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Selected Resources for Emergency and Disaster Preparedness and Response from the United States National Library of Medicine

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Abstract

The Toxicology and Environmental Health Information Program (TEHIP) of the National Library of Medicine® (NLM) works to organize and provide access to a wide range of environmental health and toxicology resources. In recent years, the demand for, and availability of, information on health issues related to natural and man-made emergencies and disasters has increased. Recognizing that access to information is essential in disaster preparedness, a new focus of NLM's 2006–2016 Long Range Plan calls for the establishment of a Disaster Information Management Research Center (DIMRC) that will aid in collecting, disseminating, and sharing information related to health and disasters. This paper introduces several of TEHIP's resources for emergency/disaster preparedness and response, such as the Radiation Event Medical Management Web site (REMM) <<http://remm.nlm.gov/>> and the Wireless Information System for Emergency Responders (WISER) <<http://wiser.nlm.nih.gov>>. Several of NLM's other disaster preparedness and response resources will also be reviewed.

Keywords

Biological warfare; bioterrorism; chemical warfare; databanks; databases; decontamination; disaster planning; disaster preparedness; emergency planning; hazardous substances; information services; Internet; National Library of Medicine (NLM); public health; radiation; radiation protection; Specialized Information Services (SIS); terrorism; TEHIP; TOXNET

INTRODUCTION

The United States National Library of Medicine (NLM) is the world's largest medical library and is a leader in the selection, acquisition, organization, and provision of medically related literature and data. NLM is part of the National Institutes of Health (NIH), within the Department of Health & Human Services (HHS).

The HHS has expressed its commitment to the President's Management Agenda (PMA), a plan created in 2001 to improve the management and performance of the federal government. The HHS FY 2007 PMA Departmental Objectives include the goal to "enable automated public health and safety monitoring and management, ensure efficient collection of quality information, transform clinical research into clinical care, and foster availability and use of health information during disasters and crises."¹

NLM has been involved in long-range strategic planning during the last two decades. In 1987, the NLM Board of Regents (BOR) published a twenty-year plan to guide the Library in using its resources to fulfill its mission.² Supplemental reports were released in the following years to address areas “that required a fresh look due to dramatic changes in the social and technological landscape in which the NLM operates.”³ In September 2006, the NLM BOR approved “Charting the Course for the 21st Century: NLM’s Long Range Plan 2006–2016.” This new plan contains four overall goals with associated recommendations.

One of the new areas of focus for the Library is to “establish a Disaster Information Management Research Center at NLM to make a strong commitment to disaster remediation and to provide a platform for demonstrating how libraries and librarians can be part of the solution to this national problem.”³

BACKGROUND

The term “disaster” has been defined as “a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources.”⁴ The disruption can originate from natural or human-made hazards. Disaster (or emergency) management is the field of handling and avoiding risks, and includes preparing for, managing, and rebuilding when natural or human-made catastrophes happen.⁵ “As long as there have been disasters, individuals and communities have tried to do something about them.”⁵

Disaster management is generally considered to be a continuous process in which individuals and communities manage risks in an effort to avoid or lessen the impact of disasters. “The range of situations that could ... involve emergency management or the emergency management system is extensive. This supports the premise that emergency management is integral to the security of everyone’s daily lives and should be integrated into daily decisions and not just called on during times of disasters.”⁵ Information access and management is a critical part of such a process. Although “NLM does not actually treat patients, investigate disease outbreaks, clean up toxic spills, or conduct clinical trials ... [its] programs have produced innovative and robust information systems and services that assist all of these activities. In recent years, NLM has conducted and supported selected research and development projects related to disaster information management, which have been similarly useful to those involved in disaster planning and management.”³

These projects include supporting pioneering work on automated bio-surveillance; self-healing wireless networks; smart tags to track patients during emergencies; partnering with the National Institute of Allergy and Infectious Diseases (NAID) on the Influenza Virus Resource⁶ to provide vaccine researchers access to genomic data of many influenza strains; developing the Open Source Independent Review and Interpretation System (OSIRIS),⁷ a software package to assist in identifying remains of September 11 victims via DNA; partnering with international organizations on the Central American Network for Disaster and Health Information (CANDHI);⁸ and working with the National Network of Libraries of Medicine <<http://nmlm.gov>> to re-establish and maintain a level of health information services in the Hurricane Katrina-affected region. NLM’s emerging Disaster Information Management Research Center (DIMRC) will focus on disaster health information resources and informatics research of direct benefit to government agencies, public health organizations, the public, special populations, and public and private health care providers. The DIMRC will seek to ensure uninterrupted access to critical information resources in the event of disaster or other emergency, natural or human-made.

