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INSTITUTE FOR DEFENSE ANALYSES

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PREFACE

This document reports work performed by the Institute for Defense Analyses (IDA) for the US Army Office of the Surgeon General (OTSG) and the Joint Staff, Joint Requirements Office for CBRN Defense (J-8, JRO) in partial fulfillment of the task order "Revision of North Atlantic Treaty Organization (NATO) AMedP-8." This document describes a program of work to support implementation of *Allied Medical Publication 8(C): NATO Planning Guide for the Estimation of Chemical, Biological, Radiological and Nuclear (CBRN) Casualties* within the existing DoD process, tools and doctrine for CBRN casualty estimation and medical planning.

The authors wish to thank Dr. John Bombardt and Dr. James Heagy for their review of this document, Ms. Margaret Hebner for her editing assistance, and Ms. Barbara Varvaglione, who produced it.

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A. INTRODUCTION

1. Objective

The US distributed *Allied Medical Publication 8 (C): NATO Planning Guide for the Estimation of CBRN Casualties, Study Draft 4,* to NATO for review in July 2009. The parameters for implementing the AMedP-8(C) methodology are presented for only a limited sample of CBRN agents and effects. It is therefore timely to consider the implications of ratification and implementation of AMedP-8(C) for casualty estimation and medical planning within the US. To that end, OTSG has tasked IDA with developing a program of work that identifies other agents or effects for which there may be quantifiable casualty estimation parameters.

2. Task Requirements

This document describes work done under Task Order CA-6-3079 "CBRN Casualty Estimation Update of the Medical CBRN Defense Planning and Response Project," Subtask 2 "Update Agents / Materials into AMedP-8(C) Methodology." It provides a "draft program of work identifying agents, effects, materials, and conditions of interest to DoD (and NATO and other Federal agencies, as requested), but not currently included in AMedP-8(C)." It is not an addendum to AMedP-8(C), but may be considered a supplement to the *AMedP-8(C) Technical Reference Manual* for US purposes. We describe our projected work estimates for the various potential components of AMedP-8 and the basis for making those estimates.

IDA reviewed literature relevant to the extension of AMedP-8 to include additional CBRN agents and effects, psychological casualties, and civilian casualty estimation. This literature review has identified tentative human response knowledge gaps, and enabled estimates of work levels required to incorporate quantitative casualty estimation parameters for new agents into AMedP-8. This report is envisioned as the first in a series of annual reports, updated as the scope of AMedP-8(C) expands.

3. AMedP-8(C) Background

Allied Medical Publication 8, "NATO Planning Guide for the Estimation of CBRN Casualties" (AMedP-8(C)), has evolved over the past four decades from a strictly nuclear casualty guide to one applicable to a wide range of CBRN agents. AMedP-8 has included various casualty estimation methodologies for a wide range of nuclear weapon yields, up to three different chemical agents, and up to 11 different biological agents or organisms.

The purpose of AMedP-8(C) is to provide a methodology for estimating casualties uniquely occurring as a consequence of CBRN attacks against Allied targets in order to support the medical planning process. The methodology provides the capability to estimate the numbers of casualties over time as well as the incidence of injury by type and severity. Previous versions of AMedP-8 provided three separate chemical, biological, and nuclear documents with tabular casualty estimates for specified brigade-size units, postures, and weapons sizes or yields. AMedP-8(C) consolidates CBRN agents and effects into a single document and allows the estimation of personnel status within user-specified scenarios.

AMedP-8(C) describes the human response to CBRN agents and effects in terms of a Human Response Injury Profile (HRIP). The HRIP is a description of changing injury severity over time as a function of either dose, dosage, or magnitude of insult. Casualty status is then defined as a function of a chosen level of injury severity. AMedP-8(C), while applicable to a wider range of agents and effects than previous AMedP-8 editions, is still limited in application. The HRIP parameters for implementing the methodology are presented for only a subset of CBRN agents and weapon effects. These agents and effects include:

a. Acute[1] effects of external whole body irradiation, including irradiation from the prompt radiation emitted by a nuclear detonation, the radiation present from the delayed radiation (fallout) resulting from a nuclear detonation, and radiation resulting from the release of seven specified radioisotopes (^{60}Co, ^{90}Sr, ^{131}I, ^{137}Cs, ^{192}Ir, ^{238}Pu, and ^{241}Am);
b. Acute effects of irradiation or radioactive contamination on the skin;
c. Acute primary blast injuries (injuries resulting from the direct effects of the blast wave passing through the body);
d. Fatalities from the dynamic pressure (wind) from a nuclear detonation;
e. Acute primary thermal injuries (flash burns) from the thermal pulse from a nuclear detonation;
f. Acute injuries from exposures to three chemical agents (sarin (GB), VX, and distilled mustard (HD)); and
g. Acute illness from exposure to five biological agents (anthrax, botulism, pneumonic plague, smallpox, and Venezuelan equine encephalitis (VEE)).

1 "Acute" is used to differentiate effects and injuries which produce sypmtoms within the first 6-8 weeks after exposure.

B. APPROACH

1. Human Response Injury Profile Parameters.

a. CRN Human Response Injury Profile. The HRIP for chemical, radiological and nuclear (CRN) agents and effects is the combination of two sub-models:
   - Toxicity: to sort each exposure into a dose/dosage/insult range according to the ultimate severity of effects resulting for each exposure type or route of entry; and
   - Injury Profile: to map the changing course of injury severity over time.

b. Biological Human Response Injury Profile. The HRIP for biological agents is the combination of five sub-models:
   - Infectivity: to estimate the number of individuals who will become ill, given their dose of agent;
   - Incubation or Latency Period: to estimate when those individuals develop signs and symptoms;
   - Duration of Illness: to estimate the length of time between onset of symptoms and death or recovery;
   - Disease Profile: to describe the course of illness or the disease through clinically differentiable stages with the severity of the associated signs and symptoms over time; and
   - Lethality: to estimate the number of ill individuals who die.

c. Prophylaxis. For both CRN and biological agents, the HRIP was developed in AMedP-8(C) without consideration of the use of any medical intervention which would change the human response to an exposure of interest. For some diseases (specifically anthrax, pneumonic plague, and smallpox) it was reasonable to expect that there would be a significantly different response due to the use of antibiotics (as chemoprophylaxis) or immunizations, and a separate set of prophylaxis parameters was developed for these agents. Therefore the availability of information on the efficacy of prophylaxis was investigated as a separate sub-model of the chemical and biological agents considered in this document. This information was collected, only for those agents with identified vaccination protocols or existing vaccination research programs and for bacterial agents that respond to antibiotics.

2. Nomination of Additional Radiological Isotopes.

At this time, pending further guidance from OTSG, no radioisotopes are considered here beyond those already included in AMedP-8(C). Many radioisotopes could be considered of interest to medical planners for estimating casualties resulting from their use in some form of a

Radiological Dispersion Device (RDD), although this list should be mitigated by considering only those which result in acute radiation casualties (within six weeks of exposure).

3. Nomination of Additional Nuclear Weapon Effects.

With the exception of fatalities due to displacement from dynamic pressure effects, AMedP-8(C) only addresses the primary prompt nuclear weapon effects (radiation, blast, and thermal). Secondary and higher order effects (such as missiling injuries, burns from secondary fires, glass breakage injuries, and others) are not considered. These have been neglected in the past due to modeling difficulties, which are still problematic. Pending further guidance from OTSG, no higher order nuclear weapon effects are considered in this document.

4. Consideration of Psychological Casualties.

An adversary's use of CBRN agents might cause significant psychological casualties, although none of this class of casualties is considered in AMedP-8(C). Extension of the AMedP-8(C) methodology to estimate psychological casualties would require:

a. First, psychological casualties must be appropriately characterized to differentiate those that would impact the acute casualty estimate from those which might be delayed beyond the period of interest. From the literature review already performed, it is clear that definitions of psychological casualties are continuing to evolve, and arriving at a consensus on terminology will require 4-6 person-months of effort.
b. Second, it would be necessary to develop a correlation of the types of psychological casualties of interest to the different classes of CBRN agent, and potentially to the populations at risk. To the extent possible, data would need to be collected to characterize that response within the CBRN class or agent models. If no data are available, a review and analysis of current studies and modeling efforts would have to be used to extrapolate this correlation. Assuming that developing this correlation is even possible, this is a considerable effort of at least 12 person-months.
c. Finally, planning factors and rules of thumb for modifying AMedP-8(C) casualty estimates would have to be derived and accredited. Given that the previous steps had been successfully completed, this is primarily a requirement for analysis, documentation, and presentation, probably requiring on the order of another 6-12 person-months of effort.

5. Extension of the Human Response Injury Profile Methodology to Civilian Populations.

Medical planners responsible for estimating casualties among host nation civilians or in domestic response contingencies may be interested in the extension of the AMedP-8(C) HRIP

methodology to civilian populations. Many of the parameters now used in the development of agent-specific models have been derived from general population data and could be applied to civilians; others are specific to a healthy young adult population or are based on assumptions of body mass. No effort was made in the development of AMedP-8(C) to identify more susceptible subpopulations and account for them in any agent model. Extension of the AMedP-8(C) HRIP methodology to civilian populations would have three components.

a. First, the parameters incorporated within current and future agent/insult models would be reviewed to determine which are derived from general population data and can be used directly in a civilian variant. At the same time, any parameters derived from animal models and scaled or applied directly to humans would be reviewed to determine the extent to which characteristics of a military population were considered in the scaling or application, and modification to the parameters would be made to reflect the characteristics of a civilian population.
b. Second, in cases where special subpopulations—like pediatric, geriatric, or immune-compromised—have unique or exaggerated responses, data would need to be collected to characterize that response within the individual agent models.
c. Third, in the absence of data on special populations, planning factors and heuristics for modifying AMedP-8(C) casualty estimates could be derived from a review of the general literature on infectious disease, toxic substances, radiation, etc. Analogous diseases and conditions would be used to determine the general extent to which casualty estimates would change given a civilian population.

The level of effort to identify the parameters, planning factors, and heuristics for modifying current AMedP-8(C) HRIP parameters so that they are applicable to civilian populations is estimated to be at least 18 person-months. This would also imply the need to develop these parameters, planning factors, and heuristics for new agents to be included in the extension the AMedP-8(C) methodology, which may add another person-month to the level of effort for each new agent.

6. Nomination of Additional Chemical and Biological Agents.

In the preparation of this report, a specific process was developed to nominate additional chemical and biological agents for extension into the AMedP-8(C) HRIP methodology, and to estimate the level of effort necessary to quantify the required parameters. This process is illustrated in Figure 1, and described below.

