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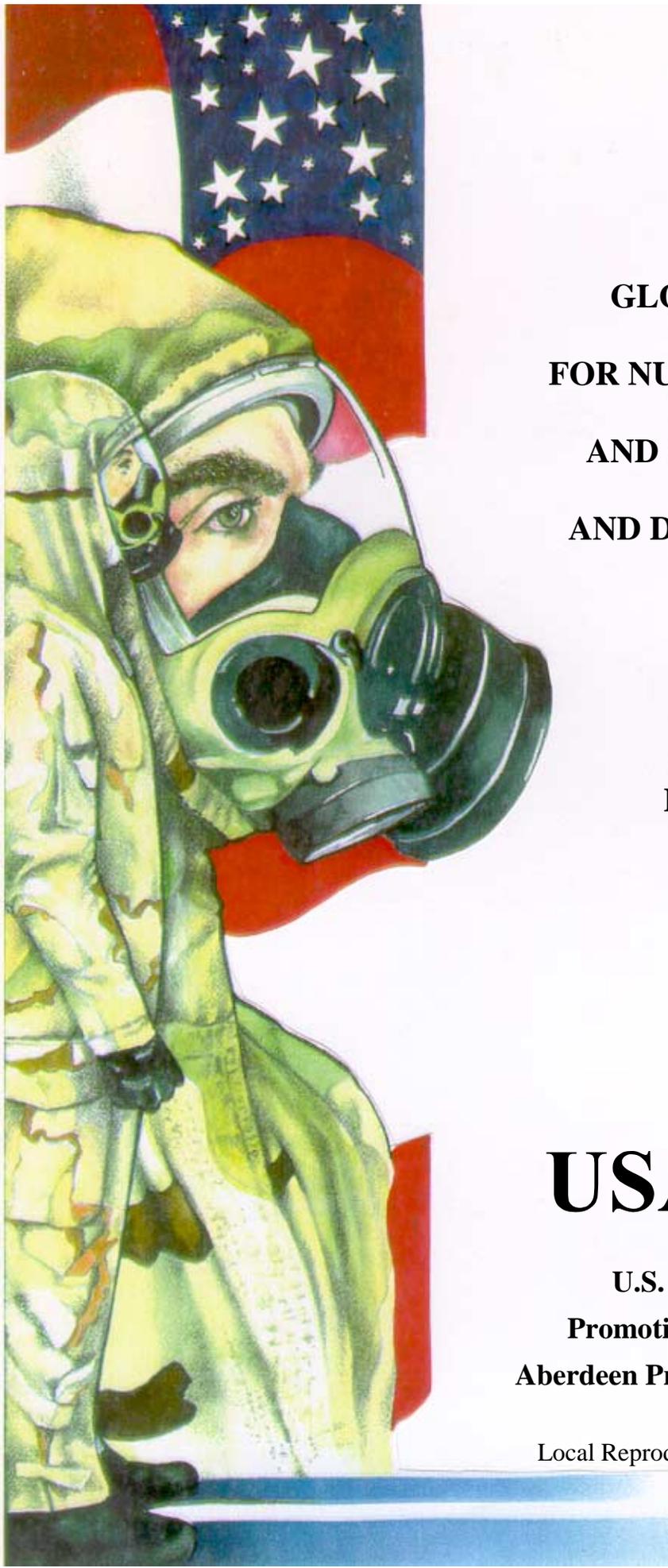
**GLOSSARY OF TERMS
FOR NUCLEAR, BIOLOGICAL,
AND CHEMICAL AGENTS
AND DEFENSE EQUIPMENT**

DECEMBER 2001

USACHPPM

**U.S. Army Center for Health
Promotion and Preventive Medicine
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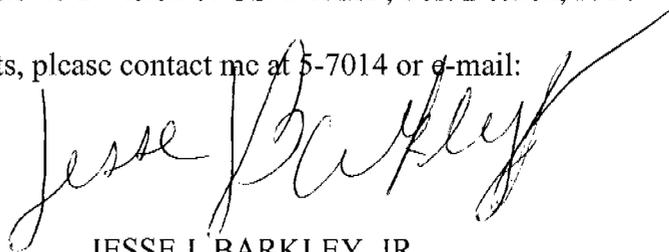
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Section 1 – Introduction

1.1 Background

In this era of the sophisticated and complex, integrated battlefield, the threat of asymmetric warfare by opposing (national or terrorist) forces using Weapons of Mass Destruction (WMD) has become a very real issue. The number of nations capable of developing and possessing WMD is steadily increasing. Furthermore, the potential for the use of WMD can range from conflict, national war, or acts of terrorism and blackmail. The contingencies necessary to protect U.S. and Allied Forces have never been more important than they are today, especially in the area of design and fielding of Nuclear, Biological and Chemical (NBC) defense equipment.

Our forces must be able to survive, fight, and win in an NBC-contaminated warfare environment. While the U.S. Forces remain the best-protected forces in the world for surviving and conducting operations in an NBC-contaminated environment, NBC warfare is not an area that healthcare providers are willingly familiar with. After Operation Desert Shield/Desert Storm, it became obvious that healthcare providers knew little about the effects of NBC agents or the medical defense against them. However, through education medical professionals have learned that medical defenses are possible and effective, that NBC casualties can be saved and returned to duty, and that mortality can be minimized. There are several ongoing initiatives directed at evaluating the health hazards, integrating human systems, and executing plans on potential materials and prototype pieces of equipment.

On the home front, efforts to enhance domestic preparedness for terrorism incidents involving WMD are equally critical. In 1998, Congress directed the establishment of the WMD Advisory Panel to assess domestic response capabilities for terrorism involving WMD and report its findings, conclusions and recommendations to the President and Congress over a three-year period. The Panel was charged with five responsibilities—

- Assess Federal agency efforts to enhance domestic preparedness for terrorism incidents involving WMD.
- Assess the progress of Federal training programs for local emergency responses to WMD incidents.
- Assess deficiencies in programs for response to WMD incidents, including a review of unfounded communications, equipment, and planning requirements, and the need of maritime regions.
- Recommend strategies for ensuring fully effective local response capabilities for WMD incidents.

- Assess the appropriate roles of state and local governments in funding effective local response capabilities.

On 8 October 2001, President George W. Bush established The Office of Homeland Security to coordinate national strategy to strengthen protections against terrorist threats or attacks in the U.S (see Section 1, Office of Homeland Security). Since Americans are looking for ways to be involved in the war against terrorism on the home front, President George W. Bush announced new initiatives that will give citizens the opportunity to support Homeland Security efforts and help every American prepare for terrorist attacks. The Corporation for National Community Service has been established to support homeland security in three major areas: public safety, public health, and disaster mitigation and preparedness.

1-2. Purpose

Our national leaders take the global NBC threat seriously. The threat of WMD is real, and the potential for devastating casualties is high for NBC agents. The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) has developed this Glossary to serve as a tool in providing an explanation of the terms, definitions, and the technical semantics associated with the discussion of NBC equipment, agents, and their potential effects.

1-3. Scope

The NBC threat will continue in planning for future conflicts as well as domestic and international terrorism. It is critical not only for our military to understand the threat of WMD, their impact on tactical operations, and the required preparations for managing casualties but for Federal, state, and local planners; first responders; and medical professionals to understand the WMD threat to civilian populations as well. This Glossary is meant to be available to a wide audience of readers, to include those who will plan and develop new concepts and systems as well as those who may be called upon to implement plans and systems in response to the use of WMD. By including terms relevant to the diverse backgrounds of users of this document, some terms may not be applicable to a particular group of readers but may still be of benefit by enhancing understanding of the terminology associated with the different aspects of WMD threats, impacts, responses and solutions. For the ease of the reader, the guide has been broken down into separate sections for General, Nuclear, Biological, and Chemical terminology.

Section 2 – General Terms

Absorption

The process of a substance penetrating into or through another substance or medium. The uptake and entry of a substance through intact skin, eyes, or linings of the body (e.g., ingestion or once the substance has entered the lungs).

Acceptable Daily Intake (ADI)

An estimate of the dose resulting from exposure to a toxicant that is likely to be without harmful effect even if continued exposure occurs over a lifetime.

Acceptable Intake for Chronic Exposure (AIC)

An estimate similar in concept to the reference dose but derived using a less strictly defined methodology. Chronic reference doses have replaced acceptable intake for chronic exposures as the USACHPPM preferred values for use in evaluating potential non-carcinogenic health effects resulting from chronic exposure to a chemical.

Acceptable Intake for Subchronic Exposure (AIS)

An estimate similar in concept to the subchronic reference dose but derived using a less strictly defined methodology. Subchronic reference doses have replaced acceptable intake for subchronic exposures as the USACHPPM preferred values for use in evaluating potential non-carcinogenic health effects resulting from subchronic exposure to a chemical.

Accuracy

The discrepancy between the true value and the result obtained by measurement.

Acute Effects

Effects that arise quickly and have a relatively short, severe course.

Acute Exposure

Single or multiple exposure(s) to a substance for less than 24 hours.

Acute Toxicity

A term used to describe immediate and severe toxicity. Its use is associated with toxic effects that are severe (e.g., mortality) in contrast to the term “subchronic toxicity,” which is associated with toxic effects that are less severe.

Adult

An individual 18 or more years of age.

Adsorption

The adhesion of a substance to the surface of another solid or liquid.

Adverse Effect

A biochemical change, functional impairment, or pathological lesion that impairs performance and reduces the ability of the organism to respond to additional challenges.

Adverse Effect Level (AEL)

An exposure level at which there are statistically or biologically significant increases in frequency or severity of harmful effects between the exposed population and its appropriate control group.

Aerosol

A suspension of finely divided liquid or solid particles suspended in a gaseous form. They are solid or liquid substances classified as dusts, fumes, smokes, mists, and fogs according to their physical nature, particle size, and method of generation. Particle size may vary from 100 micrometers (μm) to 0.01 in diameter

Airborne Exposure Limits

These are allowable concentrations in the air for occupational and general population exposures.

Air Sampling

This sampling involves the collection and analysis of samples of air to measure its radioactivity or to detect the presence of radioactive substances, particulate matter or chemical pollutants.

American Conference of Governmental Industrial Hygienists (ACGIH)

Membership includes practitioners in industrial hygiene, occupational health, environmental health, or safety. The ACGIH has 12 technical committees for a range of topics: agriculture safety and health, air sampling instruments and procedures, bioaerosols, biological exposure indices, computer technology, construction, industrial ventilation, infectious agents, small business, chemical substance threshold limit values, and physical agent threshold limit values. Through the efforts of the committees, ACGIH provides information and recommended practices to industrial hygienists worldwide.

<http://www.acgih.org/home.htm>

Anecdotal Data

Data based on descriptions of individual cases rather than on controlled studies.

Annual Basis or Annually

Annual basis or annually should be from the month of the current year to the same month of the following year. However, the time period will not exceed 13 months. This does not apply to items covered under the Army Maintenance Management System.

Antidote

Any substance or other agent that inhibits or counteracts the effects of a poison.

Aplasia

Lack of development of an organ or tissue.

Attack

Any act or series of acts by an enemy causing substantial damage or injury to property or persons in any manner by sabotage or by the use of bombs, shellfire, or atomic, radiological, chemical or biological means or other processes.

Availability (Operational)

A measure of the degree to which a system is either operating or is capable of operating at any time when used in its typical operational and support environment.

Blast Effects

When a high explosive detonates, the solid or liquid explosive material is converted into mostly gaseous product. These extremely hot gases expand immediately and compress the air around the charge to form a blast wave.

Btu

A British thermal unit. The amount of heat required changing the temperature of one pound of water one degree Fahrenheit at sea level.

Carcinogen

A chemical substance known to cause cancer (i.e., malignant tumors) in experimental animals and/or man. Four types of responses are generally accepted as evidence—

- a. An increase in incidence of the tumor types that occur in controls.
- b. The development of tumors earlier than in controls.
- c. The occurrence of tumor types not observed in controls.
- d. Two or more tumors of independent origin in one individual.

Carcinogen Classification Schemes

- a. American Conference of Governmental Industrial Hygienists (ACGIH)—

(1) *A1 - Confirmed Human Carcinogen*: The agent is carcinogenic to humans based on the weight of evidence from epidemiological studies of, or convincing clinical evidence in, exposed humans.

(2) *A2 - Suspected Human Carcinogen*: The agent is carcinogenic in experimental animals at dose levels, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that are not considered relevant to worker exposure. Available epidemiologic studies are conflicting or insufficient to confirm an increased risk of cancer in exposed humans.

(3) *A3 - Animal Carcinogen*: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by

mechanism(s) that are not considered relevant to worker exposure. Available epidemiological studies do not confirm an increased risk of cancer in exposed humans. Available evidence suggests that the agent is not likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure.

(4) *A4 - Not Classifiable as a Human Carcinogen*: There are inadequate data on which to classify the agent in terms of its carcinogenicity in humans and/or animals.

(5) *A5 - Not Suspected as a Human Carcinogen*: The agent is not suspected to be a human carcinogen on the basis of properly conducted epidemiological studies in humans. These studies have sufficiently long follow-up, reliable exposure histories, sufficiently high dosage, and adequate statistical power to conclude that exposure to the agent does not convey a significant risk of cancer to humans. Evidence suggesting a lack of carcinogenicity in experimental animals will be considered if supported by other relevant data.

Substances for which no human or experimental animal carcinogenic data have been reported are assigned no carcinogen designation.

b. U.S. Environmental Protection Agency (USEPA)—

(1) *Group A - Human Carcinogen*: Sufficient evidence in epidemiological studies to support causal association between exposure and cancer.

(2) *Group B - Probable Human Carcinogen*: Limited evidence in epidemiological studies (Group B1) and/or sufficient evidence from animal studies (Group B2).

(3) *Group C - Possible Human Carcinogen*: Limited to equivocal evidence from animal studies and inadequate or no data in humans.

(4) *Group D - Not Classified*: Inadequate or no human and animal evidence of carcinogenicity.

(5) *Group E - No Evidence of Carcinogenicity for Humans*: No evidence of carcinogenicity in at least two adequate animal tests in different species or in adequate epidemiological and animal studies.

c. International Agency for Research for Cancer (IARC)—

(1) *Group 1 - The agent (mixture) is carcinogenic to humans*. The exposure circumstance entails exposures that are carcinogenic to humans. This category is used when there is sufficient evidence of carcinogenicity in humans. Exceptionally, an agent (mixture) may be placed in this category when evidence in humans is less than sufficient; however, there may be sufficient evidence of carcinogenicity in experimental animals and strong evidence in exposed humans that the agent (mixture) acts through a relevant mechanism of carcinogenicity.

(2) *Group 2* - This category includes agents, mixtures, and exposure circumstances for which, at one extreme, the degree of evidence of carcinogenicity in humans is almost sufficient, as well as those for which, at the other extreme, there are no human data but for which there is evidence of carcinogenicity in experimental animals. Agents, mixtures, and exposure circumstances are assigned to either Group 2A (probably carcinogenic to humans) or Group 2B (possibly carcinogenic to humans) on the basis of epidemiological and experimental evidence of carcinogenicity and other relevant data.

- *Group 2A - The agent (mixture) is probably carcinogenic to humans.* The exposure circumstance entails exposures that are probably carcinogenic to humans. This category is used when there is limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals. In some cases, an agent (mixture) may be classified in this category when there is inadequate evidence of carcinogenicity in humans but sufficient evidence of carcinogenicity in experimental animals and strong evidence that the carcinogenesis is mediated by a mechanism that also operates in humans. Exceptionally, an agent, mixture, or exposure circumstance may be classified in this category solely on the basis of limited evidence of carcinogenicity in humans.

- *Group 2B - The agent (mixture) is possibly carcinogenic to humans.* The exposure circumstance entails exposures that are possibly carcinogenic to humans. This category is used for agents, mixtures, and exposure circumstances for which there is limited evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals. It may also be used when there is inadequate evidence of carcinogenicity in humans but sufficient evidence of carcinogenicity in experimental animals. In some instances, an agent, mixture, or exposure circumstance for which there is inadequate evidence of carcinogenicity in humans but limited evidence of carcinogenicity in experimental animals, together with supporting evidence from other relevant data, may be placed in this group.

(5) *Group 3 - The agent (mixture of exposure circumstance) is not classifiable as to its carcinogenicity to humans.* This category is used most commonly for agents, mixtures, and exposure circumstances for which the evidence of carcinogenicity is inadequate in humans and inadequate or limited in experimental animals. Exceptionally, agents (mixtures) for which the evidence of carcinogenicity is inadequate in humans but sufficient in experimental animals may be placed in this category when there is strong evidence that the mechanism of carcinogenicity in experimental animals does not operate in humans. Agents, mixtures, and exposure circumstances that do not fall into any other group are also placed in this category.

(6) *Group 4 - The agent (mixture) is probably not carcinogenic to humans.* This category is used for agents or mixtures for which there is evidence suggesting lack of carcinogenicity in humans and in experimental animals. In some instances, agents or mixtures for which there is inadequate evidence of carcinogenicity in humans but evidence suggesting lack of carcinogenicity in experimental animals, consistently and strongly supported by a broad range of other relevant data, may be classified in this group.

Carcinogenicity

The potential for development of cancer in a living individual. A cancer is a malignant tumor resulting from a change in the normal growth and development of cells. (Cancerous tumors have the tendency to invade surrounding tissue and spread to other sites in the body.)

Casualty

Any person who is lost to the organization by reason of having been declared dead, wounded, injured, diseased, interned, captured, retained, missing, missing in action, beleaguered, besieged, or detained.

CBRNE

Chemical, Biological, Radiological, Nuclear, and Explosives. This term is used in reference to Homeland Security Issues. (See Homeland Security.)

Ceiling Limit

An airborne concentration of a substance that should not be exceeded.

Ceiling Value

Normally refers to the maximum exposure concentration at any time, for any duration. Practically, it may be an average value over the minimum time required to detect the specified concentration.

Centers for Disease Control and Prevention (CDC)

The CDC is recognized as the lead Federal agency for protecting the health and safety of people, at home and abroad, providing credible information to enhance health decisions, and promoting health through strong partnerships. The CDC serves as the national focus for developing and applying disease prevention and control, environmental health, and health promotion and education activities designed to improve the health of the people of the U.S. (See the Department of Health and Human Services (DHHS).)

<http://www.cdc.gov/aboutcdc.htm>

Central Nervous System (CNS)

The part of the human nervous system that consists of the brain and spinal cord. Sensory impulses are transmitted and motor impulses pass out. The CNS supervises and coordinates the activity of the entire nervous system.

Cerebral Anoxia

Absence of oxygen supply to the brain despite adequate perfusion of the tissue by blood.

ChE

Cholinesterase. This is an enzyme that catalyzes the hydrolysis of acetylcholine to choline (a vitamin) and acetic acid.

ChE₅₀

The dosage producing 50 percent ChE inhibition in the given population. (Note that the ChE₅₀ is not a dosage that produces this effect in 50 percent of the given population.)

Chemical Abstracts Service (CAS)

CAS is a producer of comprehensive databases of chemical information. Their principal databases, Chemical Abstracts (CA) and REGISTRY, now include about 15 million document records and more than 23 million substance records respectively. CAS also produces databases of chemical reactions, commercially available chemicals, listed regulated chemicals and compounds claimed in patents.

Chemical/Biological Incident Response Force (CBIRF)

This is a Marine strategic organization. It is manned, trained, and equipped to counter the growing chemical/biological terrorist threat. This response force will respond to chemical or biological incidents worldwide, when directed by the National Command Authority, to assist local civilian and military agencies in order to assist the on-scene commander in providing initial post-incident consequence management. This Force deploys to incident locations by the most expeditious means possible, where they will coordinate initial relief efforts, provide security and area isolation at the affected site; detection, identification and decontamination; expert medical advice and assistance to local medical authorities; and service support assistance as required.

Chemical Stockpile Emergency Preparedness Program (CSEPP)

The U.S. Congress directed that the Army destroy certain kinds of chemical weapons stockpiled at eight U.S. Army installations within the continental U.S. The CSEPP was started in 1988 to enhance the emergency preparedness of the communities around the chemical stockpile (until the stockpile is destroyed) by developing emergency plans and providing chemical accident response equipment, training and warning systems. The CSEPP includes Army, Federal Emergency Management Agency (FEMA), state and local emergency management officials.

<http://www.fema.gov/ptc.csepp1.htm>

Chronic Effects

These are effects that persist over a long period of time. These effects may arise after months or years, may have a long course ranging from relatively mild to severe, or may arise immediately after exposure.

Chronic Exposure

These are multiple or continuous exposures occurring over an extended period of time or a significant fraction of an individual's lifetime.

Chronic Reference Dose (RfD)

An estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of harmful effects during a lifetime. Chronic RfDs are specifically developed to be protective for long-term exposure to a compound (as a Superfund program guideline, seven years to lifetime).

Chronic Study

A toxicity study designed to measure the effects (toxic) of chronic exposure to a chemical.

Chronic Toxicity

Effects that persist over a long period of time whether or not they occur immediately or are delayed. The term "chronic toxicity" is often confused with the term of chronic exposure and is often used to describe delayed toxicity.

cm

Centimeter

Code of Federal Regulations (CFR)

The Code is a consolidation and codification by subject matter of the general and permanent laws of the U.S.

Collective Protection

A shelter, with filtered air, that provides a contamination free working environment for selected personnel and allows relief from continuous wear of protective gear.

Combat Developer (COMDEV)

The command or organization responsible for formulating concepts doctrine, organization, materiel objectives, requirements, and user tests and evaluations.

Compound

A chemical combination of two or more elements combined in a fixed and definite proportion by weight.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

This act was enacted into law in 1980, and its follow-up amendment, the Superfund Amendments and Reauthorization Act (SARA), was passed in 1986. These two laws establish a series of programs for the cleanup of hazardous waste disposal and spill sites nationwide. CERCLA and SARA also establish cleanup programs for inactive and abandoned hazardous waste sites. CERCLA and SARA are administered by the USEPA in cooperation with individual states and site owners. CERCLA also enabled the revision of the National Contingency Plan (NCP).

<http://www.epa.gov/superfund/action/law/cercla.htm>

Concentration (C)

The total quantity of substance present in a given unit volume (of gas or liquid). It may be expressed in any unit or mass per unit of volume such as milligrams per cubic meter (mg/m³), grams per Liter (g/L), or as volume per volume such as parts per million (ppm).

Congestion

The excessive or abnormal accumulation of blood in a tissue or organ.

Contaminant

An impurity in water, soil, materials, etc.

Contaminate

To make impure by contact or mixture into water, soil, materials, etc.

Contamination

Any deposit, adsorption, or absorption of radioactive, biological, or chemical substances on and by structures, areas, personnel, objects, soil, and water. Food and/or water made unfit for human or animal consumption by the presence of radioactive, biological, or chemical substances.

Continuous Exposure Guidance Level (CEGL)

The ceiling concentrations designed to avoid adverse health effects, either immediate or delayed, of more prolonged exposures and to avoid degradation in growth performance that might endanger the objectives of a particular mission as a consequence of continuous exposure for up to 90 days.

Convection

The transfer of heat through a liquid or gas by the actual movement of the molecules.

Convulsion

An abnormal violent and involuntary contraction or series of contractions of the voluntary muscles.

Coronary

Pertaining to the heart.

Criterion

A standard that represents the best scientific estimate of an environmental concentration of a contaminant corresponding to a given level of hazard, which, in the case of non-cancer toxicity, represents a level that is not expected to cause additional health risk.

Ct

This means **concentration** times **time**. Note that $Ct \neq k$, a 2-minute exposure to a concentration of 100 mg/m^3 ($Ct = 200$ milligram-minutes per cubic meter (mg-min/m^3)), does NOT necessarily produce the same toxicological effects as a 50-minute exposure to a concentration of 4 mg/m^3 ($Ct = 200 \text{ mg-min/m}^3$).

Ct Value

A measure of vapor or gas exposure by inhalation. It is a product of the concentration usually expressed in mg/m^3 and duration of exposure (t) in minutes. The resulting (and somewhat confusing units) are mg-min/m^3 . It is important to recognize that this is not simple algebra; predictions of toxic effects should never be extrapolated more than twice, or less than half, known toxic exposure data. (Exposure to 1 mg/m^3 for 20 minutes; 2 mg/m^3 for 10 minutes; or

4 mg/m³ for 5 minutes are all valid extrapolations of 2-minute exposure data. All three equate to a Ct of 20 mg-min/m³.

Cutaneous

Pertaining to the skin.

Cytokine

A non-antibody protein released by one cell population that acts as an intercellular mediator on another cell population(s).

Data Quality Objectives

A quantitative or qualitative statement that clarifies study, technical, and quality objectives, defines the appropriate type of data, and specifies potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions.