TOXICOLOGY AND ENVIRONMENTAL HEALTH INFORMATION PROGRAM (TEHIP)

NLM's Toxicology and Environmental Health Information Program (TEHIP), is part of NLM's Division of Specialized Information Services (SIS). For a list of federal government acronyms used in this document with their expansions, see Table 1.

One of the major focuses of this program has been the toxicology of potentially hazardous substances <<http://tox.nlm.nih.gov/>>. TEHIP's Toxicology Data Network, or TOXNET® <<http://toxnet.nlm.nih.gov/>>, offers information on human exposure, industrial hygiene, emergency handling procedures, environmental fate, regulatory requirements, and related areas. For the past few years, TEHIP has focused on adaptation of existing resources and development of new resources to assist with disaster and emergency preparedness and response.

RADIATION EVENT MEDICAL MANAGEMENT (REMM)

The HHS's Office of the Assistant Secretary for Preparedness and Response (ASPR) <<http://www.hhs.gov/aspr/>>; serves as an advisor on issues related to bioterrorism and other public health emergencies. The ASPR also coordinates interagency activities between HHS, other federal departments, agencies, offices and state and local officials responsible for emergency preparedness, and the protection of the civilian population from acts of bioterrorism and other public health emergencies.⁹ One of the missions of the ASPR's Office of Preparedness and Emergency Operations <<http://www.hhs.gov/aspr/emergencyops.html>>; is to lead HHS preparedness by developing operational plans and analytical products for emergency response. Based on NLM's experience developing electronic resources related to hazardous materials and chemicals, ASPR and NLM formed a partnership to develop a tool to respond to mass casualty radiological/nuclear events.

The Radiation Event Medical Management System (REMM) <<http://remm.nlm.gov/>>; is a comprehensive, Web-based diagnostic and treatment toolkit designed to assist health care professionals who may need to provide medical care during such an incident (see Figure 1). REMM offers information on several types of radiation emergencies such as incidents involving radiological dispersal devices (e.g., a "dirty" bomb explosion), nuclear explosions (e.g., nuclear weapons, improvised nuclear devices/ INDs), nuclear reactor accidents, and transportation accidents. It seeks to provide timely, evidence-based, usable information for those without formal radiation medicine expertise. REMM includes easy-to-follow algorithms for the diagnosis and management of radiation contamination and exposure, and guidance for the use of radiation countermeasures. Information on radioisotopes, a dose estimator for exposure based on symptoms and laboratory values, as well as illustrations and animations concerning radiation events, principles, and safety are also provided. Its information is also downloadable, ensuring its availability if the Internet is not accessible. A CD version of REMM is planned.

Recognizing that many health professionals are new to this field, REMM offers "Where Do I Start?" <<http://remm.nlm.gov/wheretostart.htm>>:. This page provides videos on "Radiation Principles" and "Types of Ionizing Radiation and Shielding Required" as well as animations with the basics about exposure, contamination, and their difference. Information about the kinds of radiation incidents that could be mass casualty events, how radiation events are discovered, and the symptoms of Acute Radiation Syndrome is also provided. The page also assists new users in learning the algorithm for managing both contamination (which results when a radioisotope such as gas, liquid, or solid is released into the environment and is then ingested, inhaled, or deposited on the body surface)¹⁰ and exposure (which occurs when all or

part of the body receives penetrating radiation such as gamma rays or x-rays, or high-energy beta particles from an external source)¹⁰ (see Figure 2). Many checklists and other materials on the site are also available in PDF format for ease of printing.