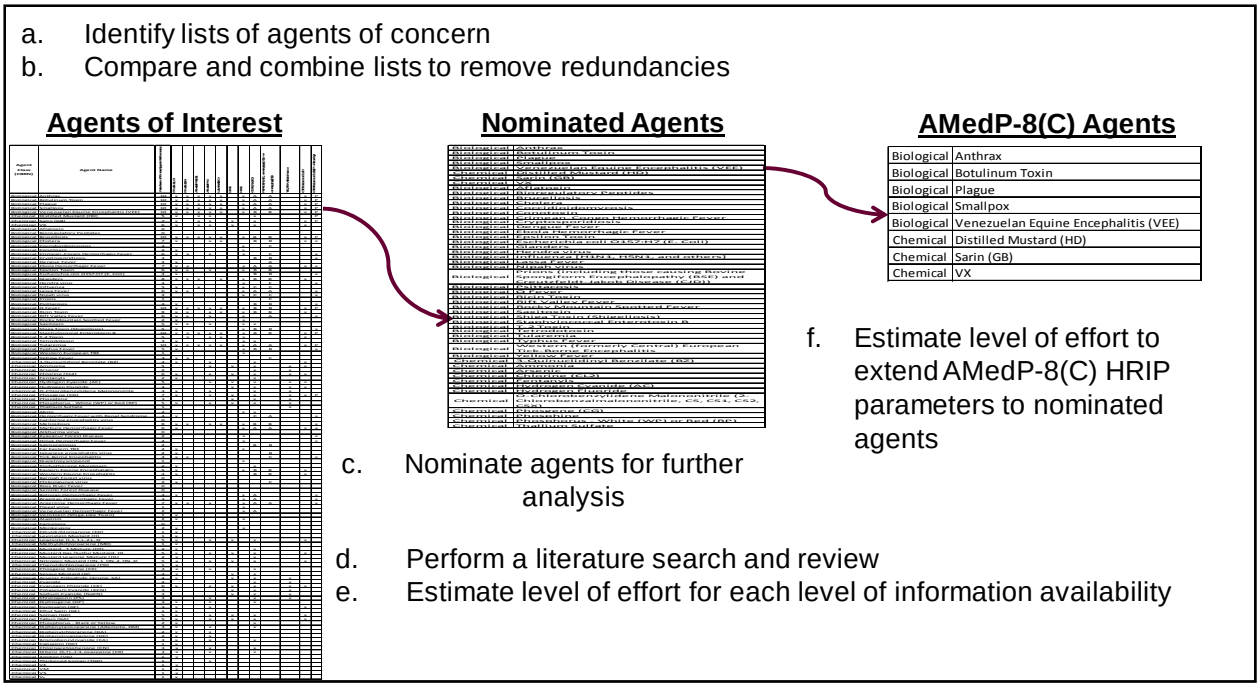

Figure 1. Screening Process for Nomination of Additional Chemical and Biological Agents

a. Identify Lists of Chemical and Biological Materials Which are of Concern to Various Governmental Agencies. Several groups within the United States and the international community maintain lists of biological or chemical agents which could be employed by terrorists. Documents indentifying such threat agents were collected from a variety of organizations including the North Atlantic Treaty Organization (NATO) and the United States Departments of Defense (DoD), Homeland Security (DHS), and Health and Human Services (HHS). These documents are listed in Appendix A.

b. Compare Lists In Order to Identify Agents with Multiple References. The development of an overall or composite list of agents clarifies the threats of widespread concern that merit a literature search. This is the first step leading to level-of-effort estimates for expansion of the AMedP-8(C) HRIP methodology. After reviewing the documents described above, as well as various internet and other sources, a list of nearly 900 biological and chemical agents was compiled. Alternate references to the same threat (e.g., causative agent, disease, code name) were subsequently consolidated into one entry. This list, indicating which sources identified each agent as a potential threat, is in Appendix A.

c. Group and Nominate Agents for Further Analysis. The full list of almost 900 agents was deemed too extensive to pursue the desired level-of-effort estimates. The agent

list in Appendix A also includes annotations which indicate the considerations that reduced the spectrum of nominated agents to a manageable size:

(1) The eight chemical and biological threats previously modeled in AMedP-8(C) (anthrax, botulism, pneumonic plague, smallpox, VEE, sarin (GB), distilled mustard (HD), and VX) were annotated as: "Currently included in AMedP-8(C)." Since no further analysis was necessary for these agents, a literature search was not performed.

(2) Agents were grouped by agent class or organism/disease type, and a representative agent from the group was chosen for further analysis. We then annotated those agents which were within the group but not analyzed as: "Grouped as a MMMM; NNNN was nominated from this group to be included in the work plan" where "MMMM" identifies the group, and "NNNN" identifies the nominated agent within this group. We recognize that such a nominated agent may not be representative of some agents in the same group. If the resulting work plan does not encompass certain agents of interest, we recommend that further effort be supported to extend this work plan. (See the discussion on "Recommendations" below.)

(3) Those agents in fewer than three of the source documents were not analyzed for this document and are annotated as: "Not included in Current Work Plan." The work plan, however, does include some agents that were not cited in three or more source documents, and excludes some that were (Table 1). The exceptional agents that were included had been used or developed as weapons (such as fentanyls or aflatoxin), or were representative of classes of biological organisms that were not otherwise represented (such as dengue fever or prions), or were frequently discussed in public fora even though they did not appear on many of the lists considered (such as conotoxins and arsenic). The exceptional agents that were excluded had other agents included on the list which were felt to be similar (for example, hydrogen fluoride was felt to have similar but more severe human effects than hydrogen chloride or hydrogen sulfide), or were excluded due to time constraints on the production of this document. The exceptional agents that were excluded should be considered for future efforts to expand the list of agents nominated to extend the AMedP-8(C) HRIP methodology.

Table 1. Agents Included in Work Plan with Two or Fewer Sources and Agents Excluded from Work Plan with Three or More Sources

Agent Class (CBRN)	Included Agents with Two or Fewer Sources	Excluded Agents with Three or More Sources
Biological	Aflatoxin Bioregulatory Peptides Coccidioidomycosis Conotoxin Dengue Fever Prions Rocky Mountain Spotted Fever Western (Central) European Tick-Borne Encephalitis	Typhoid Fever
Chemical	Arsenic Fentanyls Thallium Sulfate	Hydrogen Chloride Hydrogen Sulfide Bromine Hexachloroethane (HC) Hydrazine Nitric Acid Sodium Azide Stibine Sulfur Dioxide Titanium Tetrachloride (FM Smoke)

(4) Those agents remaining were placed on the list of agents to be analyzed for the work plan, and are annotated as: "Included in Current Work Plan."

d. Perform a Literature Search and Review on Nominated Chemical and Biological Agents. The EBSCO*host*[2] databases were searched to identify peer reviewed articles which address the human response to each agent, with additional search terms to identify available information specific to each of the HRIP sub-models of interest. This was done by specifying search terms ("key words") for each agent or disease (Table 2), and further search terms for each sub-model (Tables 3 and 4). The product of this search was a list of articles meeting the search criteria, to include title, author, journal, publication date, abstract, key words and other identifying factors. For those searches which yielded a large number of pertinent articles, only the 150 most relevant results (by agent and sub-model, as determined by EBSCO*host*) were retained for literature review (otherwise all of the search results were retained). In some cases, prior to extensive literature review, a cursory review was performed to

2 EBSCO*host* Online Research Databases (http://search.ebscohost.com/ searched "All EBSCO*host* Databases"; accessed August/September 2009) were utilized to perform literature searches because of their wide scope and easy availability to the authors. Future searches may also utilize other databases such as SCOPUS or SCIRUS to assure a crosscheck and complete coverage of biological response literature.

identify the most relevant results; this cursory review filtered the retained articles by eliminating key words or excluding other terms from the search, if necessary. If articles were consistently found to be off-target and more relevant ones were believed to exist, then the search terms were refined. For example, searching for "BZ" returned several hits on "benzodiazepine," so this term was then explicitly excluded from search results. Searching for "(Hendra OR equine morbilli) AND (length of illness OR duration of illness OR course of illness)" returned nothing, so the sub-model specific terms were broadened to simply "illness" which still only returned 13 articles. Additionally, previously collected documents that appeared to be of use in providing parameters to model sub-models were added to the database. Additional documents reviewed included references for aflatoxin, brucellosis, cholera, dengue, glanders, ebola, epsilon toxin, influenza, lassa fever, Q fever, ricin toxin, Rift Valley fever, SEB, and tularemia. Finally, articles appearing in the results from one search that were relevant to another sub-model (or at times another agent) were noted and used in the assessment as well.[3]

[3] Note: In EBSCO*host*, a wildcard is represented by a pound sign (#). To use the # wildcard, enter your search terms, adding the # in places where an alternate spelling may contain an extra character. EBSCO*host* finds all citations of the word that appear with or without the extra character. For example, type **coccidio#des** to find all citations containing **coccidiodes** or **coccidioides**. Also, truncation is represented by an asterisk (*****). To use truncation, enter the root of a search term and replace the ending with an *. EBSCO*host* finds all forms of that word. For example, type **laten*** to find the words **latent** or **latency**.

Table 2. Agent Specific Search Terms

Agent Name	Search Terms
Aflatoxin	Aflatoxin
Bioregulatory Peptides	Bioregulator*
Brucellosis	Brucell*
Cholera	Cholera*
Coccidioidomycosis	Coccidio#d*
Conotoxin	Conotoxin
Crimean-Congo Hemorrhagic Fever	Crimean-Congo
Cryptosporidiosis	Cryptosporidium parvum
Dengue Fever	Dengue
Ebola Hemorrhagic Fever	Ebola
Epsilon Toxin	Epsilon toxin OR clostridium perfringen
Escherichia coli O157:H7	Escherichia OR coli
Glanders	Glanders OR burkholderia mallei OR pseudomonas mellei
Hendra virus	Hendra OR equine morbilli
Influenza [H1N1, H5N1, etc.]	Influenza
Lassa Fever	Lassa fever
Nipah virus	Nipah
Prions	Prion OR Bovine spongiform enceph* OR BSE
Psittacosis	Psittacosis OR chlamydia psittaci
Q Fever	Q fever OR coxiella burnetii
Ricin Toxin	Ricin
Rift Valley Fever	Rift valley
Rocky Mountain Spotted Fever	Rickettsia ricketsii OR rocky mountain spotted fever
Saxitoxin	Saxitoxin OR paralytic shellfish poisoning
Shiga Toxin	Shiga toxin OR shigatoxin OR shigell*
Staphylococcal Enterotoxin B	SEB OR staphylococcal enterotoxin B
T-2 Toxin	T-2 toxin
Tetrodotoxin	Tetrodotoxin
Tularemia	Tulare*
Typhus Fever	Typhus OR rickettsia prowazekii
Western (Central) European Tick-Borne Encephalitis	European tick-born* OR european tickborn*
Yellow Fever	Yellow fever
3-Quinuclidinyl Benzilate (BZ)	Quinuclidinyl benzilate OR BZ OR QNB NOT benzodiazepine
Ammonia	Ammonia (subsequent search on: Anhydrous ammonia)
Arsenic	Arsenic
Chlorine	Chlorine gas
Fentanyls	Fentanyl
Hydrogen Cyanide	Hydrogen cyanide OR hydrocyanic acid
Hydrogen Fluoride	Hydrogen fluoride OR hydrofluoric acid
O-Chlorobenzylidene Malononitrile (CS)	CS gas OR o-chlorobenzylidene malononotrile
Phosgene	Phosgene
Phosphine	Phosphine
Phosphorus - White or Red	Phosphorus
Thallium Sulfate	Thallium sulfate

Table 3. Chemical Agent Sub-Model Specific Search Terms

Chemical Sub-Model	Search Terms
Toxicity	Toxicity OR effective dos* OR lethal dos*
Injury Profile (used two sets of search terms)	
Duration of Illness	Length of illness OR duration of illness OR course of illness
Symptoms	Symptoms OR clinical data OR clinical progression OR case
Prophylaxis	Prophylaxis OR efficacy OR vaccine OR countermeasure

Table 4. Biological Agent Sub-Model Specific Search Terms

Biological Sub-Model	Search Terms
Infectivity	Infectivity (for organisms) OR Effectivity (for toxins)
Incubation/Latency Period	Incubation OR laten* OR onset
Duration of Illness	Length of illness OR duration of illness OR course of illness
Disease Profile	Symptoms OR clinical data OR clinical progression OR case
Lethality	Lethality OR mortality OR death
Prophylaxis	Prophylaxis OR efficacy OR vaccine OR countermeasure

During the review of the EBSCO*host* search results, a rating was given to each sub-model based on the available articles. Appendix B provides a list of all agents included in the work plan, and the rating made for availability of data for each HRIP parameter. The likelihood of being able to model each sub-model was estimated using the following system:

(1) **Certain**: Documentation of congruous human studies or clinical data is available and amenable to the derivation of HRIP parameters. From the literature review, it is certain that we can cite a peer-reviewed journal article that provides data for the modeling of the specified sub-model. At least one article in this search has returned data directly associated with the estimation of the sub-model under consideration.