Data Quality Assessment

The scientific and statistical evaluation of data to determine if data are of the right type, quality, and quantity to support the intended use.

Decontaminate

To breakdown, neutralize, or remove a radioactive, chemical, or biological substance that poses a hazard to personnel or equipment.

Decontamination

Decreasing the amount of chemical agent on any person, object or area by absorbing, neutralizing, destroying, ventilating or moving chemical agents. Decontamination procedures are critical during:

- a. Response Phase: to eliminate direct and immediate threats to human life.
- b. Recovery Phase: to eliminate indirect and less immediate threats to human life (such as cross-contamination).

Department of Health and Human Services (DHHS)

The DHHS is the U.S. government's principal agency for protecting the health of all Americans and providing essential human services through over 300 different programs. Operating divisions with DHHS include the following:

- a. National Institutes of Health (NIH), a world class medical research organization, supporting some 35,000 research projects nationwide in diseases like cancer.
 - b. The CDC is the lead Federal agency responsible for protecting the health of the American public through monitoring of disease trends, investigation of outbreaks, health and injury risks, foster a safe and healthful environments, and implementation of illness and injury control and prevention interventions.
-

c. The Agency for Toxic Substances and Disease Registry (ATSDR) which seeks to prevent exposure to hazardous substances from waste sites by conducting public health assessments, health studies, surveillance activities, and health education training in communities around waste sites on the USEPA's National Priorities List. ATSDR also has developed toxicological profiles of hazardous chemicals found at these sites.

<http://www.os.dhhs.gov/>

Deposition Probability

The fraction of the activity or mass of an inhaled aerosol that is deposited in a particular region of the lung.

Dermal Exposure

Exposure to or by absorption through the skin.

Dermatitis

The inflammation of the skin from any cause.

Desquamation

The shedding of epithelial elements, chiefly of the skin, in scales or small sheets; exfoliation.

Detection

The discovery of the existence of a substance/contaminant.

Developmental Reference Dose (RfD_{at})

An estimate (with uncertainty spanning perhaps an order of magnitude or greater) of an exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of developmental effects. Developmental reference doses are used to evaluate the effects of a single exposure event.

Differential Pressure

To differentiate in pressure between two points of a system, such as between the inlet and the outlet of a pump.

Diffusion

The process of spontaneous intermixing of different substances due to molecular motion that tends to produce uniformity of concentration.

DNA (Deoxyribonucleic Acid)

A complex sugar-protein polymer of nucleoprotein that contains the complete genetic code for every enzyme in the cell. It occurs as a major component of the genes, which are located on the chromosomes in the cell nucleus.

Dosage

The amount of substance administered (or received) per body weight.

Dose

The amount of substance or energy that is taken into or absorbed by the body; the amount of substance, radiation, or energy absorbed in a unit volume, an organ, or an individual.

Dose Response

The characteristics of exposure to a substance and the spectrum of effects.

Dose-Response Evaluation

The process of quantitatively evaluating toxicity information and characterizing the relationship between the dose of a contaminant administered or received and the incidence of adverse health effects in the exposed population. From the quantitative dose-response relationship, toxicity values are derived that are used in the risk characterization step to estimate the likelihood of adverse effects occurring in humans at different exposure levels.

Dose-Response Relationship

The relationship between—

- a. The dose often based on an "administered dose" (i.e., exposure) rather than absorbed dose.
- b. The extent of toxic injury produced by that chemical. The response can increase with greater doses and can be expressed either as the severity of injury or proportion of exposed subjects affected.

Dust

Any solid particulate matter from 1 to 150 microns (μ) in diameter.

Dry Deposition

Depositing onto surfaces by settling out of particles, as opposed to droplets (liquid); also by absorption from the vapor phase.

EC₅₀ (Median Exposure Concentration)

The dosage causing a specifically defined effect in 50 percent of the given population. The route of exposure can be either inhalation or percutaneous. Similarly, the EC₀₅, EC₁₆, EC₈₄, and EC₉₅ are the dosages causing that defined effect in 5 percent, 16 percent, 84 percent, and 95 percent of the given population, respectively.

ED₅₀ (Median Effective Dose)

The dose of a substance that produces a given, defined therapeutic or toxic effect in 50 percent of the exposed population. NOT A 50 PERCENT EFFECT. This is a quantal (yes/no) determination, but it can be applied to graded effects if they are defined in a quantal manner (e.g., the dose of drug necessary to decrease diastolic blood pressure by 10 millimeters (mm) mercury in 50 percent of the subjects). Under these circumstances, it is imperative that the assumptions and definition of "effect" be stated with the dose.

Edema

The presence of abnormally large amounts of fluid in the intercellular tissue.

Element

One of the 103 known chemical substances that cannot be broken down further without changing its chemical properties. Some examples include hydrogen, nitrogen, gold, lead, and uranium.

Elimination

Removal of material from the body via urine, feces, sweat, or exhalation. Excretion usually refers to elimination via urine or feces.

Embryo/Fetus

The development of a human organism from conception until the time of birth. More accurately; embryo: 2 week (when implantation occurs) – 8 week; fetus: end of 8-week term.

Emergency

A rare and unexpected situation with potential for significant loss of life, property, or mission accomplishment.

Emergency Disposal

Immediate transportation and disposal of chemical agents/munitions when the senior explosive ordnance disposal person determines the health or safety of any person is clearly endangered.

Emergency Exposure Guidance Level (EEGL)

A concentration of a substance in air (as a gas, vapor, or aerosol) that will permit continued performance of specific tasks during rare emergency conditions, lasting for periods of 1 to 24 hours. This should not be used for planned exposures because these guidance levels are neither safe nor hygienic.

Emergency Phase

As used by FEMA and the USEPA, the initial phase of response actions, during which actions are taken in response to a threat of release or a release in progress. Short-term protective actions, such as sheltering and evacuation, may be taken during this phase to mitigate the hazard from immediate exposure to the passing plume.

Enclosed Area

Any operating building, shed, magazine, railroad car, truck, or trailer that sufficiently restricts natural ventilation to allow possible accumulation of agent vapors.

Endpoint

A response measure in a toxicity study.

Environment

The external surroundings and influences.

Estimate

A numerical value calculated from data. The average is a numerical value of the quantity under measurement. Other parameters, such as the standard deviation, are often estimated from the data.

Evacuation

The urgent removal of people from an area to avoid or reduce high-level, short-term exposure, usually from the plume or from deposited activity. Evacuation may be a preemptive action taken in response to a facility condition rather than an actual release.

Evaporation

The change of a liquid into a gas at any temperature below its boiling point.

Exposure

The amount of chemical that enters the body by some route for a specified frequency and duration.

Exposure Assessment

A process that takes into account the chemical and physical properties of the substance, the effect the substance produces, the exposure frequency and duration, and the affected subject.

Exposure Duration

The length of time that a receptor population is exposed to a contaminant.

Exposure Routes

The major courses of exposure include ingestion, inhalation, and absorption through the skin.

Extrapolation

An estimate of response or quantity at a point outside the range of the experimental data. Also refers to the estimation of a measured response in a different species or by a different route than that used in the experimental study of interest (i.e., species to species, route to route, acute to chronic, high to low).

Extremity

A bodily limb such as hand, elbow, arm below the elbow, foot, knee, or leg below the knee.

Federal Emergency Management Agency (FEMA)

The mission of FEMA is to reduce loss of life and property and protect the nation's critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery.

<http://www.fema.gov/about>

Fertility

The ability to reproduce.

Fever

Abnormally high body temperature, characterized by marked increase of temperature, acceleration of the pulse, increased tissue destruction, restlessness, and sometimes delirium.

Field Operations

Activities conducted outdoors or outside of man-made enclosures or structures which contain built-in alarms or engineered chemical agent controls. Short-term operations in storage structures are also considered field operations.

First Aid

Any one-time treatment, and any follow-up visit for the purpose of observation or minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care. Such one-time treatment and follow-up visit for observation, is considered first aid, even though provided by a physician or registered medical professional personnel.

g

gram.

g/L

grams per Liter

Gas

A state of matter in which the material is compressible and has a low density and viscosity.

Genetic Effect

An effect in a descendant resulting from the modification of genetic material in a parent.

Geneva Protocol

“Geneva Protocol for the Prohibition of the Use in War of Asphyxiating Gases and Poisonous or other Bacteriological Methods of Warfare” of 17 June 1925; first diplomatic attempt to limit biological warfare; ratified by the USA in 1975.

<http://www.state.gov/www/global/arms/treaties/geneva1.html#1>

Germ Cell

A cell from which another organism can develop; a sex cell.

Global Positioning System (GPS)

A high-precision satellite navigation service created by the U.S. military.

Granulocytopenia

A symptom complex consisting of a marked decrease in the number of circulating white blood cells, with lesions of the throat and mucous membranes.

Hazardous Materials

Any material that is flammable, corrosive, an oxidizing agent, explosive, toxic, poisonous, etiological, radioactive, nuclear, unduly magnetic, a chemical agent, biological research material, compressed gases, or any other material that, because of its quantity, properties, or packaging, may endanger human life or property.

Health Hazard

An existing or likely condition, inherent to the operation or use of materiel, that can cause death, injury, acute or chronic illness, disability, or reduced job performance of personnel by exposure to acoustical energy, biological substances, chemical substances, oxygen deficiency, radiation energy, shock, temperature extremes, trauma, and vibration.

Health Hazard Assessment (HHA)

The application of biomedical knowledge and principles to document and quantitatively determine the health hazards of systems. This assessment identifies, evaluates, and recommends solutions to control the risks to the health and effectiveness of personnel who test, use, or service Army systems. This assessment includes the evaluation of hazard severity, hazard probability, risk assessment, and operational constraints; the identification of required precautions and protective devices; and the training requirements.

Health Hazard Assessment Report (HHAR)

The formal Army documentation for a given system, the assessment of health hazard issues and risks, the recommendation of preventive or control actions, and the recommendation of training requirements.

Health Hazard Domain Report (HHDR)

This report is one of the seven domain reports made under the Army Manpower and Personnel Integration (MANPRINT) Program. It identifies potential health hazards that may be associated with the development, acquisition, operation, and maintenance of Army systems. This identification will be done early in the system's life cycle to preserve and protect the humans who will—

- a. Operate, maintain, and support the equipment.
- b. Enhance total system effectiveness.
- c. Reduce system retrofit needed to eliminate health hazards.
- d. Reduce personnel compensation.

Data from this report are entered into the MANPRINT Program Report and the System Manpower and Personnel Integration Program Management Plan (SMMP).

Health Standards

Published documents specifying conditions of acceptable risk for individual health hazards.

These can include medical exposure limits, health conservation criteria, and materiel design standards.

Heat Cramps

An illness due, in part, to excessive loss of salt during sweating resulting in painful muscle spasms in the extremities, back and abdomen.

Heat Exhaustion

An illness due to circulatory failure in which venous blood returned to the heart is significantly reduced; fainting may result. This failure is caused because the individual's blood supply is not adequate to serve both heat regulation and other bodily needs.

Heat Strain

The natural, physiological response reaction of the body to the application of heat stress.

Heat Stress

The relative amount of thermal strain from the environment.

Heat Stroke

An illness due to the body temperature reaching a level where sweating stops. The body temperature can then rise to critical levels causing tissue damage and death.

Homeland Security

A national strategy to strengthen protections against terrorist threats or attacks in the U.S. (See Office of Homeland Security.)

<http://www.whitehouse.gov/homeland>

Host

A living animal or plant that harbors or nourishes another organism.

Hypotension

Abnormally low blood pressure.

Ileus

Obstruction of the intestines.

Immediate versus Delayed Toxicity

The immediate effects that occur or develop rapidly after a single administration of a substance; delayed effects are those that occur after the lapse of some time. These effects have also been referred to as acute and chronic, respectively.

Immediately Dangerous to Life or Health (IDLH)

The maximum concentration from which, in the event of respiratory failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing (for example, severe eye irritation) or irreversible health effects (Department of Health and Human

Services, National Institute for Occupational Safety and Health (NIOSH) Publication No. 90-117). (Respiratory protection and sufficient oxygen to support life (at least 16 percent by volume) are addressed in Code of Federal Regulations, Part 1910.134, Title 29 e(3) and g(5).)

Incapacitate

To render a subject unable to perform normal activities or tasks.

Incapacitating Agent

A chemical that produces a temporary, disabling condition that persists for hours to days after exposure has ceased. Complete recovery of casualties is expected without medical treatment.

Incapacitating Dose

The concentration/dose that renders an individual unable to perform normal activities or tasks.

Incapacitation

Considered to be "moderate-to-severe"--unless otherwise specified. It may include prostration and convulsions.

Incidence

The number of new cases of a disease within a specified period of time or dose.

Incidence Rate

The rate new cases of a disease or condition develop within a specified period of time or dose.

Incubation Period

The time required between initial contact with an infectious agent and the appearance of the first clinical symptoms of disease.

Individual

Any human being.

Individual Risk

The probability that a person will experience an adverse effect. This is identical to population risk unless specific population subgroups can be identified that have different (higher or lower) risks.

Inflammation

Reaction of tissues to injury; characterized by pain, heat, redness, or swelling of the affected parts.

Initial Response Force (IRF)

An emergency action organization tasked to provide first response to a chemical accident/incident at an installation assigned a chemical surety mission or in the public domain. The IRF performs the following functions:

- a. Rescue operations.
- b. Accident site security.
- c. Firefighting.
- d. Initiation of appropriate explosive ordnance material procedures.
- e. Radiation monitoring.
- f. Establishment of command, control, and communication.
- g. Public affairs activities.

Injury

A specific impairment of body structure or function caused by an outside agent or force that may be physical or chemical.

Intake

Quantity of material introduced into the body by inhalation, by ingestion, or through the skin.

International Agency for Research for Cancer (IARC)

The mission of IARC is to coordinate and conduct research on the causes of human cancer, the mechanisms of carcinogenesis, and to develop scientific strategies for cancer control. The Agency is involved in both epidemiological and laboratory research and provides scientific information through publications, meetings, courses, and fellowships.

<http://www.iarc.fr/>

In-vitro

In an artificial environment, referring to a process or reaction occurring therein, as in a test tube or culture media.

In-vivo

In the living body, referring to a process or reaction occurring therein.

Irritant

A substance that produces an irritating effect when it contacts skin, eyes, nose, or respiratory system.

kg

kilogram.

km

kilometers.

Laboratory

A location or facility where engineering controls include a glove box or laboratory type ventilation hood and the quantities of chemical agents in use at one time are small, normally not exceeding one Liter. These operations may include research and development, production/acceptance testing, sample analysis and evaluation, limited detoxification, animal testing, or other small-scale agent operations.

Latent Period

A period of seeming inactivity.

LC₅₀ (Median Lethal Concentration)

A dosage of a substance by inhalation that results in death in 50 percent of the exposed population.

LD₅₀ (Median Lethal Dose)

A dose of a substance that produces death in 50 percent of the exposed population usually as a single dose, with the route of exposure specified.

Liter

A metric unit of volume equal to 1000 cubic centimeters (cm³) or 1.056 quart.

Local versus Systemic Toxicity

Local effects occur at the site of entry (e.g., lungs, stomach) of a toxicant into the body; systemic effects are elicited after absorption and distribution of the toxicant from its entry point to a distant site.

Lowest-Effect Level (LEL)

The lowest exposure level at which there are statistically or biologically significant increases in frequency or severity of effects between the exposed population and its appropriate control group.

Lowest-Observed Adverse Effect Level (LOAEL)

The lowest exposure level at which there are statistically or biologically significant increases in frequency or severity of adverse effects between the exposed population and its appropriate control group.

Malformation

A birth defect; an abnormal structure or form.

“Man”

An individual assumed to be a healthy, 18-35 year old, 70 kg adult male.

Manpower and Personnel Integration (MANPRINT)

The process of integrating the full range of manpower, personnel, training, human engineering,

health hazard, system safety, and soldier survivability to improve individual performance and total system performance throughout the entire system development and acquisition process.

Materiel Developer (MATDEV)

The command or organization responsible for developing or modifying materiel.

Maximum Contaminant Level (MCL)

The maximum permissible level of a contaminant in water that is delivered to the consumer.

Medical Contaminant Criteria

The varying amounts of air contaminants and duration of exposure causing specific adverse effects to health.

meter (m)

A metric unit of length equal to 39.37 inches.

mg/kg

milligram/kilogram.

mg/m³

milligrams per cubic meter.

mg-min/m³

milligram-minutes per cubic meter. It is a product of the concentration of a substance in milligrams per cubic meter times the exposure time in minutes.

micron (μ)

A unit of measurement equal to one-millionth (10^{-6}) of a meter.

milligram (mg)

A metric unit of mass equal to one thousandth of a gram, 1×10^{-3} gram.

milliliter (mL)

A metric unit of liquid capacity equal to 0.061 cubic inch.

μg

microgram, 1×10^{-6} g of 1×10^{-3} mg.

μm

micrometer(s)

Microsecond

A one-millionth part of a second. (See Curie, Section 3.)

Military Occupational Specialty (MOS)

A grouping of duty positions possessing such a close occupational or functional relationship that an optimal degree of interchangeability among persons so classified exists at any given skill level.

Military Standard (MIL-STD)

Standards and specifications, also known as MIL-SPEC, developed to specify military-unique requirements whether it is for parts, materials, processes, interfaces, data, or tests.

Milli

A prefix that divides a basic unit by 1000.

Minor

An individual less than 18 years of age.

Minute Volume (MV)

The amount of air expelled from the lungs in a minute that is assumed to be 15 L--unless otherwise stated. This amount represents mild activity.

Mission-Oriented Protective Posture (MOPP)

A flexible system that provides maximum nuclear, biological, and chemical protection for the individual with the lowest risk possible and still maintains mission accomplishment. Typically used to refer to chemical response personnel's personal protection equipment.

Mission Specific Protection

Measures for important units, systems, and functions so that the military units can continue to work with their primary tasks to the greatest extent possible. The aim is that the defense forces will retain their operative ability even after an NBC attack.

Mist

The liquid particles up to 100 μ in diameter.

mm

millimeter.

Molecule

A group of atoms held together by chemical forces. The smallest unit of a compound that can exist by itself and retain all its chemical properties.

Morbidity

The ratio of sick to well individuals in a community; sick rate.

Mortality

The ratio of people who die to those who survive exposure to nuclear/radiological, biological, or chemical agents; death rate.

Mutagen

Anything that can cause a change (mutation) in the genetic material of a living cell.

Mutagenicity

The cause of changes in cellular genetic material that may be passed on to subsequent generations of cells. When these changes occur in germ cells (i.e., sperm or ova), the mutations may be passed on to subsequent generations.

National Command Authority (NCA)

The U.S. President and the Secretary of Defense or their duly deputized alternates or successors, hold this nuclear weapons release authority for the U.S. Armed Forces.

<http://www.periscope.ucg.com/terms/t0000206.html>

National Contingency Plan (NCP)

The set of regulations that implement CERCLA and direct responsibility and procedures for cleanup of hazardous material spills. The regulations are codified at Code of Federal Regulations, Part 300, Title 40, et seq.

<http://www.epa.gov/oilspill/ncpover.htm>

National Institute for Occupational Safety and Health (NIOSH)

NIOSH was established by the Occupational Safety and Health Act of 1970. NIOSH is part of the CDC and is the only Federal institute responsible for conducting research and making recommendations for the prevention of work-related illnesses and injuries.

<http://www.cdc.gov/niosh/homepage.html>

Nausea

Tendency to vomit; sickness of the stomach.

NBC

Nuclear, Biological and Chemical. This terminology is used in deployment issues.

Nerve Agent

A toxic substance that inhibits the cholinesterase enzyme and, therefore, elevates the acetylcholine level in the body. Symptoms include pinpoint pupils, difficulty focusing, headache, and secretion from the skin and mucous membranes. Nausea, vomiting, and loss of bladder and bowel control lead to severe dehydration. These lead to general muscular fasciculation followed by violent convulsions, respiratory arrest, and death. (See Section 5, Nerve Agent.)

No-Observed Adverse Effects Level (NOAEL)

An exposure level at which there are no statistically or biologically significant increases in the frequency or severity of adverse effects (to tissue, cells, organs, etc.) between the exposed population and its appropriate control (some effects may be produced at this level, but they are not considered as adverse, nor precursors to specific adverse effects). It is based on the highest exposure without adverse effect.

No-Observed Effects Level (NOEL)

An exposure level at which there are no statistically or biologically significant increases in the frequency or severity of any effect (to tissue, cells, organs, etc.) between the exposed population and its appropriate control.

North Atlantic Treaty Organization (NATO)

This organization is to enhance the stability, well-being and freedom of its members through a system of collective security. Members of the alliance agree to defend one another from attack by other nations. The alliance includes Belgium, Canada, Denmark, France, the United Kingdom, Iceland, Italy, Luxembourg, The Netherlands, Norway, Portugal, the United States, Greece, Turkey, the newly unified Germany, Hungary, Poland, and the Czech Republic.

<http://www.nato.int/>

Nuclear, Biological, and Chemical (NBC) Contamination

The deposition and/or absorption of residual radioactive material or biological or chemical agents on or by structures, areas, personnel, or objects.

Nuclear, Biological, and Chemical (NBC) Survivability

The capability of a system (and its crew) to withstand an NBC-contaminated environment and relevant decontamination without losing the ability to accomplish the assigned mission. An NBC-contamination survivable system is hardened against NBC contamination and decontaminants. This system can be decontaminated and is compatible with individual protective equipment.

Occupational Safety and Health Administration (OSHA)

The mission of OSHA is to save lives, prevent injuries and protect the health of America's workers. OSHA and its state partners have thousands of inspectors, plus complaint discrimination investigators, engineers, physicians, educators, standards writers, and other technical and support personnel spread over more than 200 offices throughout the country. This staff establishes protective standards, enforces those standards, and reaches out to employers and employees through technical assistance and consultation programs.

<http://www.osha.gov/comp.links.html>

Office of Homeland Security

President George W. Bush established this office on 8 October 2001. Its mission is to develop and coordinate the implementation of a comprehensive national strategy to secure the U.S. from terrorist threats or attacks. The Office will coordinate the executive branch's efforts to detect, prepare for, prevent, protect against, respond to, and recover from terrorist attacks within the U.S.

<http://www.whitehouse.gov/homeland>

Overpressure

The transient pressure that is created by the shock wave of an explosion and exceeds the ambient pressure; expressed in pounds per square inch.

Parameter

The property or quantity that measurements are expected to evaluate.

Parasite

A plant or animal that lives upon or within another living organism at whose expense it obtains some advantage.

Particle Size-Selective-Threshold Limit Values (PSS-TLV[®]s)

Expressed in three forms—

- a. Inhalable Particulate Mass-TLVs (IPM-TLVs): for those materials that are hazardous when deposited anywhere in the respiratory tract. Particles with aerodynamic diameters up to 100 μm are of interest.
- b. Thoracic Particulate Mass-TLVs (TPM-TLVs): for those materials that are hazardous when deposited anywhere within the lung airways and the gas-exchange regions. Particles with aerodynamic diameters up to 25 μm are of interest.
- c. Respirable Particulate Mass-TLVs (RPM-TLVs): for those materials that are hazardous when deposited in the gas-exchange region. Particles with aerodynamic diameters up to 10 μm are of interest.

Particulate

A particle of solid or liquid matter. Particle aerodynamic diameters of biological interest range up to 100 μm .

Parts per million (ppm)

Parts (molecules) of a substance contained in a million parts of air.

Pathogenic Organism

Any disease-producing organism.

Perceived Threat

Any possible danger that is experienced by a person subjectively and out of proportion to the real threat or physical danger.

Percutaneous Exposure

The absorption of a contaminant through the unbroken skin.

TLV[®] is a registered trademark of the American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio. Use of trademarked name does not imply endorsement by the U.S. Army but is intended only to assist in identification of a specific product.

Periodic Table

An arrangement of chemical elements in order of increasing atomic number. Elements of similar properties are placed one under the other, yielding groups or families of elements. Within each group, there is a variation of chemical and physical properties, but in general, there is a similarity of chemical behavior within each group.

Permissible Exposure Limit (PEL)

Time-weighted average concentrations that must not be exceeded during any 8-hour work shift of a 40-hour workweek.

Personal Protective Equipment (PPE)

The combination of clothing and respirator designed to protect the wearer from exposure to chemical and biological warfare agents.

Personnel

Military and civilian individuals with the abilities, skill level, and grades required to operate, maintain, and support a system in peacetime and wartime. It refers to the Army's ability to provide qualified people of specific aptitudes, experience, and other human characteristics needed to use, operate, maintain, and support Army systems or items. It requires a detailed assessment of the aptitudes that soldiers must possess in order to complete training and to use, to operate, and/or to maintain the system successfully.