Other features of REMM include a Dictionary of Radiological Terms,¹¹ links to related dictionaries, a list of Emergency Contacts,¹² and information about the Strategic National Stockpile (SNS).¹³

WISER: A TOOL FOR EMERGENCY RESPONDERS

NLM often undertakes investigations into new ways to promote better understanding of its resources and databases. At times, this has required adapting both the amount and the presentation of information for different audiences. An example of such an adaptation is WISER® (Wireless Information System for Emergency Responders) <<http://wiser.nlm.nih.gov>>. WISER is designed to serve as an easy-to-use information system for emergency responders (ERs) at a hazardous materials (HAZMAT) scene.¹⁴

Emergency responders and HAZMAT units routinely face a host of decisions that must be made quickly and accurately to save lives and to minimize the impact on the natural environment and physical property. Accurate information about the hazardous substance(s), the emergency resources available, and the surrounding environmental conditions is critical in such situations. WISER can serve as an aid in decision making. It provides a wide range of information on over 400 hazardous substances, including help in identifying unknown chemicals and their physical characteristics (properties), human health and emergency treatment information, and containment and suppression guidance. The information is formatted for mobile devices (e.g., Personal Digital Assistants (PDAs), tablets, and field laptops) and is also available on the Web.

WISER's content is extracted from NLM's Hazardous Substances Data Bank (HSDB®) and includes information from many of the resources that emergency responders currently use separately (in book or CD format) when on-site at an incident, such as the U.S. Department of Transportation's (DOT) *Emergency Response Guidebook*,¹⁵ the National Institute for Occupational Safety and Health's (NIOSH) *Pocket Guide to Chemical Hazards*,¹⁶ and Micromedex's *Tomes*¹⁷ and *POISINDEX System*.¹⁸

Approximately 420 of HSDB's 5,000 hazardous substances are included in WISER. Their selection was based on toxicity and likelihood of exposure. If the substance has been identified in the United States Centers for Disease Control and Prevention's (CDC) Agency for Toxic Substances and Disease Registry (ATSDR)'s Medical Management Guidelines <<http://www.atsdr.cdc.gov/mhmi/mmg.html>> or identified on multiple government lists of hazardous substances, it is included in WISER. Future versions of WISER will allow customization of this core set, and the ability to delete and/or add substances to the database based on specific needs and environment.

WISER's interface differs slightly to fit the information needs of three "user roles": First Responder, Emergency Medical Services, and HAZMAT Specialist. When the chemical is known, the user can select it from a list or enter its name, Chemical Abstracts Services Registry (CAS) number, or DOT number. If the substance is unknown, observed properties (e.g., odor, color, form) and symptoms can be selected from lists (see Figure 3). WISER searches its database for chemical substances that have the selected characteristic; as more information about the substance is provided, the number of suggested chemicals decreases. Users can click on each substance to get more information, or remove substances from their list. To further assist in identification, the substances can also be sorted by physical properties (e.g., state, pH, specific gravity, vapor density).

In addition, the complete contents of the Emergency Response Guidebook (ERG) 2004 <<http://hazmat.dot.gov/pubs/erg/gydebook.htm>>; is integrated within WISER, allowing the user to search for guide page and protective distance information by name, placards, rail cars, and road trailers. Access to the supporting documentation in the ERG's white pages is also provided. Mass exposure to radiologic substances presents a unique challenge to the entire response effort, including first responders. WISER recently added twenty-nine radioisotopes and radioisotope-specific data to its substance list (see Figure 4). New tools include an onset-of-vomiting dose estimator, patient triage flow charts, and reference documentation.

