116, 117, 134)	**1** (4, 18, 114, 115, 116, 117, 134)	**1.0**	**2** (18, 32, 112, 113, 114, 117, 137)	**0**)18, 32, 112, 113, 114, 137)	**1** (18, 117)	**2** (11)	**6.0**
HIV	**1** (32, 122, 137)	**1** (122)	**1** (43, 119, 120, 121, 122)	**1** (43, 119, 120, 121, 122)	**1.0**	**2** (41, 42, 43, 121, 122, 137)	**0** (41, 42, 43, 121, 122, 137)	**2** (41, 42, 118, 119)	**1** (11, 42)	**6.0**
SARS	**3** (11, 32, 77, 78, 79, 137)	**1** (11, 82)	**0** (77, 78, 79, 81, 82)	**1** (77, ,78, 81, 82)	**1.25**	**2** (4, 11, 77, 78, 79, 80, 81, 82, 137	**0** (4, 11, 77, 78, 79, 80, 81, 82, 137)	**1** (78)	**2** (11, 78, 123)	**6.25**
vCJD	**2** (11, 32, 128, 129, 130, 137)	**3** (11, 125, 128, 130)	**1** (11, 128, 130)	**1** (11, 128, 130)	**1.75**	**2** (11, 124, 126, 127, 128, 129, 130, 137)	**0** (11, 124, 126, 127, 128, 129, 130, 137)	**3** (128, 130)	**1** (11)	**8.75**

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Table 12. Transporter Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
Anthrax	**2** (3,4,6,8,9, 131, 133 , 134, 135, 136, 137, 138)	**3** (1,4,13, 20, 132, 134 135, 138)	**0** (3,4,7,8,9,10,, 12,13, 131, 133, 134, 135, 138)	**0** (3,4,7,8,9,10,12, 13, 131,133, 134, 138)	**1.25**	**1** (2,3,8,13,18, 131, 133, 136, 137, 138)	**0** (2,3,8,13,18, 131, 133, 136, 137, 138)	**3** (1,2,3,4,5,18)	**1** (11)	**6.25**
Botulinum Toxin	**2** (4,12, 13,14,16,17, 131, 134, 136, 137, 138)	**3** (4,15,16,20, 132, 134, 138)	**1** (4,13,14, 131, 134, 135, 138)	**1** (4,12, 13,14,15, 13, 134, 138)	**1.75**	**1** (12, 13,16,17,18, 131, 134, 136, 137, 138)	**0** (12, 13, 16, 17, 18, 131, 134, 136, 137, 138)	**2** (4, 14, 15, 17, 18, 19)	**2** (11, 15)	**6.75**
Brucellosis	**1** (4, 22, 134, 135, 137)	**1** (21, 22, 134, 135)	**1** (18, 4, 22, 134)	**0** (4, 22, 134)	**0.75**	**1** (21, 137)	**0** (21, 137)	**3** (18)	**1** (11)	**5.75**
Chikungunya	**1** (23, 24, 25, 137)	**1** (18, 23, 24)	**1** (18, 23, 24,25)	**1** (18 23, 24,25)	**1**	**1** (18, 137)	**0** (18, 137)	**1** (18)	**1** (11)	**4.0**
Cholera	**2** (26, 27, 28, 134, 137)	**3** (4, 18, 27, 28, 132, 134)	**0** (4, 18, 27, 28, 134, 135)	**0** (18, 27,28, 134)	**1.25**	**1** (4, 18 ,27,28, 137)	**0** (4, 18, 28, 137)	**3** (4, 18,28)	**1** (11)	**6.25**
Ebola	**3** (29,31,32, 54, 56, 131, 133, 134, 136, 137, 138)	**3** (4,30,31 49, ,54) 131, 13, 134, 138)	**1** (18, 31, 131, 133, 134, 138)	**1** (18, 31, 131, 133, 134, 138)	**2**	**1** (29,,30,31,32, 54, 5, 131, 133, 134, 136, 137, 138)	**0** (,29,31,32, 54, 56, 131, 133, 134, 136, 137, 138)	**2** (4, 131)	**3** (4,11, 56, 131)	**8.0**