(2) **Likely**: Documentation of congruous animal studies is available and amenable to the derivation of HRIP parameters. Extrapolation from existing animal studies is less certain, but can likely be used to determine the desired HRIP parameters. From the literature review, it is likely that we can cite a peer-reviewed journal article that provides data for the modeling of the specified sub-model. Although the articles in this category may be simple statements of values (e.g., an LD50 and

probit are provided with no animal data), the article likely contains useful references to other articles or sources.

(3) **Possible**: Similar agents, or relevant human studies or clinical data, exist, which may allow for the derivation of HRIP parameters. Extrapolation from one agent to another, or one human effect to another, may possibly be used to determine the desired HRIP parameters. From the literature review, it is possible that we can cite a peer-reviewed journal article that provides data for the modeling of the specified sub-model. Articles in this category may include animal studies but may not be obviously and/or directly related to the subject considered.

(4) **Unlikely**: No human or animal data were identified; this will therefore require a more in-depth review of the scientific literature and, perhaps, more fundamental research into health effects than is available through IDA. Based on our initial literature review, it is unlikely that we can cite a peer-reviewed journal article that provides necessary data for the specified sub-model. For example, all of the available articles in a search on toxicity returned articles advising first responders of potential fatalities associated with the agent; no articles on agent experimentation or toxicity results were included.

Note: Due to limitations on available funds and time, full articles were not available for review in all cases, so a determination of "likely" or "possible" was sometimes made more subjectively on the basis of the potential to find useful articles upon further review. For example, if many articles indicated that they may contain relevant human or animal studies, but none could be confirmed by the abstract alone, it was deemed "likely" that we would be able to cite a peer-reviewed journal article once these articles were acquired and thoroughly reviewed. In the same way, when citing a source was judged to be "possible," this sometimes indicated that there were fewer potentially useful articles or that those located were less likely to contain directly relevant information.

Although a prophylaxis literature search was performed for each agent as described above, the relevance of the resulting articles depended mainly on whether a US Food and Drug Administration (FDA) approved vaccine or course of pre-exposure antibiotics exists for the specified agent. To determine which biological agents had approved vaccines (in the US or otherwise), we consulted the CDC's online version of the 2010 Yellow Book.[4] For agents in the work plan which were identified as being

[4] Brunette, Gary W., Phyllis E. Kozarsky, Alan J. Magill, and David Shlim, "CDC Health Information for International Travel 2010 (The Yellow Book)," (Mosby Ltd., 2009), http://wwwnc.cdc.gov/travel/yellowbook/2010/table-of-contents.aspx.

vaccine-preventable or which were not mentioned in the Yellow Book at all, the literature search results constituted the basis for rating the HRIP prophylaxis parameters for that agent. Those agents identified as having no available vaccine were deemed "unlikely," with the exception of bacterial agents. For bacterial agents, it is assumed that there is an antibiotic that is effective as chemoprophylaxis; by rule, all bacterial agents were categorized as "possible," unless already rated as "likely" based on vaccine data. (We recognize that some bacterial agents have antibiotic resistant strains, but generally all bacterial agents have antibiotic susceptible strains and can utilize a prophylactic model.) Since no pre-exposure prophylaxis was identified for any chemical agent in the plan of work, the probability of citing an article providing HRIP parameters was "unlikely."

e. Correlate a Level of Effort to the Availability of Information. The final step in the development of a program of work is to estimate a level of effort appropriate to address the availability of information. This is done separately for the CRN and the biological models because there is a different set of parameters for these different classes of HRIP models. Plus, we have the sense that it may be easier to populate the biological models than it is the chemical models. Developing a chemical model requires development of the associated injury profiles, something for which there has been less work (and therefore less literature available) and for which IDA has less experience. The level of effort estimate is based upon IDA's experience in developing the HRIP methodology, which required defining parameters for multiple nuclear weapon effects, three chemical agents, and five biological agents. The level of effort is estimated at each level of certainty for each HRIP sub-model (Table 5). (A separate estimation was made for the level of effort required to estimate the prophylaxis parameters for CRN and biological agents (Table 6).) Thus the level of effort required to develop new HRIP parameters is estimated as:

Table 5. Level of Effort Associated with Information Availability for Each HRIP Parameter

Level of Effort (person-months)				
Information Availability	Certain	Likely	Possible	Unlikely*
CRN HRIP Sub-Model				
Toxicity	1	2	3	6
Injury Profile	1	2	4	9
Bio HRIP Sub-Model				
Infectivity	1	1	2	2
Incubation/Latency Period	1	1	2	3
Duration of Illness	1	1	2	3
Disease Profile	1	1	3	6
Lethality	1	1	2	2

* The level of effort listed reflects interviewing or convening panels of experts as well as literature review. We have included a recommendation to perform more research on these topics in order to more confidently address this information shortfall.

Table 6. Level of Effort Associated with Information Availability for Prophylaxis

Level of Effort to Include Prophylaxis (person-months)				
Information Availability	Certain	Likely	Possible	Unlikely
CRN HRIP	1	3	4	Perform Basic Research
Bio HRIP	1	2	5	Perform Basic Research

f. Estimate Level of Effort to Extend AMedP-8(C) HRIP Parameters to Nominated Agents. By applying the level of effort estimates in Tables 5 and 6 to each of the agents in Appendix B, we developed estimates of the effort required to develop HRIP parameters for more than 40 agents (Tables 7 and 8). Given these estimates, we recommend that the US Army Office of the Surgeon General:

i. Prioritize (high, medium, low) chemical, biological, and radiological agents by the urgency of the need for casualty estimation parameters;
ii. Include in this prioritization consideration of psychological casualties and the extension of the AMedP-8(C) HRIP methodology to civilian populations;
iii. Recommend agents for analyses to estimate HRIP parameters, based on the estimated level of effort required and the availability of resources, for each fiscal year;
iv. Provide recommendations on further literature review and extension of this work plan for agents not addressed herein; and
v. Perform future research for those agents for which there appears to be insufficient information available (i.e., where the information availability is rated as “Unlikely”) and as desired by the military requirements community.

Table 7. Estimate of Effort (person-months) Necessary to Extend AMedP-8(C) Human Response Injury Profile (HRIP) Methodology to Nominated Biological Agents

Nominated Biological Agents	Level of Effort (person-months)
Staphylococcal Enterotoxin B	5
Coccidioidomycosis	6
Crimean-Congo Hemorrhagic Fever	6
Dengue Fever	6
Nipah virus	6
Tetrodotoxin	6
Cryptosporidiosis	7
Ebola Hemorrhagic Fever	7
Prions	7
Q Fever	7
Ricin Toxin	7
Rift Valley Fever	7
Aflatoxin	8
Lassa Fever	8
Western (Central) European TBE	8
Influenza [H1N1, H5N1, etc.]	10
Shiga Toxin (Shigellosis)	10
Tularemia	10
Brucellosis	11
Cholera	11
Hendra virus	11
Rocky Mountain Spotted Fever	11
Saxitoxin	11
T-2 Toxin	11
Yellow Fever	11
Conotoxin	12
Epsilon Toxin	12
Psittacosis	13
Typhus Fever	13
Escherichia coli O157:H7	13
Glanders	15
Bioregulatory Peptides	16*†

* This estimate of effort assumes the use of expert panels. We recommend that further research in human response to exposure to these agents be performed as desired by the military requirements community.

† More specificity in agent identification is required to refine the literature search and review necessary to better develop these estimates.

Table 8. Estimate of Effort (person-months) Necessary to Extend AMedP-8(C) Human Response Injury Profile (HRIP) Methodology to Nominated Chemical Agents

Nominated Chemical Agents	Level of Effort (person-months)
Phosgene	5
Hydrogen Cyanide	6
Hydrogen Fluoride	6
Ammonia	7
Arsenic	7
Chlorine	7
O-Chlorobenzylidene Malononitrile (CS)	7
Phosphine	7
Phosphorus - White or Red	7
Thallium Sulfate	10
3-Quinuclidinyl Benzilate (BZ)	15*
Fentanyls	15*†

* This estimate of effort assumes the use of expert panels. We recommend that further research in human response to exposure to these agents be performed as desired by the military requirements community.

† More specificity in agent identification is required to refine the literature search and review necessary to better develop these estimates.

Appendix A

CHEMICAL AND BIOLOGICAL AGENTS OF INTEREST

The matrix in this appendix illustrates those agents of concern to NATO and various US organizations, as indicated by their presence in documents or lists regarding potential chemical or biological threats. Agents are ordered by their status in the current work plan:

- Currently Included in AMedP-8(C)
- Included in Current Work Plan
- Grouped as a ___; ___ was nominated from this group to be included in the work plan
- Not included in Current Work Plan

Documents referenced in this matrix are:

- Multiservice Publication, *Potential Military Chemical/Biological Agents and Compounds*, FM 3-11.9/MCRP 3-37.1B/NTRP 3-11.32/AFTTP(I) 3-2.55, Washington, DC: U.S. Government Printing Office, January 2005.
- Multiservice Publication, *Treatment of Biological Warfare Agent Casualties*, FM 8-284/NAVMED P-5042/ AFMAN(I) 44-156/MCRP 4-11.1C, Washington, DC: U.S. Government Printing Office, 17 July 2000.
- North Atlantic Treaty Organization (NATO), *AMedP-8(B), Volume II: Medical Planning Guide for the Estimation of CBRN Battle Casualties (Biological)*, STANAG 2476, 20 December 2007.
- North Atlantic Treaty Organization (NATO), *AMedP-8(A), Volume III: Medical Planning Guide for the Estimation of NBC Battle Casualties (Chemical)*, STANAG 2477, 20 April 2005.
- North Atlantic Treaty Organization (NATO), *AMedP-6(C), Volume II: NATO Handbook on Medical Aspects of NBC Defensive Operations (Biological)*, STANAG 2462, 11 May 2005.
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- Darling, Robert G., and Jon B. Woods, eds., *USAMRIID's Medical Management of Biological Casualties Handbook*, 5th ed., Ft. Detrick, MD: U.S. Army Medical Research Institute for Infectious Diseases, 2004.
- Department of Homeland Security, "Appendix to Chemical Facility Anti-Terrorism Standards; Final Rule," *Federal Register* 72, no. 223, 20 November 2007, 65396-435.
- Department of Health and Human Services, "HHS Select Agents and Toxins," *Code of Federal Regulations*, title 42, sec. 73.3, 1 October 2008.
- Centers for Disease Control and Prevention (CDC), "Biological Agents," http://emergency.cdc.gov/agent/agentlist.asp.
- Centers for Disease Control and Prevention (CDC), "Chemical Agents," http://emergency.cdc.gov/agent/agentlistchem.asp.
- National Institute of Allergy and Infectious Diseases (NIAID), "Biodefense: NIAID Category A, B, and C Priority Pathogens," http://www3.niaid.nih.gov/topics/BiodefenseRelated/Biodefense/research/CatA.htm.

- National Institute of Allergy and Infectious Diseases (NIAID), "Emerging and Re-emerging Infectious Diseases," http://www3.niaid.nih.gov/topics/emerging/list.htm.
- Sutto, Thomas E., "Appendix D: Naval Research Laboratory's Industrial Chemical Analysis Inhalation Ocular Hazard Database" and "Appendix E: Naval Research Laboratory's Industrial Chemical Analysis Percutaneous Hazard Database," in *Memorandum For Record #1: TIC/TIM Task Force Prioritization & Application Recommendations*, 24 February 2009.
- Office of the Surgeon General (OTSG) guidance to Defense Medical Standardization Board (DMSB) Common User Database (CUD), handout to authors, 3 September 2009.
- Defense Threat Reduction Agency (DTRA) guidance to Defense Medical Standardization Board (DMSB) Common User Database (CUD), handout to authors, 3 September 2009.