HAZARDOUS SUBSTANCES DATA BANK (HSDB) CHEMICAL WARFARE AGENTS AND IONIZING RADIATION SERIES

The Hazardous Substances Data Bank (HSDB) <<http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB.htm>>; is part of the National Library of Medicine's TOXNET system <<http://toxnet.nlm.nih.gov/>>,. HSDB is a peer-reviewed resource that focuses on the toxicology of over 5,000 potentially hazardous substances and is enhanced with information on human exposure, industrial hygiene, emergency handling procedures, environmental fate, regulatory requirements, and related areas. The information is excerpted from the scientific literature, including handbooks, textbooks, technical reports, and journal articles.¹⁹

The collaborative effort of NLM with ASPR on REMM and the development of WISER prompted the addition of radiation information to HSDB, including a general record for "Ionizing Radiation"²⁰ (see Figure 5). Ionizing radiation may result from unstable atomic nuclei or from high-energy electron transitions; it includes electromagnetic radiation as well as particles. A series of specific radionuclide records, including radioactive lead, radon, and polonium, were also added to HSDB, and are included on REMM's Sources of Radiological/ Nuclear Information page <http://remm.nlm.nih.gov/remm_SourcesofRadInfo.htm#hsdb>.

HSDB also maintains records with detailed toxicology information for several chemical warfare agents that can be intentionally used to cause toxic effects on humans, animals, and plants: hydrogen cyanide, lewisite, mustard gas, phosgene, ricin, sarin, soman, and tabun.

ENVIRO-HEALTH LINKS

The NLM's Enviro-Health Links Web guides <<http://sis.nlm.nih.gov/enviro/envirohealthlinks.html>>; cover toxicology and environmental health topics of recent special interest. Links to Web sites and to relevant books and journal articles that are available for free are included. Pre-formulated ("canned") searches of relevant NLM databases such as PubMed, HSDB, and ChemIDplus® <<http://chem.sis.nlm.nih.gov/chemidplus/>>; are offered in each guide. In the area of emergency and disaster preparedness and response, Enviro-Health Links includes the following:

- Hurricanes: Links to Health Information (information on hurricane recovery, cleanup, and handling, hazardous substances maps)
- Chemical Warfare Agents (covering chemical agents that can be intentionally employed to cause toxic effects on humans, animals, and plants; see Figure 6)
- Biological Warfare Agents (information on biological pathogens that can be intentionally deployed to cause disease or death), and
- Health Effects from the Collapse of the World Trade Center (respiratory and other health consequences resulting from the September 11, 2001 World Trade Center disaster).

- California Wildfires: The California Wildfires Web page includes information on the health effects from fires and exposure to smoke; links to air quality resources, environmental clean-up following fires, and animals in disasters.

MEDLINE/PubMed/PUBMED CENTRAL

MEDLINE® (Medical Literature Analysis and Retrieval System Online) is the NLM's premier bibliographic database containing over 17 million references to biomedical journal articles. MEDLINE records are indexed with NLM's Medical Subject Headings (MeSH®). MEDLINE is the primary component of PubMed®.²¹

MEDLINE/PubMed <<http://www.pubmed.gov>>; provides links to many sites providing full-text articles and other related resources, as well as links to related articles for a selected citation. MEDLINE/PubMed includes several journals related to disaster medicine, such as the *International Journal of Mass Emergencies and Disasters* (*Int J Mass Emerg Disasters*), *Prehospital and Disaster Medicine* (*Prehospital Disaster Med*), *Disaster Management & Response* (*Disaster Manag Response*), *Emergency*, and *Disasters*. In addition, thousands of other articles related to emergencies and disasters are cited in PubMed.

PubMed Central™ <<http://www.pubmedcentral.nih.gov/>>; is NLM's free digital archive of biomedical and life sciences journal literature at the NIH. It contains over 9,000 full-text articles on disaster/emergency preparedness and response, all linked to from references in MEDLINE/PubMed.

MedlinePlus: DISASTER AND EMERGENCY PREPAREDNESS RESOURCES

MedlinePlus® <<http://medlineplus.gov/>>; is NLM's consumer health information Web site designed to help the general public locate authoritative health information. Its "Health Topics" pages contain Web links to health information from the NIH and other authoritative sources. They also include a MEDLINE/PubMed search for references to the published literature, current news items about the topic, and links to related topics. MedlinePlus provides a number of health topics related to disaster and emergency preparedness:

- Anthrax (includes interactive tutorial)
- Biodefense and Bioterrorism
- Bird Flu
- Chemical Weapons
- Coping with Disaster
- Disaster Preparation and Recovery
- Emergency Medical Services
- Fire Safety
- Man-Made Disasters
- Natural Disasters
- Post-Traumatic Stress Disorder
- Radiation Exposure
- Smallpox (includes interactive tutorial).