Table 12. Transporter Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
EEE	**2** (4, 33 ,35, 36, 131, 134, 137)	**3** (4, 12, 33 ,34,35, ,36, 134)	**1** (4, 12, 33,35,36, 131, 134)	**1** (4, 12, 33, ,35 ,36, 131, 134)	**1.75**	**1** (4, 12, 18, 32, 35, ,36, 131, 137)	**0** (4,12, 18, 32 35, 36 131, 137)	**1** (4, 18)	**2** (11)	**5.75**
Glanders	**2** (4, 39, 40, 136, 137, 138)	**3** (4, 18, 37, 38, 39, 138)	**1** (4, 37, 39, 138)	**0** (4, 37, 138)	**1.5**	**1** (4, 37, 38, 39, 136, 137, 138)	**0** (37, 38, 39, 136, 137, 138)	**2** (4, 38)	**2** (4,11)	**6.5**
Junin/ Marchupo	**3** (4, 131, 133, 134, 136, 137, 138)	**3** (4, 45, 131, 133, 134, 138)	**1** (4, 45, 131, 133, 134, 138)	**1** (4, 45,131, 133,134, 138)	**2**	**1** (4,44, 45,131, 133, 134, 136, 137, 138)	**0** (4, 44, 45, 133, 134, 136, 137, 138)	**1** (4)	**1** (4, 11, 45, 131)	**5.0**
Lassa VHF Fever	**3** (4, 32, 46, 54, 56, 131, 133, 134, 136, 137, 138)	**3** (4,46,48, 49, 133, 134, 138)	**1** (4,18, 47, 48, 49, 131, 133, 134, 138)	**0** (4, 18, 46, 47,48, 49, 131, 133, 134, 138)	**1.75**	**1** (4, 18, 44,46, 47,48,49, 54, 56 131, 133, 134, 136, 137, 138)	**0** (4, 18, 44, 46, 47, 48, 49, 54, 56, 131, 133, 134, 136, 137, 138)	**2** (4, 18, 49)	**3** (4,11, 56, 131)	**7.75**
Marburg	**3** (32, 54, 56, 131, 133, 134, 136, 137, 138)	**3** (4, 20 49, 50, 51,52, 53, 54, 55, 56, 134, 138)	**1** (4, 18, 20, 47, 50, 54, 55, 131, 133, 134, 138)	**1** (4, 18, 20, 47, 50, 54, 55, 131, 133, 134, 138)	**2.0**	**1** (4,32, 47, 50, 51,53, 54, 55, 56, 131, 133, 136, 137, 138)	**0** (4,32, 47, 50,51, 53, 54, 55, 56, 131, 133, 136, 137, 138)	**2** (4, 50)	**3** (4,11, 56)	**8.0**
Melioidosis	**2** (4, 32, 59, 137, 138)	**2** (4, 57, 59, 138)	**1** (4, 18, 47, 49, 57, 59, 131, 138)	**0** (4, 18, 47, 49, 57, 59, 131, 138)	**1.25**	**1** (4, 18, 47, 59, 137, 138)	**0** (4, 18, 47, 59, 137, 138)	**2** (18, 57, 59)	**2** (4, 11)	**6.25**

Table 12. Transporter Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
Mycotoxins	**2** (4, 18, 60, 134, 136, 137, 138)	**2** (4, 60, 134, 138)	**1** (4, 18, 60, 61, 133, 134, 138)	**1** (4, 18, 60, 61, 133, 134, 138)	**1.5**	**1**)(4, 18, 60, 133, 134, 136, 137, 138)	**0** (4, 18, 60, 133, 134, 136, 137, 138)	**1** (4, 18, 60, 61, 134)	**1** (11)	**4.5**
Pneumonic Plague	**3** (4, 13, 47, 32, 64, 131, 133, 134, 136, 137, 138)	**3** (4, 13, 32, 47, 64, 132, 134, 138)	**1** (4, 13, 18, 32, 47, 131, 133, 134, 135, 138)	**0** (4, 13, 18, 32, 47, 131, 133, 134, 138)	**1.75**	**1** (4, 13, 18, 32, 43, 47, 64 131, 134, 136, 137, 138)	**0** (4, 13, 18, 32, 43, 47, 64, 131, 134, 136, 137, 138)	**2** (18, 47, 63, 131)	**1** (11, 13, 64,)	**5.75**
Q Fever	**1** (4, 32, 47, 65, 66, 134, 136, 137, 138)	**1** (4 47, ,66, 132, 134, 138)	**1** (4, 47, 65, 66, 134, 138)	**0** (4, 47, 65, 66, 134, 138)	**0.75**	**1** (4, 32, 47, 65, 66, 134, 136, 137, 138)	**0** (4, 32, 47, 65, 66, 136, 137, 138)	**2** (4, 47, 66)	**1** (11)	**4.75**
Ricin	**2** (4, 67, 71, 134, 136, 137, 138)	**3** (4, 69, 134, 138)	**1** (4, 67, 68, 70, 71, 73, 134, 138)	**1** (4, 67, 68, 70, 71, 73, 134, 138)	**1.75**	**1** (67, 68, 69, 71, 72, 73, 134, 136, 137, 138)	**0** (67,68, 69, 71, 72, 73, 134, 136, 137, 138)	**1** (4,67,69, 71, 72, 73,)	**1** (11, 73, 74)	**4.75**
Rift Valley Fever	**1** (32, 54, 75, 76, 134, 136, 137)	**1** (20, 49, 54, 75, 76, 134)	**0** (4, 18, 20, 47, 54, 75, 76, 134, 135)	**1** (4, 18, 20, 47, 54, 75, 76, 134)	**0.75**	**1** (4, 18, 54, 47, 75, 76, 136, 137)	**0** (4, 18, 47, 54, 75, 76, 136, 137)	**1** (18, 76)	**1** (11)	**4.75**
Saxitoxin	**2** (4, 19, 83, 84, 137)	**1** (83, 84)	**1** (4, 19, 83, 85,)	**1** (4, 19, 83, 85,)	**1.25**	**1** (4, 19, 83, 137)	**0** (4, 19, 83, 137)	**2** (4,18, 19, 83, 85)	**1** (11)	**5.25**