Presence of an agent on a list is indicated by one of the following symbols:

- x = Present on List
- A = Category A Agent
- B = Category B Agent
- C = Category C Agent
- E = Emerging Disease (pathogen newly recognized in the past two decades)
- R = Re-Emerging Disease
- P = Marked as a Priority on the DTRA list to the CUD

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Biological	Anthrax	10	x	x	x	x	x		x	A	A		x	P	Currently included in AMedP-8(C)
Biological	Botulinum Toxin	10	x	x	x	x	x		x	A	A		x	P	
Biological	Plague	10	x	x	x	x	x		x	A	A		x	P	
Biological	Smallpox	10	x	x	x	x	x		x	A	A		x	P	
Biological	Venezuelan Equine Encephalitis (VEE)	10	x	x	x	x	x		x	B	B		x	P	
Chemical	Sarin (GB)	7	x		x	x		x		x			x	P	
Chemical	VX	6	x		x	x		x		x			x		
Chemical	Distilled Mustard (HD)	5	x		x	x				x				P	
Biological	Brucellosis	10	x	x	x	x	x		x	B	B		x	P	Included in Current Work Plan
Biological	Q Fever	10	x	x	x	x	x		x	B	B		x	P	
Biological	Staphylococcal Enterotoxin B	10	x	x	x	x	x		x	B	B		x	P	
Biological	Tularemia	10	x	x	x	x	x		x	A	A		x	P	

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Biological	Glanders	8	x	x	x		x		x	B	B		x		
Biological	Ricin Toxin	8	x	x		x	x		x	B	B		x		
Biological	Cholera	7	x			x	x			B	B		x	x	
Biological	Ebola Hemorrhagic Fever	7	x	x					x	A	A		x	x	
Biological	Crimean-Congo Hemorrhagic Fever	6	x	x		x			x		C			x	
Biological	Epsilon Toxin	6	x	x		x			x	B	B				
Biological	Lassa Fever	6	x	x					x	A	A			x	
Biological	Rift Valley Fever	6	x	x		x			x		A			x	
Biological	Influenza (H1N1, H5N1, and others)	5	x		x				x	C	C				
Biological	Saxitoxin	5	x	x		x			x	x					
Biological	Shiga Toxin (Shigellosis)	5	x						x	B	B			x	
Biological	T-2 Toxin	5		x		x	x		x				x		
Biological	Typhus Fever	5	x						x	B	B			x	
Biological	Escherichia coli O157:H7 (E. Coli)	4	x							B	B			x	
Biological	Nipah virus	4							x	C	C			x	
Biological	Psittacosis	4	x							B	B			x	
Biological	Cryptosporidiosis	3								B	B			x	
Biological	Hendra virus	3							x		E			x	
Biological	Tetrodotoxin	3	x						x	x					
Biological	Yellow Fever	3	x	x							C				
Biological	Coccidioidomycosis	2							x		C				Included in Current Work Plan
Biological	Conotoxin	2	x						x						
Biological	Dengue Fever	2	x								A				
Biological	Rocky Mountain Spotted Fever	2	x						x						
Biological	Prions (including those causing Bovine Spongiform Encephalopathy (BSE) and Creutzfeldt-Jakob Disease (CJD))	1									C				
Biological	Western (formerly Central) European Tick-Borne Encephalitis	1							x						
Biological	Aflatoxin	0													
Biological	Bioregulatory Peptides	0													

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Phosgene (CG)	7	x			x		x		x		x	x	P	
Chemical	Chlorine (CL2)	6	x			x		x		x		x	x		
Chemical	Ammonia	5				x		x		x		x	x		
Chemical	Hydrogen Cyanide (AC)	5				x		x		x		x	x		
Chemical	Phosphorus - White (WP) or Red (RP)	5	x			x		x		x		x			
Chemical	3-Quinuclidinyl Benzilate (BZ)	4	x			x				x			x		
Chemical	Hydrogen Fluoride	4						x		x		x	x		
Chemical	O-Chlorobenzylidene Malononitrile (2-Chlorobenzalmalononitrile, CS, CS1, CS2, CSX)	4	x			x				x		x			
Chemical	Phosphine	3						x		x		x			
Chemical	Arsenic	2								x		x			
Chemical	Fentanyls	2	x							x					
Chemical	Thallium Sulfate	1										x			
Biological	Abrin	2							x	x					Grouped as a biotoxin similar to Ricin Toxin; Ricin Toxin is regarded as representative of this group
Chemical	Lewisiste (L,L-1,L-2,L-3)	5	x			x		x		x			x		Grouped as a Blister Agent; Distilled Mustard (HD) was nominated from this group, and is currently included in AMedP-8(C)
Chemical	Mustard Gas (Sulfur Mustard, H)	5	x			x		x		x			x		
Chemical	Nitrogen Mustard (HN-1, HN-2, HN-3)	5	x			x		x		x			x		
Chemical	Phosgene Oxime (CX)	3	x			x				x					
Chemical	Sesqui Mustard (Q)	3	x					x		x					
Chemical	Mustard - T Mixture (HT)	2	x							x					
Chemical	Mustard Lewisite Mixture (HL)	2	x							x					
Chemical	Ethyldichloroarsine (ED)	1	x												
Chemical	Levinstein Mustard (H)	1	x												
Chemical	Methyldichloroarsine (MD)	1	x												
Chemical	Phenyldichloroarsine	1	x												

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
	(PD)														
Chemical	Cyanogen Chloride (CK)	6	x			x		x		x		x	x		Grouped as a Blood Agent; Hydrogen Cyanide (AC) was nominated from this group to be included in the work plan
Chemical	Arsenic Trihydride (Arsine, SA)	4	x					x		x		x			
Chemical	Potassium Cyanide (KCN)	3						x		x		x			
Chemical	Sodium Cyanide (NaCN)	3						x		x		x			
Chemical	Cyanide	2								x		x			
Biological	Hemorrhagic Fever with Renal Syndrome (formerly Korean Hemorrhagic Fever)	4	x							C	A			x	Grouped as a Bunyavirus and as a Viral Hemorrhagic Fever; Crimean-Congo Hemorrhagic Fever was nominated from this group to be included in the work plan
Biological	California encephalitis virus	0													Grouped as a Bunyavirus and as an Encephalitide; Rift Valley Fever was nominated from this group to be included in the work plan
Biological	Melioidosis	8	x	x		x	x		x	B	B			x	Grouped as a Burkholderia; Glanders was nominated from this group to be included in the work plan
Chemical	Chloropicrin (PS)	3				x				x		x			Grouped as a Choking Agent; Phosgene (CG) was nominated from this group to be included in the work plan
Chemical	Diphosgene (DP)	3	x			x				x					
Biological	Marburg Hemorrhagic Fever	6	x						x	A	A		x	x	Grouped as a Filovirus and as a Viral Hemorrhagic Fever; Ebola Hemorrhagic Fever was nominated from this group to be included in the work plan
Biological	Kyasanur Forest Disease	2							x					x	Grouped as a Flavivirus

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Biological	Omsk Hemorrhagic Fever	2							x					x	and as a Viral Hemorrhagic Fever; Yellow Fever was nominated from this group to be included in the work plan
Biological	Salmonellosis	2								B	B				
Biological	Alkhurma virus	0													
Biological	Tick-Borne Encephalitis	4	x	x							C			x	Grouped as a Flavivirus and as an Encephalitide; Western (formerly Central) European Tick-Borne Encephalitis was nominated from this group to be included in the work plan
Biological	Far Eastern (formerly Russian Spring and Summer) Tick-Borne Encephalitis	2	x						x						
Biological	Japanese encephalitis virus	2	x								B				
Chemical	Soman (GD)	5	x			x		x		x			x		Grouped as a G Agent; Sarin (GB) was nominated from this group, and is currently included in AMedP-8(C)
Chemical	Tabun (GA)	5	x			x		x		x			x		
Chemical	Cyclosarin (GF)	3	x			x							x		
Chemical	Ethyl Sarin (GE)	1	x												
Chemical	Phosphorus - Black or Yellow	2	x							x					Grouped as a Phosphorus; Phosphorus - White (WP) or Red (RP) was nominated from this group to be included in the work plan

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Diphenylaminearsine (Adamsite, DM)	3	x			x				x					Grouped as a Respiratory Irritant; Chlorine (CL2) was nominated from this group to be included in the work plan
Chemical	Diphenylchlorarsine (DA)	2	x			x									
Chemical	Diphenylcyanoarsine (DC)	2	x			x									
Chemical	Bromobenzylcyanide (CA)	3	x			x				x					Grouped as a Riot Control Agent; O-Chlorobenzylidene Malononitrile (2-Chlorobenzalmalononitrile, CS, CS1, CS2, CSX) was nominated from this group to be included in the work plan
Chemical	Chloroacetophenone (CN)	3	x			x				x					
Chemical	Dibenz (b,f)–1:4-oxazepine (CR)	3	x			x				x					
Chemical	Capsaicin (OC)	1	x												
Biological	Trichothecene Mycotoxin	2	x							x					Grouped as a Trichothecene Mycotoxin; T-2 Toxin was nominated from this group to be included in the work plan
Biological	Diacetoxyscirpenol	1							x						
Chemical	Amiton (VG)	1	x												Grouped as a V Agent; VX was nominated from this group to be inlcuded in the work plan
Chemical	Thickened Soman (TGD)	1				x									
Chemical	VE	1	x												
Chemical	VM	1	x												
Chemical	VS	1	x												
Chemical	VX	1	x												
Biological	Eastern Equine Encephalatis	5	x						x	B	B		x		Grouped as an Alphavirus and an Encephalitide; Venezuelan Equine Encephalitis (VEE) was nominated from this group, and is currently included in AMedP-8(C)
Biological	Western Equine Encephalitis	4	x							B	B		x		

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Biological	Chikungunya virus	2	x								C				Grouped as an Alphavirus with rash and arthralgias; Dengue Fever is regarded as representative of this disease although it is recognized that Dengue Fever is a Flavivirus, not an Alphavirus
Biological	Barmah Forest virus	0													
Biological	Ross River Fever	0													
Biological	Semliki Forest Disease	0													
Biological	Argentine Hemorrhagic Fever [Junin virus]	7	x	x		x			x	A	A			x	Grouped as an Arenavirus and a Viral Hemorrhagic Fever; Lassa Fever was nominated from this group to be included in the work plan
Biological	Bolivian Hemorrhagic Fever [Machupo virus]	4	x						x	A				x	
Biological	Brazilian Hemorrhagic Fever [Sabia virus]	3							x	A				x	
Biological	Venezuelan Hemorrhagic Fever [Guanarito virus]	2							x	A					
Biological	Flexal virus	1							x						
Biological	Verotoxin (Shiga-Like Toxin)	2	x						x						Grouped as an Enterotoxin; Shiga Toxin (Shigellosis) was nominated from this group to be included in the work plan
Biological	Alastrim	2	x						x						Grouped as an Orthopoxvirus; Smallpox was nominated from this group to be included in the work plan
Biological	Monkeypox	2	x						x						
Biological	Camelpox	0													
Biological	Typhoid Fever	3	x							B				x	Not included in Current Work Plan
Biological	Hepatitis A	2								B	B				
Biological	Lymphocytic Choriomeningitis	2	x											x	
Biological	Acanthamebiasis	1									E				
Biological	African Swine Fever	1	x												
Biological	Australian bat lyssavirus	1									E				
Biological	Babesiosis	1									E				
Biological	Bartonella henselae	1									E				
Biological	Brevetoxin	1								x					
Biological	Campylobacter spp.	1									B				