ADDITIONAL RESOURCES

Several other NLM resources may be useful for emergency and disaster health preparation, response, and recovery.

TOXMAP

Both man-made and natural disasters can lead to release of otherwise-contained hazardous materials into the environment, posing a potential public health threat. For example, flood waters can infiltrate waste sites and absorb and transport a range of contaminants. Understanding what and where these contaminants are can be useful to public health, waste management, and emergency response professionals.

NLM's TOXMAP® <<http://toxmap.nlm.nih.gov>>; is a Geographic Information System (GIS) that helps users explore data from the United States' Environmental Protection Agency (EPA)'s Toxics Release Inventory (TRI) <<http://www.epa.gov/tri/>>; and Superfund Programs <<http://www.epa.gov/superfund/index.htm>>; (see Figure 7). TOXMAP users can create nationwide or local maps showing where TRI chemicals are released, as well as locations of Superfund hazardous waste sites on the National Priority List (NPL) <<http://www.epa.gov/superfund/sites/npl>>,. Detailed information about all chemical contaminants present at these sites is provided.¹⁸

Resource Guide for Public Health Preparedness

Through support of NLM, the New York Academy of Medicine (NYAM) has developed a Web-based *Resource Guide for Public Health Preparedness* <<http://phpreparedness.info>>,. The guide provides a gateway to online resources related to public health preparedness including expert guidelines, fact sheets, Web sites, research reports, articles, and other tools for the public health community.

Central American Network for Disaster Health Information (CANDHI)

NLM has partnered with the Pan American Health Organization/World Health Organization (PAHO/WHO), the United Nations International Strategy for Disaster Reduction (UN ISDR), and the Regional Disaster Information Center for Latin America and the Caribbean (CRID) in the development of the Central American Network for Disaster and Health Information (CANDHI).⁸ CANDHI's goal is to promote disaster reduction by capacity-building activities in the area of disaster-related information management. The target countries—Honduras, Nicaragua, El Salvador, Guatemala, Costa Rica, and Panama—have established local Disaster Information Centers <<http://www.candhi.org>>; to collect, organize, store, and disseminate public health and medical information related to disasters. These centers can assist health professionals, government agencies, and non-government organizations in their countries to quickly access vital information that was previously unavailable, via a digital library of over 12,000 full-text documents, assessments, reports on disasters, and other disaster resources.

LIBRARIANS: A CALL TO ACTION

Emergencies and disasters can strike at any time and in any place. Physicians, hospitals, and other health care facilities will assume the responsibility for aiding individuals injured during such events and need to be better prepared to serve as resources for their communities. However, many health professionals are unfamiliar with the diagnosis and treatment of some types of less common emergencies, such as mass casualty radiation or other hazardous material incidents. Resources like WISER and REMM can assist emergency responders and hospital personnel prepare for, and respond to, these situations.

But how can librarians help? Just as librarians train health professionals to search PubMed, librarians can encourage and assist emergency response personnel (emergency responders and emergency room personnel) to download WISER and REMM to their computers (in case the Internet is not available), teach them how to use these resources, and make it clear that libraries and librarians should be part of the critical infrastructure, helping to find information before, during, and after disasters. Knowledge of, and familiarity with, resources such as WISER and REMM before an emergency may help with all phases of a disaster, including preparedness, response, and recovery.

CONCLUSION

Access to reliable and timely information is vital for understanding and handling natural and man-made emergencies and disasters. To decrease vulnerability, the medical and information communities should have a solid understanding of the associated hazards and their medical management, and should be prepared to act. The National Library of Medicine has developed a broad range of products and services that address these issues and will continue to respond to the need for new information.