Table 12. Transporter Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
SEB	**2** (18, 19, 47, 86, 87, 88, 137, 138)	**1** (4, 18, 47, 19, 87, 88, 138)	**1** (4, 47, 18, 19, 87, 88, 138)	**1** (4, 18, 47, 19, 87, 88, 138)	**1.25**	**1** (4, 18, 32, 47, 86, 87, 88, 137 138)	**0** (4, 18, 32, 47, 86, 87, 88, 137, 138)	**3** (18, 19, 47, 87, 88)	**1** (11, 88)	**6.25**
Shigellosis	**1** (4, 90,137)	**1** (4, 89, 90)	**1** (4, 89, 90,	**0** (4, 89, 90,)	**0.75**	**1** (4, 11, 32, 89, 90, 137)	**0** (4, 11, 32, 89, 90, 137)	**1** (89)	**1** (11)	**3.75**
Smallpox	**3** (4, 13, 18, 32, 47, 96, 131, 133, 134, 137, 138)	**2** (4, 12, 13, 18 32, 47, , 96, 133, 134, 135, 136, 138)	**0** (4, 12, 13, 18, 32, 47, 91, 92, 94, 96, 131, 133, 134, 135, 136, 138)	**1** (4, 12, 13, 18, 32,47, 92, 96, 131, 133, 134, 138)	**1.5**	**1** (4, 13, 18,32,47, 95, 131, 136, 137, 138)	**0** (4, 13, 18, 32, 47, 95, 96, 131, 136, 137, 138)	**2** (4, 13, 18, 32, 47, 93 96, 131)	**3** (11, 13, 18, 47, 96)	**7.5**
Tularemia	**2** (32, 47, 98, 99,131, 133, 134, 137, 138)	**2** (4, 97, 99, 132, 134, 138)	**0** (4, 47, 18, 99, 131, 133, 134, 138)	**0** (4, 18, 47, 99, 131, 133, 134 138)	**1.0**	**1** (4, 32, 47, 18, 99, 131, 133, 134, 137, 138)	**0** (4, 18, 32, 47, 99, 131, 133, 134, 137, 138)	**2** (4, 18)	**2** (11)	**5.0**
Typhus	**1** (100, 101, 102, 103, 105, 137)	**3** (100, 101, 102, 103, 104)	**1** (18, 100, 101, 102, 103, 104, 105, 106)	**0** (18, 100, 101, 103, 104, 105)	**1.25**	**1** (18, 32, 103, 105, 137)	**0** (18, 32, 103, 105, 137)	**3** (18)	**1** (11)	**6.25**
VEE	**1** (4, 47, 107, 111, 134, 137, 138)	**1** (47, 107, 111, 132, 134, 135, 136, 138)	**1** (4, 18, 47, 107, 108, 109, 110, 111, 134, 13)	**1** (4, 18, 47, 107, 108, 109, 110, 111, 134, 138)	**1.0**	**1** (18, 32, 47, 107, 109, 110, 111, 137, 138)	**0** (18, 32, 47, 107, 109, 110, 111, 137, 138)	**1** (18, 109)	**2** (11, 110)	**5.0**

Table 12. Transporter Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
WEE	**1** (4, 115, 116, 134, 137)	**1** (4, 115, 116, 134)	**1** (4, 18, 114, 115, 116, 117, 134)	**1** (4, 18, 114, 115, 116, 117, 134)	**1.0**	**1** (18, 32, 112, 113, 114, 117, 137)	**0**)18, 32, 112, 113, 114, 137)	**1** (18, 117)	**2** (11)	**5.0**
HIV	**1** (32, 122, 137)	**1** (122)	**1** (43, 119, 120, 121, 122)	**1** (43, 119, 120, 121, 122)	**1.0**	**1** (41, 42, 43, 121, 122, 137)	**0** (41, 42, 43, 121, 122, 137)	**2** (41, 42, 118, 119)	**1** (11, 42)	**5.0**
SARS	**3** (11, 32, 77, 78, 79, 137)	**1** (11, 82)	**0** (77, 78, 79, 81, 82)	**1** (77, ,78, 81, 82)	**1.25**	**1** (4, 11, 77, 78, 79, 80, 81, 82, 137	**0** (4, 11, 77, 78, 79, 80, 81, 82, 137)	**1** (78)	**2** (11, 78, 123)	**5.25**
vCJD	**2** (11, 32,128, 129, 130, 137)	**3** (11, 125, 128, 130)	**1** (11, 128, 130)	**1** (11, 128, 130)	**1.75**	**1** (11, 124, 126, 127, 128, 129, 130, 137)	**0** (11, 124, 126, 127, 128, 129, 130, 137)	**3** (128, 130)	**1** (11)	**6.75**