Pico

A prefix that divides a basic unit by one trillion.

Population

A group of items/persons/animals belonging to a well-defined class from which items/persons/animals are taken for measurement.

Potency

The degree to which an agent can cause strong or toxic effects.

Preliminary Hazard Analysis (PHA)

The initial effort in hazard analysis during the system design phase or the programming and requirements development phase for facilities acquisition. It may also be used on an operational system for the initial examination of the state of safety. The purpose of the PHA is not to affect control of all risks but is to fully recognize the hazardous states with all of the accompanying system applications.

Preliminary Hazards List (PHL)

This list provides the MATDEV with a list of hazards that may require special safety design emphasis or hazardous areas where in-depth analyses need to be done. The MATDEV may use the results of the PHL to determine the scope of follow-on hazard analyses.

Pressor

Tending to increase blood pressure.

Prevalence

The total number of cases of a disease existing in a population at a certain time in a designated area.

Prodrome

A premonitory symptom or precursor; a symptom indicating the onset of a disease.

Prodromal Effects

The forewarning symptoms of more serious health effects.

Properties

The characteristics by which a substance may be identified. Physical properties describe its state of matter, color, odor, and density; chemical properties describe its behavior in reaction with other materials.

Pulmonary

Pertaining to the lungs.

Quarter

A period of time equal to one-fourth of the year observed by the licensee (approximately 13 consecutive weeks), providing that the beginning of the first quarter in a year coincides with the starting date of the year and that no day is omitted or duplicated in consecutive quarters

Range

The difference between the largest and smallest values in a collection of measurements.

Readiness

Phase of preparations to deal with an accident or incident.

Reaction

Any process involving a chemical or nuclear change.

Reconstruction

Rebuilding and replacing destroyed structures and utilities to approximate the pre-disaster condition.

Recovery Phase

a. The period following the response when immediate threat to human life has passed and general evacuation has ceased. This phase includes—

(1) Recovery: Recovery decontamination refers to the actions taken to restore an affected area to its pre-emergency condition. Thus, it refers to the process of reducing exposure rates and

concentrations in the environment to acceptable levels for unconditional occupancy or use after the emergency phase of an accident or incident. Recovery differs from reentry in that recovery encompasses the efforts and resources needed to return the affected area to its pre-accident condition. Recovery includes both short- and long-term activities. Short-term recovery returns vital systems to minimum operating standards, seeks to restore critical services to the community, and provides for the basic needs of the public. Long-term recovery focuses on restoring the community to its normal, or improved state of affairs and on returning life to normal or improved levels. The recovery period is also an opportune time to institute mitigation measures, particularly those related to the recent emergency.

(2) Reentry: Reentry deals with persons entering an affected (i.e., contaminated or potentially contaminated) area following a release. The terms controlled reentry, restricted reentry, occupational reentry, and emergency reentry refer to the temporary, short-term readmission of persons (primarily emergency workers) into a restricted zone for the purpose of performing specific tasks (such as monitoring teams). The terms uncontrolled reentry, unrestricted reentry, and general reentry are used in the context of uncontrolled, permanent re-access referring to those provisions leading up to unlimited public access, reoccupation, or use of previously restricted zones after the hazards have been reduced to acceptable levels or have been declared "clean."

(3) Restoration: Removal and decontamination of all NBC agents, removal of any rubble, and emergency repair of structures and facilities. The culmination of these activities is reestablishment of major utilities and services and the return of social and economic activities to near-normal levels. The terms *recovery* and *restoration* have been used in combination to refer to the entire group of activities undertaken to prepare a previously contaminated and restricted area for unlimited reoccupation and/or use by the public.

Reference Concentration (RfC)

An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily inhalation exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime.

Reference Dose (RfD)

The toxicity value for evaluating non-carcinogenic effects resulting from exposure at Superfund sites. See specific entries for chronic reference dose, subchronic reference dose, and developmental reference dose. The acronym RfD, when used without other modifiers, either refers generically to all types of reference dose or specifically to chronic reference dose; it never refers specifically to subchronic or developmental RfD.

Reference Man

A hypothetical aggregation of human physical and physiological characteristics arrived at by international consensus. These characteristics may be used by researchers and public health workers to standardize results of experiments and to relate biological insult to a common base.

Relocation

Temporary or permanent removal of a population or community in response to an emergency or disaster. A protective action in which persons are asked to vacate a contaminated area to avoid chronic exposure from deposited contamination.

Reproductive Death

The loss of the ability to reproduce. Reproductive death may cause irreversible organ damage.

Reproductive Effects

A toxic effect of a substance that is evident in the second or third generation of exposed grandparents.

Residual Hazards

Hazards that are not eliminated by design.

Residual Risk

The probability or likelihood of injury resulting from the actual use of a substance in the quantity and manner proposed once all recommendations to eliminate or minimize the hazard have been implemented.

Restricted Area or Zone

Any region with controlled access from which the population has been evacuated or relocated; any area to which access is controlled for the protection of individuals from exposure to contamination from NBC agents.

Retained Quantity

The quantity of a deposited material in a compartment, in an organ, or in the whole body at a given time after intake, deposition, or uptake.

Retention Function

A function describing the time dependence of the retained quantity.

Return

Refers to the reoccupation of areas cleared for unrestricted residence or use by previously evacuated populations. It includes what was termed "resettlement" in earlier draft USEPA guidance.

RfD_s

Subchronic Reference Dose. An estimate (with certainty spanning perhaps an order of magnitude or greater) of a daily exposure level for the human population (including sensitive populations) that is likely to be without an appreciable risk of deleterious effects during a portion of a lifetime.

Risk

The probability or likelihood of an adverse effect or event (e.g., injury, disease, or death)

resulting from the actual use of a substance in the quantity and manner proposed. It is the product of—

- a. The probability that an adverse effect or event will occur under specific circumstances of exposure.
- b. The probability that those specific circumstances of exposure will be realized. In quantitative terms, risk is expressed in values ranging from zero (representing the certainty that harm will not occur) to one (representing the certainty that harm will occur).

Risk Assessment

The scientific process of evaluating the toxic properties of a chemical and the conditions of human exposure to it, in order to both ascertain the likelihood that exposed humans will be adversely affected, and to characterize the nature of the effects they may experience. It may contain some or all of the following four steps—

- a. Hazard Identification: The determination of whether a particular chemical is or is not causally linked to particular health effect(s).
- b. Dose-Response Assessment: The determination of the relation between the magnitude of exposure and the probability of occurrence of the health effects in question.
- c. Exposure Assessment: The determination of the extent of human exposure.
- d. Risk Characterization: The description of the nature and often the magnitude of human risk, including attendant uncertainty.

Risk Assessment Code (RAC)

A code used to quantify risk to personnel operating or maintaining the system or conducting an operation. The RACs show the adverse health effect or possible loss of bodily systems described in categories of hazard severity and hazard probability. The RAC is assigned based on the failure to implement the recommendations for eliminating or minimizing the hazard. It is an expression of the risk associated with a hazard that combines the hazard severity and accident probability into a single Arabic numeral as described in Army Regulation 385-10.

Risk Management

A decision-making process that entails consideration of political, social, economic, and engineering information with risk-assessment information to develop, analyze, and compare regulatory options and to select the appropriate regulatory response to a potential health risk.

RNA (Ribonucleic Acid)

RNA consists of five-carbon sugar (ribose), phosphate, and four nitrogenous bases (adenine, guanine, cytosine, and uracil). In an RNA molecule, the sugar and phosphate combine to form a structure to which the nitrogenous bases are attached. These molecules range in composition from fewer than 100 to several thousand nitrogenous bases, and vary in shape from helical to

uncoiled. RNA is the primary agent of protein formation, and processes genetic information from DNA molecules into enzymes necessary for life.

Safety

The opposite of risk. It is the probability that harm will not occur under specified conditions.

Sample Data Collection

A method for obtaining information on the performance and maintainability of equipment. Data are obtained directly from observations made in the field. An effort is made to see that the sample form from which feedback is obtained represents the total population.

Sanitary Sewerage

A system of public sewers for carrying off waste water and refuse, but excluding sewage treatment facilities, septic tanks, and leach fields owned or operated by the licensee.

Sepsis

The presence of pathogenic microorganisms (bacteria) or their toxins in the blood or other tissues.

Severity

The degree to which an effect changes and impairs the functional capacity of an organ system.

Shock

An upset in the body caused by inadequate amounts of blood circulating in the bloodstream. It manifests itself by a drop in blood pressure, rapid weak pulse, pale moist clammy skin, marked thirst, and a state of great anxiety. Shock can be caused by marked blood loss, overwhelming infection, severe injury to tissues, emotional factors, etc.

Short-Term Exposure

Multiple or continuous exposures occurring over a week or so.

Short-Term Public Emergency Guidance Level (SPEGL)

A suitable concentration of a substance in air (as a gas, vapor, or aerosol) for unpredicted, single, short-term, emergency exposure of the general public.

Site Closure and Stabilization

Those actions that are taken upon completion of operations that prepare the disposal site for custodial care and assure that the disposal site will remain stable and will not need ongoing active maintenance.

Skin Permeability

The rate at which the skin absorbs a liquid; expressed as a coefficient. The lower a substance's coefficient, the greater the rate of absorption.

Symptom

Information related by an individual about himself/herself that may indicate illness or injury. Signs or observations are made about an individual or an animal that may indicate illness or injury.

Syndrome

A set of symptoms that occur together.

Synergistic

Acting together to enhance the effect of another force or agent

System MANPRINT Management Plan (SMMP)

It is a planning and management tool that outlines and documents the Human Systems Integration (HSI) management approach, associated decisions and planning efforts, user concerns, and resolution of MANPRINT issues during system development and acquisition process. Identifying and documenting these issues early in the system acquisition process increases the probability of their resolution, thereby enhancing total system performance, affordability, supportability, and conservation of the Army resources.

Systemic

Spread throughout the body, affecting all body systems and organs, not localized in one spot or area.

Systemic Effects

Results that require absorption and distribution of the toxicant to a site distant from its portal of entry, at which point effects are produced. Most chemicals that produce systemic toxicity do not cause a similar degree of toxicity in all organs, but usually demonstrate major toxicity to one or two organs. These are referred to as target organs of toxicity for that chemical.

Systemic Toxicity

See Systemic Effects.

t

time.

Terrorism

Terrorism is the use or threatened use of force designed to achieve political or social objectives. It is the premeditated, deliberate, systematic murder, mayhem, and threatening of uninvolved people to create fear and intimidation. To protect against terrorism, individuals should—

a. Be alert and learn where emergency exits are located. Think ahead about how to evacuate a building, subway, or congested public area in a hurry. Learn where staircases are located.

b. Take precautions when traveling. Be aware of conspicuous or unusual behavior. Do not leave luggage unattended. Do not accept packages from strangers.

c. Learn about the different types of terrorist weapons including explosives, kidnappings, hijackings, biological agents, arson, and shootings.

<http://www.whitehouse.gov/homeland/>

Threshold

The lowest dose or exposure at which a specified effect begins to be produced.

Threshold, Th₅₀

The vapor dosage producing the defined threshold (low-level) response in 50 percent of the given population. Within the context of this Glossary, the route of exposure can be either inhalation or percutaneous. (Note that percutaneous vapor effects can also include direct vapor effects upon the eyes.)

Threshold Dose

The smallest amount of toxic substance that can produce the first recognizable injuries (e.g., irritation of skin, eyes, or nose; miosis).

Threshold Limit Value (TLV)

A value that refers to airborne concentrations of substances and represents conditions under which it is believed nearly all workers may be repeatedly exposed day after day, without adverse health. A table of these values and accompanying precautions is published annually by the ACGIH.

Threshold Limit Value Categories—

a. Threshold Limit Value- Time-Weighted Average (TLV-TWA): The TWA concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

b. Threshold Limit Value- Short-Term Exposure Limit (TLV-STEL): The concentration to which workers can be exposed continuously for a short period of time without suffering from: (1) irritation, (2) chronic or irreversible tissue damage, or (3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue, or materially reduce work efficiency, provided that the daily TLV-TWA is not exceeded. It is not a separate independent exposure limit; rather, it supplements the time-weighted average limit where there are recognized acute effects from a substance whose toxic effects are primarily of a chronic nature. Exposures up to the STEL should not be longer than 15 minutes and should not occur more than four times per day.

c. Threshold Limit Value - Ceiling (TLV-C): The concentration that should not be exceeded during any part of the working exposure.

Time-Weighted Average (TWA) Concentration

The concentration of airborne contaminants that have been weighted for the time duration, usually eight hours. A sufficient number of samples are needed to determine a time-weighted average concentration throughout a complete cycle of operations or through the work shift.

Time-Weighted Average Exposure

An average over a given (working) period of an individual's exposure, as determined by sampling at given times during the period.

Total Parenteral Nutrition

By injection through some route other than the canal providing sustenance or nourishment.

Toxic

Harmful to living organisms; poisonous.

Toxic Dose

The dose of a substance needed to produce a defined toxic effect in 100 percent of the exposed population.

Toxic Dose, TD₅₀

The dose of a substance needed to produce a defined toxic effect in 50 percent of the exposed population. It is an infrequently used term, equivalent to ED₅₀ where "toxicity" is the measured "effect."

Toxic Substances

A substance that destroys life or injures health when introduced into or absorbed by a living organism.

Toxicity

The capacity of a substance to induce injury. It describes the nature, degree, and extent of undesirable effects.

Training Device

Any three-dimensional object developed, fabricated, or procured specifically for improving the learning process.

Tumor

A swelling or enlargement due to pathogenic overgrowth of tissue.

Uncertainty Factor (UF)

One of several, generally 10-fold, factors used in operationally deriving a standard or a reference dose from experimental data. UFs are intended to account for—

- a. The variation in sensitivity among the members of the human population.

- b. The uncertainty in extrapolating animal data to the case of humans.
- c. The uncertainty in extrapolating from data obtained in a study involving less-than-lifetime exposure.
- d. The uncertainty in using lowest-observed adverse effect level data rather than NOAEL data.
- e. The inability of any single study to address adequately all possible adverse outcomes in man.

Uptake

Quantity of material taken up into the extra-cellular fluids. It is usually expressed as a fraction of the deposition in the organ from which uptake occurs.

U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID)

The Department of Defense's lead laboratory for medical aspects of biological warfare defense. It conducts research to develop vaccines, drugs, and diagnostics for laboratory and field use. USAMRIID also formulates strategies, information, procedures, and training programs for medical defense against biological threats. It is Located in Fort Detrick, MD.

<http://www.usamriid.army.mil>

U.S. Environmental Protection Agency (USEPA)

The mission of the USEPA is to protect human health and to safeguard the natural environment. The USEPA implements the Federal laws designed to promote public health by protecting our nation's air, water, and soil from harmful pollution and endeavors to accomplish its mission systematically by proper integration of a variety of research, monitoring, standard-setting, and enforcement activities.

<http://www.epa.gov/>

Vapor

The gaseous form of substances that is normally in the solid or liquid state; it can be changed to this state by increasing the pressure or decreasing the temperature. These vapors will diffuse.

Vaporization

Change of a substance from a liquid into a gas.

Ventilation

One of the principal methods to control health hazards; it may be defined as "causing fresh air to circulate to replace foul air simultaneously removed."

Ventilation, Dilution

Airflow designed to dilute contaminants to acceptable levels.

Ventilation, Mechanical

Air movement caused by a fan or other air-moving device.

Ventilation, Natural

Air movement caused by wind, temperature difference, or other non-mechanical factors.

Virus

Any of various submicroscopic pathogens consisting essentially of a core of a single nucleic acid surrounded by a protein coat, having the ability to replicate only inside a living cell.

Weapons of Mass Destruction (WMD)

This term means any destructive device to include—

- a. Any explosive, incendiary, or poison gas.
- b. Bomb.
- c. Grenade.
- d. Rocket having a propellant charge of more than four ounces.
- e. Missile having an explosive or incendiary charge of more than one-quarter ounce.
- g. Mine.
- h. Any type of weapon (excluding a shotgun or a shotgun shell used for sporting purposes) that can be readily converted to, expel a projectile by the action of an explosive or other propellant, and which has any barrel with a bore of more than one-half inch in diameter.
- i. Any combination of parts either designed or intended for use in converting any device into any destructive device described above, above from which a destructive may be readily assembled.
- j. Any weapon that is designed or intended to cause death or serious bodily injury through the release, dissemination, or impact of toxic or poisonous chemicals or their precursors.
- k. Any weapon involving a disease or organism.
- l. Any weapon that is designed to release radiation or radioactivity at a level dangerous to human life.

Well Bore

A drilled hole in which wire line service operations or subsurface tracer studies are performed.

Wire Line

A cable containing one or more electrical conductors which is used to lower and raise logging tools in the well bore.

Wire Line Service Operation

Any evaluation or mechanical service that is performed in the well bore using devices on a wire line.

Section 3 – Nuclear Terms

Ablation

The functional destruction of an organ through surgery or exposure to large doses of radiation.

Absorbed Dose

The energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and the gray.

Absorber

Any material that absorbs or lessens the intensity of ionizing radiation. Neutron absorbers (like boron, hafnium, and cadmium) are used in control rods for reactors. Concrete and steel absorb gamma rays and neutrons in reactor shields. A thin sheet of paper or metal will absorb or weaken alpha particles and all except the most energetic beta particles. (See Shielding.)

Absorption

The process by which the number of particles or photons entering a body of matter is reduced or attenuated by interaction with the matter.

Accident Response Group

A group of technical and scientific experts composed of U.S. Department of Energy personnel assigned responsibility for providing assistance to peacetime accidents and significant incidents involving nuclear materials anywhere in the world.

Activation

The process of making a material radioactive by bombardment with neutrons, protons, or other nuclear radiation. (See Induced Radioactivity.)

Activity

The rate of disintegration (transformation) or decay of radioactive material. The units of activity are the curie (Ci) and the becquerel (Bq).

Activity Median Aerodynamic Diameter

The diameter of a unit density sphere with the same terminal settling velocity in air as that of the aerosol particle whose activity is the median for the entire aerosol.

Acute Radiation Exposure

The absorption of a relatively large amount of radiation (or intake of radioactive material) over a short period of time.

Acute Radiation Health Effects

Prompt radiation effects (those that would be observable within a short period of time) for which the severity of the effect varies with the dose, and for which a practical threshold exists.

Acute Radiation Syndrome

The combination of clinical syndromes occurring during a period of hours to weeks after an exposure.

Added Filtration

Any filtration that is in addition to the inherent filtration.

Afterwind

Wind currents that are created near a nuclear explosion by the updraft accompanying the rise of the fireball and that travel toward the blast.

Airborne Radioactive Material

Radioactive material dispersed in the air in the form of dusts, fumes, particulates, mists, vapors, or gases.

Airborne Radioactivity Area

A room, enclosure, or area in which airborne radioactive materials exist in concentrations—

- a. In excess of the specified derived air concentrations.
- b. To such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake or 12 derived air concentration hours.

Air Burst

The explosion of a nuclear weapon at such a height that the expanding fireball does not contact the Earth's surface.

Alpha Particle

A positively charged particle ejected spontaneously from the nuclei of some radioactive elements. It is identical to a helium nucleus that has a mass number of 4 and an electrostatic charge of +2.

Aluminum Equivalent

The thickness of type 1100 aluminum alloy (the nominal chemical composition of type 1100 aluminum is 99.00 percent minimum aluminum, 0.12 percent copper) affording the same attenuation, under specified conditions, as the material in question.

Analytical X-Ray Equipment

Equipment used for x-ray diffraction or fluorescence analysis.

Analytical X-Ray System

A group of components utilizing x or gamma rays to determine the elemental composition or to examine the microstructure of materials.

Anion

Negatively charged ion. (See Ionization.)

Annual Limit on Intake (ALI)

The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. The ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 5 rems (0.05 Seivert (Sv)) or a committed dose equivalent of 50 rems (0.5 Sv) to any individual organ or tissue.

Anti-contamination Clothing

Clothing consisting of coveralls, shoe covers, gloves, and hood or hair cap. This clothing provides protection for the user from alpha radiation, and is also a control device to prevent the spread of contamination.

Armed

The configuration of a nuclear weapon which a single signal initiates the action for a nuclear detonation.

Armed Forces Radiobiology Research Institute

This organization provides support to commanders during the response to a nuclear accident or radiological incident. They provide functional area experts in the field of health physics, radiation medicine, and site remediation.

<http://www.afrii.usuhs.mil>

Arming System

As applied to weapons and ammunition, the changing from a safe condition to a state of readiness for initiation.

As Low As is Reasonably Achievable (ALARA)

Making every reasonable effort to maintain exposures to radiation as far below the dose limits as is practical and consistent with the purpose for which the licensed activity is undertaken. It must be taken into consideration the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest.

Atmospheric Release Advisory Capability

A centralized computer-based system that provides estimates of the transport, diffusion, and deposition of radioactive or other hazardous material released to the atmosphere and dose projection to people and the environment.

Atom

The smallest particle of an element that cannot be divided or broken up by chemical means. It

consists of a central core called the nucleus, which contains protons and neutrons. Electrons revolve in orbits in the region surrounding the nucleus.

Atomic Energy

Energy released in nuclear reactions. Of particular interest is the energy released when a neutron initiates the breaking up or fissioning of an atom's nucleus into smaller pieces (fission), or when two nuclei are joined together under millions of degrees of heat (fusion). It is more correctly called "nuclear energy."

Atomic Number

The number of positively charged protons in the nucleus of an atom and the number of electrons on an electrically neutral atom.

Atomic Weight

The number of nucleons (neutrons or protons) in the nucleus of an atom. (See Mass Number.)

Attenuation

The process by which a beam of radiation is reduced in intensity when passing through some material. It is the combination of absorption and scattering processes and leads to a decrease in flux density of the beam when projected through matter.

Attenuation Coefficient

Of a substance, for a parallel beam of specified radiation: the quantity μ in the expression μdx for the fraction removed by attenuation in passing through a thin layer of thickness dx of that substance. It is a function of the energy of the radiation. As dx is expressed in terms of length, mass per unit area, moles or atoms per unit area, μ is called the linear, mass, molar, or atomic attenuation coefficient respectively.

Back End

The series of steps after fuel is burned in the reactor, including the handling of discharged fuel elements from the reactor, chemical reprocessing, recycling of recovered fissile and fertile material, and radioactive waste disposal.

Background Radiation

Radiation from cosmic sources; naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material) and global fallout as it exists in the environment from the testing of nuclear explosive devices. Background radiation does not include radiation from source, byproduct, or special nuclear materials.

Beam Limiting Device

A device that provides a means to restrict the dimensions of the x-ray field.

Beryllium

A low-density, gray metal used in many industries because of its high permeability to x-rays, light weight, and high tensile strength. It is also used in aerospace structures and inertial

guidance systems. It is highly toxic; death may result from ingestion of very low concentrations of the element and its salts. Beryllium compounds can enter the body through inhalation of the dusts and fumes, and they may act locally on the skin.

Beta Gauge

An industrial device that uses beta radiation for measuring thickness or density of materials.

Beta Particle, Radiation

A charged particle emitted from a nucleus during radioactive decay, with a mass equal to 1/1837 that of a photon. A negatively charged beta particle is identical to an electron. A positively charged beta particle is called a positron. Large amounts of beta radiation may cause skin burns, and beta emitters are harmful if they enter the body. Beta particles are easily stopped by a thin sheet of metal or plastic.

Becquerel (Bq)

A unit, in the International System of Units, of measurement of radioactivity equal to one transformation per second.

Binding Energy

The minimum energy required separating a nucleus into its component neutrons and photons.

Bioassay

The determination of kinds, quantities or concentrations, and, in some cases, the locations of radioactive material in the human body, whether by direct measurement (in-vivo counting) or by analysis and evaluation of materials excreted or removed from the human body (radiobioassay).

Biological Half-Life

The time required for a biological system, such as that of a human, to eliminate by natural processes half the amount of a substance (such as a radioactive material) that has entered it.

Biological Shield

A mass of absorbing material placed around a reactor or radioactive source to reduce the radiation to a level safe for humans.

Blast Wave

A pulse of air in which the pressure increases sharply at the front propagated by the explosion.

“Blue Glow”

The characteristic blue light emitted by very high-energy particle interaction with matter. It is usually only visible in the vicinity of very intense radiation such as a reactor core or spent fuel pools.

Body Burden

The amount of radioactive material that if deposited in the total body will produce the maximum permissible dose rate to the body organ considered the critical organ.