As a natural continuation of the NLM's mission of providing access to critical, trusted health information, its DIMRC will serve as part of a larger federal effort to prevent, respond to, and reduce the adverse health effects of disasters in partnership with federal agencies, local communities, and their public health workers by helping to provide access to health and scientific information that support programs related to disaster preparedness and response.

FOR MORE INFORMATION

More information about disaster and emergency resources of the National Library of Medicine can be found at the Division of Specialized Information Services home page <<http://sis.nlm.nih.gov/>>; Updates on these resources can be obtained from the NLM-Tox-Enviro-Health-L e-mail announcement list <<http://sis.nlm.nih.gov/enviro/envirolistserv.html>>; The TEHIP RSS (Really Simple Syndication) feed <<http://sis.nlm.nih.gov/rss/sisnewsfeed.rss>>; provides information about new resources, updates to NLM toxicology, environmental health, disaster/ emergency databases, and posts alerts to scientific meetings at which NLM will have exhibits, presentations, or classes.

Questions about these resources can be sent to Dr. Colette Hochstein (colette@nlm.nih.gov) and Ms. Stacey Arnesen (stacey_arnesen@nlm.nih.gov), or to tehip@tehip.nlm.nih.gov.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

REFERENCES

1. FY 2007 Departmental Objectives, One Department. One Mission. One HHS. [Accessed: June 15, 2007]. Available: <<http://www.hhs.gov/pma/depObj.html>>.
2. Long Range Plan/Report of the Board of Regents, National Library of Medicine. Bethesda, MD: National Library of Medicine; [Accessed: June 15, 2007]. National Library of Medicine (U.S.) Board of Regents, 1986–7. Available: <<http://www.nlm.nih.gov/archive/20040721/pubs/plan/lrp/contents.html>>.
3. Charting a Course for the 21st Century: NLM's Long Range Plan 2006–2016. Bethesda, MD: NLM Board of Regents, National Library of Medicine; [Accessed: June 15, 2007]. National Library of

- Medicine (U.S.) Board of Regents, 2006. Available:
http://www.nlm.nih.gov/pubs/plan/lrp06/NLM_LRP2006_PRINT.pdf.
4. International Strategy for Disaster Reduction (ISDR)'s Terminology: Basic Terms of Disaster Risk Reduction. [Accessed: June 15, 2007]. Available:
<http://www.unisdr.org/eng/library/libterminology-eng%20home.htm>.
 5. Haddow; George, D.; Bullock; Jane, A. Introduction to Emergency Management. Boston: Butterworth-Heinemann; 2004. p. 1
 6. National Institute of Allergy and Infectious Diseases (NAID)'s Influenza Virus Resource. Available:
<http://www.ncbi.nlm.nih.gov/genomes/FLU/FLU.html>.
 7. OSIRIS, Open Source Independent Review and Interpretation System. [Accessed: June 15, 2007]. Available: <http://www.nlm.nih.gov/pubs/plan/lrp06/briefing/panel4/osiris.html>.
 8. Central American Network for Disaster and Health Information (CANDHI). Available:
<http://sis.nlm.nih.gov/outreach/outreachcandhi.html>.
 9. Office of the Assistant Secretary for Preparedness and Response (ASPR). [Accessed: June 15, 2007]. Available: <http://www.hhs.gov/aspr/>.
 10. REMM's Animations, Illustrations, Photos: Radiation Concepts. [Accessed: June 15, 2007]. Available: <http://remm.nlm.nih.gov/imagegallery.htm#A>.
 11. REMM's Dictionary of Radiological Terms. [Accessed: June 15, 2007]. Available:
<http://remm.nlm.nih.gov/dictionary.htm>.
 12. REMM's Emergency Contacts. [Accessed: June 15, 2007]. Available:
http://remm.nlm.nih.gov/remm_RefDataCtr.htm#emergencyContact.
 13. The Strategic National Stockpile (SNS). [Accessed: June 15, 2007]. Available:
<http://remm.nlm.nih.gov/sns.htm#whatis>.
 14. Colette, Hochstein; Stacey, Arnesen; Jeanne, Goshorn. Environmental Health and Toxicology Resources of the United States National Library of Medicine. Medical Reference Services Quarterly 26(no 3):21–45. [PubMed: 17915629](Fall 2007)
 15. U.S. Department of Transportation (DOT)'s Emergency Response Guidebook. Available:
<http://hazmat.dot.gov/pubs/erg/gydebook.htm>.
 16. National Institute for Occupational Safety and Health (NIOSH)'s Pocket Guide to Chemical Hazards. [Accessed: June 15, 2007]. Available: <http://www.cdc.gov/niosh/npg/>.
 17. Micromedex's Tomes. [Accessed: June 15, 2007]. Available:
<http://www.micromedex.com/products/tomes/>.
 18. Micromedex's POISINDEX System. Available: <http://www.micromedex.com/products/poisindex/>.
 19. Colette, Hochstein; Martha, Szczur. TOXMAP: A GIS-Based Gateway to Environmental Health Resources. Medical Reference Services Quarterly 25(no3):13–31. [PubMed: 16893844](Fall 2006)
 20. NLM's Hazardous Substances Data Bank (HSDB), record for "Ionizing Radiation". [Accessed: June 15, 2007]. Available:
<http://toxnet.nlm.nih.gov/cgi-bin/sis/search/r?dbs+hsdb:@term+@na+ionizing+radiation>.
 21. Fact Sheet: MEDLINE. [Accessed: June 15, 2007]. Available:
<http://www.nlm.nih.gov/pubs/factsheets/medline.html>.