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Table 13. Prosector Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
Anthrax	**2** (3,4,6,8,9, 131, 133 , 134, 135, 1 36, 137, 138)	**3** (1,4,13, 20, 132, 134, 135, 138)	**0** (3,4,7,8,9,10,, 12,13, 131, 133, 134, 135, 138)	**0** (3,4,7,8,9,10,12, 13, 131,133, 134, 138)	**1.25**	**3** (2,3,8,13,18, 131, 133, 136, 137, 138)	**1** (2,3,8,13,18, 131, 133, 136, 137, 138)	**3** (1,2,3,4,5,18)	**1** (11)	**9.25**
Botulinum Toxin	**2** (4,12, 13,14,16,17, 131, 134, 136, 137, 138)	**3** (4,15,16,20, 132, 134, 138)	**1** (4,13,14, 131, 134, 135, 138)	**1** (4,12, 13,14,15, 13, 134, 138)	**1.75**	**3** (12, 13,16,17,18, 131, 134, 136, 137, 138)	**1** (12, 13, 16, 17, 18, 131, 134, 136, 137, 138)	**2** (4, 14, 15, 17, 18, 19)	**2** (11, 15)	**9.75**
Brucellosis	**1** (4, 22, 134, 135, 137)	**1** (21, 22, 134, 135)	**1** (18, 4, 22, 134)	**0** (4, 22, 134)	**0.75**	**3** (21, 137)	**1** (21, 137)	**3** (18)	**1** (11)	**8.75**
Chikungunya	**1** (23, 24, 25, 137)	**1** (18, 23, 24)	**1** (18, 23, 24,25)	**1** (18 23, 24,25)	**1**	**3** (18, 137)	**1** (18, 137)	**1** (18)	**1** (11)	**7.0**
Cholera	**2** (26, 27, 28, 134, 137)	**3** (4, 18, 27, 28, 132, 134)	**0** (4, 18, 27, 28, 134, 135)	**0** (18, 27,28, 134)	**1.25**	**3** (4, 18 ,27,28, 137)	**1** (4, 18, 28, 137)	**3** (4, 18,28)	**1** (11)	**9.25**
Ebola	**3** (29,31,32, 54, 56, 131, 133, 134, 136, 137, 138)	**3** (4,30,31 49, ,54) 131, 13, 134, 138)	**1** (18, 31, 131, 133, 134, 138)	**1** (18, 31, 131, 133, 134, 138)	**2**	**3** (29,,30,31,32, 54, 5, 131, 133, 134, 136, 137, 138)	**1** (,29,31,32, 54, 56, 131, 133, 134, 136, 137, 138)	**2** (4, 131)	**3** (4,11, 56, 131)	**11.0**
EEE	**2** (4, 33 ,35, 36, 131, 134, 137)	**3** (4, 12, 33 ,34,35, ,36, 134)	**1** (4, 12, 33,35,36, 131, 134)	**1** (4, 12, 33, ,35 ,36, 131, 134)	**1.75**	**3** (4, 12, 18, 32, 35, ,36, 131, 137)	**1** (4,12, 18, 32 35, 36 131, 137)	**1** (4, 18)	**2** (11)	**8.75**

Table 13. Prosector Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
Glanders	**2** (4, 39, 40, 136, 137, 138)	**3** (4, 18, 37, 38, 39, 138)	**1** (4, 37, 39, 138)	**0** (4, 37, 138)	**1.5**	**3** (4, 37, 38, 39, 136, 137, 138)	**1** (37, 38, 39, 136, 137, 138)	**2** (4, 38)	**2** (4,11)	**9.5**
Junin/ Marchupo	**3** (4, 131, 133, 134, 136, 137, 138)	**3** (4, 45, 131, 133, 134, 138)	**1** (4, 45, 131, 133, 134, 138)	**1** (4, 45,131, 133,134, 138)	**2.0**	**3** (4,44, 45,131, 133, 134, 136, 137, 138)	**1** (4, 44, 45, 133, 134, 136, 137, 138)	**1** (4)	**1** (4, 11, 45, 131)	**8.0**
Lassa VHF Fever	**3** (4, 32, 46, 54, 56, 131, 133, 134, 136, 137, 138)	**3** (4,46,48, 49, 133, 134, 138)	**1** (4,18, 47, 48, 49, 131, 133, 134, 138)	**0** (4, 18, 46, 47,48, 49, 131, 133, 134, 138)	**1.75**	**3** (4, 18, 44,46, 47,48,49, 54, 56 131, 133, 134, 136, 137, 138)	**1** (4, 18, 44, 46, 47, 48, 49, 54, 56, 131, 133, 134, 136, 137, 138)	**2** (4, 18, 49)	**3** (4,11, 56, 131)	**10.75**
Marburg	**3** (32, 54, 56, 131, 133, 134, 136, 137, 138)	**3** (4, 20 49, 50, 51,52, 53, 54, 55, 56, 134, 138)	**1** (4, 18, 20, 47, 50, 54, 55, 131, 133, 134, 138)	**1** (4, 18, 20, 47, 50, 54, 55, 131, 133, 134, 138)	**2.0**	**3** (4,32, 47, 50, 51,53, 54, 55, 56, 131, 133, 136, 137, 138)	**1** (4,32, 47, 50,51, 53, 54, 55, 56, 131, 133, 136, 137, 138)	**2** (4, 50)	**3** (4,11, 56)	**11.0**
Melioidosis	**2** (4, 32, 59, 137, 138)	**2** (4, 57, 59, 138)	**1** (4, 18, 47, 49, 57, 59, 131, 138)	**0** (4, 18, 47, 49, 57, 59, 131, 138)	**1.25**	**3** (4, 18, 47, 59, 137, 138)	**1** (4, 18, 47, 59, 137, 138)	**2** (18, 57, 59)	**2** (4, 11)	**9.25**
Mycotoxins	**2** (4, 18, 60, 134, 136, 137, 138)	**2** (4, 60, 134, 138)	**1** (4, 18, 60, 61, 133, 134, 138)	**1** (4, 18, 60, 61, 133, 134, 138)	**1.5**	**3**)(4, 18, 60, 133, 134, 136, 137, 138)	**1** (4, 18, 60, 133, 134, 136, 137, 138)	**1** (4, 18, 60, 61, 134)	**1** (11)	**7.5**