Bone Seeker

A radioisotope that tends to accumulate in the bones when it is introduced into the body. An example is strontium-90, which behaves chemically like calcium.

Brachytherapy

A method of radiation therapy in which sealed sources are utilized to deliver a radiation dose at a distance of up to a few centimeters, by surface, intracavitary, or interstitial application.

Breeder, Breeder Reactor

A reactor which produces more fissile nuclei than are consumed. The fissile material is produced both in the reactor's core and when neutrons are captured in fertile material placed around the core.

Bremstrahlung

The process by which a beta particle emits an x-ray photon during its interaction with an atomic nucleus.

Buildup Factor

In the passage of radiation through a medium, the ratio of the total value of a specified radiation quantity at any point to the contribution to that value from radiation reaching the point through the medium without having undergone a collision.

Buildup Factor, Energy Absorption, B_A

A photon buildup factor in which the quantity of interest is the absorbed or deposited energy in the shield medium. The energy response function is that of absorption in the material.

Buildup Factor, Exposure B_D

A photon buildup factor in which the quantity of interest is exposure. The energy response function is that of absorption in air.

Byproduct Material

- a. Any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or utilizing special nuclear material.
- b. The tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes. Underground bodies depleted by these solution extraction operations do not constitute byproduct material within this definition.

Cadmium

A metal with a very high absorption factor for neutrons in a certain energy range. It is used in detectors to separate thermal neutrons from fast neutrons, and for control rods and neutron shielding.

Cation

A positively charged ion. (See Ionization.)

Centrifuge

A machine using centrifugal force that can be used for isotope enrichment or uranium.

Cephalometric Device

A device intended for the radiographic visualization and measurement of the dimensions of the human head.

Chain Reaction

A response that stimulates its own repetition. In a fission chain reaction, a fissionable nucleus absorbs a neutron and fissions, releasing additional neutrons. These in turn can be absorbed by other fissionable nuclei, releasing still more neutrons. A fission chain reaction is self-sustaining when the number of neutrons released in a given time equals or exceeds the number of neutrons lost by absorption in non-fissionable material or by escape from the system.

Charged Particle

An ion. An elementary particle carrying a positive or negative electric charge.

Chemical Recombination

Following an ionization event, the positively and negatively charged ion pairs may or may not realign themselves to form the same chemical substance they formed before ionization. Thus, chemical recombination could change the chemical composition of the material bombarded by radiation.

China Syndrome

A phrase referring to the possibility of a core reassembling into a critical mass after meltdown, and burning its way downward through the earth to China.

Chronic Exposure

The absorption of radiation (or intake of radioactive materials over a long period of time, i.e., over a lifetime).

Class (Lung Class or Inhalation Class)

A classification scheme for inhaled material according to its rate of clearance from the pulmonary region of the lung. Materials are classified as D, W, or Y, which applies to a range of clearance half-times; for Class D (Days) of less than 10 days, for Class W (Weeks) from 10 to 100 days, and for Class Y (Years) of greater than 100 days.

Cleanup System

Components used for continuously filtering and demineralizing the reactor coolant system to reduce contamination levels and minimize corrosion.

Cloudshine

Gamma radiation from radioactive materials in an airborne plume.

Cobalt

A gray, hard, magnetic, ductile, and somewhat malleable metal. It is relative rare and generally obtained as a byproduct of other metals such as copper.

Cold Neutrons

Neutrons in thermal equilibrium with an environment cooled well below 20 degrees Celsius typically at 20-50° Kelvin.

Collective Dose

The sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation.

Command Disable

A subsystem of command and control features that destroy a weapon's ability to produce nuclear yield.

Committed Dose Equivalent ($H_{T, 50}$)

The dose equivalent to organs or tissues of reference that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

Committed Effective Dose

See Committed Effective Dose Equivalent.

Committed Effective Dose Equivalent ($H_{E, 50}$)

The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues—

$$(H_{E, 50} = \sum W_T H_{T, 50})$$

Contamination, Radioactive

The deposition of unwanted radioactive material on the surfaces of structures, areas, objects, or personnel.

Contamination Control

Procedures to avoid, reduce, remove, or render harmless, temporarily or permanently, nuclear, biological, chemical agent and hazardous materials contamination.

Containment Building

A structure made of steel-reinforced concrete that houses the nuclear reactor. It is designed to protect the reactor from external hazards and to prevent the escape of radioactive material into the environment.

Containment Vessel

A gas-tight shell or other enclosure around a nuclear reactor.

Coordinating Committee (COCOM)

This group grew out of the NATO's Cold War efforts to restrict militarily useful trade to the Soviet Union. Belgium, Canada, Denmark, France, the United Kingdom, Italy, Luxembourg, The Netherlands, Norway, Portugal, and the United States founded COCOM. Since its inception, COCOM has worked to control technology rather than products.

Correction Factor, Shield Tissue Interface

A correction factor to be applied to the basic infinite-medium exposure buildup factor to correct for the scattering in a tissue phantom after emerging from a shield.

Cosmic Radiation

Penetrating ionizing radiation, both particulate and electromagnetic, originating in space. Secondary cosmic rays, formed by interactions in the earth's atmosphere, account for about 45 to 50 millirem annually.

Count Rate

The number of particles of a given type or radiation counted per second.

Counter

A general designation applied to radiation detection instruments or survey meters that detect and measure radiation. The signal that announces an ionization event is called a count.

Critical Mass

The smallest mass of fissionable material that will support a self-sustaining chain reaction.

Critical Organ

The body organ receiving a radionuclide or radiation dose that results in the greatest overall damage to the body.

Criticality

A term used in reactor physics to describe the state when the number of neutrons released by fission is exactly balanced by the neutrons being absorbed (by the fuel and poisons) and escaping the reactor core. A reactor is said to be "critical" when it achieves a self-sustaining nuclear chain reaction.

Cumulative Dose

The total dose resulting from repeated exposures of radiation to the same region, or to the whole body, over a period of time.

Curie (Ci)

The basic unit used to describe the intensity of radioactivity in a sample of material. The Ci is equal to 37 billion disintegrations per second, which is approximately the rate of decay of 1 g of

radium. A Ci is also a quantity of any radionuclide that decays at a rate of 37 billion disintegrations per second.

Daughter Products/Progeny

Isotopes that are formed by the radioactive decay of some other isotope. In the case of radium-226, for example, there are 10 successive daughter products, ending in the stable isotope lead-206.

Decay

The decrease in the radiation intensity of any radioactive material with respect to time.

Decay Heat

The heat produced by the decay of radioactive fission products after the reactor has been shut down.

Decay, Radioactive

The decrease in the amount of any radioactive material with the passage of time, due to the spontaneous emission from the atomic nuclei of either alpha or beta particles, often accompanied by gamma radiation.

Decommission

The process of removing a nuclear facility from service by a reduction of residual radioactivity to a level that permits the release of the property for unrestricted use or maintenance under protection for reasons of public health and safety.

Decontamination, Radioactive

The reduction or removal of contaminating radioactive material from a structure, area, object, or person. Decontamination may be accomplished by—

- a. Treating the surface to remove or decrease the contamination.
- b. Letting the material stand so that the radioactivity is decreased as a result of nature decay.
- c. Covering the contamination to shield or attenuate the radiation emitted.

Deep-Dose Equivalent (H_d)

Which applies to external whole-body exposure, is the dose equivalent at a tissue depth of 1 centimeter (cm) (1000 mg/m^3).

Delayed Fallout

Radioactive fallout that returns to Earth later than 24 hours after a nuclear detonation.

Delayed Health Effects

The results of radiation that are manifested long after the relevant exposure. The vast majority is

stochastic, that is, the severity is independent of dose and the probability is assumed to be proportional to the dose, without threshold.

Demilitarization

The process of eliminating or reducing military weapons, materials, or other hardware and organizational structures.

Depleted Uranium

Uranium having a percentage of uranium-235 smaller than the 0.7 percent found in natural uranium. It is obtained from spent (used) fuel elements or as by-product tails, or residues, from uranium isotope separation.

Derived Air Concentration

The concentration of a given radionuclide in air which, if breathed, by the reference man for a working year of 2,000 hours under conditions of light work (inhalation rate 1.2 m^3 of air per hour), results in an intake of one ALI.

Derived Air Concentration-Hour (DAC-Hour)

The product of the concentration of radioactive material in air (expressed as a fraction or multiple of the derived air concentration for each radionuclide) and the time of exposure to that radionuclide, in hours. A licensee may take 2,000 derived air concentration-hours to represent one ALI equivalent to a committed effective dose equivalent of 5 rems (0.05 Sv).

Derived Response Level (DRL)

The amount of radioactivity in an environmental medium that would be expected to produce a dose equal to its corresponding Protective Action Guide.

Detector

A material or device that is sensitive to radiation and can produce a response signal suitable for measurement or analysis. A radiation detection instrument.

Deterministic Effect

A result that occurs after a certain dose threshold, with the severity of the effect determined by the dose.

Detonation

An explosion.

Detonator

A device containing a sensitive explosive intended to produce a detonation wave for setting off a high explosive element.

Deuterium

An isotope of hydrogen with one proton and one neutron in the nucleus. (See Heavy Water.)

Deuteron

The nucleus of deuterium. It contains one proton and one neutron.

Disassembly

The process of taking apart a nuclear warhead and removing the subassemblies, components, and individual parts.

Disintegration

See Decay, Radioactive.

Doppler Coefficient

See Fuel Temperature Coefficient of Reactivity.

Dose or Radiation Dose

A generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent.

Dose Conversion Factor

Any factor that is used to change an environmental measurement to dose in the units of concern. Frequently used as the factor that expresses the committed effective dose equivalent to a person from the intake (inhalation or ingestion) of a unit activity of a given radionuclide.

Dose Equivalent (H_T)

The product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and Sv. The ICRP defines this as the equivalent dose.

Dose Rate

The radiation dose delivered per unit of time. Measured, for example, in rem per hour.

Dosimeter

A portable instrument for measuring and registering the total accumulated exposure to ionizing radiation.

Dosimetry

The theory and application of the principles and techniques involved in the measurement and recording of radiation doses. Its practical aspect is concerned with the use of various types of radiation instruments with which measurements are made. (See Film Badge.)

Dosimetry Processor

An individual or an organization that processes and evaluates individual monitoring equipment in order to determine the radiation dose delivered to the equipment.

Dynamic Pressure

Air pressure that results from the wind behind the shock front of a blast wave.

Early Fallout

Radioactive debris that returns to the Earth within 24 hours after a nuclear detonation; local fallout.

Effective Dose Equivalent (H_E)

The sum of the products of the dose equivalent to the organ or tissue (H_T) and the weighting factors (W_T) applicable to each of the body organs or tissues that are irradiated ($H_E = \sum W_T H_T$). The ICRP defines this as the effective dose.

Effective Half-Life

The time required for the amount of a radioactive element deposited in a living organism to be diminished 50 percent as a result of the combined action of radioactive decay and biological elimination. (See Biological Half-Life.)

Electromagnetic Pulse

A sharp pulse of radio-frequency electromagnetic radiation is produced when a nuclear explosion occurs in an unsymmetrical environment, especially at or near the earth's surface or at high altitudes.

Electromagnetic Radiation

A traveling wave motion resulting from changing electric or magnetic fields. Familiar electromagnetic radiation range from x rays (and gamma rays) of short wavelength, through the ultraviolet, visible, and infrared regions, to radar and radio waves of relatively long wavelength. All electromagnetic radiation travel in a vacuum with the velocity of light. (See Photon.)

Electron

An elementary particle with a unit negative charge and a mass 1/1837 that of the photon. Electrons surround the positively charged nucleus and determine the chemical properties of the atom.

Energy Absorption Coefficient

Of a substance, for a parallel beam of specified radiation: the quantity μ_{en} in the expression $\mu_{en} dx$ for the fraction removed by attenuation in passing through a thin layer of thickness dx of that substance. It is a function of energy of the radiation. As dx is expressed in terms of length, mass per unit area, moles per unit area, or atoms per unit area, μ_{en} is called the linear, mass, molar, or atomic energy absorption coefficient. NOTE: It is that part of the attenuation coefficient resulting from energy absorption only, and is equal to the product of the energy transfer coefficient and $1-g$, where g is the fraction of the energy of secondary charged particles that is lost to bremsstrahlung in the material.

Energy Reorganization Act (Public Law 93-438, 93rd Congress, H.R. 11510, October 11, 1974)

An act to reorganize and consolidate certain functions of the Federal Government in a new Energy Research and Development Administration and in a new Nuclear Regulatory

Commission (NRC) in order to promote more efficient management of such functions.
(<http://www-acala1.ria.army.mil/LC/R/RS/act.htm>)

Enrichment

See Isotopic Enrichment.

Exposure

A measure of the ionization produced in air by x or gamma radiation; the sum of electric charges on all ions of one sign produced in air when all electrons liberated by photons in a volume of air are completely stopped in air, divided by the mass of the air in the volume; a unit of exposure in air is the roentgen (R), or coulomb per kg (International System of Units).

Eye Dose Equivalent

Applies to the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 cm (300 mg/m³).

Fallout

The process or phenomenon of the descent to the Earth's surface of particles contaminated with radioactive material from the radioactive cloud produced by a nuclear detonation.

Fast Breeder Reactor

This reactor is fueled by a mixture of plutonium and natural uranium oxides and relies on the nuclear fission of the two atoms in an intense flux of high energy neutrons produced in a highly compact core without any moderator.

Fast Fission

Fission of a heavy atom (such as uranium-238) when it absorbs a high-energy (fast) neutron. Most fissionable materials need thermal (slow) neutrons in order to fission.

Fast Neutron

A neutron with kinetic energy greater than its surroundings released during fission.

Federal Radiological Emergency Response Plan

The Federal plan to assist state and local government officials or other Federal agencies in the response to a radiological emergency in the U.S., its possessions and territories.

<http://www.fema.gov/pte/rep/352-22.htm>

Federal Radiological Monitoring and Assessment Center

A Center established near the scene of a radiological emergency responsible for off-site radiological response from which the Center Director conducts the response.

Federal Radiological Monitoring and Assessment Plan

A plan to provide coordinated radiological monitoring and assessment assistance to the state and local governments in response to radiological emergencies.

Fertile Material

A material, which is not itself fissile (fissionable by thermal neutrons) that can be converted into a fissile material by irradiation in a reactor. There are two basic fertile materials, uranium-238 and thorium-232. When these fertile materials capture neutrons, they are converted into fissile plutonium-239 and uranium-233, respectively.

Film Badge

A pack of photographic film used for approximate measurement of radiation exposure for personnel monitoring purposes. The badge may contain two or three films of differing sensitivity, and it may contain a filter that shields part of the film from certain types of radiation.

Fireball

Hot gases that form a luminous sphere after a nuclear explosion.

Fissile Material

Although sometimes used as a synonym for fissionable material, this term has acquired a more restricted meaning; namely, any material fissionable by thermal (slow) neutrons. The three primarily fissile materials are uranium-233, uranium-235, and plutonium-239.

Fission

The splitting of a nucleus into at least two other nuclei and the release of a relatively large amount of energy. Two or three neutrons are usually released during this type of transformation.

Fission Gases

Those fission products that exist in the gaseous state. Primarily the noble gases (e.g., krypton, xenon, etc.).

Fission Products

The nuclei (fission fragments) formed by the fission of heavy elements, plus the nuclides formed by the fission fragments' radioactive decay.

Fissionable Material

Commonly used as a synonym for fissile material, the meaning of this term has been extended to include material that can be fissioned by fast neutrons, such as uranium-238.

Flash Burn

A burn caused by excessive exposure of the skin to thermal radiation.

Fluence

The number of radioactive particles, neutrons, or photons per unit cross-sectional area.

Flux

A term applied to the amount of some type of radiation crossing a certain area per unit time. The unit of flux is the number of particles, energy, etc., per square centimeter per second.

Flux Density

The flux density at a point is the number of radioactive particles, neutrons, or photons passing per unit time, per unit area of the beam.

Fuel Cycle

The sequences of operations involved in supplying fuel for nuclear power generation, for irradiating the fuel in a nuclear reactor, and for handling and treating the fuel elements following discharge from the reactor.

Fuel Temperature Coefficient of Reactivity

The physical property of fuel pellet material (uranium-238) that causes the uranium to absorb more neutrons away from the fission process as fuel pellet temperature increases. This acts to stabilize power reactor operations. Also known as the Doppler Coefficient.

Fusion

A nuclear reaction characterized by joining together of light nuclei to form heavier nuclei, the energy for the reactions being provided by violent thermal agitation of particles at very high temperatures. If the colliding particles are properly chosen and the agitation is violent enough, there will be a release of energy from the reaction. The energy of the stars is derived from such reactions.

Gamma Ray

High-energy, short wavelength electromagnetic radiation (a packet of energy) emitted from the nucleus. Gamma radiation frequently accompanies alpha and beta emissions and always accompanies fission. Gamma rays are very penetrating and are best stopped or shielded against by dense materials, such as lead or uranium. Gamma rays are similar to x-rays but are usually more energetic.

Gamma Ray, Radiation

High-energy electromagnetic radiation emitted by nuclei during nuclear reactions or radioactive decay. These rays have high energy and a short-wave length.

Gamma Ray Camera

A device for transporting and handling intense gamma ray sources in the field for the purpose of gamma radiography. It consists of a heavily shielded container with a shutter and remote controls so that the source can be exposed without hazard to the operator.

Gamma Ray Detector

A detector designed to measure gamma rays rather than x-rays.

Gases

Normally formless fluids that completely fill the space and take the shape of their container.

Gaseous Diffusion

A method of isotopic separation based on the fact that gas atoms or molecules with different

masses will diffuse through a porous barrier (or membrane) at different rates. This method is used to separate uranium-235 from uranium-238; it requires large gaseous diffusion plants and enormous amounts of electric power.

Geiger-Mueller Counter

A radiation detection and measuring instrument. It consists of a gas-filled tube containing electrodes, between which there is an electrical voltage but no current flowing. When ionizing radiation passes through the tube, a short, intense pulse of current passes from the negative electrode to the positive electrode and is measured or counted. The number of pulses per second measures the intensity of radiation.

Gonad Shield

A protective barrier for the testes or ovaries.

Graphite

A form of carbon, similar to the lead used in pencils, used as a moderator in some nuclear reactors.

Gray (Gy)

The International System of Units of absorbed dose. One Gy is equal to an absorbed dose of 1 J kg^{-1} (100 rad).

Groundshine

Gamma radiation from radioactive materials deposited on the ground.

Half-Life

The time in which half the atoms of a particular radioactive substance disintegrate to another nuclear form. Measured half-lives vary from millionths of a second to billions of years.

Half-Life, Effective

The time required for a radionuclide contained in a biological system, such as a human or an animal, to reduce its activity by half as a combined result of radioactive decay and biological elimination.

Half-Thickness

The thickness of any given absorber that will reduce the intensity of a beam of radiation to one-half its initial value. (See Attenuation; Shielding.)

Half-Time, Biological (T_b)

The time in which half the quantity of a material in a component, in an organ, or in the whole body is eliminated by biological processes.

Half-Time, Effective (T_e)

The time taken for the activity of a radioactive material in a compartment, in an organ, or in the

whole body to be reduced to half its value by a combination of biological elimination and radioactive decay.

$$\frac{1}{T_e} = \frac{1}{T_b} + \frac{1}{T_R} \quad \text{or} \quad T_e = \frac{T_b \times T_R}{T_b + T_R}$$

Half-Time, Physical (T_R)

The time taken for the activity of a radionuclide to lose half its value by radioactive decay.

Health Physics

The science concerned with recognition, evaluation, and control of health hazards from ionizing and non-ionizing radiation.

Heat Exchanger

Any device that transfers heat from one fluid (liquid or gas) to another fluid or to the environment.

Heat Sink

Anything that absorbs heat; usually part of the environment, such as the air, a river or outer space.

Heavy Metal

The fuel materials, including uranium, plutonium, and thorium, with atomic numbers of 90 and above, used in nuclear reactors and nuclear weapons.

Heavy Water (D_2O)

Water containing significantly more than the natural proportions (1 in 6500) of heavy hydrogen (deuterium) atoms to ordinary hydrogen atoms. Heavy water is used as a moderator in some reactors because it slows down neutrons effectively and also has a low probability for absorption of neutrons.

Heavy Water Reactor

A nuclear reactor that uses heavy water as a moderator and/or coolant and natural uranium as fuel.

Hematopoietic

Pertaining to or effecting the formation of blood cells.

Hemorrhage

The escape of blood from the vessels.

High-Radiation Area

An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.1 rem (1 milli/Sv (m/Sv) in 1 hour at 30 cm from the radiation source or from any surface that the radiation penetrates.

Hot

A colloquial term meaning highly radioactive.

Hot Cells

Any type of shielded room with remote handling equipment for examining and processing radioactive materials.

Hot Line

The inner boundary of the contamination control station, marked with tape or line.

Hot Spot

The region in an NBC contamination area in which the level of contamination is noticeably greater than in neighboring regions in the area.

Hydrogen Bomb

A nuclear weapon that derives its energy largely from fusion; it is also known as thermo-nuclear weapon.

Hyperpyrexia

A highly elevated body temperature.

Image Intensifier

A device, installed in its housing, which instantaneously converts an x-ray pattern into a corresponding light image or higher energy density.

Image Receptor

Any device, such as a fluorescent screen or radiographic film, which transforms incident x-ray photons either into a visible image or into another form which can be made into a visible image by further transformations.

Individual Monitoring

- a. The assessment of dose equivalent by the use of devices designed to be worn by an individual.
- b. The assessment of committed effective dose equivalent by bioassay (see Bioassay) or by determination of the time-weighted air concentrations to which an individual has been exposed (i.e., derived air concentration-hours).
- c. The assessment of dose equivalent by the use of survey data.

Individual Monitoring Devices (Individual Monitoring Equipment)

Devices designed to be worn by a single individual for the assessment of dose equivalent such as film badges, thermoluminescent dosimeters, pocket ionization chambers, and personal (“lapel”) air sampling devices.

Induced Radioactivity

Radioactivity that is created when stable substances are bombarded by neutrons. For example, the stable isotope cobalt-59 becomes the radioactive isotope cobalt-60 under neutron bombardment.

Industrial Radiography

The examination of the macroscopic structure of materials by nondestructive methods using sources of ionizing radiation to produce radiographic images.

Ingestion Pathway

Route for internalization of radioactive contaminants; the pathway most accessible for decontamination.

Inhalation Pathway

The means by which a person at the accident area or downwind is subjected to respiratory radiation exposure.

Inherent Filtration

The filtration of the useful beam provided by the permanently installed components of the tube housing assembly.

Internal Dose

That portion of the dose equivalent received from radioactive material taken into the body.

International Commission on Radiological Protection (ICRP)

ICRP is an independent Registered Charity, established in 1928 in the United Kingdom, to advance for the public benefit the science of radiological protection, in particular by showing recommendations and guidance on all aspects of protection against ionizing radiation.

<http://www.icrp.net/>

Ion

An atom that has too many or too few electrons, causing it to be chemically active; an electron that is not associated (in orbit) with a nucleus. (See Ionization.)

Ionization

The process of stripping electrons from their atomic orbits by radiation.

Ionization Chamber

An instrument that detects and measures ionizing radiation by measuring the electrical current that flows when radiation ionizes gas in a chamber, making the gas a conductor of electricity. (See Counter.)

Ionizing Radiation

Any radiation capable of displacing electrons from atoms or molecules, thereby producing ions.

Examples: alpha, beta, gamma, x-rays, neutrons and ultraviolet light. High doses of ionizing radiation may produce severe skin or tissue damage.

Irradiation

Exposure to radiation.

Isotone

One of several different nuclides having the same number of neutrons in their nuclei.

Isotope

One of two or more atoms with the same number of protons but different numbers of neutrons in their nuclei. Thus, carbon-12, carbon-13, and carbon-14 are isotopes of the element carbon, the numbers denoting the approximate atomic weights. Isotopes have very nearly the same chemical properties but often different physical properties (e.g., carbon-12 and -13 are stable, carbon-14 is radioactive).

Isotope Separation

The process of separating isotopes from one another or changing their relative abundances, as by gaseous diffusion or electromagnetic separation. Isotope separation is a step in the isotopic enrichment process.

Isotopic Enrichment

A process by which the relative abundances of the isotopes of a given element are altered, thus producing a form of the element that has been enriched in one particular isotope and depleted in its other isotopic forms.

keV

A kiloelectronvolt, 1000 electronvolts.

Kelvin

The unit of thermodynamic temperature equal to 1/273.16 of the thermodynamic temperature of the triple point of water.

Kilo (k)

A prefix that multiplies a basic unit by 1000. Example: 1 kilometer = 1000 meters.