RADIATION EVENT MEDICAL MANAGEMENT
Guidance on Diagnosis & Treatment for Health Care Providers

WHAT KIND OF EMERGENCY? INITIAL EVENT ACTIVITIES PATIENT MANAGEMENT MANAGEMENT MODIFIERS TOOLS & GUIDELINES

SEARCH

WHAT KIND OF EMERGENCY?

- Radiological Dispersal Devices: Dirty Bomb, Other Dispersal Methods, Hidden Sealed Source
- Nuclear Explosions: Weapons, Improvised Nuclear Devices
- Nuclear Reactor Accidents
- Transportation Accidents
- Discovering an Event

INITIAL EVENT ACTIVITIES

- Onsite Activities
- Triage Guidelines
- Hospital Activities

OTHER AUDIENCES

- First Responders in the Field
- Mental Health Professionals
- Hospitals
- Public Information Officers
- Radiation Safety and Protection
- Preplanning
- Practices and Drills

PATIENT MANAGEMENT

- Choose Appropriate Algorithm: Evaluate for Contamination/Exposure
- Contamination
- Exposure (Acute Radiation Syndrome)
- Exposure + Contamination

MANAGEMENT MODIFIERS

- Radiation + Trauma
- Burn Triage and Treatment
- Mass Casualty
- Psychological Issues
- Specific Populations

TOOLS & GUIDELINES

- Dose Estimator for Exposure
- Template for Hospital Orders
- Use of Blood Products
- Follow-up Instructions
- Manage Long-Term Monitoring
- Management of the Deceased
- Develop a Hospital Medical

FEATURES

- HHS Public Health Emergency Medical Countermeasures Plan for Chemical, Biological, Radiological and Nuclear (CBRN) Threats, 4/2007 (HHS)
- Polonium-210 Information: Properties, Treatment, and Fact Sheets
- NIH Radiation Countermeasures Strategic Plan, 6/2005 (NIH/NIAD)

QUICK LINKS

- **New Users: Where Do I Start?**
- Patient Management Algorithms
- Print Algorithms & Tables
- Isotopes of Interest
- Countermeasures
- Decontamination Procedures
- Dose Estimator for Exposure
- Manage ARS Subsyndromes
- Hematopoietic Subsyndrome
- Time/Dose Effects in ARS
- Strategic National Stockpile
- Animations, Illustrations, Photos
- Dictionary

FIGURE 1.
REMM Home Page

You are here: [Home](#) > Choose Appropriate Algorithm: Evaluate for Contamination and/or Exposure

[View/Print as PDF \(PDF - 48 KB\)](#) [Text Version](#)