Table 13. Prosector Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
Pneumonic Plague	**3** (4, 13, 47, 32, 64, 131, 133, 134, 136, 137, 138)	**3** (4, 13, 32, 47, 64, 132, 134, 138)	**1** (4, 13, 18, 32, 47, 131, 133, 134, 135, 138)	**0** (4, 13, 18, 32, 47, 131, 133, 134, 138)	**1.75**	**3** (4, 13, 18, 32, 43, 47, 64 131, 134, 136, 137, 138)	**1** (4, 13, 18, 32, 43, 47, 64, 131, 134, 136, 137, 138)	**2** (18, 47, 63, 131)	**1** (11, 13, 64,)	**8.75**
Q Fever	**1** (4, 32, 47, 65, 66, 134, 136, 137, 138)	**1** (4 47, ,66, 132, 134, 138)	**1** (4, 47, 65, 66, 134, 138)	**0** (4, 47, 65, 66, 134, 138)	**0.75**	**3** (4, 32, 47, 65, 66, 134, 136, 137, 138)	**1** (4, 32, 47, 65, 66, 136, 137, 138)	**2** (4, 47, 66)	**1** (11)	**7.75**
Ricin	**2** (4, 67, 71, 134, 136, 137, 138)	**3** (4, 69, 134, 138)	**1** (4, 67, 68, 70, 71, 73, 134, 138)	**1** (4, 67, 68, 70, 71, 73, 134, 138)	**1.75**	**3** (67, 68, 69, 71, 72, 73, 134, 136, 137, 138)	**1** (67,68, 69, 71, 72, 73, 134, 136, 137, 138)	**1** (4,67,69, 71, 72, 73,)	**1** (11, 73, 74)	**7.75**
Rift Valley Fever	**1** (32, 54, 75, 76, 134, 136, 137)	**1** (20, 49, 54, 75, 76, 134)	**0** (4, 18, 20, 47, 54, 75, 76, 134, 135)	**1** (4, 18, 20, 47, 54, 75, 76, 134)	**0.75**	**3** (4, 18, 54, 47, 75, 76, 136, 137)	**1** (4, 18, 47, 54, 75, 76, 136, 137)	**1** (18, 76)	**1** (11)	**7.75**
Saxitoxin	**2** (4, 19, 83, 84, 137)	**1** (83, 84)	**1** (4, 19, 83, 85,)	**1** (4, 19, 83, 85,)	**1.25**	**3** (4, 19, 83, 137)	**1** (4, 19, 83, 137)	**2** (4,18, 19, 83, 85)	**1** (11)	**8.25**
SEB	**2** (18, 19, 47, 86, 87, 88, 137, 138)	**1** (4, 18, 47, 19, 87, 88, 138)	**1** (4, 47, 18, 19, 87, 88, 138)	**1** (4, 18, 47, 19, 87, 88, 138)	**1.25**	**3** (4, 18, 32, 47, 86, 87, 88, 137 138)	**1** (4, 18, 32, 47, 86, 87, 88, 137, 138)	**3** (18, 19, 47, 87, 88)	**1** (11, 88)	**9.25**
Shigellosis	**1** (4, 90,137)	**1** (4, 89, 90)	**1** (4, 89, 90,	**0** (4, 89, 90,)	**0.75**	**3** (4, 11, 32, 89, 90, 137)	**1** (4, 11, 32, 89, 90, 137)	**1** (89)	**1** (11)	**6.75**