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Biological	Clostridium difficile	1									R				Not included in Current Work Plan
Biological	Contagious Bovine Pleuropneumonia	1	x												
Biological	Digitalis (Digoxin)	1								x					
Biological	Ehrlichiosis	1									E				
Biological	Encephalitozoon cuniculi	1									E				
Biological	Encephalitozoon hellem	1									E				
Biological	Enterocytozoon bieneusi	1									E				
Biological	Enterovirus 71	1									R				
Biological	Group A Streptococcal Infections	1									R				
Biological	Heartwater	1	x												
Biological	Helicobacter pylori	1									E				
Biological	Hepatitis C	1									E				
Biological	Hepatitis E	1									E				
Biological	Herpes B Virus	1							x						
Biological	Human herpesvirus 6	1									E				
Biological	Human herpesvirus 8	1									E				
Biological	Listeriosis	1									B				
Biological	Lyme Disease (Borreliosis)	1									E				
Biological	Microcystin	1	x												
Biological	Multi-Drug-Resistant Tuberculosis (MDRTB)	1									C				
Biological	Mumps	1									R				
Biological	Parvovirus B19	1									E				
Biological	Protozoa	1									B				
Biological	Rabies	1									C				
Biological	Severe Acute Respriatory Syndrome (SARS)	1									C				
Biological	Teschovirus Encephalomyelitis (formerly Enterovirus Encephalomyelitis, Teschen Disease, or Talfan Disease)	1	x												
Biological	Trench Fever	1	x												
Biological	West Nile virus	1									B				

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Biological	African Horse Sickness Virus	0													Not included in Current Work Plan
Biological	Akabane virus	0													
Biological	Bovine Malignant Catarrhal Fever	0													
Biological	Classical Swine Fever	0													
Biological	Contagious Caprine Pleuropneumonia	0													
Biological	Cyclospora cayetanensis	0													
Biological	Entamoeba histolytica	0													
Biological	Giardiasis	0													
Biological	Lumpyskin Disease	0													
Biological	Malaria	0													
Biological	Menangle virus	0													
Biological	Microsporidia	0													
Biological	Peronosclerospora philippinensis (Peronosclerospora sacchari)	0													
Biological	Phoma glycinicola (Pyrenochaeta glycines)	0													
Biological	Ralstonia solanacearum race 3 biovar. 2	0													
Biological	Rathayibacter toxicus	0													
Biological	Sandfly Fever	0													
Biological	Sclerophthora rayssiae var. zeae	0													
Biological	Synchytrium endobioticum	0													
Biological	Toxoplasma spp.	0													
Biological	Xanthomonas oryzae	0													
Biological	Xylella fastidiosa (citrius variegated chlorosis strain)	0													
Biological	Yersinia enterocolitica	0													
Chemical	Hydrogen Chloride	5				x		x		x		x	x		
Chemical	Hydrogen Sulfide	4				x		x				x	x		
Chemical	Bromine	3						x		x		x			
Chemical	Hexachloroethane (HC)	3	x			x						x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Hydrazine	3						x		x		x			
Chemical	Nitric Acid	3						x				x	x		
Chemical	Sodium Azide	3						x		x		x			
Chemical	Stibine	3						x		x		x			
Chemical	Sulfur Dioxide	3						x				x	x		
Chemical	Titanium Tetrachloride (FM Smoke)	3	x			x		x							
Chemical	1,1-Dimethylhydrazine	2						x				x			
Chemical	1,3-Butadiene	2						x				x			
Chemical	Acetaldehyde	2						x				x			
Chemical	Acrolein	2						x				x			
Chemical	Acrylonitrile	2						x				x			
Chemical	Allyl Alcohol	2						x				x			
Chemical	Barium	2								x		x			
Chemical	Benzene	2								x		x			
Chemical	Boron Trifluoride	2						x				x			
Chemical	Carbon Disulfide	2						x				x			
Chemical	Carbon Monoxide	2				x				x					Not included in Current Work Plan
Chemical	Chlorine Dioxide	2						x				x			
Chemical	Chloroform	2						x				x			
Chemical	Chlorosulphonic Acid (CSA)	2				x		x							
Chemical	Crotonaldehyde	2						x				x			
Chemical	Diborane	2						x				x			
Chemical	Dimethylamine	2						x				x			
Chemical	Epichlorohydrin	2						x				x			
Chemical	Ethyl Chloride	2						x				x			
Chemical	Ethyl Ether	2						x				x			
Chemical	Ethyl Mercaptan	2						x				x			
Chemical	Ethylamine	2						x				x			
Chemical	Ethylene Oxide	2						x				x			
Chemical	Ethylenediamine	2						x				x			
Chemical	Ethyleneimine	2						x				x			
Chemical	Fluorine	2						x				x			
Chemical	Hydrogen Bromide	2						x				x			
Chemical	Hydrogen Selenide	2						x				x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Indoles	2	x			x									Not included in Current Work Plan
Chemical	Isopropyl Alcohol (OPA)	2	x									x			
Chemical	Isopropylamine	2	x									x			
Chemical	LSD	2	x			x									
Chemical	Mercury	2								x		x			
Chemical	Methyl Chloride	2						x				x			
Chemical	Methyl Formate	2						x				x			
Chemical	Methyl Hydrazine	2						x				x			
Chemical	Methyl Isocyanate	2						x				x			
Chemical	Methyl Mecaptan	2						x				x			
Chemical	Methylamine	2						x				x			
Chemical	Nitric Oxide	2						x				x			
Chemical	Nitrobenzene	2						x				x			
Chemical	Nitroglycerin	2						x				x			
Chemical	Nitromethane	2						x				x			
Chemical	Oxygen Difluoride	2						x				x			
Chemical	Paraquat	2								x		x			
Chemical	Perchloromethyl mercaptan	2						x				x			
Chemical	Perchloryl Fluoride	2						x				x			
Chemical	Phosphorus Pentasulfide	2						x				x			
Chemical	Phosphorus Trichloride	2						x				x			
Chemical	Potassium Nitrate	2						x				x			
Chemical	Potassium Permanganate	2						x				x			
Chemical	Propane	2						x				x			
Chemical	Propylene Oxide	2						x				x			
Chemical	Selenium Hexafluoride	2						x				x			
Chemical	Sodium Chlorate	2						x				x			
Chemical	Sodium Nitrate	2						x				x			
Chemical	Sulfur Trioxide	2						x				x			
Chemical	Sulfuryl Fluoride	2								x		x			
Chemical	Tetranitromethane	2						x				x			
Chemical	Thallium	2								x		x			
Chemical	1,1,1,2-Tetrachloro 2, 2-difluoroethane	1										x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	1,1,2,2-Tetrachloro 1, 2-difluoroethane	1										x			Not included in Current Work Plan
Chemical	1,1,2,2-Tetrachloroethane	1										x			
Chemical	1,1,2-Trichloro 1,2, 2-trifluoroethane	1										x			
Chemical	1,1,2-Trichloroethane	1										x			
Chemical	1,1-Dichloroethane	1										x			
Chemical	1,2,3-Trichloropropane	1										x			
Chemical	1,2-Dichloroethylene	1										x			
Chemical	1,2-Dimethylimidazole	1										x			
Chemical	1,3-Bis (2-chloroethylthio) -n-propane	1						x							
Chemical	1,3-Dichloro 5,5-dimethylhydantoin	1										x			
Chemical	1,3-Pentadiene	1						x							
Chemical	1,4-Bis (2-chloroethylthio)-n-butane	1						x							
Chemical	1,5-Bis(2-chloroethylthio)-n-pentane	1						x							
Chemical	1-Butene	1						x							
Chemical	1-Chloro-1-nitropropane	1										x			
Chemical	1-Chloropropylene	1						x							
Chemical	1H-Tetrazole	1						x							
Chemical	1-Methyl imidazole	1										x			
Chemical	1-Nitropropane	1										x			
Chemical	1-Pentene	1						x							
Chemical	2 Aminopyridine	1										x			
Chemical	2,2-Dimethylpropane	1						x							
Chemical	2,4,5-T	1										x			
Chemical	2,4-D	1										x			
Chemical	2,6-Di-tert-butyl-p-cresol	1										x			
Chemical	2-Butanone	1										x			
Chemical	2-Butene	1						x							
Chemical	2-Butene-cis	1						x							
Chemical	2-Butene-trans	1						x							
Chemical	2-Butoxyethanol	1										x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	2-Chloroacetophenone	1										x			Not included in Current Work Plan
Chemical	2-Chlorobenzoyl Chloride	1										x			
Chemical	2-Chloroethylchloromethylsulfide	1						x							
Chemical	2-Chloropropylene	1						x							
Chemical	2-Diethylaminoethanol	1										x			
Chemical	2-Ethoxyethanol	1										x			
Chemical	2-Ethoxyethyl acetate	1										x			
Chemical	2-Hexanone	1										x			
Chemical	2-Methyl-1-butene	1						x							
Chemical	2-Methylpropene	1						x							
Chemical	2-Nitropropane	1										x			
Chemical	2-Pentanone	1										x			
Chemical	2-Pentene, (E)-	1						x							
Chemical	2-Pentene, (Z)-	1						x							
Chemical	2-Thiophenecarbonitrile (as CN)	1										x			
Chemical	3-Methyl-1-butene	1						x							
Chemical	4-Chlorobutyronitrile (as CN)	1										x			
Chemical	5-Methyl 3-heptanone	1										x			
Chemical	5-Nitrobenzotriazol	1						x							
Chemical	Acephate	1										x			
Chemical	Acetic Acid	1										x			
Chemical	Acetic Anhydride	1										x			
Chemical	Acetone	1										x			
Chemical	Acetone Cyanohydrin, Stabilized	1						x							
Chemical	Acetonitrile	1										x			
Chemical	Acetyl Bromide	1						x							
Chemical	Acetyl Chloride	1						x							
Chemical	Acetyl Iodide	1						x							
Chemical	Acetylene	1						x							
Chemical	Acetylene Tetrabromide	1										x			
Chemical	Acrylamide	1										x			
Chemical	Acrylyl Chloride	1						x							