Kilovolt (kV)

The unit of electrical potential equal to 1000 volts.

Kinetic Energy

The energy that a body possesses by virtue of its mass and velocity; the energy of motion.

Laser

A device that produces a coherent, intense, and collimated beam of electromagnetic radiation of well-determined wave length, through a physical process known as stimulated emission.

Late Effect

A biological effect that occurs long after radiation exposure ends (e.g., cancer).

Lethal Dose (LD) 50/60

The dose of radiation expected to cause death within 60 days to 50 percent of those exposed. Generally accepted as 500 rad received over a short period of time.

Light Water

Ordinary water (H₂O) as distinguished from heavy water (D₂O).

Light Water Reactor

The most common type of nuclear reactor in which ordinary water is used as the moderator and coolant and enriched uranium is used as fuel. They are usually boiling water reactors or pressurized water reactors.

Limits

The permissible upper bounds of radiation doses (dose limits).

Linear Energy Transfer

A measure of the ability of biological material to absorb ionizing radiation; specifically, for charged particles traversing a medium, the energy lost per unit length of path as a result of those collisions with electrons in which the energy loss is less than a specified maximum value. A similar quantity may be defined for photons.

Liquid Nitrogen

A major coolant for various types of radiation detectors.

Lixiscope

A portable light intensified imaging device using a sealed source.

Low-Level Waste

A general term for a wide range of radioactive wastes that includes materials such as laboratory wastes and protective clothing that contain only small amounts of radioactivity, pose few health hazards, and are usually disposed of by shallow land burial.

Low Population Zone

An area of low population density often required around a nuclear installation. The number and density of residents is of concern in emergency planning so that certain protective measures (such as notification and instructions to residents) can be accomplished in a timely manner.

Lung Class (Days, Weeks, or Years or Fast Absorption, Moderate Absorption, and Slow Absorption)

A classification scheme for inhaled material according to its rate of clearance from the pulmonary region of the lung.

Lymphocyte

A mononuclear leukocyte; chiefly a product of lymphoid tissue and participates in humoral and cell-mediated immunity.

Mach Stem

The shock front formed by the merging of the primary and reflected shock fronts from an explosion.

Mass-Energy Equation

The equation developed by Albert Einstein which is usually given as $E = mc^2$, showing that, when the energy of a body changes by an amount E (no matter what form the energy takes), the mass, m , of the body will change by an amount equal to E/c^2 . The c^2 , the square of the speed of light in a vacuum, may be regarded as the conversion factor relating units of mass and energy. The equation predicted the possibility of releasing enormous amounts of energy by the conversion of mass to energy. It is also called the Einstein equation.

Mass Number

The number of nucleons (neutrons and protons) in the nucleus of an atom. Also known as the atomic weight of an atom.

Maximum Permissible Dose

That radiation dose which a military commander or other appropriate authority may prescribe as the limiting cumulative radiation dose to be received over a specific period of time by members of the command, consistent with operational military consideration.

Mean Free Path

The average distance that photons of a given energy travel before an interaction in a given medium occurs. It is equal to the reciprocal of the attenuation coefficient. Thus, the distance x in ordinary units can be converted into the dimensionless distance μx , the number of mean free path lengths.

Mean Lifetime

An average lifetime related to the biologic of the effective half-time, or the physical half-life. Effective mean lifetime = 1.443 x effective half-time.

Mega

A prefix that multiplies a basic unit by 1,000,000.

Megacurie

One million curies. (See Curie.)

Meltdown

A situation in a nuclear reactor, in which the core materials melt.

MeV

A megaelectronvolt, 1 million electronvolts.

meV

A millielectronvolt, 1/1000 of an electronvolt.

Member of the Public

An individual in a controlled or unrestricted area. However, an individual is not a member of the public during any period in which the individual receives an occupational dose.

Microcurie

A one-millionth part of a curie.

Milli

Prefix meaning 10^{-3} , or 1/1000th part.

Milling

A process in the uranium fuel cycle by which ore containing only a very small percentage of uranium oxide is converted into material containing a high percent of uranium oxide, often referred to as yellowcake.

Millirem

A one-thousandth part of a rem. (See Rem.)

Milliroentgen

A one-thousandth part of a roentgen. (See Roentgen.)

Missile Technology Control Regime

A joint effort of 23 member countries led by the U.S. to control the proliferation of missiles (and missile technology) capable of delivering nuclear weapons.

<http://fas.org/nuke/control/mctr/>

Moderator Temperature Coefficient of Reactivity

The property of a reactor moderator to slow down fewer neutrons as its temperature increases. This acts to stabilize power reactor operations.

Monitoring, Radiation

The measurement of radiation levels, concentrations, surface area concentrations or quantities of radioactive material and the use of the results of these measurements to evaluate potential exposures and doses.

Nadir

The point at which a blood count drops to or closest to zero before beginning to increase.

Nano

A prefix that divides a basic unit by one billion.

Nanocurie

One billionth part of a curie.

Natural Radiation

See Background Radiation.

Natural Uranium

Uranium is found in nature. It contains 0.7 percent uranium-235, 99.3 percent uranium-238, and a trace of uranium-234.

Negative Temperature Coefficient

See Moderator Temperature Coefficient of Reactivity.

Neutron

An uncharted elementary particle with a mass slightly greater than that of the proton, and found in the nucleus of every atom heavier than hydrogen.

Neutron Capture

The process in which an atomic nucleus absorbs or captures a neutron.

Neutron Chain Reaction

A process in which some of the neutrons released in one fission event causes other fissions to occur. There are three types of chain reactions—

- a. Non-sustaining (see Subcriticality).
- b. Sustaining (see Criticality).
- c. Multiplying (see Supercriticality).

Neutron Generation

The release, thermalization, and absorption of fission neutrons by a fissile material and the fission of that material producing a second generation of neutrons. In a typical reactor system, there are about 40,000 generations of neutrons every second.

Neutron Radiography

The industrial use of neutrons to produce x-ray like images of the internal structure of objects. It has been used to examine explosive devices.

Neutron Source

A radioactive material (i.e., decays by neutron emission) that can be inserted into a reactor to

ensure that a sufficient quantity of neutrons is available to start a chain reaction and register on neutron detection equipment.

Non-penetrating Radiation

External radiation of such low penetrating power that the absorbed dose from human exposure is in the skin and does not reach deeper organs to any damaging extent.

Neutron, Thermal

A neutron that has (by collision with other particles) reached an energy state equal to that of its surroundings.

Noble Gas

A gaseous chemical element that does not readily enter into chemical combination with other elements. An inert gas. (See Fission Gases.)

Non-ionizing Radiation

Electromagnetic radiation that does not have sufficient energy to remove electrons from the outer shells of atoms. Types of non-ionizing radiation would include ultraviolet, visible light, infrared, microwave, radio and television, and extremely low frequency. The primary health effect from high exposure levels of non-ionizing radiation arises from heat generation in body tissue.

Nonstochastic Effect

Health effects, the severity of which varies with the dose and for which a threshold is believed to exist. Radiation-induced cataract formation is an example of a non-stochastic effect (also called a Deterministic Effect).

Normal Form Radioactive Material

Radioactive material that has not been demonstrated to qualify as special form radioactive material.

Nuclear Accident Response Procedures

A manual summarizing Department of Defense responsibilities and provides procedural guidance for a joint response to accidents involving nuclear weapons or components thereof in the U.S. and its territories or possessions.

http://www.dtra.mil/cs/cs_narp.html

Nuclear Detonation

A nuclear explosion resulting from fission or fusion reactions in nuclear materials such as from a nuclear weapon.

Nuclear Device

Nuclear fission together with the arming, fuzing, firing, chemical explosive, canister, and diagnostic measurement equipment that have not reached the development status of an operational nuclear weapon.

Nuclear Emergency Search Team

A cadre of highly trained technical personnel that maintain on-call, deployable search, identification and diagnostic capabilities to respond to lost or stolen nuclear weapons and special nuclear materials; nuclear explosive threats; and radiation dispersal threats.

<http://www.milnet.com/milnet/nest.htm>

Nuclear Energy

The energy liberated by a nuclear reaction (fission or fusion) or by radioactive decay.

Nuclear Force

A powerful short-ranged attractive force that holds together the particles inside an atomic nucleus.

Nuclear Materials Licensing Requirements

Within the U.S., a license is required from the NRC to deliver, receive, possess, use, or transfer thorium, plutonium, or uranium. A specific license is required to authorize a general licensee to acquire, deliver, receive, possess, use, transfer, import, or export special nuclear material.

Nuclear Power Plant

Any device or assembly that converts nuclear energy into useful power. In a nuclear electric power plant, heat produced by a nuclear reactor is used to produce steam to drive a turbine that in turn drives an electricity generator.

Nuclear Radiation

See Radiation.

Nuclear/Radiological Agent

Traditionally, uranium and plutonium used to produce a nuclear detonation via the fission or fusion process. The fuel is compressed into a given volume to cause supercriticality. The major products include blast effects, heat, nuclear radiation, and fallout.

Nuclear Reaction

See Reaction.

Nuclear Regulatory Commission (NRC)

The NRC is an independent agency established by the Energy Reorganization Act of 1974 to regulate civilian use of nuclear materials. Its mission is to regulate the Nation's civilian use of byproduct, source, and special nuclear materials to ensure adequate protection of public health and safety, to promote the common defense and security, and to protect the environment.

<http://www.nrc.gov/>

Nuclear Technology Security Program

A Department of Energy program dedicated to controlling the transfer or dissemination outside the U.S. or certain unclassified equipment and materials and scientific and technical information.

<http://www.td.anl.gov/Programs/nmts/nmts.html>

Nuclear Waste

The radioactive by-products formed by fission and other nuclear processes in a reactor. It is separated from irradiated fuel in a processing plant.

Nuclear Weapon

A device that releases nuclear energy in an explosive manner as the result of nuclear chain reactions involving the fission or fusions, or both, of atomic nuclei.

Nuclear Weapon Incident

An unexpected event involving a nuclear weapon, facility, or component resulting in any of the following, but not constituting a nuclear weapon(s) accident:

- a. An increase in the possibility of explosion or radioactive contamination.
- b. Errors committed in the assembly, testing, loading, or transportation of equipment, and/or the malfunctioning of equipment and material which could lead to an unintentional operation of all or part of the weapon arming and/or firing sequence, or which could lead to a substantial change in yield, or increased dud probability.
- c. Any act of God, unfavorable environment, or condition resulting in damage to a weapon, facility, or component.

Nucleated Blood Cell

A blood cell that contains a nucleus, to include white cells and reticulocytes.

Nucleon

Common name for a constituent particle of the atomic nucleus. At present, applied to protons and neutrons but may include any other particles found to exist in the nucleus.

Nucleus, (Pl. Nuclei)

The small, central, positively charged regions of an atom that carries essentially all the mass. Except for the nucleus of ordinary (light) hydrogen, which has a single proton, all atomic nuclei contain both protons and neutrons. The number of protons determines the total positive charge, or atomic number; this is the same for all the atomic nuclei of a given chemical element. The total number of neutrons or protons is called the mass number (or Atomic Nucleus).

Nuclide

A general term referring to all known isotopes, both stable (279) and unstable (about 5000), of the chemical elements.

Occupational Dose

The dose received by an individual in a restricted area or in the course of employment in which the individual's assigned duties involve exposure to radiation and to radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the licensee or other person. Occupational dose does not include dose received from background radiation, as a

patient from medical practices, from voluntary participation in medical research programs, or as a member of the general public.

Open Beam Configuration

An analytical x-ray system in which an individual could accidentally place some part of his body in the primary beam path during normal operation.

Oralloy

Uranium enriched in the isotope uranium-235. This material is an excellent fission fuel and is capable of sustaining a chain reaction.

Parent

A radionuclide that upon radioactive decay or disintegration yields a specific nuclide (the daughter/progeny).

Particulate Radiation

Radiation in the form of particles as opposed to electromagnetic radiation.

Penetrating Radiation

External radiations of such penetrating power that the absorbed dose from exposure is delivered in significant and damaging quantities to human tissues and other organs. It refers to most gamma radiation, x-ray radiation, and neutron radiation.

Personnel Monitoring

The determination of the degree of radioactive contamination on individuals using survey meters, or the determination of radiation dosage received by means of dosimetry devices.

Phantom

A volume of material behaving in a manner similar to tissue with respect to the attenuation and scattering of radiation.

Photodosimetry

The determination of the cumulative dose of ionizing radiation by use of photographic film.

Photon

A quantum (or packet) of energy emitted in the form of electromagnetic radiation. Gamma rays and x-rays are examples of photons.

Phototimer

A method for controlling radiation exposures to image receptors by the amount of radiation that reaches a radiation monitoring device(s). The radiation monitoring device(s) is part of an electronic circuit that controls the duration of time the tube is activated.

Picocurie

One trillionth part of a curie.

Pig

A container (usually lead) used to ship or store radioactive materials. The thick walls protect the person handling the container from radiation. Large containers are commonly called casks.

Pit

The components of a nuclear warhead located within the inner boundary of the high explosive assembly, but not including safing materials.

Planned Special Exposure

An infrequent exposure to radiation, separate from and in addition to the annual dose limits.

Plume

Airborne material spreading from a particular source; the dispersal of particles, gases, vapors, and aerosols in the atmosphere.

Plutonium (Pu)

A heavy, radioactive, manmade metallic element with atomic number 94. Its most important isotope is fissile plutonium-239, which is produced by neutron irradiation of uranium-238.

Pocket Dosimeter

A small ionization detection instrument that indicates radiation exposure directly. An auxiliary charging device is usually necessary.

Positron

Particle equal in mass, but opposite in charge, to the electron; a positive electron.

Power Reactor

A nuclear reactor designed to produce electricity as distinguished from reactors used primarily for research for producing radiation or fissionable materials.

Primary Stage

The fission trigger or first stage of a thermonuclear weapon or device.

Projected Dose

Future dose calculated for a specified time period on the basis of estimated or measured initial concentrations of radionuclides or exposure rates and in the absence of protective actions.

Proportional Counter

An instrument in which an electronic detection system receives pulses that are proportional to the number of ions formed in a gas-filled tube in ionizing radiation.

Protective Action

An activity conducted in response to an incident or potential incident to avoid or reduce radiation dose to members of the public (sometimes called a protective measure).

Protective Barrier

A radiation absorbing material(s) used to reduce radiation exposure. The types of protective barriers are as follows:

- a. Primary Protective Barrier: the material, excluding filters, placed in the useful beam, for protection purposes, to reduce the radiation exposure.
- b. Secondary Protective Barrier: a barrier sufficient to attenuate the stray radiation to the required degree.

Proton

An elementary nuclear particle with a positive electric charge located in the nucleus of an atom. (See Atomic Number.)

Public Dose

The dose received by a member of the public from exposure to radiation and to radioactive material released by a licensee, or to another source of radiation either within a licensee's controlled area or in unrestricted areas. It does not include occupational dose or doses received from background radiation, as a patient from medical practices, or from voluntary participation in medical research programs.

Quality Factor

The modifying factor that is used to derive dose equivalent from absorbed dose.

Quantum Theory

The concept that energy is radiated intermittently in units of definite magnitude called quanta, and absorbed in a like manner. (See Photon.)

Rad

The special unit of absorbed dose. One rad is equal to an absorbed dose of 100 ergs/g or 0.01 J kg^{-1} (0.01 Gy).

RADIAC

An acronym derived from "radioactivity detection indication and computation," a generic term applying to radiological instruments or equipment.

Radiation

Alpha particles, beta particles, gamma rays, x-rays, neutrons, high-speed electrons, high-speed protons, and other particles capable of producing ions. Radiation, as used in this part, does not include non-ionizing radiation, such as radio- or microwaves, or visible, infrared, or ultraviolet light. (See Ionizing Radiation.)

Radiation Area

An area, accessible to individuals, in which radiation levels could result in an individual

receiving a dose equivalent in excess of 0.005 rem (0.05 mSv) in 1 hour at 30 cm from the radiation source or from any surface that the radiation penetrates.

Radiation Detection Instrument

A device that detects and records the characteristics of ionizing radiation.

Radiation Dispersal Weapon

Any device other than a nuclear exposure device and including weapons or equipment that are specifically designed to disseminate radioactive material to cause destruction, fear, or injury by means of the radiation produced by the decay of such material.

Radiation Machine

Any device capable of producing radiation except those that produce radiation only from radioactive material.

Radiation Shielding

Reduction of radiation by interposing a shield of absorbing material between any radioactive source and a person, work area, or radiation-sensitive device.

Radiation Sickness

The complex of symptoms characterizing the disease known as radiation injury, resulting from excessive exposure to the whole body (or large part) to ionizing radiation. The earliest of these symptoms are nausea, fatigue, vomiting, and diarrhea, which may be followed by loss of hair (epilation), hemorrhage, inflammation of the mouth and throat, and general loss of energy. In severe cases, where the radiation exposure has been relatively large, death may occur within 2 to 4 weeks. Those who survive 6 weeks after the receipt of a single large dose of radiation may generally be expected to recover. (See Syndrome.)

Radiation Source

Usually a manmade-sealed source of radiation used in teletherapy, radiography, as a power source for batteries, or in various types of industrial gauges. Machines such as accelerators and radioisotope generators and natural radionuclides may be considered sources.

Radiation Standards

Exposure standards, permissible concentrations, rules for safe handling, regulations for transportation, regulations for industrial control of radiation and control of radioactive material by legislative means.

Radiation Syndrome

See Radiation Sickness.

Radiation Warning Symbol

An officially prescribed symbol (a magenta, purple, or black trefoil) on a yellow background that must be displayed where certain quantities of radioactive materials are present or where certain doses of radiation could be received.

Radioactive Cloud

An all-inclusive term for the cloud of hot gases, smoke, dust, dirt, and debris from a weapon and the environment. The cloud is carried aloft in conjunction with the rising fireball produced by the detonation of a nuclear weapon.

Radioactive Contamination

Deposition of radioactive material in any place where it may harm persons or equipment.

Radioactive Decay

The process in which a radioactive nucleus emits radiation and changes to a different isotope or element.

Radioactive Isotope

A radioisotope. (See Radioisotope.)

Radioactive Series

A succession of nuclides, each of which transforms by radioactive disintegration into the next until a stable nuclide results. The first member is called the parent, the intermediate members are called daughters, and the final stable member is called the end product.

Radioactive Waste

See Waste, Radioactive.

Radioactivity

The spontaneous emission of radiation, generally alpha or beta particles, often accompanied by gamma rays, from the nucleus of an unstable isotope.

Radioassay

The process of identifying the radioactive elements and their amounts in a sample of material such as low-level waste.

Radiographer

Any individual who performs or personally supervises industrial radiographic operations and who is responsible to the licensee or registrant for assuring compliance with the requirements of these regulations and all license and/or certificate of registration conditions.

Radiological Accident

A loss of control over radiation or radioactive material which presents a potential hazard to personnel, public health, property, or the environment.

Radioisotope

An unstable isotope of an element that decays or disintegrates spontaneously, emitting radiation. Approximately 5000 natural and artificial radioisotopes have been identified.

Radiological Assistance Program Team

A part of the Nuclear Incident Response, it is a team of expert personnel who assist state and local authorities in dealing with accidents or incidents involving radiation.

<http://www.llnl.gov/nai/rdiv/nucinc.html>

Radiological Control Team

A special radiological team of the U.S. Army and U.S. Navy organized to provide technical assistance and advice in radiological emergencies.

Radiological Release

An unplanned incident in which radiological material is discharged into the biosphere.

Radiological Survey

The evaluation of the radiation hazards accompanying the production, use, or existence of radioactive materials under a specific set of conditions. Such evaluation customarily includes a physical survey of the disposition of materials and equipment, measurements or estimates of the levels of radiation that may be involved, and a sufficient knowledge of processes affecting these materials to predict hazards resulting from unexpected or possible changes in materials or equipment.

Radiology

That branch of medicine dealing with the diagnostic and therapeutic applications of radiant energy, including x-rays and radioisotopes.

Radionuclide

A radioisotope.

Radiosensitivity

The relative susceptibility of cells, tissues, organs, organisms, or other substances to the injurious action of radiation.

Radium (Ra)

A radioactive metallic element with atomic number 88. As found in nature, the most common isotope has a mass number of 226. It occurs in minute quantities associated with uranium in pitchblende, carnotite and other minerals.

Radon (Rn)

A radioactive element that is one of the heaviest gases known. Its atomic number is 86, and its mass number is 222. It is a decay product or progeny of radium.

Rainout

The removal of radioactive particles from a nuclear cloud by precipitation when the cloud is within a rain cloud.

Reactivity

A term expressing the departure of a reactor system from criticality. A positive reactivity addition indicates a move toward supercriticality (power increase). A negative reactivity addition indicates a move toward subcriticality (power decrease).

Reactor

A facility that contains a controlled nuclear fission chain reaction. It can be used to generate electricity, conduct research, and produce isotopes and manmade elements such as plutonium.

Recording Level (RL) (for intake of radionuclides)

Level of committed dose equivalent or intake, above which the result is of sufficient interest to be worth keeping and interpreting. Recording levels are defined for routine monitoring, RL_R , and for special or operational monitoring, RL_S . Derived recording levels, DRL_R and DRL_S , are values of body or organ content or elimination rate that correspond to recording levels, RL_R and RL_S . The values are calculated by means of defined models of intake, deposition, uptake, retention, and elimination.

Recovery

The process of reducing radiation exposure rates and concentrations of radioactive material in the environment to levels acceptable for unconditional occupancy or use.

Recycling

The reuse of fissionable material after it has been recovered by chemical processing from spent or depleted reactor fuel, re-enriched and then re-fabricated into new fuel elements.

Reentry

Temporary entry into a restricted zone under controlled conditions.

Rem (Roentgen Equivalent Man)

The special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor (1 rem = 0.01 Sv).

Respiratory Protective Device

An apparatus, such as a respirator, used to reduce the individual's intake of airborne radioactive materials.

Roentgen (R)

A unit of exposure to ionizing radiation. It is that amount of gamma or x-rays required to produce ions carrying 1 electrostatic unit of electrical charge in 1 cm³ of dry air under standard conditions.

Safing

As applied to weapons and ammunition, the changing from a state of readiness to initiation to a safe condition that prevents an unauthorized firing.

Scattered Radiation

Radiation that, during passage through matter, has been deviated in direction.

Scavenging

The selective removal of material from the radioactive cloud by inert substances, such as precipitation, introduced into the fireball.

Scintillation Detector or Counter

The combination of phosphor, photo-multiplier tube, and associated electronic circuits for counting light emissions produced in the phosphor by ionizing radiation.

Secondary Radiation

Radiation originating as the result of absorption of other radiation in matter. It may be either electromagnetic or particulate in nature.

Seismic Category I

A term used to define structures, systems and components that are designed and built to withstand the maximum potential (earthquake) stresses for the particular region that a nuclear plant is sited.

Seivert (Sv)

The SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in Sv is equal to the absorbed dose in gray multiplied by the quality factor (1 Sv - 100 rem).

Shallow-Dose Equivalent (H_s)

Applying to the external exposure of the skin or an extremity is taken as the dose equivalent at a tissue depth of 0.007 cm (7 milligram per square meter (mg/m^2)) averaged over an area of 1 square centimeter (cm^2).

Sheltering

The use of a structure for radiation protection from an airborne plume and/or deposited radioactive materials.

Shielded Room Radiography

Industrial radiography conducted in a room shielded so that radiation levels at every location on the exterior meet the limitations specified in the regulations.

Shielding

Any material or obstruction that absorbs radiation and thus tends to protect personnel or materials from the effects of ionizing radiation.

Shock Wave

A pressure pulse that is initiated by the expansion of hot gases produced in an explosion and that is continuously propagated in the medium surrounding the explosion.

Short-Lived Daughters

Radioactive progeny of radioactive isotopes that have half-lives on the order of a few hours or less.

Site Boundary

That line beyond which the land or property is not owned, leased, or otherwise controlled by the licensee.

Skin Decontamination

Removal of radioactive material from the skin.

Somatic Cell

Body cell other than a germ cell.

Somatic Effects of Radiation

Effects of radiation limited to the exposed individual, as distinguished from genetic effects, which may also affect subsequent unexposed generations.

Source Image Receptor Distance

The distance from the source to the center of the input surface of the image receptor.

Source Material

- a. Uranium or thorium or any combination of uranium and thorium in any physical or chemical form.
- b. Ores that contain, by weight, one-twentieth of 1 percent (0.05 percent), or more, of uranium, thorium, or any combination of uranium and thorium.