Table 13. Prosector Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
Smallpox	**3** (4, 13, 18, 32, 47, 96, 131, 133, 134, 137, 138)	**2** (4, 12, 13, 18 32, 47, , 96, 133, 134, 135, 136, 138)	**0** (4, 12, 13, 18, 32, 47, 91, 92, 94, 96, 131, 133, 134, 135, 136, 138)	**1** (4, 12, 13, 18, 32,47, 92, 96, 131, 133, 134, 138)	**1.5**	**3** (4, 13, 18,32,47, 95, 131, 136, 137, 138)	**1** (4, 13, 18, 32, 47, 95, 96, 131, 136, 137, 138)	**2** (4, 13, 18, 32, 47, 93 96, 131)	**3** (11, 13, 18, 47, 96)	**10.5**
Tularemia	**2** (32, 47, 98, 99,131, 133, 134, 137, 138)	**2** (4, 97, 99, 132, 134, 138)	**0** (4, 47, 18, 99, 131, 133, 134, 138)	**0** (4, 18, 47, 99, 131, 133, 134 138)	**1.0**	**3** (4, 32, 47, 18, 99, 131, 133, 134, 137, 138)	**1** (4, 18, 32, 47, 99, 131, 133, 134, 137, 138)	**2** (4, 18)	**2** (11)	**8.0**
Typhus	**1** (100, 101, 102, 103, 105, 137)	**3** (100, 101, 102, 103, 104)	**1** (18, 100, 101, 102, 103, 104, 105, 106)	**0** (18, 100, 101, 103, 104, 105)	**1.25**	**3** (18, 32, 103, 105, 137)	**1** (18, 32, 103, 105, 137)	**3** (18)	**1** (11)	**9.25**
VEE	**1** (4, 47, 107, 111, 134, 137, 138)	**1** (47, 107, 111, 132, 134, 135, 136, 138)	**1** (4, 18, 47, 107, 108, 109, 110, 111, 134, 13)	**1** (4, 18, 47, 107, 108, 109, 110, 111, 134, 138)	**1.0**	**3** (18, 32, 47, 107, 109, 110, 111, 137, 138)	**1** (18, 32, 47, 107, 109, 110, 111, 137, 138)	**1** (18, 109)	**2** (11, 110)	**8.0**
WEE	**1** (4, 115, 116, 134, 137)	**1** (4, 115, 116, 134)	**1** (4, 18, 114, 115, 116, 117, 134)	**1** (4, 18, 114, 115, 116, 117, 134)	**1.0**	**3** (18, 32, 112, 113, 114, 117, 137)	**1** (18, 32, 112, 113, 114, 137)	**1** (18, 117)	**2** (11)	**8.0**
HIV	**1** (32, 122, 137)	**1** (122)	**1** (43, 119, 120, 121, 122)	**1** (43, 119, 120, 121, 122)	**1.0**	**3** (41, 42, 43, 121, 122, 137)	**1** (41, 42, 43, 121, 122, 137)	**2** (41, 42, 118, 119)	**1** (11, 42)	**8.0**

Table 13. Prosector Risk Matrix Scoring With Corresponding Reference Numbers										
Disease	**Complexity of care**					**Transmission**	**Resp**	**Persistence**	**BSL**	**Total**
	Hosp	**Mortality**	**Proph**	**Therap**	**Average**					
SARS	**3** (11, 32, 77, 78, 79, 137)	**1** (11, 82)	**0** (77, 78, 79, 81, 82)	**1** (77, ,78, 81, 82)	**1.25**	**3** (4, 11, 77, 78, 79, 80, 81, 82, 137	**1** (4, 11, 77, 78, 79, 80, 81, 82, 137)	**1** (78)	**2** (11, 78, 123)	**8.25**
vCJD	**2** (11, 32,128, 129, 130, 137)	**3** (11, 125, 128, 130)	**1** (11, 128, 130)	**1** (11, 128, 130)	**1.75**	**3** (11, 124, 126, 127, 128, 129, 130, 137)	**1** (11, 124, 126, 127, 128, 129, 130, 137)	**3** (128, 130)	**1** (11)	**8.75**

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Annex I. HHS and USDA Select Agents and Toxins List Comparison

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Annex I. HHS and USDA Select Agents and Toxins List Comparison

The following tables were developed based on the risk matrix tool established in the original study. The agents in this list were derived from three previously published lists of agents or infectious substances of concern established by US Department of Transportation (DOT), DoD, and the HHS, namely the HHS/USDA Select Agent Toxins list (7CFR Part 331, 9 CFR Part 121, and CFR Part 73).

The primary reason for evaluating these selected agents was to support the US Army CASCOM and the Army G4 efforts to safely transport all biological-infected decedents back to the US for final interment. To achieve this, DoD is required to obtain an importation permit from the HHS/CDC for any items infected with bio agents identified on their list. Additionally, items infected with such agents must be appropriately packaged to ensure safe transport, as per DOT. As such, the original study was repeated to identify if any additional bio agents ranked within the highest risk group.

The select agents scoring the highest (those representing the greatest exposure risk for all personnel categories) were Ebola, Marburg, Kyasanur Forest Disease, Herpes B Virus and smallpox. For general handlers and transporters, these top scoring select agents did not fall into the Risk Group 1 (highest risk group) category but rather fell into Risk Group 2. These select agents, however, did rank within Risk Group 1 for prosectors.