Choose Appropriate Algorithm: Evaluate for Contamination and/or Exposure

FIGURE 2.
REMM Algorithm to Evaluate for Contamination/Exposure

FIGURE 3.
Example of WISER Symptom Screen

FIGURE 4.
Radiologic Information in WISER

Hazardous
Substances
Data Bank
HSDB

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[Search Results](#)
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TOXNET
Home

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 - ☐ [Absorption, Distribution & Excretion](#)

IONIZING RADIATION

CASRN: NO CAS RN

Ionizing radiation may result from unstable atomic nuclei or from high energy electron transitions. It includes electromagnetic radiation (e.g., gamma rays and X-rays) as well as particles (e.g., alpha particles, beta particles, high-speed neutrons, high-speed electrons, high-speed protons, etc.) having energies greater than 34 ev. Such electromagnetic radiation and particles are capable of producing charged particles (e.g., ions) that can impact matter, including tissue, where DNA strand breaks may be produced. This record contains general toxicological, safety and handling, measurement, and environmental information on ionizing radiation emitted from chemical sources, whether these sources are compounds or metals. For information on specific radionuclides, refer to the appropriate individual records.

This record does not address regulatory or licensing requirements that may be imposed by state, local or federal authorities.

For purposes of this record, a radiation event is defined as the accidental or intentional release of ionizing radiation or radioactive materials from nuclear reactors, industrial sources, medical sources, and terrorist devices that places victims at significant risk of developing deterministic effects, such as skin erythema (reddening) and radiation-induced cataract formation, or stochastic effects, especially cancer.

For other data, click on the Table of Contents

FIGURE 5.
HSDB Record for Ionizing Radiation

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Enviro-Health Links - Chemical Warfare Agents

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Chemical Categories
Centers for Disease Control and
Prevention

Overview

- [Chemical and Biological Warfare \(CBW\)](#)
[Science Tracer Bullets Online](#)
- [Chemical and Biological Weapons: New Questions, New Answers](#)
[Hood E. Environmental Health Perspectives.](#)
1999 Dec;107(12):931-932
- [Chemical Categories](#)
[Centers for Disease Control and Prevention](#)
- [Chemical Terrorism](#)
[Occupational Safety and Health Administration, U.S. Department of Labor](#)
- [Chemical Threat](#)
[Ready.gov](#)
- [Chemical, Biological, and Nuclear Terrorism/Warfare: A bibliography](#)
Very large file
[Dudley Knox Library Naval Postgraduate School](#)
- [Material Safety Data Sheets \(MSDS\) for Chemical Agents](#)
[Noblis™](#)

FIGURE 6.
Enviro-Health Links “Chemical Warfare”

FIGURE 7.
TOXMAP TRI/Superfund Map

TABLE 1**Guide to Federal Government Acronyms**

Guide to Federal Government Acronyms	
ATSDR	United States Centers for Disease Control and Prevention's Agency for Toxic Substances and Disease Registry
ASPR	United States Department of Health and Human Services's Office of the Assistant Secretary for Preparedness and Response
CANDHI	Central American Network for Disaster and Health Information
CDC	United States Centers for Disease Control and Prevention
DIMRC	National Library of Medicine's Disaster Information Management Research Center
DOT	United States Department of Transportation
EPA	United States Environmental Protection Agency
HHS	United States Department of Health and Human Services
HSDB	National Library of Medicine's Hazardous Substances Data Bank
NIAID	United States National Institute of Allergy and Infectious Diseases
NCBI	National Library of Medicine's National Center for Biotechnology Information
NIH	United States National Institutes of Health
NIOSH	United States Centers for Disease Control and Prevention's National Institute for Occupational Safety and Health
NLM	United States National Library of Medicine
NPL	National Priorities List
REMM	Radiation Event Medical Management web site
SIS	National Library of Medicine's Division of Specialized Information Services
TEHIP	National Library of Medicine's Toxicology and Environmental Health Information Program
TOXNET	National Library of Medicine's Toxicology Data Network
TRI	Environmental Protection Agency's Toxics Release Inventory
WISER	Wireless Information System for Emergency Responders