Special Form Radioactive Material

Radioactive material that satisfies the following conditions:

- a. It is either a single solid piece or is contained in a sealed capsule that can be opened only by destroying the capsule.
- b. The piece or capsule has at least one dimension not less than 5 mm (0.197 inch).
- c. It satisfies the test requirements specified by the NRC.

Special Nuclear Material

- a. Plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the NRC determines to be special nuclear material but does not include source material.
-

b. Any material artificially enriched by any of the foregoing but does not include source material.

Spent Fuel

Fuel elements that have been removed from the reactor because they contain too little fissile material and too high a concentration of radioactive fission products. They are highly radioactive.

Stable Isotope

An isotope that does not undergo radioactive decay.

Stay Time

The period during which personnel may remain in a restricted area before accumulating some permissible dose.

Stochastic Effects

Health effects that occur randomly and for which the probability of the effect occurring, rather than its severity, is assumed to be a linear function of dose without threshold. Hereditary effects and cancer incidence are examples of stochastic effects.

Stratosphere

A relatively stable layer of the atmosphere extending from the tropopause to an altitude of about 30 miles.

Subcriticality

The condition of a nuclear reactor system when the rate of production of fission neutrons is lower than the rate of production in the previous generation due to increased neutron leakage and poisons.

Subsurface Burst

The explosion of a nuclear weapon beneath the surface of the Earth.

Supercriticality

The condition for increasing the level of operation of a reactor. The rate of fission neutron production exceeds all neutron losses, and the overall neutron population increases.

Surety

Umbrella term for safety, security, and use control of nuclear weapons.

Survey, Radiological

An evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation. When appropriate, such an evaluation includes a physical survey of the location of radioactive material and measurements or calculations of levels of radiation, or concentrations or quantities of radioactive material present.

Survey Meter

Any portable radiation detection instrument especially adapted for inspecting an area to establish the existence and amount of radioactive material present.

Tail, Tailings

The depleted stream of an enrichment plant or stage after the enriched produced is removed, expressed as percent of uranium-235 content.

Technologically Enhanced

Substance that because of processing contains more naturally occurring radioactive material than originally.

Teletherapy

Therapeutic irradiation in which the source of radiation is at a distance from the body.

Tenth Thickness

The thickness of a given material that will decrease the amount (or dose) of radiation to one-tenth of the amount incident upon it. Two-tenth thickness will reduce the dose received by a factor of 10 x 10 (i.e., 100, and so on). (See Shielding.)

Terrestrial Radiation

The portion of natural radiation (background) that is emitted by naturally occurring radioactive materials in the earth.

Thermal Radiation

Electromagnetic radiation (infrared, visible, and ultraviolet) emitted from the fireball of a nuclear explosion as a consequence of high temperatures.

Thermal Reactor

A reactor in which the fission chain reaction is sustained by low-energy neutrons which have been moderated to thermal energy in order to produce a chain reaction.

Thermonuclear

An adjective referring to the process in which very high temperatures are used to bring about the fusion of light nuclei, such as those of the hydrogen isotopes, deuterium and tritium, with the accompanying liberation of energy. (See Fusion.)

Tomogram

The depiction of the x-ray attenuation properties of a section through the body.

Total Effective Dose Equivalent (TEDE)

The sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

Transport Index

The dimensionless number, rounded up to the first decimal place, placed on the label of a package to designate the degree of control to be exercised by the carrier during transportation. The transport index is the number expressing the maximum radiation level in millirem per hour at 1 meter from the external surface of the package.

Transition

A nuclear change from one energy state to another, generally accompanied by the emission of particles. Often called decay or disintegration.

Tritium

A radioactive isotope of hydrogen (one proton, two neutrons). Because it is chemically identical to natural hydrogen, tritium can easily be taken into the body by any ingestion path. Its radioactive half-life is about 12 1/2 years.

Tube

An x-ray tube, unless otherwise specified.

Type A Quantity

A quantity of radioactive material, the aggregate radioactivity of which does not exceed A_1 for special form radioactive material or A_2 for normal form radioactive material.

Type B Quantity

A quantity of radioactive material greater than a Type A quantity.

Ultraviolet

Electromagnetic radiation of a wavelength between the shortest visible violet and low-energy x-rays.

Uranium (U)

A radioactive element with the atomic number 92, and as found in natural ores, an atomic weight of approximately 238. The two principal natural isotopes are uranium-235 (0.7 percent of natural uranium), which is fissile, and uranium-238 (99.3 percent of natural uranium), which is fissionable by fast neutrons and is fertile. Natural uranium also includes a minute amount of uranium-234.

U.S. Munitions List

The following is a list of items designated by the President to require export licenses to all nuclear countries: firearms; artillery projectors; ammunition; launch vehicles, etc.; explosives, propellants, incendiary agents and their constituents; vessels of war and special naval equipment; tanks and military vehicles; aircraft and associated equipment; military training equipment; protective personnel equipment; military electronics; fire control, range finder, optical and guidance and control equipment; auxiliary military equipment; toxicological agents and equipment and radiological equipment; spacecraft systems and associated equipment; nuclear weapons design and related equipment; classified articles, technical data, and defense services

not otherwise enumerated; submersible vessels, oceanographic and associated equipment; and miscellaneous articles.

<http://www.ciponline.org/facts/munilist.htm>

Very High Radiation Area

An area, accessible to individuals, in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rad (5 Gys) in 1 hour at 1 m from a radiation source or from any surface that the radiation penetrates. [Note: At very high doses received at high dose rates, units of absorbed dose (e.g., rad and Gy) are appropriate, rather than units of dose equivalent (e.g., rem and SvS).]

Venting

The escape through the surface to the atmosphere of gases or radioactive products from a sub-surface high explosive or nuclear detonation.

Vessel

The part of the nuclear reactor that contains the nuclear fuel.

Warhead

That part of a missile, projectile, torpedo, rocket, or other munition that contains either the nuclear or thermonuclear system, high explosive system, chemical or biological agents, or inert materials intended to inflict damage.

Washout

The removal of radioactive particles from a nuclear cloud by precipitation when the cloud is below a rain or snow cloud.

Weapon Debris

The highly radioactive material consisting of fission products, various products of neutron capture, unspent fuel, and shards of bomb casing that remain after a nuclear explosion.

Weapon System

Collective term for the nuclear and nonnuclear components, systems, and subsystems that compost a nuclear weapon.

Weathering Factor

The fraction of radioactivity remaining after being affected by average weather conditions for a specified period of time.

Weighting Factor W_T

For an organ of tissue (T) is the proportion of the risk of stochastic effects resulting from irradiation of that organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly. Presently, the organ dose weighting defined by the NRC and ICRP differ.

Well Logging

All operations involving the lowering and raising of measuring devices or tools which may contain sources of radiation into well bores or cavities for the purpose of obtaining information about the well or adjacent formations.

Whole Body

For purposes of external exposure, head, trunk, arms above the elbow, or legs above the knee.

Whole-Body Counter

A device used to identify and measure the radiation in the body (body burden) of human beings and animals; it uses heavy shielding to keep out background radiation and ultra-sensitive radiation detectors and electronic counting equipment.

Whole-Body Exposure

An exposure of the body to radiation, in which the entire body rather than an isolated part, is irradiated. Where a radioisotope is uniformly distributed throughout the body tissues, rather than being concentrated in certain parts the irradiation can be considered as a whole-body exposure.

Wipe Sample (Swipe Sample)

A sample made for the purpose of determining the presence of removable radioactive contamination on a surface. It is done by wiping, with slight pressure, a piece of soft filter paper over a representative type of surface area.

Working Level (WL)

Any combination of short-lived radon daughters (for radon-222, polonium-218, lead-214, bismuth-214, and polonium-214; and for radon-220: polonium-216, lead-212, bismuth-212, and polonium-212) in 1 liter of air that will result in the ultimate emission of 1.3×10^5 million electron volts of potential alpha particle energy.

Working Level Month (WLM)

An exposure to 1 working level for 170 hours (2,000 working hours per year/12 months per year = approximately 170 hours per month).

Wound Contamination

The presence of a radioactive substance in a wound, whether an abrasion, puncture, or laceration; condition in which the loss of intact skin increases the risk that the contaminant will be absorbed.

X-ray Control

A device that controls input power to the x-ray high voltage generator and/or the x-ray tube. It includes equipment such as timers, photo-timers, automatic brightness stabilizers, and similar devices, which control the technique factors of an x-ray exposure.

X-ray Equipment

An x-ray system, subsystem, or component thereof. Types of x-ray equipment are as follows:

- a. Mobile x-ray equipment means x-ray equipment mounted on a permanent base with wheels and/or casters for moving while completely assembled.
- b. Portable x-ray equipment means x-ray equipment designed to be hand carried.
- c. Stationary x-ray equipment means x-ray equipment that is installed in a fixed location.

X-ray High Voltage Generator

A device that transforms electrical energy from the potential supplied by the x-ray control to the tube operating potential. The device may also include means for transforming alternative current to direct current, filament transformers for the x-ray tube(s), high voltage switches, electrical protective devices, and other appropriate elements.

X-ray System

An assemblage of components for the controlled production of x-rays. It includes minimally an x-ray high voltage generator, an x-ray control, a tube housing assembly, a beam limiting device, and the necessary supporting structures. Additional components that function with the system are considered integral parts of the system. X-ray subsystem means any combination of two or more components of an x-ray system.

X-rays

Penetrating electromagnetic radiation (photon) having a wavelength that is much shorter than that of visible light. Rays produced by excitation of the electron field around certain nuclei are called characteristic x-rays. In nuclear reactions, it is customary to refer to photon originating in the nucleus as gamma rays, and to those originating in the electron field of the atom as X-rays.

Yellowcake

A concentrated form of uranium ore known as UO.

Yield

The energy released in a nuclear explosion, expressed usually as the number of tons of TNT that would release the same amount of energy.

Section 4 – Biological Terms**Acetylcholine (ACH, ACh)**

The neurotransmitter substance at cholinergic synapses that causes cardiac inhibition, vasodilation, gastrointestinal peristalsis, and other parasympathetic effects. It is liberated from preganglionic and post-ganglionic endings of parasympathetic fibers and from pre-ganglionic fibers of the sympathetic nervous system as a result of nerve injuries, whereupon it acts as a transmitter on the effector organ; it is hydrolyzed into choline and acetic acid by acetylcholinesterase before a second impulse may be transmitted.

Acetylcholinesterase (AChE)

True cholinesterase. Acetylcholinesterase hydrolyzes acetylcholine within the Central Nervous System and peripheral neuroeffector functions.

Active Immunization

The act of artificially stimulating the body to develop antibodies against infectious disease by the administration of vaccines or toxoids.

Acute Samples

Samples (e.g., blood, sputum, urine, etc.) taken from a patient who is experiencing the full symptoms of a disease.

Adenopathy

Swelling or morbid enlargement of the lymph nodes.

Aedes Aegypti

Asian tiger mosquito; an alien mosquito established in the southeast U.S. and from which Eastern Equine Encephalitis has been isolated.

Aerosol

A suspension of very small solid liquid particles in gas (such as air).

Alpha Interferon

One of a group of heat-stable and soluble basic antiviral glycoproteins produced by cells exposed to the action of a virus, bacterium, or toxin; used medically as an antiviral compound.

Amikacin

An antibiotic drug effective against Gram-negative bacteria (particularly gentamicin- and tobramycin-resistant strains) or staphylococci.

Amino Acid

An organic compound having both an amino group (NH₂) and a carboxylic acid (COOH) group.

Analgesic

- a. A compound capable of producing analgesia (i.e., one that relieves pain without producing anesthesia or loss of consciousness).
- b. Characterized by reduced response to painful stimuli.

Anaphylaxis

Hypersensitivity or abnormal reaction to a foreign substance (e.g., penicillin) induced by a small preliminary or sensitizing injection of the substance; it is an extreme form of allergy that often has serious consequences (i.e., swelling of tissues) and has been known to be fatal.

Anemia

A condition in which the blood is deficient in red blood cells, in hemoglobin, or in total volume.

Anthrax

A highly lethal infection caused by the bacterium *Bacillus anthracis*; normally, a disease of livestock that can be transmitted to man by direct contact with or ingestion of contaminated meat, hide, wool, hair, blood, or excreta. In most cases involving humans, the bacteria enters the body through skin wounds and infects the skin. In other cases, the bacteria may be ingested (eaten) or inhaled. Spore inhalation results in the inhalation form of anthrax that is characterized by a human fatality rate of nearly 90 percent. A short period of flu-like symptoms that is followed by respiratory distress; shock and death usually follows within 24 - 36 hours after onset of respiratory distress. Anthrax can be treated with antibiotics, but treatment must be started early to be effective.

Anthrax Vaccine

Inactivated vaccine made from protective antigen of organisms. Protects against dermal exposure in occupational setting. Vaccine may be less effective with overwhelming challenge of inhaled spores.

Antibody

A protein substance produced in the blood or tissues in response to a specific antigen, such as bacterium or a toxin. Antibodies destroy or weaken bacteria and neutralize organic poisons, thus forming the basis of immunity.

Antibiotic

A substance produced by or derived from a microorganism that inhibits or kills another microorganism (such as bacteria).

Anticonvulsant

An agent that prevents or arrests seizures.

Antigen

A molecule capable of eliciting a specific antibody or T-cell response.

Antiserum

The blood fluid remaining after blood cells, fibrinogen, and fibrin are removed, and which also contains antibodies; immune serum.

Antitoxin

An antibody formed in response to and capable of neutralizing a biological poison; an animal serum containing antitoxins.

Arbovirus

A group of viruses transmitted to humans and animals from ticks and insects such as mosquitoes and sand flies; shortened form of arthropod-borne virus.

Arenavirus

A family of viruses that includes the viral Hemorrhagic Fevers, Lassa Fever, Argentine Hemorrhagic Fever, Venezuelan Hemorrhagic Fever, Brazilian Hemorrhagic Fever, and Bolivian Hemorrhagic Fever.

Arthralgia

Severe pain in a joint, especially one not inflammatory in character.

Aseptic

Preventing infection; free or freed of pathogens by use of disinfectants, filtration, etc.

AST

Aspartate aminotransferase, a liver enzyme.

Asthenia

Weakness or debility.

Ataxia

An inability to coordinate muscle activity during voluntary movement so that smooth movements occur. Most often due to disorders of the cerebellum or the posterior columns of the spinal cord; may involve the limbs, head, or trunk.

Atelectasis

The absence of gas from a part or the whole of the lungs, due to failure of expansion or resorption of gas from the alveoli.

Bacillus

A rod-shaped bacteria.

Bacteria

Small, free-living microscopic organisms that reproduce by simple division; the diseases they produce often respond to treatment with antibiotics. Bacteria are single-celled, can exist

independently, and vary in size from about 0.3 μm to 10 μm . Bacteria can cause disease either by directly invading body tissue or by producing toxins once inside the body.

Bilirubin

A red bile pigment formed from hemoglobin during normal and abnormal destruction of erythrocytes. Excess bilirubin is associated with jaundice.

Biodegradation

The breakdown of substances of environmental concern by living cells.

Biohazard

A biological agent or condition (e.g., an infectious organism or insecure laboratory procedures) that constitutes a hazard to humans or the environment.

Biological Agent

A microorganism that causes disease in man, plants, or animals or causes the deterioration of material.

Biological Integrated Detection System (BIDS)

This system provides commanders with an effective system to detect and presumptively identify biological warfare agents. Its primary purpose is to provide information to limit the impact of large-area-coverage biological agent attacks that have the potential for catastrophic effects to U.S. forces at the operational levels of war. It consists of wheeled vehicles and specially trained operators.

Biological Operation

Employment of biological agents to produce casualties in man or animal and damage to plants or materiel, or defense against such employment.

Biological Warfare

The use, for military or terrorist purposes, of living organisms or material derived from them, which are intended to cause death or incapacitation in man, animals, or plants.

Biological Warfare Agent

Living organisms or their derivatives that can be used in weapons to cause incapacitation or death. Biological agents have the ability to reproduce themselves, thus they are less predictable than chemical agents.

Bioregulators/Modulators

Biological agents that are biochemical compounds, such as peptides that occur naturally in organisms.

Biosafety Level (BSL)

A designation that indicates specific precautions that must be taken when culturing or working with infectious organisms or toxins. Each biosafety level describes appropriate laboratory

practices and techniques as well as required safety equipment. Biosafety levels range from BL-1, for organisms that can cause minor infections, to BL-4 for those that can cause fatal diseases for which there is no known cure.

Blood Agar

A mixture of blood and nutrient agar, used for the cultivation of many medically important microorganisms.

Bomblet

A small munition capable of containing a biological warfare agent; a submunition. Numerous bomblets could be packed inside a larger munition (e.g., a bomb or warhead) that would explode in the air scattering the bomblets over a relatively wide area.

Botulism

Poisoning by toxic derived from the microorganism *Clostridium botulinum*.

Bronchiolitis

The inflammation of the bronchioles often associated with bronchopneumonia.

Bronchitis

Inflammation of the mucous membrane of the bronchial tubes.

Brucella

A genus of encapsulated, non-motile bacteria (family *Brucellaceae*) containing short, rod-shaped to coccoid, Gram-negative cells. These organisms are parasitic, invading all animal tissues and causing infection of the genital organs, the mammary gland, and the respiratory and intestinal tracts, and are pathogenic for man and various species of domestic animals. They do not produce gas from carbohydrates. If used as a biological warfare agent, it would move likely be delivered by the aerosol route; the resulting infection would be expected to mimic natural disease.

Bubo

Inflammatory swelling of one or more lymph nodes, usually in the groin; the confluent mass of nodes usually suppurates and drains pus.

Bubonic Plague

A form of plague characterized by the presence of inflammatory swellings of lymph nodes that first occur at the regional node site closest to the bite of an infected flea. (See Plague.)

Bulla (Pl. Bullae)

A large blister appearing as a circumscribed area of separation of the epidermis from the subepidermal structure (subepidermal *bulla*) or as a circumscribed area of separation of epidermal cells (intraepidermal *bulla*) caused by the presence of serum, or occasionally by an injected substance.

Carbuncle

Deep-seated pyogenic infection of the skin and subcutaneous tissues, usually arising in several contiguous hair follicles, with formation of connecting sinuses; often preceded or accompanied by fever, malaise, and prostration.

Casual Contact

A person who has been in the proximity to an infected person or animal (e.g., sharing an airplane, bus, taxi, etc.) but has not been associated with body fluids or excretions.

Cerebrospinal

Relating to the brain and the spinal cord.

Chemoprophylaxis

Prevention of disease by the use of chemicals or drugs.

Cholera

A diarrheal disease caused by *Vibrio cholera*, a short, curved, gram-negative bacillus. Humans acquire the disease by consuming water or food contaminated with the organism. The organism multiplies in the small intestine and secretes an enterotoxin that causes a secretory diarrhea. If used as a biological warfare agent, it would most likely be used to contaminate water supplies.

Cholinergic

Relating to nerve cells or fibers that employ acetylcholine as their neurotransmitter.

Ciprofloxacin

An antibiotic drug useful in treating bacterial infections; the recommended antibiotic for treating anthrax infections as well as prophylaxis in a biological warfare setting.

Clostridium Perfringens Toxins

A common anaerobic bacterium associated with three distinct disease syndromes: gas gangrene or clostridial myonecrosis, enteritis necroticans, and clostridium food poisoning.

Coagulopathy

A disease affecting the coagulability of the blood.

Coccobacillus

A short, thick bacterial rod of the shape of an oval or slightly elongated coccus.

Communicable

Capable of being transmitted from human to human, animal to animal, animal to human, or human to animal.

Conjunctiva (Pl. Conjunctivae)

The mucous membrane investing the anterior surface of the eyeball and the posterior surface of the lids.

Contagion

The spread of disease from one person to another.

Crimean-Congo Hemorrhagic Fever

A viral disease caused by Crimean-Congo Hemorrhagic Fever virus. The virus is transmitted by ticks, principally of the genus *Hyalomma*. Humans become infected through tick bites, crushing an infected tick, or at the slaughter or viremic livestock. If used as a biological warfare agent, it would most likely be delivered by aerosol.

Cutaneous

Relating to the skin.

Cyanosis

A dark bluish or purplish coloration of the skin and mucous membrane due to deficient oxygenation of the blood, evident when reduced hemoglobin in the blood exceeds 5 g/100 mL.

Cytotoxin

Toxin that directly damages and kills the cell with which it makes contact.

Decay Rate

The predictable rate at which microorganisms die/or which biological agents lost viability.

Dengue

An acute infectious disease caused by an arbovirus transmitted by *Aedes aegypti* mosquitoes characterized by fever, chills, headache, nausea, vomiting, rash, and severe muscle and joint pains.

Diathesis

The constitutional or inborn state disposing to a disease, group of diseases, or metabolic or structural anomaly.

Diplopia

The condition in which a single object is perceived as two objects.

Distal

Situated away from the center of the body, or from the point of origin; specifically applied to the extremity or distant part of a limb or organ.

Dysarthria

A disturbance of speech and language due to emotional stress, to brain injury, or to paralysis, incoordination, or spasticity of the muscles used for speaking.

Dysentery

An often infectious disease characterized by severe diarrhea with passage of mucus and blood.

Dysphagia, dysphagy

Difficulty in swallowing.

Dysphonia

Altered voice production.

Dyspnea

Shortness of breath, a subjective difficulty or distress in breathing, usually associated with disease of the heart or lungs; occurs normally during intense physical exertion or at high altitude.

Eastern Equine Encephalitis

A member of the Alphavirus family transmitted by mosquitos that generally infect horses but can cause epidemics in humans. Those infected present symptoms of malaise, headache, nausea, and vomiting.

Ebola

An RNA virus of the Filovirus family that causes one of the viral hemorrhagic fevers. Contact with infected body fluids rather than aerosols may be the principal mode of transmission. The incubation period is 20 to 21 days. The initial symptoms are fever, headache, sore throat, abdominal pain, vomiting and diarrhea. Those patients who exhibit hemorrhage usually follow a downhill course to shock and death.

Ecchymosis

A purplish patch caused by extravasation of blood into the skin, differing from petechiae only in size (larger than 3 mm diameter).

Eczema

Generic term for inflammatory conditions of the skin, particularly with vesiculation in the acute stage, typically erythematous, edematous, papular, and crusting; followed often by lichenification and scaling and occasionally by duskiness of the erythema and, infrequently, hyperpigmentation; often accompanied by sensations of itching and burning.

Edema

An accumulation of an excessive amount of watery fluid in cells, tissues, or serous cavities.

Enanthem, Enanthema

A mucous membrane eruption, especially one occurring in connection with one of the exanthemas.

Encephalitis (Pl. Encephalitides)

Inflammation of the brain.

Endemic

A disease process that is continuously present in a given community, population, or geographic location.

Endotoxemia

Presence in the blood of endotoxins.

Endotoxin

A toxin produced in an organisms and liberated only when the organism disintegrates.

Endotracheal Intubation

Passage of a tube through the nose or mouth into the trachea for maintenance of the airway during anesthesia or for maintenance of an imperiled airway.

Enterotoxin

Toxins of bacterial origin that affect the intestines, causing diarrhea (e.g., toxins from *Vibrio cholera*, *Staphylococcus*, *Shigella*, *E. coli*, *Clostridium perfringens*, *Pseudomonas*).

Enzyme

A protein formed by living cells which acts as a catalyst on physiological chemical processes.

Enzyme-Linked Immunosorbent Assay (ELISA)

An immunological technique used to quantify the amount of antigen or antibody in a sample such as blood plasma or serum.

Epidemic

The condition in which a disease spreads rapidly through a community in which that disease is not normally present.

Epistaxis

Profuse bleeding from the nose.

Epizootic

a. Denoting a temporal pattern of disease occurrence in an animal population in which the disease occurs with a frequency clearly in excess of the expected frequency in that population during a given time interval.

b. An outbreak (epidemic) of disease in an animal population; often with the implication that it may also affect human populations.

Erythema

Redness of the skin due to capillary dilatation.

Erythema Multiforme

An acute eruption of macules, papules, or subdermal vesicles presenting a multiform appearance, the characteristic lesion being the target or iris lesion over the dorsal aspect of the hands and forearms; its origin may be allergic, seasonal, or from drug sensitivity, and the eruption, although

usually self-limited (e.g., multiforme minor), may be recurrent or may run a severe course, sometimes with fatal termination (e.g., multiforme major).

Erythrocyte

A mature red blood cell.

Erythropoiesis

The formation of red blood cells.

Etiologic Agent

A viable microorganism or its toxin that causes, or may cause, human disease.

Exanthema

A skin eruption occurring as a symptom of an acute viral or coccal disease, as in scarlet fever or measles.

Exotoxin

A toxin secreted by a microorganism into the surrounding medicine.

Extracellular

Outside the cells.