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Aldicarb	1										x			Not included in Current Work Plan
Chemical	Aldrin	1										x			
Chemical	Allyl Chloride	1										x			
Chemical	Allyl Glycidyl Ether	1										x			
Chemical	Allylamine	1						x							
Chemical	Allyltrichlorosilane, Stabilized	1						x							
Chemical	Aluminum (Powder)	1						x							
Chemical	Aluminum Bromide, Anhydrous	1						x							
Chemical	Aluminum Chloride, Anhydrous	1						x							
Chemical	Aluminum Phosphide	1						x							
Chemical	Ammonia (as Ammonium Hydroxide)	1										x			
Chemical	Ammonia (Conc. 20% or Greater)	1						x							
Chemical	Ammonium Chloride	1										x			
Chemical	Ammonium Nitrate, (with more than 0.2 percent combustible substances, including any organic substance calculated as carbon, to the exclusion of any other added substance)	1						x							
Chemical	Ammonium Nitrate, Solid (nitrogen concentration of 23% nitrogen or greater)	1						x							
Chemical	Ammonium Perchlorate	1						x							
Chemical	Ammonium Persulfate	1										x			
Chemical	Ammonium Picrate	1						x							
Chemical	Ammonium Sulfamate	1										x			
Chemical	Amyltrichlorosilane	1						x							
Chemical	Aniline	1										x			
Chemical	Antimony Oxide	1										x			
Chemical	Antimony Pentafluoride	1						x							
Chemical	ANTU	1										x			
Chemical	Aqua Regia	1										x			
Chemical	Arsenic Trichloride	1						x							
Chemical	Arsenic Trioxide	1										x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Atrazine	1										x			Not included in Current Work Plan
Chemical	Azinphos-ethyl	1										x			
Chemical	Azinphosmethyl	1										x			
Chemical	Barium Azide	1						x							
Chemical	Barium Nitrate	1										x			
Chemical	Benomyl	1										x			
Chemical	Benzoyl Peroxide	1										x			
Chemical	Benzyl Chloride	1										x			
Chemical	Beta-Chloroprene	1										x			
Chemical	Bifenthrin	1										x			
Chemical	Biphenyl	1										x			
Chemical	Bis(2-chloroethylthio) methane	1						x							
Chemical	Bis(2-chloroethylthiomethyl) ether	1						x							
Chemical	Bismuth	1										x			
Chemical	Boron	1										x			
Chemical	Boron Tribromide	1						x							
Chemical	Boron Trichloride	1						x							
Chemical	Boron Trifluoride Compound with Methyl Ether (1:1)	1						x							
Chemical	Brass	1	x												
Chemical	Brodifacoum (Superwarfarin)	1								x					
Chemical	Bromine Chloride	1						x							
Chemical	Bromine Pentafluoride	1						x							
Chemical	Bromine Trifluoride	1						x							
Chemical	Bromoacetone (BA)	1				x									
Chemical	Bromobenzene	1										x			
Chemical	Bromodiolone	1										x			
Chemical	Bromoform	1										x			
Chemical	Bromomethane (Methyl Bromide)	1								x					
Chemical	Bromotrifluorethylene	1						x							
Chemical	Bromoxynil	1										x			
Chemical	Buprofezin	1										x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Butane	1						x							Not included in Current Work Plan
Chemical	Butene	1						x							
Chemical	Butyltrichlorosilane	1						x							
Chemical	Cadmium	1										x			
Chemical	Calcium Carbonate	1										x			
Chemical	Calcium Chloride	1										x			
Chemical	Calcium Hydrosulfite	1						x							
Chemical	Calcium Hydroxide	1										x			
Chemical	Calcium Phosphide	1						x							
Chemical	Camphor (synthetic)	1										x			
Chemical	Carbaryl	1										x			
Chemical	Carbendazim	1										x			
Chemical	Carbon Monoxide H2/Syngas	1										x			
Chemical	Carbon Oxysulfide	1						x							
Chemical	Carbon Tetrachloride	1										x			
Chemical	Carbonyl Fluoride	1						x							
Chemical	Carbonyl Sulfide	1						x							
Chemical	Castor Oil	1										x			
Chemical	Chloracetone	1				x									
Chemical	Chlordane	1										x			
Chemical	Chlorinated Camphene	1										x			
Chemical	Chlorine Monoxide	1						x							
Chemical	Chlorine Pentafluoride	1						x							
Chemical	Chlorine Trifluoride	1						x							
Chemical	Chloroacetaldehyde	1										x			
Chemical	Chloroacetyl Chloride	1						x							
Chemical	Chlorobenzene	1										x			
Chemical	Chlorobromomethane	1										x			
Chemical	Chlorodiphenyl (42% Chlorine)	1										x			
Chemical	Chloroform-D	1										x			
Chemical	Chloromethyl Ether	1						x							
Chemical	Chloromethyl Methyl Ether	1						x							
Chemical	Chlorosarin	1						x							

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Chlorosoman	1						x							Not included in Current Work Plan
Chemical	Chlorpyrifos	1										x			
Chemical	Chromium	1								x					
Chemical	Chromium Oxychloride	1						x							
Chemical	Cobalt (II) Nitrate	1										x			
Chemical	Cobalt Dichloride	1										x			
Chemical	Colchicine	1								x					
Chemical	Collodion	1										x			
Chemical	Coniline (R-2-ethylpiperidine)	1										x			
Chemical	Copper Oxychloride	1										x			
Chemical	Copper Sulfate	1										x			
Chemical	Crag (r) Herbicide	1										x			
Chemical	Cumene	1										x			
Chemical	Cyanogen	1						x							
Chemical	Cyanogen Bromide	1				x									
Chemical	Cyclohexane	1										x			
Chemical	Cyclohexanol	1										x			
Chemical	Cyclohexanone	1										x			
Chemical	Cyclohexene	1										x			
Chemical	Cyclohexylamine	1						x							
Chemical	Cyclohexyltrichlorosilane	1						x							
Chemical	Cyclopentadiene	1										x			
Chemical	Cyclopropane	1						x							
Chemical	Cypermethrin	1										x			
Chemical	DDT	1										x			
Chemical	Decaborane	1										x			
Chemical	Deltamethrin	1										x			
Chemical	Demeton	1										x			
Chemical	DF	1						x							
Chemical	Diacetone Alcohol	1										x			
Chemical	Diaxodinitrophenol	1						x							
Chemical	Diazomethane	1										x			
Chemical	Dibasic Sodium Phosphate	1										x			
Chemical	Dibutyl Phosphate	1										x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Dibutyl Phosphate R Based on Monobutyl Ester	1										x			Not included in Current Work Plan
Chemical	Dibutyl Phthalate	1										x			
Chemical	Dichlorodifluoromethane	1										x			
Chemical	Dichloroethyl Ether	1										x			
Chemical	Dichloromonofluoro methane	1										x			
Chemical	Dichlorosilane	1						x							
Chemical	Dichlorotetrafluoroethne	1										x			
Chemical	Dichlorvos	1										x			
Chemical	Dicofol	1										x			
Chemical	Dieldrin	1										x			
Chemical	Diesel Fuel No. 2 (DF-2)	1	x												
Chemical	Diethyl Methylphosphonite	1						x							
Chemical	Diethylamine	1										x			
Chemical	Diethyldichlorosilane	1						x							
Chemical	Diethylene Glycol	1										x			
Chemical	Diethyleneglycol Dinitrate	1						x							
Chemical	Difethialone	1										x			
Chemical	Difluorodibromomethane	1										x			
Chemical	Difluoroethane	1						x							
Chemical	Diglycidyl Ether	1										x			
Chemical	Diisobutyl Ketone	1										x			
Chemical	Diisopropylamine	1										x			
Chemical	Diketene	1										x			
Chemical	Dimethoate	1										x			
Chemical	Dimethyl 1,2-dibromo 2,2-dichlorethyl	1										x			
Chemical	Dimethyl 1,2-dibromo 2,2-dichlorethyl phosphate	1										x			
Chemical	Dimethyl Acetamide	1										x			
Chemical	Dimethyl Sulfate	1										x			
Chemical	Dimethyldichlorosilane	1						x							
Chemical	Dimethylformamide	1										x			
Chemical	Dimethylphthalate	1										x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Dimethylpolysulfide (NM)	1	x												Not included in Current Work Plan
Chemical	Dingu	1						x							
Chemical	Dinitrobenzene (o, m, p isomers)	1										x			
Chemical	Dinitrocresol	1										x			
Chemical	Dinitrogen Tetroxide	1						x							
Chemical	Dinitrophenol	1						x							
Chemical	Dinitroresorcinol	1						x							
Chemical	Dinitrotoluene	1										x			
Chemical	Dioxane	1										x			
Chemical	Diphenyl Ether	1										x			
Chemical	Diphenyldichlorosilane	1						x							
Chemical	Dipicryl Sulfide	1						x							
Chemical	Dipicrylamine [or] Hexyl	1						x							
Chemical	Dipropylene Glycol Methyl Ether	1										x			
Chemical	Di-syston	1										x			
Chemical	Dodecyltrichlorosilane	1						x							
Chemical	Endosulfan	1										x			
Chemical	Endrin	1										x			
Chemical	EPN	1										x			
Chemical	Ethane	1						x							
Chemical	Ethanolamine	1										x			
Chemical	Ethyl Acetate	1										x			
Chemical	Ethyl Acetylene	1						x							
Chemical	Ethyl Acrylate	1										x			
Chemical	Ethyl Alcohol	1										x			
Chemical	Ethyl Benzene	1										x			
Chemical	Ethyl Bromide	1										x			
Chemical	Ethyl Butyl Ketone	1										x			
Chemical	Ethyl Formate	1										x			
Chemical	Ethyl Nitrite	1						x							
Chemical	Ethyl Phosphonyl Difluoride	1						x							
Chemical	Ethyl Silicate	1										x			
Chemical	Ethyldiethanolamine	1						x							

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Ethylene	1						x							Not included in Current Work Plan
Chemical	Ethylene Chlorohydrins	1										x			
Chemical	Ethylene Dibromide	1										x			
Chemical	Ethylene Dichloride	1										x			
Chemical	Ethylene Glycol	1								x					
Chemical	Ethylene Glycol Dinitrate	1										x			
Chemical	Ethylphosphonothioic Dichloride	1						x							
Chemical	Ethyltrichlorosilane	1						x							
Chemical	Fenpropathrin	1										x			
Chemical	Fenvalerate	1										x			
Chemical	Ferbam	1										x			
Chemical	Fluorosulfonic Acid	1						x							
Chemical	Fluorotrichloromethane	1										x			
Chemical	Fog Oil (SGF-2)	1	x												
Chemical	Formaldehyde (Formalin Solution-37% Methanol)	1										x			
Chemical	Formaldehyde (Solution)	1						x							
Chemical	Formic acid	1										x			
Chemical	Furan	1						x							
Chemical	Furfural	1										x			
Chemical	Furfuryl Alcohol	1										x			
Chemical	Germane	1						x							
Chemical	Germanium Tetrafluoride	1						x							
Chemical	Glycidol	1										x			
Chemical	Graphite	1										x			
Chemical	Guanidine Hydrochloride	1										x			
Chemical	Guanyl Nitrosaminoguanyli dene Hydrazine	1						x							
Chemical	Gypsum	1										x			
Chemical	Halothane	1										x			
Chemical	Heptachlor	1										x			
Chemical	Hexachlorobenzene	1										x			
Chemical	Hexachloronaphthalene	1										x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Hexaethyl Tetraphosphate and Compressed Gas Mixtures	1						x							Not included in Current Work Plan
Chemical	Hexafluoroacetone	1						x							
Chemical	Hexanitrostilbene	1						x							
Chemical	Hexolite	1						x							
Chemical	Hexone	1										x			
Chemical	Hexyltrichlorosilane	1						x							
Chemical	HMX	1						x							
Chemical	Hydrochloric Acid (Conc. 37% or Greater)	1						x							
Chemical	Hydrocyanic Acid	1						x							
Chemical	Hydrofluoric Acid (Conc. 50% or Greater)	1						x							
Chemical	Hydrogen	1						x							
Chemical	Hydrogen Iodide, Anhydrous	1						x							
Chemical	Hydrogen Peroxide	1										x			
Chemical	Hydrogen Peroxide (Concentration of at Least 35%)	1						x							
Chemical	Hydroquinone	1										x			
Chemical	Imidacloprid	1										x			
Chemical	Iodine	1										x			
Chemical	Iodine Pentafluoride	1						x							
Chemical	Iron Oxide	1										x			
Chemical	Iron Phosphate	1										x			
Chemical	Iron, Pentacarbonyl-	1						x							
Chemical	Isoamyl Acetate	1										x			
Chemical	Isoamyl Alcohol (Primary and Secondary)	1										x			
Chemical	Isobutane	1						x							
Chemical	Isobutyl Acetate	1										x			
Chemical	Isobutyl Alcohol	1										x			
Chemical	Isobutyronitrile	1						x							
Chemical	Isocyanates	1				x									
Chemical	Isoflurane	1										x			
Chemical	Isopentane	1						x							