Resultantly, the added 23 HHS/USDA agents and toxins did not present any more exposure risk to MA personnel dealing with infected decedents than those decedents infected with WMD bio agents or the identified non-WMD agents. Thus, safe transportation and handling of theses decedents is possible when end users apply the same infection control practices established for non-WMD bio-infected decedents.

Tables 1, 2, and 3 within this annex, identify each end user and WMD bio agent toxins/scores (appearing in black text), non-WMD bio conditions/scores (appearing in blue text), and the HHS/USDA select agents/scores (appearing in green text) associated with each risk level.

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Table 1. General Handler Bio Agent Exposure Risk Groups for HHS/USDA Select Agent Toxins, WMD Bio Agents and Non-WMD Bio Conditions

General Handler Bio Agent Exposure Risk Groups for HHS/USDA Select Agents Toxins, WMD Bio Agents, and Non-WMD Bio Conditions		
Risk Level 1 (9.17-12.0)	**Risk Level 2 (6.33-9.16)**	**Risk Level 3 (3.5-6.32)**
None	Ebola, 9.0	**SARS, 6.25**
	Marburg, 9.0	Saxitoxin, 6.25
	Kyasanur Forest, 9.0	Rickettsia, 6.25
	Lassa Fever, 8.75	CETBE, 6.25
	Herpes B Virus, 8.5	Tularemia,6.0
	Smallpox, 8-5	VEE, 6.0
	vCJD, 8.0	WEE, 6.0
	Guanarito Virus, 8.0	Hantaan Virus, 6.0
	Abrin, 8.0	Junin/Marchupo, 6.0
	Crimean Congo HF, 7.75	Ricin, 5.75
	Sabia Virus, 7.75	Rift Valley Fever, 5.75
	Botulinum Toxin, 7.75	Shiga Like Ribosome, 5.75
	Flexal Virus, 7.75	Q Fever 5.75
	Glanders, 7.5	1918 Pan Flu Type, 5.5
	Hendra Virus, 7.5	Botulinum Neuro, 5.5
	Nipah Virus, 7.5	Mycotoxins, 5.5
	Russian Spring/Summer, 7.5	Variola Minor, 5.25
	Typhus, 7.25	Chikungunya, 5.0
	SEB, 7.25	**HIV, 5.0**
	Melioidosis, 7.25	Coccidioides, 5.0
	Cholera, 7.25	Hanta Virus, 5.0
	Anthrax, 7.25	Shigellosis,4.75
	Omsk HF, 7.25	
	Monkeypox, 7.0	
	Brucellosis, 6.75	
	Pneumonic Plague,6.75	
	EEE, 6.75	
	FETBE, 6.5	

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Table 2. Transporter Bio Agent Exposure Risk Groups for HHS/USDA Select Agent Toxins, WMD Bio Agents and Non-WMD Bio Conditions

Transporter Bio Agent Exposure Risk Groups for HHS/USDA Select Agents Toxins, WMD Bio Agents, and Non-WMD Bio Conditions		
Risk Level 1 (9.17-12.0)	**Risk Level 2 (6.33-9.16)**	**Risk Level 3 (3.5-6.32)**
None	Ebola, 8.0	SEB, 6.25
	Kyasanur Forest, 8.0	Cholera, 6.25
	Marburg, 8.0	Melioidosis, 6.25
	Lassa fever, 7.75	Typhus 6.25
	Herpes B virus, 7.5	Omsk, 6.25
	Smallpox, 7.5	Anthrax, 6.25
	vCJD, 7.0	Monkeypox, 6.0
	Guanarito Virus, 7.0	EEE, 5.75
	Abrin, 7.0	Pneumonic plague, 5.75
	Crimean Congo, 6.75	Brucellosis, 5.75
	Botulinum toxin, 6.75	**HIV, 5.5**
	Sabia, 6.75	FETBE, 5.5
	Flexal, 6.75	Saxitoxin, 5.25
	Russian Spring/Summer, 6.5	**SARS, 5.25**
	Glanders 6.5	CETBE, 5.25
	Hendra Virus, 6.5	Rickettsia, 5.25
	Nipah Virus, 6.5	Hantaan Virus, 5.0
		Junin/Marchupo, 5.0
		Tularemia,5.0
		VEE, 5.0
		WEE, 5.0
		Ricin, 4.75
		Q fever, 4.75
		Rift Valley Fever, 4.75
		Shiga Like Ribosome, 4.75
		Mycotoxins, 4.5
		1918 Pan Flu, 4.5
		Botulinum Neurotoxin, 4.5
		Variola Minor, 4.25
		Chikungunya, 4.0
		Coccidioides, 4.0
		Hanta Virus, 4.0
		Shigellosis, 3.75

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Table 3. Prosector Bio Agent Exposure Risk Group Levels for HHS/USDA Select Agent Toxins, WMD Bio Agents, and Non-WMD Bio Conditions