Extraocular

Adjacent to but outside the eyeball.

Fasciculation

Involuntary contractions, or twitchings, of groups (fasciculi) of muscle fibers, a coarser form of muscular contraction than fibrillation.

Febrile

Denoting or relating to fever.

Filovirus

A member of the Filoviridae viral family. Filoviruses are highly pathogenic and capable of epidemic transmission. The family includes the Ebola and Marburg viruses. Filoviruses are string-shaped, often with a little hook or loop at one end.

Flash Message

A communication message with top priority to warn units of an actual or predicted chemical or biological agent hazard; a category of the NBC Warning and Reporting System.

Fomite

Objects, such as clothing, towels, and utensils that possibly harbor a disease agent and are capable of transmitting it.

Formalin

A 37 percent aqueous solution of formaldehyde.

Fulminant Hepatitis

Severe, rapidly progressive loss of hepatic function due to viral infection or other cause of inflammatory destruction of liver tissue.

Fungus

A general term used to denote a group of eukaryotic protist, including mushrooms, yeasts, rusts, molds, smuts, etc., which are characterized by the absence of a rigid cell wall composed of chitin, mannans, and sometimes cellulose.

Gene

A sequence of nucleic acids in the DNA molecules representing the genetic code for the production of one or more proteins in a living cell.

Generalized Vaccinia

Secondary lesions of the skin following vaccination that may occur in subjects with previously healthy skin but are more common in the case of traumatized skin, especially in the case of eczema (eczema vaccinatum). In the latter instance, generalized vaccinia may result from mere contact with a vaccinated person. Secondary vaccinal lesions may also occur following transfer of virus from the vaccination to another site by means of the fingers (autoinnoculation).

Germicide

An agent that destroys disease-causing microorganisms.

Gram Stain

A staining procedure used in classifying bacteria. A bacterial smear on a slide is stained with a purple basic triphenyl methane dye, usually crystal violet, in the presence of iodine/potassium iodide. The cells are then rinsed with alcohol or other solvent, and then counterstained, usually with safranin. The bacteria then appear purple or red according to their ability to keep the purple stain when rinsed with alcohol. This property is related to the composition of the bacterial cell wall.

Gram-Negative

Refers to the inability of many bacteria to retain crystal violet or similar stain through the standard Gram stain procedure. They show only the red counterstain.

Gram-Positive

Refers to the ability of many bacteria to retain crystal violet or similar stain through the standard Gram stain procedure. They retain a purple color.

Granulocytopenia

Less than the normal number of granular leukocytes in the blood.

Guarnieri Bodies

Intracytoplasmic acidophilic inclusion bodies observed in epithelial cells in variola (smallpox) and vaccinia infections, and which include aggregations of Paschen body's or virus particles.

Half-Life, Biological

The time required for the body to eliminate half of the material taken in by natural biological means.

Hemagglutination

The agglutination of red blood cells; may be immune as a result of specific antibody either for red blood cell antigens per se or other antigens which coat the red blood cells, or may be non-immune as in hemagglutination caused by viruses or other microbes.

Hemagglutinin

A substance, antibody or other, that causes hemagglutination.

Hematemesis

Vomiting of blood.

Hematuria

Any condition in which the urine contains blood or red blood cells.

Hemoglobin

The constituent of red blood cells that carried oxygen and gives them their color.

Hemopoietic

Pertaining to or related to the formation of blood cells.

Hemorrhage

The discharge of blood, as from a ruptured blood vessel.

Hemorrhagic Fever

Any of a diverse group of diseases characterized by a sudden onset, fever, muscle aches, petechiae, bleeding in the internal organs, and shock.

Hematuria

Any condition in which the urine contains blood or red blood cells.

Hemodynamic

Relating to the physical aspects of the blood circulation.

Hemolysis

Alteration, dissolution, or destruction of red blood cells in such a manner that hemoglobin is liberated into the medium in which the cells are suspended (e.g., by specific complement-fixing antibodies, toxins, various chemical agents, tonicity, alteration of temperature).

Hemolytic Uremic Syndrome

Hemolytic anemia and thrombocytopenia occurring with acute renal failure.

Hemoptysis

The spitting of blood derived from the lungs or bronchial tubes as a result of pulmonary or bronchial hemorrhage.

Hepatic

Relating to the liver.

Heterologous

- a. Pertaining to cytologic or histologic elements occurring where they are not normally found.
- b. Derived from an animal of a different species, as the serum of a horse is heterologous for a rabbit.

Host

Organism that serves as a home to, and often as a food supply for, a parasite, such as a virus.

Hot Agent

An extremely lethal infectious microorganism that is potentially airborne.

Hot Zone

An area that contains lethal, infectious organisms.

Human Immunodeficiency Virus (HIV)

The condition of having antibodies indicating the presence of HIV; the pathogen that causes Acquired Immune Deficiency Syndrome (AIDS).

Hyperemia

The presence of an increased amount of blood in a part or organ.

Hyperesthesia

Abnormal acuteness of sensitivity to touch, pain, or other sensory stimuli.

Hypotension

Subnormal arterial blood pressure.

Hypovolemia

A decreased amount of blood in the body.

Hypoxemia

Subnormal oxygenation of arterial blood, short of anoxia.

Idiopathic

Denoting a disease of unknown cause.

Immunity

- a. Resistance usually associated with the presence of antibodies or cells in a body that effectively resist the effects of an infectious disease organism or toxin.
- b. A condition of being able to resist a particular disease especially through preventing growth and development of a pathogenic microorganism or by counteracting the effects of its products.

Immunization

Administration either of a non-toxic antigen to confer active immunity or antibody to confer passive immunity to a person or animal in order to render them insusceptible to the toxic effects of a pathogen or toxin.

Immunoassay

Detection and assay of substances by serological (immunological) methods; in most applications the substance in question serves as antigen, both in antibody production and in measurement of antibody by the test substance.

Immunogen

An antigen that provokes an immune response.

Induration

- a. The process of becoming extremely firm or hard, or having such physical features.
- b. A focus or region of indurated tissue.

Infectious

Capable of producing disease in a susceptible host.

Inguinal

Relating to the groin.

Inoculation

Introduction into the body of the causative organism of a disease.

Interim Biological Agent Detector (IBAD) – Rapid Prototype

Detector that provides a near-term solution to a deficiency in shipboard detection of biological warfare agents. This equipment is capable of detecting an increase in the particulate background, which may indicate a man-made biological attack is underway, and sampling the air for identification analysis. It can also detect a change in background within 15 minutes and can identify biological agents within an additional 30 minutes.

Ion-Channel-Binding Toxins

These toxins interfere with the movement of ions such as sodium or potassium, through membranes.

Isolation

Separation of infected persons or animals from others to prevent or limit direct or indirect transmissions of the infectious agent.

Joint Biological Point Detection System (JBPDS)

The Army, Navy, Air Force, and Marine Corps use this detection system. The developmental system will replace all existing biological detection systems (Biological Integrated Detection System, Interim Biological Agent Detector, and Air Base/Port Advanced Concept Technology Demonstration), and provide biological detection capabilities throughout the services and throughout the battlespace. The common biological detection suite will consist of four functionalities—

- a. Trigger (detects a significant change in the ambient aerosol in real time).
- b. Collector (collects samples of the suspect aerosol for analysis by the JBPDS, and for confirmatory analysis by supporting laboratories in the Communications Zone and the continental U.S.
- c. Detector (able to broadly categorize the contents of the aerosol and lend confidence to the detection process; e.g., biological material in the aerosol or not, bacteriological, spore, protein, etc.).
- d. Identification (provides presumptive identification of the suspect biological warfare agent and increases confidence in the detection process). The JBPDS program consists of two phases (Block I and Block II) to allow the fastest possible fielding of a joint biological detection system, while at the same time preparing to take advantage of the rapid advances taking place in the biological detection/identification, information processing and engineering services.

Lassa Fever

An acute illness caused by the RNA containing Arenavirus. This is also classified as one of the viral hemorrhagic fevers. Transmission may be from infected rodents, contact with infected body fluids, or person-to-person contact. The incubation period is 6 to 21 days. Headache, sore throat, cough, chest pain, abdominal pain, vomiting, diarrhea and fever are frequent symptoms.

Lethal Toxin

One of the proteins comprising the anthrax toxin; a zinc metalloprotease with a molecular weight of 90,000.

Leukopenia

The opposite of leukocytosis; any situation in which the total number of leukocytes in the

circulating blood is less than normal, the lower limit of which is generally regarded as 4000-5000/mm³.

Long Range Biological Standoff Detection System (LR-BSDS) P31

This detection system uses infrared light detection and ranging (Infrared Light-Detection and Ranging) technology to detect, range, and track aerosol clouds that are indicative of a biological warfare attack; the LR-BSDS cannot discriminate biological from non-biological clouds. The system has three major components—

- a. A diode pulsed ionizing radiation laser transmitter operating at infrared wavelength.
- b. A receiver and telescope.
- c. An information processor and display.

This system has been designed in two phases: a non-developmental item phase designed to rapidly field an interim capability, and a pre-planned product improvement (P31) phase. The non-developmental item system is able to detect and track man-made aerosols out to 30 km, but non-eyesafe out to about 2.5 km. The P31 LR-BSDS will be eyesafe, have a longer operating range (50 km), and be easier to operate.

Lumbosacral

Relating to the lumbar vertebrae and the sacrum.

Lumen (Pl. Lumina)

The space in the interior of a tubular structure, such as an artery or the intestine.

Lymphadenopathy

Any disease process affecting a lymph node or lymph nodes.

Lymphopenia

A reduction, relative or absolute, in the number of lymphocytes in the circulating blood.

M31 Biological Integrated Detection System (BIDS)

This detection system uses a multiple technology approach, both developmental and off-the-shelf material, to detect biological agents with maximum accuracy. The BIDS is a vehicle-mounted, fully integrated biological detection system. The system is capable of detecting and presumptively identifying four biological warfare agents simultaneously in less than 45 minutes.

Macula, (Pl. Maculae)

- a. A small spot, perceptibly different in color from the surrounding tissue.
- b. A small, discolored patch or spot on the skin, neither elevated above nor depressed below the skin's surface.

Malaria

A chronic parasitic disease caused by Plasmodia and transmitted by the bites of infected mosquitoes. It is accompanied by severe chills and fever at regular intervals.

Marburg Virus

One of the RNA containing Filovirus family also classified in the viral hemorrhagic fever group. The incubation period is 3 to 9 days. The disease is contracted by skin or mucous membrane contact with blood or other tissues of infected monkeys or humans. The disease is manifested by headache, sore throat, muscle aches, chest pain, vomiting, diarrhea, skin rash, jaundice, easy bruising and bleeding.

Mediastinitis

Inflammation of the cellular tissue of the mediastinum.

Mediastinum

The median partition of the thoracic cavity, covered by the mediastinal pleura and containing all the thoracic viscera and structures except the lungs.

Megakaryocyte

A large cell with a polyploid nucleus that is usually multilobed; megakaryocytes are normally present in bone marrow, not in the circulating blood, and give rise to blood platelets.

Melena

Passage of dark-colored, tarry stools, due to the presence of blood altered by the intestinal juices.

Melioidosis

An infectious disease of humans and animals caused by *Pseudomonas pseudomallei*, a gram-negative bacillus. A biological warfare attack with this organism would most likely be by the aerosol route.

Meningism

A condition in which the symptoms simulate a meningitis, but in which no actual inflammation of these membranes is present.

Meningitis

Inflammation of the membranes covering the brain and spinal cord.

Meningococcemia

Presence of meningococci (*N. meningitidis*) in the circulating blood.

Meninges

Any membrane; specifically, the membranous coverings of the brain and spinal cord.

Microcyst

A tiny cyst, frequently of such dimensions that a magnifying lens or microscope is required for observation.

Microscopy

Investigation of minute objects by means of a microscope.

Microorganism

Any organism of microscopic dimensions. Once they enter the body, microorganisms multiply, overcoming the body's natural defenses, and produce disease.

Monkey Pox Virus

A virus that causes a blister type rash in monkeys similar to small pox in man. The disease is endemic in Western and Central Africa and has infected humans in this geographic area. It may have the ability for person-to-person transmission. It causes swollen lymph nodes in the neck and groin areas.

Moribund

Dying; at the point of death.

Mucocutaneous

Relating to mucous membrane and skin; denoting the line of junction of the two at the nasal, oral, vaginal, and anal orifices.

Myalgia

Muscular pain.

Mycotoxin

A fungal toxin. They can cause illness or death upon ingestion, skin contact or inhalation. They exhibit great stability and heat resistance. Mycotoxins are difficult to detect, to identify, and to decontaminate.

Mydriasis

Dilation of the pupil.

Narcosis

General and nonspecific reversible depression of neuronal excitability, produced by a number of physical and chemical agents, usually resulting in stupor rather than in anesthesia.

Necrosis

Pathologic death of one or more cells, or of a portion of tissue or organ, resulting from irreversible damage.

Nephropathia Epidemica

A generally benign form of epidemic hemorrhagic fever reported in Scandinavia.

Neurotoxic

Poisonous to nerve tissue.

Neutrophilia

An increase of neutrophilic leukocytes in blood or tissues; also frequently used synonymously with leukocytosis, inasmuch as the latter is generally the result of an increased number of neutrophilic granulocytes in the circulating blood (or in the tissues, or both).

Node

Swelling

Nodule

A small mass of rounded or irregular shape.

Nosocomial

Denoting a new disorder (not the patient's original condition) associated with being treated in a hospital, such as a hospital-acquired infection.

Oliguria

Scanty urine production.

Organism

A complex structure of interdependent and subordinate elements whose relations and properties are largely determined by their function in the whole.

Oropharynx

The portion of the pharynx that lies posterior to the mouth; it is continuous above with the nasopharynx via the pharyngeal isthmus and below with the laryngopharynx.

Osteomyelitis

Inflammation of the bone marrow and adjacent bone.

Pancytopenia

Pronounced reduction in the number of erythrocytes, all types of white blood cells, and the blood platelets in the circulating blood.

Pandemic

Denoting a disease affecting or attacking the population of an extensive region, country, continent; extensively epidemic.

Papule

A small, circumscribed, solid elevation on the skin.

Parasitemia

The presence of parasites in the circulating blood; used especially with reference to malarial and other protozoan forms, and microfilariae.

Passive Immunity

Providing temporary protection from disease through the administration of exogenously produced antibody (i.e., transplacental transmission of antibodies to the fetus or the injection of immune globulin for specific preventive purposes).

Pathogen

Biological agents that are disease-producing microorganisms, such as bacteria, mycoplasma, rickettsia, fungi, or viruses.

Penicillin

A drug of choice for therapy of anthrax. (See antibiotics.)

Peptide

Any of various amides that are derived from two or more amino acids by combination of the amino group of one acid with the carboxyl group of another and are usually obtained by partial hydrolysis of proteins.

Percutaneous

Denoting the passage of substances through unbroken skin, for example, by needle puncture, including introduction of wires and catheters.

Perivascular

Surrounding a blood or lymph vessel.

Petechia (Pl. Petechiae)

Minute hemorrhagic spots, of pinpoint to pinhead size, in the skin, that are not blanched by pressure.

Pharyngeal

Relating to the pharynx.

Pharyngitis

Inflammation of the mucous membrane and underlying parts of the pharynx.

Photophobia

Morbid dread and avoidance of light. Photosensitivity, or pain in the eyes with exposure to light, can be a cause.

Plague

An acute infectious disease caused by *Yersinia pestis*. Under normal conditions, humans become infected as a result of contact with rodents and their fleas. In a biological warfare scenario, the

plague bacillus could be delivered by means of contaminated vectors (fleas) causing the bubonic type or, more likely, by means of aerosol causing the pneumonic type. The incubation period is 2 to 8 days following the bite of an infected flea and is characterized by high fever; chills; prostration; enlarged, painful lymph nodes known as buboes, located particularly in the groin or under the arms. The bacteria can invade the blood stream leading to the septicemic form of the disease. Subsequent invasion of the lungs causes a rapidly fatal form known as pneumonic plague that can be transmitted from person-to-person via airborne respiratory droplets. The agent is highly infectious by the aerosol route and most populations are completely susceptible.

Plasma

The fluid portion of the blood, as opposed to the particulate bodies suspended in the blood.

Pleurisy

Inflammation of the two membranous sacs (pleura), each of which lines one side of the thoracic cavity and envelops the adjacent lung, reducing the friction of respiratory movements to a minimum.

Pneumonia

Inflammation of the lungs caused by viral or bacterial infections or by irritants.

Polymerase Chain Reaction (PCR)

An in-vitro method for enzymatically synthesizing and amplifying defined sequences of DNA in molecular biology. It can be used for improving DNA-based diagnostic procedures for identifying unknown biological warfare agents.

Polymorphonuclear

Having nuclei of varied forms; denoting a variety of leukocyte.

Polyuria

Excessive excretion of urine.

Potency

The quality or state of having force or power to cause an effect, as—

- a. Chemical or medicinal strength (e.g., a vaccine or drug).
- b. The ability of a pathogen or toxin to cause infection or intoxication. (When two pathogens or toxins are being compared, the one with the smallest effective dose is the most potent.)

Presynaptic Neurotoxins

Microbial paralytic toxins, such as botulinum and tetanus toxins and snake phospholipases. They block release of acetylcholine from nerve terminals.

Prophylaxis (Pl. Prophylaxes)

The prevention of disease or of a process that can lead to disease.

Prostration

A marked loss of strength, as in exhaustion.

Protein

Any of numerous naturally occurring extremely complex substances that consist of amino-acid residues joint by peptide bonds, contain the elements carbon, hydrogen, nitrogen, oxygen, usually sulfur, and occasionally other elements and include many essential biological compounds or immunoglobulins.

Proteinuria

The presence of urinary protein in concentrations greater than 0.3 g in a 24-hour urine collection or in concentrations greater than 1 g/L in a random urine collection on two or more occasions at least 6 hours apart; specimens must be clean, voided midstream, or obtained by catheterization.

Pruritus

Itching.

Ptosis (Pl. Ptoses)

Drooping of the eyelids.

Pulmonary Edema

Swelling or excessive accumulation of serous fluid in the lungs.

Pyrogenic

Causing fever.

Q Fever

An acute, febrile, incapacitating disease caused by the rickettsial bacterium *Coxiella burnetti* and transmitted via inhalation of contaminated aerosols, the bites of infected ticks or ingestion of milk from infected dairy animals. A biological warfare attack would cause disease similar to that occurring naturally.

Quarantine

Detaining, isolating, or restricting the activities of people or animals exposed to a communicable disease during the period in which the disease can be transmitted to prevent others from contracting disease.

Reservoir

Any person, animal, anthropod, plant, soil, or substance (or combination of these) in which an infectious agent normally lives and multiplies, on which it depends for survival, and in which it reproduces itself in such a manner that it can be transmitted to a susceptible vector.

Retinitis

Inflammation of the retina (a delicate multilayer light-sensitive membrane lining the inner eyeball and connected by the optic nerve to the brain).

Retrosternal

Posterior to the sternum.

Rhinorrhea

A discharge from the nasal mucous membrane.

Ribavirin

An antiviral drug used in the treatment of viral hemorrhagic fevers.

Ricin

A glycoprotein toxic from the seed of the castor plant. It blocks protein synthesis by altering the RNA, thus killing the cell. Ricin's significance as a potential biological warfare agent relates to its availability worldwide, ease of production, and extreme pulmonary toxicity when inhaled.

Rickettsia

A microorganism of the genus *Rickettsia*, made up of small rod-shaped coccoids occurring intracytoplasmically or free in the lumen of the gut of lice, fleas, ticks, and mites, by which they are transmitted to man and other animals. They cause diseases such as typhus, scrub typhus, and Rocky Mountain Spotted Fever in humans.

Rift Valley Fever

One of the viral hemorrhagic fevers caused by the Bunyaviridae viral group. It is transmitted to humans by *Aedes Aegypti* mosquitoes. It may affect the retina of the eye, leading to permanent blindness.

Salmonella

A group of nonspore forming bacteria capable of causing gastroenteritis, enteric fever, bacteremia, and localized infections. After ingestion of contaminated food or water, nausea, vomiting, diarrhea, fever headache, and muscle aches will occur lasting between 2 to 7 days.

Saxitoxin

The parent compound of a family of chemically related neurotoxins. In nature they are predominantly produced by marine dinoflagellates, although they have also been identified in association with such diverse organisms as blue-green algae, crabs, and the blue-ringed octopus. The natural route of exposure to these toxins is oral. In a biological warfare scenario, the most likely route of delivery would be by inhalation or toxic projectile. It could also be used in a confined area to contaminate water supplies.

Scarification

The making of a number of superficial incisions in the skin. It is the technique used to administer tularemia and smallpox vaccines.

Secondary Contamination

Contamination that occurs due to contact with a contaminated person or object rather than to direct contact with agent aerosols; cross contamination.

Septic Shock

- a. Shock associated with sepsis, usually associated with abdominal and pelvic infection complicating trauma or operations.
- b. Shock associated with septicemia caused by Gram-negative bacteria.

Sequellae

A condition following as a consequence of a disease.

Serum

That part of the whole blood that remains after the blood has clotted; generally yellowish in color.

Shigellosis

Bacillary dysentery caused by bacteria of the genus *Shigella*, often occurring in epidemic patterns.

Shock

An upset in the body caused by inadequate amounts of blood circulating in the bloodstream. It can be caused by marked blood loss, overwhelming infection, severe injury to tissues, emotional factors, etc.

Smallpox

An acute, systemic, potentially fatal and highly contagious viral disease caused by the variola Orthopoxvirus; characterized by the appearance of skin lesions and pustules on the face and body, with chills and fever. Under natural conditions, the virus is transmitted by direct (face-to-face) contact with an infected case, by fomites, and occasionally by aerosols.

Spores

Resistant, dormant cells of some bacteria; primitive reproductive bodies of fungi.

Staphylococcal Enterotoxin

An incapacitating toxin produced by the bacterium *Staphylococcus aureus*; responsible for the fever, chills, and gastrointestinal upsets of “food poisoning” from ingestion of improperly prepared food items. The weaponized form is an aerosol; potent incapacitator in small doses; could render up to 80 percent of exposed personnel clinically ill for approximately two weeks.

Sterile Abscess

An abscess whose contents are not caused by pyogenic bacteria.

Sterilization

The complete killing of all organisms, usually by the use of physical or chemical means such as autoclaving or exposure to high concentrations of formaldehyde.

Stridor

A high-pitched, noisy respiration, like the blowing of the wind; a sign of respiratory obstruction, especially in the trachea or larynx.

Submunition

Individual bomblets that can be filled with biological or chemical agent and packed into the aeroshell of a missile; follow independent flight patterns after air burst release from the “parent” missile.

Superantigen

An antigen that interacts with the T-cell receptor in a domain outside of the antigen recognition site. This type of interaction induces the activation of larger numbers of T cells compared to antigens that are presented in the antigen recognition site.

Superinfection

A new infection in addition to one already present.

T-Cell

Any of several types of lymphocytes that control cell-mediated and humoral immunity, or that lyse antigen-bearing cells.

T-2 Mycotoxin

A trichothecene mycotoxin produced by filamentous fungi growing on moldy cereal grains.

Tachycardia

Rapid beating of the heart, conventionally applied to rates over 100 per minute.

Teratogenicity

The property or capability of producing fetal malformation.

Tetracycline

A drug that can be used in combination with streptomycin in the therapy of brucellosis. It is also a drug of choice for Q Fever and may be used as alternative therapy for plague and tularemia. (See antibiotic.)

Thrombocytopenia

A condition in which there is an abnormally small number of platelets in the circulating blood.

Toxemia

A condition caused by the circulation of toxins in the blood.

Toxic

Poisonous.

Toxin

Any poisonous substance of microorganism, plant, or animal origin.

Toxoid

A modified bacterial toxin that has been rendered nontoxic (commonly with formaldehyde) but retains the ability to stimulate the formation of antitoxins (antibodies) and, thus, producing an active immunity. Examples include Botulinum, Tetanus, and Diphtheria Toxoids.

Tracheitis

Inflammation of the lining membrane of the trachea (a thin-walled cartilaginous and membranous tube carrying air to the lungs).

Trichothecene Mycotoxins

A diverse group of more than 40 compounds produced by fungi. They are potent inhibitors of protein synthesis, impair DNA synthesis, alter cell membrane structure and function, and inhibit mitochondrial respiration. Secondary metabolites of fungi, such as T-2 toxin and others, produce toxic reactions called mycotoxicoses upon inhalation or consumption of contaminated food products by humans or animals.