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Chemical	Isophorone	1										x			Not included in Current Work Plan
Chemical	Isoprene	1						x							
Chemical	Isopropyl Acetate	1										x			
Chemical	Isopropyl Chloride	1						x							
Chemical	Isopropyl Chloroformate	1						x							
Chemical	Isopropyl Ether	1										x			
Chemical	Isopropyl Glycidyl Ether	1										x			
Chemical	Isopropylphosphono thioic Dichloride	1						x							
Chemical	Isopropylphosphonyl Difluoride	1						x							
Chemical	Jet Fuel Grade (JP-8)	1	x												
Chemical	Kerosene	1										x			
Chemical	Lead Azide	1						x							
Chemical	Lead Nitrate	1										x			
Chemical	Lead Oxide	1										x			
Chemical	Lead Syphnate	1						x							
Chemical	Lindane	1										x			
Chemical	Lithium	1										x			
Chemical	Lithium Amide	1						x							
Chemical	Lithium Nitride	1						x							
Chemical	Magnesium (Powder)	1						x							
Chemical	Magnesium Diamide	1						x							
Chemical	Magnesium Incendiaries	1	x												
Chemical	Magnesium Oxide	1										x			
Chemical	Magnesium Phosphide	1						x							
Chemical	Malathion	1										x			
Chemical	Mancozeb	1										x			
Chemical	MDEA	1						x							
Chemical	MDMA (Ecstasy)	1	x												
Chemical	Melamine	1								x					
Chemical	Mercuric Arsenate	1										x			
Chemical	Mercuric Chloride	1										x			
Chemical	Mercuric Nitrate	1										x			
Chemical	Mercuric Salicylate	1										x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Mercury Calc.	1										x			Not included in Current Work Plan
Chemical	Mercury Fulminate	1						x							
Chemical	Mercury Oxycyanide as Hg	1										x			
Chemical	Mesityl Oxide	1										x			
Chemical	Metalaxyl	1										x			
Chemical	Methacrylonitrile	1						x							
Chemical	Methamidophos	1										x			
Chemical	Methane	1						x							
Chemical	Methidathion	1										x			
Chemical	Methomyl	1										x			
Chemical	Methoxychlor	1										x			
Chemical	Methoxyflurane	1										x			
Chemical	Methyl (n-amyl) ketone	1										x			
Chemical	Methyl Acetate	1										x			
Chemical	Methyl Acetylene	1										x			
Chemical	Methyl Acrylate	1										x			
Chemical	Methyl Alcohol	1										x			
Chemical	Methyl Bromide	1										x			
Chemical	Methyl Cellosolve	1										x			
Chemical	Methyl Cellosolve (r) acetate	1										x			
Chemical	Methyl Chloroform	1										x			
Chemical	Methyl Chloroformate	1						x							
Chemical	Methyl Ether	1						x							
Chemical	Methyl Iodide	1										x			
Chemical	Methyl Isobutyl Carbinol	1										x			
Chemical	Methyl Methacrylate	1										x			
Chemical	Methyl Parathion	1										x			
Chemical	Methyl Phosphonic Acid (DF)	1	x												
Chemical	Methyl Thiocyanate	1						x							
Chemical	Methylal	1										x			
Chemical	Methylchlorosilane	1						x							
Chemical	Methylcyclohexane	1										x			
Chemical	Methylcyclohexanol	1										x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Methyldichlorosilane	1						x							Not included in Current Work Plan
Chemical	Methylene Bisphenyl Isocyanate	1										x			
Chemical	Methylene Bisphenyl Isocyanate R as Resin	1										x			
Chemical	Methylene Chloride	1										x			
Chemical	Methylisocyanate	1								x					
Chemical	Methylphenyldichloro silane	1						x							
Chemical	Methylphosphonothioic Dichloride	1						x							
Chemical	Methyltrichlorosilane	1						x							
Chemical	Metribuzin	1										x			
Chemical	Molybdophosphoric Acid	1										x			
Chemical	Monomethyl Aniline	1										x			
Chemical	Morpholine	1										x			
Chemical	N,N-(2-diethylamino) ethanethiol	1						x							
Chemical	N,N-(2-diisopropylamino) ethanethiol	1						x							
Chemical	N,N-(2-dimethylamino) ethanethiol	1						x							
Chemical	N,N-(2-dipropylamino) ethanethiol	1						x							
Chemical	N,N-Diethly Phosphoramidic Dichloride	1						x							
Chemical	N,N-Diisopropyl Phosphoramidic Dichloride	1						x							
Chemical	N,N-Dimethyl Phosphoramidic Dichloride	1						x							
Chemical	N,N-Dimethylaniline	1										x			
Chemical	N,N-Dipropyl Phosphoramidic Dichloride	1						x							
Chemical	N-Amyl Acetate	1										x			
Chemical	Naphthalene	1										x			
Chemical	N-Butyl Acetate	1										x			
Chemical	N-Butyl Alcohol	1										x			
Chemical	N-Butyl Glycidyl Ether	1										x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	N-Butyl Mercaptan	1										x			Not included in Current Work Plan
Chemical	N-Butylamine	1										x			
Chemical	N-Ethylmorpholine	1										x			
Chemical	N-Heptane	1										x			
Chemical	N-Hexane	1										x			
Chemical	Nickel Carbonyl	1						x							
Chemical	Nicotine	1								x					
Chemical	Nitrocellulose	1						x							
Chemical	Nitroethane	1										x			
Chemical	Nitrogen Dioxide	1										x			
Chemical	Nitrogen Mustard Hydrochloride	1						x							
Chemical	Nitrogen Trifluoride	1										x			
Chemical	Nitrogen Trioxide	1						x							
Chemical	Nitromannite	1						x							
Chemical	Nitrostarch	1						x							
Chemical	Nitrosyl Chloride	1						x							
Chemical	Nitrotoluene	1										x			
Chemical	Nitrotriazolone	1						x							
Chemical	No.1 Diesel Fuel (DF-1)	1	x												
Chemical	Nonyltrichlorosilane	1						x							
Chemical	N-Pentane	1										x			
Chemical	N-Propyl Acetate	1										x			
Chemical	N-Propyl Alcohol	1										x			
Chemical	N-Propyl Nitrate	1										x			
Chemical	O-(2 Diisopropylaminoethyl)-O'Ethyl Methyl Phosphonite (QL)	1	x												
Chemical	O,O-Diethyl S-[2-(diethylamino)ethyl] phosphorothiolate	1						x							
Chemical	O-Anisidine	1										x			
Chemical	Octadecyltrichlorosilane	1						x							
Chemical	Octane	1										x			
Chemical	Octolite	1						x							
Chemical	Octonal	1						x							

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Octyltrichlorosilane	1						x							Not included in Current Work Plan
Chemical	O-Dichlorobenzene	1										x			
Chemical	Oil and Metal Incendiary Mixtures	1	x												
Chemical	Oleum (Fuming Sulfuric Acid)	1						x							
Chemical	O-Methylcyclohexanone	1										x			
Chemical	OMPA	1										x			
Chemical	O-Mustard (T)	1						x							
Chemical	Osmium Tetroxide	1								x					
Chemical	O-Toluidine	1										x			
Chemical	Oxalic Acid	1										x			
Chemical	Oxydemeton-Methyl	1										x			
Chemical	P-Anisidine	1										x			
Chemical	Paracetamol	1										x			
Chemical	Parathion	1										x			
Chemical	PCP	1	x												
Chemical	P-Dichlorobenzene	1										x			
Chemical	Pentaborane	1										x			
Chemical	Pentachlorophenol	1										x			
Chemical	Pentaerythrite Tetranitrate	1										x			
Chemical	Pentane	1						x							
Chemical	Pentolite	1						x							
Chemical	Peracetic Acid	1						x							
Chemical	Perfluoroisobutylene (PFIB)	1				x									
Chemical	Periodic Acid	1										x			
Chemical	PETN	1						x							
Chemical	Phenamiphos	1										x			
Chemical	Phenol	1										x			
Chemical	Phenyl Etherbiphenyl Mixture (Vapor)	1										x			
Chemical	Phenyl Glycidyl Ether	1										x			
Chemical	Phenylhydrazine	1										x			
Chemical	Phenyltrichlorosilane	1						x							
Chemical	Phosdrin	1										x			
Chemical	Phosdrin (Mevinphos)	1										x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Phosphamidon	1										x			Not included in Current Work Plan
Chemical	Phosphate	1										x			
Chemical	Phosphoric Acid	1										x			
Chemical	Phosphorus Oxychloride	1						x							
Chemical	Phosphorus Pentabromide	1						x							
Chemical	Phosphorus Pentachloride	1										x			
Chemical	Phosphoryl Trichloride	1										x			
Chemical	Phosphotungstic Acid	1										x			
Chemical	Picrite	1						x							
Chemical	Pindone	1										x			
Chemical	Piperidine	1						x							
Chemical	Pirimicarb	1										x			
Chemical	P-Nitroaniline	1										x			
Chemical	P-Nitrochlorobenzene	1										x			
Chemical	Polyphosphoric Acid	1										x			
Chemical	Potassium Chlorate	1						x							
Chemical	Potassium Dichromate	1										x			
Chemical	Potassium Ferrocyanide	1										x			
Chemical	Potassium Fluoride	1										x			
Chemical	Potassium Hydroxide	1										x			
Chemical	Potassium Orthophosphate	1										x			
Chemical	Potassium Perchlorate	1						x							
Chemical	Potassium Phosphide	1						x							
Chemical	P-Phenylene Diamine	1										x			
Chemical	Profenofos	1										x			
Chemical	Propadiene	1						x							
Chemical	Propionitrile	1						x							
Chemical	Propyl Chloroformate	1						x							
Chemical	Propylene	1						x							
Chemical	Propylene Dichloride	1										x			
Chemical	Propylene Imine	1										x			
Chemical	Propyleneimine	1						x							
Chemical	Propylphosphonothioic Dichloride	1						x							

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Propylphosphonyl Difluoride	1						x							Not included in Current Work Plan
Chemical	Propyltrichlorosilane	1						x							
Chemical	Propyne	1						x							
Chemical	P-Tert-Butyltoluene	1										x			
Chemical	Pyrethrum	1										x			
Chemical	Pyridine	1										x			
Chemical	QL	1						x							
Chemical	Quinone	1										x			
Chemical	RDX	1						x							
Chemical	RDX and HMX Mixtures	1						x							
Chemical	Red Mercuric Oxide	1										x			
Chemical	Ronnel	1										x			
Chemical	Rotenone	1										x			
Chemical	Sec Hexyl Acetate	1										x			
Chemical	Sec-Amyl Acetate	1										x			
Chemical	Sec-Butyl Acetate	1										x			
Chemical	Sec-Butyl Alcohol	1										x			
Chemical	Selenium	1								x					
Chemical	Signaling Smokes	1	x												
Chemical	Silane	1						x							
Chemical	Silica	1										x			
Chemical	Silicon Tetrachloride	1						x							
Chemical	Silicon Tetrafluoride	1						x							
Chemical	Silver Nitrate	1										x			
Chemical	Sodium Bicarbonate	1										x			
Chemical	Sodium Borate	1										x			
Chemical	Sodium Borohydride	1										x			
Chemical	Sodium Chloride	1										x			
Chemical	Sodium Dodecyl Sulfate	1										x			
Chemical	Sodium Fluoride	1										x			
Chemical	Sodium Fluoroacetate	1										x			
Chemical	Sodium Hydrosulfite	1						x							
Chemical	Sodium Hydroxide	1										x			