Prosector Bio Agent Exposure Risk Groups for HHS/USDA Select Agents Toxins, WMD Bio Agents, and Non-WMD Bio Conditions		
Risk Level 1 (9.17-12.0)	**Risk Level 2 (6.33-9.16)**	**Risk Level 3 (3.5-6.32)**
Ebola, 11.0	Anthrax, 9.0	1918 Pan Flu, 5.5
Marburg, 11,0	Monkeypox, 9.0	
Kyasanur Forest, 11.0	EEE, 8.75	
Lassa fever,10.75	Brucellosis, 8.75	
Herpes B Virus, 10.5	Pneumonic plague, 8.75	
Smallpox, 10.5	FETBE, 8.5	
Guanarito Virus, 10.0	Saxitoxin, 8.25	
Abrin, 10.0	Rickettsia, 8.25	
Crimean Congo, 9.75	CETBE, 8.25	
Sabia Virus, 9.75	Tularemia, 8.0	
Flexal Virus, 9.75	Junin/Marchupo, 8.0	
Botulinum toxin, 9.75	Hantaan Virus, 8.0	
Nipah, 9.5	**HIV, 8.0**	
Hendra, 9.5	**vCJD, 8.0**	
Russian Spring/Summer, 9.5	VEE, 8.0	
Glanders, 9.5	WEE, 8.0	
Omsk, 9.25	Ricin, 7.75	
SEB, 9.25	Rift Valley Fever, 7.75	
Cholera, 9.25	Q fever, 7.75	
Melioidosis, 9.25	Shiga Like Ribosome, 7.75	
Typhus, 9.25	Botulinum Neuro, 7.5	
	Mycotoxins, 7.5	
	SARS, 7.25	
	Variola Minor, 7.25	
	Chikungunya, 7.0	
	Hanta Virus, 7.0	
	Coccidioides, 7.0	
	Shigellosis, 6.75	


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Attachment B

Defense Health Board
Categorizing Biological Agents In Post Mortem Risk Groups

TERMS OF REFERENCE

These terms of reference establish the objectives for the Defense Health Board's (DHB) assessment of the Army report on the transportation of contaminated remains. They outline the scope of the Board's examination as well as the Board's methodology for responding to the Department's request

Mission Statement: Complete an independent assessment of the report entitled, "Categorizing Weapons of Mass Destruction Biological Agents into Post Mortem Risk Groups."

Issue Statement: The Army completed an extensive review of infection control practices in Mortuary Affairs (MA) Operations in July 2009. The Science and Technology Working Group (S&T WG), a section of the interagency Mortuary Affairs Task Force, conducted a study exploring the exposure risk associated with biologically contaminated decedents for specific Department of Defense (DoD) end users. The study hypothesized that biological agents of concern do not necessarily pose an inherent, significant exposure risk to those handling biologically infected decedents. The S&T WG assessed postmortem exposure risk and categorized biological agents into postmortem risk groups using a risk matrix analysis. The risk matrix identified biological agents rendering the greatest to the least risk for MA handlers, transporters, and those who perform autopsies. The study concludes that many casualties who die from a biological weapon of mass destruction (WMD) agent infection are no more hazardous than those who die from non-WMD agents/conditions. Thus the ability to safely handle such decedents and return them to the United States for final deposition can be achieved within the precautionary measures currently taken when managing other decedents.

In order to develop appropriate MA policies, the S&T WG is seeking the concurrence of the DHB in an effort to obtain the medical community's consensus regarding this topic. The Surgeon General of the U.S. Army endorsed this request, and it was formally issued to the DHB by the Acting Under Secretary of Defense for Personnel and Readiness on April 20, 2012.

Objectives and Scope: The Board will address and provide concurrence or non-concurrence regarding the following:

- Definition of exposure post mortem
- Categorization of postmortem risk groups
- Use of specific non- WMD biological agents as comparative and benchmark agents regarding exposure risk to those handling decedents
- Prioritization of future postmortem research involving bio agents
- Recommendation that bio agents scoring lower than all the benchmark agents for transponders do not require any additional packaging to safely transport decedents to and through the US
- Recommendation that bio agents categorized as Risk Group 3 for Transporters do not require any additional packaging to safely transport decedents to and through the US
- Transporters that handle biologically contaminated decedents that are packaged are not required to wear anything additional than Standard Precautions for contact hazards

Defense Health Board
Categorizing Biological Agents In Post Mortem Risk Groups

Methodology: A subset of the DHB, consisting of four Board members, will receive briefings from subject matter experts (SMEs). The members will review the literature and available best practices, and, using this information as well as the information received from briefings, will present their findings and positions to the DHB for consideration and deliberation. The DHB will deliberate the findings, during which time members may propose recommendations, and vote on those recommendations in an open public session.

Deliverable: The subset of Board members will complete its work and report out to the DHB in a public forum at the November 2012 meeting.

Membership: Four appointed DHB members will comprise the subset of the Board leading the primary investigation, and will consult SMEs as needed.

Support:

1. The DHB office will provide any necessary administrative and logistical support for the Board.

2. Funding for this review is included in the DHB operating budget.