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Sodium Monofluoroacetate (Compound 1080)	1								x					Not included in Current Work Plan
Chemical	Sodium Phosphide	1						x							
Chemical	Sodium Sulfate	1										x			
Chemical	Sodium Sulfide	1										x			
Chemical	Strontium Phosphide	1						x							
Chemical	Strychnine	1								x					
Chemical	Strychnine Sulfate	1										x			
Chemical	Styrene	1										x			
Chemical	Sulfur Monochloride	1										x			
Chemical	Sulfur Pentafluoride	1										x			
Chemical	Sulfur Tetrafluoride	1						x							
Chemical	Sulfur w/ Small Amounts of Silica Gel (NE)	1	x												
Chemical	Sulfuric Acid	1										x			
Chemical	Sulfuryl Chloride	1						x							
Chemical	Synthetic Graphite	1	x												
Chemical	Tantalum (Ta)	1	x												
Chemical	TEDP	1										x			
Chemical	Tellurium Hexafluoride	1						x							
Chemical	TEPP	1										x			
Chemical	Terphenyls	1										x			
Chemical	Tert-Butyl Acetate	1										x			
Chemical	Tert-Butyl Alcohol	1										x			
Chemical	Tetrachloroethylene	1										x			
Chemical	Tetraethyl Lead	1										x			
Chemical	Tetrafluoroboric Acid	1										x			
Chemical	Tetrafluoroethylene	1						x							
Chemical	Tetrahydrofuran	1										x			
Chemical	Tetramethyl Succinonitrile	1										x			
Chemical	Tetramethylenedisulfotetramine	1										x			
Chemical	Tetramethylethylenediamine	1										x			
Chemical	Tetramethyllead	1						x							
Chemical	Tetramethylsilane	1						x							

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Tetranitroaniline	1						x							Not included in Current Work Plan
Chemical	Tetrazene	1						x							
Chemical	Tetryl	1										x			
Chemical	Thermite and Thermate Incendiaries	1	x												
Chemical	Thiodiglycol	1						x							
Chemical	Thioglycol	1										x			
Chemical	Thionyl Chloride	1						x							
Chemical	Thiophanate Methyl	1										x			
Chemical	Thiram	1										x			
Chemical	TNT	1						x							
Chemical	Toluene	1										x			
Chemical	Toluene Sulfonic Acid	1										x			
Chemical	Toluene-2,4-diisocyanate	1										x			
Chemical	Torpex	1						x							
Chemical	Toxaphene	1										x			
Chemical	Toxic Alcohols	1								x					
Chemical	Tributyl Phosphate	1										x			
Chemical	Trichloroethylene	1										x			
Chemical	Trichlorosilane	1						x							
Chemical	Triethanolamine	1						x							
Chemical	Triethanolamine Hydrochloride	1						x							
Chemical	Triethyl Phosphite	1						x							
Chemical	Triethylamine	1										x			
Chemical	Trifluoroacetyl Chloride	1						x							
Chemical	Trifluorobromomethane	1										x			
Chemical	Trifluorochloroethylene	1						x							
Chemical	Trimethlamine	1						x							
Chemical	Trimethyl Phosphite	1						x							
Chemical	Trimethylchlorosilane	1						x							
Chemical	Trinitroaniline	1						x							
Chemical	Trinitroanisole	1						x							
Chemical	Trinitrobenzene	1						x							
Chemical	Trinitrobenzenesulfonic Acid	1						x							

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Trinitrobenzoic Acid	1						x							Not included in Current Work Plan
Chemical	Trinitrochlorobenzene	1						x							
Chemical	Trinitrofluorenone	1						x							
Chemical	Trinitro-Meta-Cresol	1						x							
Chemical	Trinitronaphthalene	1						x							
Chemical	Trinitrophenetole	1						x							
Chemical	Trinitrophenol	1						x							
Chemical	Trinitroresorcinol	1						x							
Chemical	Trinitrotoluene	1										x			
Chemical	Triphenyl Phosphate	1										x			
Chemical	Trithion	1										x			
Chemical	Tritonal	1						x							
Chemical	Trypan Blue	1										x			
Chemical	Ttert-Butyl Chromate	1										x			
Chemical	Tungsten Hexafluoride	1						x							
Chemical	Turpentine	1										x			
Chemical	Vinyl Acetate Monomer	1						x							
Chemical	Vinyl Acetylene	1						x							
Chemical	Vinyl Chloride	1						x							
Chemical	Vinyl Ethyl Ether	1						x							
Chemical	Vinyl Fluoride	1						x							
Chemical	Vinyl Methyl Ether	1						x							
Chemical	Vinyl Toluene	1										x			
Chemical	Vinyl Toluene (Inhibited)	1										x			
Chemical	Vinylidene Chloride	1						x							
Chemical	Vinylidene Fluoride	1						x							
Chemical	Vinyltrichlorosilane	1						x							
Chemical	Warfarin	1										x			
Chemical	Xylenes	1										x			
Chemical	Xylidine	1										x			
Chemical	Zinc	1										x			
Chemical	Zinc Hydrosulfite	1						x							
Chemical	Ammonium Metavanadate	0													
Chemical	Diphacinone	0													

Agent Class (CBRN)	Agent Name	Reference Frequency	FM 3-11.9	FM 8-284	AMedP-8(A/B)	AMedP-6	USAMRIID	DHS	HHS	CDC	NIAID	TIC/TIM Task Force	OTSG List to CUD	DTRA List to CUD	Comment
Chemical	Flexal Muscle Relaxant	0													Not included in Current Work Plan
Chemical	Formaldehyde	0													
Chemical	Methylphosphonothioic Acid	0													
Chemical	Opioids	0													

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Appendix B

ESTIMATE THAT INFORMATION IS AVAILABLE ON NOMINATED CHEMICAL AND BIOLOGICAL AGENTS

Based on a review of the available literature for the agents listed in Table 1, an estimate was made by agent sub-model of the likelihood of being able to cite some peer-reviewed source which could provide the HRIP parameters necessary for modeling the agent. These estimates are shown below for the nominated biological and chemical agents.

Biological Agents (Including Toxins)	Likelihood of Being Able to Cite the HRIP Parameters Required for each Sub-Model Based on Review of Available Open Source Literature					
	Infectivity	Incubation/ Latency Period	Duration of Illness	Disease Profile	Lethality	Prophylaxis
Staphylococcal Enterotoxin B	LIKELY	LIKELY	LIKELY	LIKELY	LIKELY	UNLIKELY
Coccidioidomycosis	LIKELY	LIKELY	POSSIBLE	LIKELY	LIKELY	UNLIKELY
Dengue Fever	POSSIBLE	LIKELY	LIKELY	LIKELY	LIKELY	UNLIKELY
Nipah virus	POSSIBLE	LIKELY	LIKELY	LIKELY	LIKELY	UNLIKELY
Tetrodotoxin	POSSIBLE	LIKELY	LIKELY	LIKELY	LIKELY	UNLIKELY
Crimean-Congo Hemorrhagic Fever	UNLIKELY	LIKELY	LIKELY	LIKELY	LIKELY	UNLIKELY
Ebola Hemorrhagic Fever	POSSIBLE	LIKELY	POSSIBLE	LIKELY	LIKELY	UNLIKELY
Prions	POSSIBLE	POSSIBLE	LIKELY	LIKELY	LIKELY	UNLIKELY
Ricin Toxin	POSSIBLE	POSSIBLE	LIKELY	LIKELY	LIKELY	UNLIKELY
Rift Valley Fever	POSSIBLE	LIKELY	POSSIBLE	LIKELY	LIKELY	UNLIKELY
Aflatoxin	POSSIBLE	POSSIBLE	POSSIBLE	LIKELY	LIKELY	UNLIKELY
Lassa Fever	POSSIBLE	POSSIBLE	POSSIBLE	LIKELY	LIKELY	UNLIKELY
Q Fever	LIKELY	LIKELY	LIKELY	LIKELY	LIKELY	LIKELY
Cryptosporidiosis	LIKELY	LIKELY	LIKELY	POSSIBLE	LIKELY	UNLIKELY
Western (Central) European TBE	POSSIBLE	LIKELY	LIKELY	LIKELY	LIKELY	LIKELY
Shiga Toxin (Shigellosis)	CERTAIN	CERTAIN	LIKELY	LIKELY	LIKELY	POSSIBLE
Tularemia	CERTAIN	LIKELY	LIKELY	LIKELY	LIKELY	POSSIBLE
Hendra virus	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	UNLIKELY
Influenza (H1N1, H5N1, and others)	LIKELY	LIKELY	LIKELY	LIKELY	LIKELY	POSSIBLE
Saxitoxin	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	UNLIKELY
T-2 Toxin	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	UNLIKELY
Brucellosis	LIKELY	LIKELY	POSSIBLE	LIKELY	LIKELY	POSSIBLE
Cholera	LIKELY	POSSIBLE	LIKELY	LIKELY	LIKELY	POSSIBLE

Biological Agents (Including Toxins)	Likelihood of Being Able to Cite the HRIP Parameters Required for each Sub-Model Based on Review of Available Open Source Literature					
	Infectivity	**Incubation/ Latency Period**	**Duration of Illness**	**Disease Profile**	**Lethality**	**Prophylaxis**
Rocky Mountain Spotted Fever	POSSIBLE	LIKELY	LIKELY	LIKELY	LIKELY	POSSIBLE
Yellow Fever	POSSIBLE	LIKELY	LIKELY	LIKELY	LIKELY	POSSIBLE
Conotoxin	POSSIBLE	POSSIBLE	UNLIKELY	POSSIBLE	POSSIBLE	UNLIKELY
Epsilon Toxin	POSSIBLE	POSSIBLE	UNLIKELY	POSSIBLE	POSSIBLE	UNLIKELY
Psittacosis	POSSIBLE	LIKELY	POSSIBLE	LIKELY	POSSIBLE	POSSIBLE
Typhus Fever	POSSIBLE	POSSIBLE	POSSIBLE	LIKELY	LIKELY	POSSIBLE
Escherichia coli O157:H7	LIKELY	LIKELY	LIKELY	POSSIBLE	LIKELY	POSSIBLE
Glanders	POSSIBLE	LIKELY	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE
Bioregulatory Peptides	UNLIKELY	UNLIKELY	UNLIKELY	UNLIKELY	UNLIKELY	UNLIKELY

Chemical Agent	Likelihood of Being Able to Cite the HRIP Parameters Required for each Sub-Model Based on Review of Available Open Source Literature		
	Toxicity	**Injury Profile**	**Prophylaxis**
Phosgene	POSSIBLE	LIKELY	UNLIKELY
Hydrogen Cyanide	LIKELY	POSSIBLE	UNLIKELY
Hydrogen Fluoride	LIKELY	POSSIBLE	UNLIKELY
Ammonia	POSSIBLE	POSSIBLE	UNLIKELY
Arsenic	POSSIBLE	POSSIBLE	UNLIKELY
Chlorine	POSSIBLE	POSSIBLE	UNLIKELY
O-Chlorobenzylidene Malononitrile (CS)	POSSIBLE	POSSIBLE	UNLIKELY
Phosphine	POSSIBLE	POSSIBLE	UNLIKELY
Phosphorus - White or Red	POSSIBLE	POSSIBLE	UNLIKELY
Thallium Sulfate	UNLIKELY	POSSIBLE	UNLIKELY
3-Quinuclidinyl Benzilate (BZ)	UNLIKELY	UNLIKELY	UNLIKELY
Fentanyls	UNLIKELY	UNLIKELY	UNLIKELY

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14. ABSTRACT

NATO is expected to consider ratification of Allied Medical Publication 8 (C): NATO Planning Guide for the Estimation of CBRN Casualties in 2010. Within AMedP-8(C), the parameters for implementing the human response methodology are presented for only a limited sample of CBRN agents and effects. IDA has reviewed literature relevant to the extension of AMedP-8 to include additional CBRN agents and effects, psychological casualties, and civilian casualty estimation. This document identifies agents, effects, materials, and conditions of interest to DoD (but not currently included in AMedP-8(C)), identified gaps in available knowledge, and estimates the level of work required to incorporate new agent models into AMedP-8. This document may be considered a supplement to the AMedP-8(C) Technical Reference Manual for US purposes. This report is envisioned as the first in a series of annual reports, updated as new lists of agents of concern are identified and as new agents are included in the analysis of required effort for development of the AMedP-8(C) parameters.

15. SUBJECT TERMS

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