Tularemia

A zoonotic disease caused by *Francisella tularensis*, a gram-negative bacillus. Humans acquire the disease under natural conditions through inoculation of skin or mucous membranes with blood or tissue fluids of infected animals, or bites of infected deerflies, mosquitoes, or ticks.

Undulating

Rising and falling; fluctuating.

Urticaria

An eruption of itching wheals, usually of systemic origin; it may be due to a state of hypersensitivity to foods or drugs, foci of infection, physical agents (heat, cold, light, friction), or psychic stimuli.

Vaccine

A suspension of attenuated live or killed microorganisms (bacteria, viruses, or rickettsiae), or fractions thereof, administered to induce immunity and thereby prevent infectious disease.

Vaccinia

An infection, primarily local and limited to the site of inoculation, induced in man by inoculation with the vaccinia (cowpox) virus in order to confer resistance to smallpox (variola). On about the third day after vaccination, papules form at the site of inoculation which become transformed into umbilicated vesicles and later pustules; they then dry up, and the scab falls off on about the 21st day, leaving a pitted scar; in some cases there are more or less marked constitutional disturbances.

Varicella

An acute contagious disease, usually occurring in children, caused by the varicella-zoster virus, a member of the family Herpesviridae. It is marked by a sparse eruption of papules, which become vesicles and then pustules, like those of smallpox although less severe and varying in stages, usually with mild constitutional symptoms. The incubation period is about 14 to 17 days (synonym: chickenpox).

Variola

Smallpox.

Variolation

The historical practice of inducing immunity against smallpox by “scratching” the skin with the purulency from smallpox skin pustules.

Vectors

An animal, insect, or other organism that carries and transmits a virus or other microorganism.

Venezuelan Equine Encephalitis

A member of the Alphavirus family transmitted by mosquitoes that generally infects horses but can cause epidemics in humans. It can also cause infections if aerosols containing the virus are inhaled. Infection is manifested by fever, headache, sore throat, vomiting, and muscle aches.

Viral Hemorrhagic Fevers

A diverse group of human viral illnesses characterized by acute febrile onset accompanied by headache and complicated by increased vascular permeability, damage, and bleeding; mortality is high. Examples include Rift Valley Fever, Ebola Hemorrhagic Fever, and Yellow Fever.

Viremia

The presence of virus in the bloodstream.

Virion

The complete virus particle that is structurally intact and infectious.

Virus

Any of a large group of submicroscopic agents infecting plants, animals, and bacteria and unable to reproduce outside the tissues of the host.

Western Equine Encephalitis Virus

A member of the Alphavirus family transmitted to mosquitoes that generally affects horses but can cause epidemics in humans.

Yellow Fever Virus

A member of the Flavivirus group endemic to South America and Africa transmitted to humans by the *Aedes Aegypti* mosquito. It is also a viral hemorrhagic fever virus. After a 3 to 6 day

incubation period, there is abrupt onset of headache, nausea, vomiting, muscle aches, chills, and fever.

Yellow Rain

A lethal yellow substance thought to have been dispersed aurally as a warfare agent in Southeast Asia and Afghanistan; the lethal component is thought to have been a trichothecene mycotoxin. Reported to produce severe nausea and vomiting, disturbances in the central nervous system, fever, chills, and abnormally low blood pressure. Case mortality approximately 50 percent.

Zoonosis

An infection or infestation shared in nature by humans and other animals that are the normal or usual host; a disease of humans acquired from an animal source.

Zootoxin

A toxin or poison of animal, such as the venom of snakes, spiders, and scorpions.

Section 5 – Chemical Terms

Accessible Form

Undiluted agent that has not been decontaminated or neutralized, but that could possibly be removed for unauthorized purposes. Includes agents in munitions, bulk, and in laboratory containers.

Action Level

A concentration designated in Code of Federal Regulations, Part 1910, Title 29 for a specific substance, calculated as an 8-hour time-weighted average (TWA) which initiates certain required activities such as exposure monitoring and medical surveillance. (Note: For many substances the action level is one-half the permissible exposure limit.)

Agent

A force or substance that causes a change.

Agent Activity/Operation

Any operation which involved chemical agents, including storage, shipping, handling, manufacturing, maintenance, test chamber activities, laboratory activities, surveillance, demilitarization, decontamination, disposal, and training.

Agent Area

A physical location where entry and exit are restricted and controlled; where agents are manufactured, processed, packaged, repackaged, demilitarized, released, handled, stored, used, or disposed of.

Agent Facility

Any location at which chemical agent operations are carried out including storage facilities, renovation, maintenance, and demilitarization facilities, manufacturing plants, disposal sites, and laboratories. Depending on the activity, the facility may be a building, enclosure, or possibly an open area.

Agent BZ

The chemical 3-quinuclidinyl ester, CAS Registry No. 6581-06-2. BZ is a code designation for a potent psychoactive compound that has a pharmacological action similar to that of other anticholinergic drugs (e.g., atropine, scopolamine) except that the effects are more severe and longer lasting. It has an incapacitating agent classified as a Class B poison for transportation purposes. It is an odorless, white crystalline solid that in granular form may be compounded with a fuel-oxidizer mix for thermal dissemination.

Agent GA

The chemical Ethyl N,N-dimethylphosphoramidocyanidate, CAS Registry No. 77-81-6, in pure form and in the various impure forms found in storage as well as in industrial, depot, or laboratory operations (synonym - Tabun). Agent GA is a nerve agent.

Agent GB

The chemical Isopropyl methylphosphonofluoridate, CAS Registry No. 107-44-8, in pure form and in the various impure forms found in storage as well as in industrial, depot, or laboratory operations (synonym - Sarin). Agent GB is a nerve agent.

Agent GD

The chemical Pinacolyl methyl phosphonofluoridate, methyl-1, 2, 2-trimethylpropyl ester, CAS Registry No. 96-64-0, in pure form and in the various impure forms found in storage as well as in industrial, depot, or laboratory operations (synonym - Soman). Agent GD is a nerve agent.

Agent H

Levinstein mustard, CAS Registry No. 471-03-4. A mixture of 70 percent bis(2-chloroethyl) sulfide and 30 percent sulfur impurities produced by the Levinstein process. Agent H is a blister agent.

Agent HD

Distilled mustard or bis(2-chloroethyl) sulfide, CAS Registry No. 505-60-2. Distilled mustard (HD) is mustard (H) that has been purified by washing and vacuum distillation to reduce sulfur impurities. Agent HD is a blister agent.

Agent HT

A plant-run mixture of 60 percent HD and 40 percent T plus a variety of sulfur contaminants and impurities. T is bis[2-(2-chloroethylthio)ethyl]ether, CAS Registry No. 63918-89-8. T is a sulfur, oxygen and chlorine compound similar in structure to HD. Agent HT is a blister agent.

Agent L, or Lewisite

Dichloro 2-chlorovinylchloroarsine, CAS Registry No. 541-25-3; its chemical formula is $C_2H_2AsCl_3$. Agent L is a blister agent.

Agent Operating Area

That portion of an agent area where workers are actively conducting agent operations.

Agent VX

The chemical Phosphonothioic acid, methyl-S-[2-(bis(1-methylethyl)amino)ethyl] 0-ethyl ester, CAS Registry No. 50782-69-9, in pure form and in the various impure forms that may be found in storage as well as in industrial, depot, or laboratory operations. Agent VX is a nerve agent.

AIC

Acceptable Intake for Chronic Exposure.

Aldehydes

Any of various highly reactive compounds typified by acetaldehyde and characterized by the group CHO.

Alkali

A class of bases that neutralize acids and forms salts.

Amine

Any of a class of organic compounds derived from ammonia by replacement of hydrogen with one or more alkyl groups.

Analgesic

A substance used in medicine to relieve pain.

Anthropometric

Relates to the study of human body measurements, especially on a comparative basis.

Aqueous Media

Environmental media that contain a large proportion of water, such as storm water runoff from agricultural fields, animal and plant fluids, etc.

Arsenicals

A category of blister agents in which arsenic is the central atom. Although more volatile than mustard agents, they are much more dangerous as liquids than as vapors.

Atropine

An alkaloid obtained from the plant *Atropa belladonna*. It is used as an antidote for nerve agent poisoning. It inhibits the actions of acetylcholine at the nerve/muscle junction.

Automatic Chemical Agent Alarm (ACAA)

See M8A1, M-21, M-22, and M-90 descriptions.

Automatic Continuous Air Monitoring System (ACAMS)

This system can detect G agents, VX, or mustard at very low levels. It is an automated gas chromatograph that first collects agent on a solid sorbent and then thermally desorbs the agent into a separation column for analysis.

Automatic Liquid Agent Detector (ALAD)

A liquid agent device that can detect droplets of GD, VX, HD, and Lewisite as well as thickened agents. It transmits its alarm by field wire to a central alarm unit.

Binary Chemical Munitions

Munitions designed to use two non-lethal chemicals that combine only during weapon functions to produce a chemical agent.

Binary Precursors

The component chemicals that combine to produce chemical agents. Examples of two common chemical agent ingredients are as follows:

a. The precursors for binary GB (GB²) are methylphosphonic difluoride (DF) and isopropyl alcohol with an amine added (OPA).

b. The precursors for binary VX (VX²) are O,O-ethyl (2-isopropyl aminoethyl) methylphosphinite (QL) and dimethylpolysulfide (NM).

Blast

The brief and rapid movement of air vapor away from a center of outward pressure, as in an explosion. This term is commonly used to mean explosion, but the two terms should be distinguished.

Bliss Slope

The slope of the dose-response curve when the x-axis is expressed as the log of the administered dose and the y-axis is expressed as probits (probability units) of response. It is also called a Probit Slope.

Blister Agent

A chemical (e.g., sulfur mustard) that produces local irritation and damage to the skin and mucous membranes that progresses in severity to fluid-filled blisters on skin. This chemical can cause damage by exposure to liquid or vapor inhalation. It can also produce damage to the respiratory tract.

Blood Agent

A chemical (e.g., hydrogen cyanide, allyl chloride) that is absorbed into the general circulation system and carried to all body tissues. These agents deprive tissue cells of oxygen, even though the blood is capable of carrying oxygen. The brain, being highly dependent upon a continual source of oxygenation, is especially susceptible. Clinical signs include hyperventilation, which further enhances the dose received, resulting in abrupt cardiovascular collapse.

Breathing Zone

That zone of the surrounding environment in which a person performs the normal respiratory function.

Breathing Zone Sample

An air sample collected in the breathing area (around the nose) of an individual to assess his/her exposure to airborne contaminants.

Buddy-Aid

The administration of a chemical agent antidote to a soldier exhibiting symptoms of severe chemical agent poisoning when unable to administer self-aid.

Buffer Zone

As used by the FEMA and the USEPA, an area adjacent to a restricted zone which residents may return to, but where protective measures are recommended to reduce dose or exposure.

CAIRA

Chemical Accident or Incident Response and Assistance.

Chemical Accident/Incident (CAI)

Chemical events involving chemical agent material—

- a. Chemical Accident: a chemical event resulting from non-deliberate acts where safety is of primary concern.
- b. Chemical Incident: a chemical event resulting from deliberate acts (e.g., terrorism or criminal acts) where security is of concern.

Chemical Agent

A chemical substance that is intended for use in military operations to kill, seriously injure, or incapacitate people through its physiological properties. For consideration are blood, nerve, choking, blister, and incapacitating agents. Excluded are industrial chemicals, riot control agents, chemical herbicides, and smoke and flame materials.

Chemical Agent Casualty

An individual who has been affected sufficiently by a chemical agent to prevent or seriously degrade his or her ability to carry out the mission.

Chemical Agent Monitor (CAM)/Improved Chemical Agent Monitor (ICAM)

This item is used to detect chemical agent vapors and provide a readout of the relative concentration of the vapor present. It is a hand-held, battery-operated device for the monitoring of decontamination procedures and effectiveness on personnel and equipment. It can detect, identify and provide relative vapor concentration readouts for G and V-type nerve agents and H-type blister agents. The ICAM is a hand-held, soldier-operated, post-attack device for monitoring chemical agent decontamination on people and equipment. It detects vapors of chemical agents by sensing molecular ions of specific mobilities (time of flight) and uses timing and microprocessor techniques to reject interference.

Chemical Bombs

Devices in which a chemical reaction takes place within a confined space. The following are the most common types:

- a. Acid Bomb. Common ingredients are hydrochloric acid and aluminum foil that chemically reacts to give off heat, ultimately producing hydrogen gas and sufficient pressure to burst the container.
- b. Caustic Bomb. Alkali based devices mixed with water and aluminum foil. The most common ingredient is sodium hydroxide, a corrosive in both liquid and solid forms that can immediately cause serious burns to skin on contact.

c. **Dry Ice Bomb.** When dry ice evaporates, carbon dioxide gas is released. It usually takes 30 to 45 minutes for enough pressure to build to rupture the contained. When detonation occurs before all the dry ice has evaporated, the remaining dry ice becomes fragments that can cause frostbite when contacting skin tissues.

Chemical Cartridge

A type of absorption unit used with a respirator for removal of solvent vapors and certain gases.

Chemical Contamination

The deposition of chemical agents on personnel, clothing, equipment, structures, or areas. Chemical contamination mainly consists of liquid, solid particles, and vapor hazards. Vapor hazards are probably the most prevalent means of contaminating the environment, although they are not necessarily a contact hazard.

Chemical Demilitarization

The mutilation, destruction, or neutralization of chemical agent materials, rendering it harmless and ineffectual for military purposes.

Chemical Demilitarization Program

The Department of Defense was directed by Congress through Public Law 99-145 as the government agency responsible for the destruction of the chemical weapons stockpile. This program is also responsible ensuring maximum protection to the environment, general public, and personnel involved in the destruction effort. To comply with treaty agreements and Congressional mandate, destruction of these weapons must be complete by 2007. The Program Manager for Chemical Demilitarization is responsible for the Chemical Stockpile Disposal Program that consists of four separate programs—

a. **The Chemical Stockpile Disposal Program (CDSP):** responsible for the destruction of the U.S. stockpile of unitary chemical weapons. The current technology uses manual unpacking, automated disassembly, and incineration of agent, explosives, metal, and dunnage in four separate incinerators, followed by exhaust gas processing through separate pollution abatement systems.

b. **The Alternative Technologies and Approaches (ATA):** responsible for conducting pilot testing of alternative destruction technologies that may be implemented in future chemical weapon destruction facilities.

c. **The Non-Stockpile Chemical Materiel Program (NSCMP):** responsible for the destruction of non-stockpile chemical warfare material, including binary chemical weapons, miscellaneous chemical warfare materiel, recovered chemical weapons, former production facilities, and buried chemical warfare materiel.

d. **The Chemical Stockpile Emergency Preparedness Program (CSEPP):** responsible for providing maximum protection of the civilian population during storage, handling, and

destruction of the U.S. chemical weapons stockpile by improving state and local governments preparedness for an accidental release of agent.

<http://www.hnd.usace.army.mil/chemde/index.asp>

Chemical Event

Applies to the following:

- a. Chemical agent leaks of munitions in the chemical agent stockpile.
- b. Requirements for emergency transportation and/or disposal of known or suspected chemical agents.
- c. Any release of chemical agent to the environment outside of closed systems, facilities, or devices (for example, lab hood, glove box, munitions, bulk container which are specifically designed to contain chemical agents) greater than established The Surgeon General airborne exposure standards (as per Department of Defense Directive 6055.9 standards promulgated in Army Regulation 385-64), or release resulting in personnel exhibiting clinical signs or symptoms of chemical agent exposure.
- d. Any exposure or release of agent that does not exceed airborne exposure standards established by The Surgeon General but, nonetheless, is receiving media attention.
- e. Any deliberate release of chemical agent resulting from a terrorist or criminal act (including employment of an improvised chemical device intended to disperse chemical agent regardless of whether device has functioned or not).
- f. Loss of chemical surety material (other than deliberate destruction by approved, authorized laboratory, and demilitarization process, including training expenditures).
- g. Release of or exposure to chemical agents, whether classified as chemical agent or experiments.

Chemical Event Emergency Notification System

A joint system of emergency notification of chemical events for off-post response. If a release of chemical agents happens, immediate action must be taken to notify and protect personnel in the predicted hazard area. The criteria to make this notification will be based on predicted dosage and distances.

Chemical Management Evaluation

An evaluation conducted by The Inspector General or the Major Army Command Inspector General of chemical operations with inquiry into the chemical functions and responsibilities of staff agencies, inspection teams, major and intermediate command levels, and assistance teams to determine management, systemic, or functional problem areas in the chemical program attributable to any echelon.

Chemical Overgarment-84 (OG-84)

This garment is a camouflage colored (woodland or desert), expendable, two-piece over garment consisting of one coat and one pair of trousers. It provides protection against chemical agent vapors, liquid droplets, biological agents, toxins, and radioactive alpha contamination. Its protective qualities last for a minimum of 30 days. This over garment provides a minimum of 24 hours of protection against exposure to liquid or vapor chemical agent.

Chemical Substance

A substance usually associated with some description of its toxicity or exposure hazard, including solids, liquids, mists, vapors, fumes, gases, and particulate aerosols. Exposure, via inhalation, ingestion, or contact with skin or eyes, may cause toxic effects, usually in a dose-dependent manner.

Chemical Surety

Those controls, procedures, and actions that contribute to the safety, security, and reliability of chemical agents and their associated weapon systems throughout their life cycle without degrading operational performance.

Chemical Surety Material

All lethal and incapacitating chemical agents and their related weapon systems, including binary munitions and their critical components that are either adopted or considered for military use. Excluded are riot control agents, defoliants, incendiaries, smoke, and flame.

Chemical Warfare

All aspects of military operations involving the use of lethal munitions/agents and the warning and protective measures associated with such offensive operations.

Chemical Weapons

- a. Toxic chemicals and their precursors, except where intended for purposes not prohibited under the Chemical Weapons Convention.
- b. Munitions and devices, specifically designed to cause death or other harm through the toxic properties of toxic chemicals which would be released as a result of the employment of such munitions and devices.
- c. Any equipment specifically designed for use directly in connection with the employment of munitions.

Chemical Weapons Convention

This Convention prohibits the development, production, stockpiling, and use of chemical weapons. It was opened for signature in 1993, and entered into force in 1997. The Organisation for the Prohibition of Chemical Weapons (OPCW) in the Hague is responsible for implementation. The State Parties to this Convention work towards achieving effective progress towards general and complete disarmament under strict and effective international control,

including the prohibition and elimination of all types of weapons of mass destruction. This Convention reaffirms the principles and objectives of and obligations assumed under the Geneva Protocol of 1925, and the Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction signed on in April 1972.

<http://www.opcw.nl/>

<http://projects.sipri-se/cbw/docs/cw-cwc-mainpage.html>

Chemical Weapons System

An integrated relationship of chemical agents, munitions or spraying devices and their mode of delivery to the target.

Choking Agent

Compounds that injure an unprotected individual chiefly in the respiratory tract (the nose, throat, and lungs). In extreme cases membranes swell, lungs become filled with liquid, and death results from lack of oxygen.

Chlorine (Cl)

A choking agent. A chemical agent that is typically a non-persistent, heavy greenish-yellow gas. It irritates the eyes and throat and can lead to pulmonary edema resulting in death.

Cholinesterase (ChE)

An enzyme that catalyzes the hydrolysis of acetylcholine to choline (a vitamin) and acetic acid.

Clean Areas

Those areas where environments are free of liquid agent contamination and have been monitored to verify that air concentrations are below the adverse effect levels.

Complementary Binary Precursors

Both the critical and non-critical precursors of a binary chemical agent (e.g., DF and OPA, or QL and NM).

Confounder

A condition or variable that may be a factor in producing the same response as the substance under study. The effects of such factors may be discerned through careful design and analysis.

Controlled Release

A release of a chemical agent that may not be intended but is anticipated. It is followed by immediate action that will suppress the vapor or liquid release by approved decontamination procedures and/or use of other suppression techniques that have also been approved beforehand.

Cyanide

A compound that contains a nitrogen and a carbon atom bound in a special way. It is very poisonous and affects the ability of our tissues to use oxygen. Health effects are similar whether

it is breathed, ingested, or come in contact with skin. Symptoms include difficulty breathing, irregular heartbeat, uncontrolled movement, convulsions, coma, and possibly death.

Decomposition

The breaking down of a substance or compound through a chemical reaction into its similar components.

Demilitarization

The mutilation, destruction, or neutralization of chemical agent material, thereby, rendering it harmless and ineffectual for military purposes.

Desiccant

A substance that has an affinity for water.

Detection Limit

Analytical capability based on the amount of the sample and the sensitivity of the analytical method.

Diesel Fuel Smoke

A visual obscurant used to conceal personnel and equipment. It is formed by injecting diesel fuel into the exhaust manifold of a tactical vehicle where the fuel is vaporized and expelled with the vehicle's exhaust. Upon dilution and cooling to the ambient temperature, the fuel condenses into a dense white smoke.

Dilute Solutions

Those mixtures presenting significantly reduced hazards. A solution of H, HD, L, or HT is considered dilute if its concentration is not greater than 10 milligrams per milliliter (neat agent/solvent) and it contains no more than 100 mg of neat agent. For agent GB, a maximum concentration of 2 mg/mL of agent in a solution containing a maximum quantity of 20 mg of neat agent is considered dilute. For agent VX, a maximum concentration of 1 mg/mL of agent in a solution containing a maximum quantity of 10 mg of neat agent is considered dilute.

DS-2

A decontaminating agent against biological and chemical contamination, an apestropic mixture combining diethylenetriamine (70 percent), ethylene glycol monomethyl ether (28 percent), and sodium hydroxide (2 percent).

Enzyme

Organic substance capable of causing chemical changes to take place quickly at body temperature by catabolic action as in digestion.

Erythema

A severe redness of the skin, as caused by chemical poisoning or sunburn.

Exclusion Area

The area immediately surrounding one or more receptacles in which chemical agents are contained. In the absence of positive preventive measures, access into area constitutes access to the chemical agent.

Experimental Chemical Agent

Chemical substances being tested, developed, or altered for chemical defense purposes that will be used solely by the military. These substances will have toxicities equal to or greater than current nerve or mustard agents.

Explosive Ordnance Disposal (EOD)

The detection, identification, field evaluations, rendering safe, recovery, and final disposal of unexploded explosive ordnance or munitions chemical agents.

Explosive Ordnance Disposal Procedures

Those particular courses or modes of action for access to, recovery, render safe, and final disposal of explosive ordnance or any hazardous material associated with an explosive ordnance disposal incident.

Exposed Worker, Chemical Agent

a. An exposed worker—

(1) Exhibits clinical signs or symptoms or nerve agent intoxication.

(2) Has cholinesterase depression, consistent with nerve agent effect.

b. A potentially exposed worker—

(1) Works in an agent operating area where levels of nerve agent or mustard exceed the protective capability of the personal protective equipment.

(2) Works in an agent operating area where levels of nerve agent or mustard are detectable and there is a breach in personal protective equipment or engineering controls.

c. An exposed worker is an individual who exhibits clinical signs or symptoms of mustard effect.

Feasibility Study

A study undertaken by the lead agency to develop and evaluate options for remedial action.

Flash Point

The lowest temperature at which a substance gives off enough combustible vapors to produce momentary ignition when a flame is applied under controlled conditions.

Fog Oil Smoke

Smoke generated by injecting mineral oil into a heated manifold. The oil vaporizes upon heating and condenses when exposed to the atmosphere, producing respirable particles. Graphite can be added to fog oil to provide screening in the infrared range of the electromagnetic spectrum. The chemical and physical properties of fog oil are similar to those of petroleum-based lubricating and cutting oils.

G-Series Nerve Agents

Include tabun (GA), sarin (GB), soman (GD), and GF that are members of a class of compounds that are more lethal and quicker acting than mustard. They act rapidly and may be absorbed through the skin or the respiratory tract. Exposure to a lethal dose may cause death in as little as several minutes. These less persistent agents are used to cause immediate casualties and to create a short-term respiratory hazard on the battlefield.

Gas

A fluid that has neither independent shape nor volume but tends to expand indefinitely.

Hexachloroethane Smoke

The toxicity of hexachloroethane (HCE) (referred to as HC smoke) is attributed to the production of zinc chloride. HC smoke is produced by burning a mixture containing roughly equal parts of hexachloroethane and zinc oxide. The U.S. military uses HC smoke in a wide variety of munitions. It is used in smoke pots and smoke grenades to generate a screening effect.

Hg

Mercury.

High-Efficiency Particulate Air (HEPA) Filter

A filter that is at least 99.97 percent efficient in removing particles with a diameter of 0.3 μ ; used to treat exhaust air from equipment that may generate aerosols.

Hydrocarbons

An organic compound containing only carbon hydrogen and often occurring in petroleum, natural gas, coal, and bitumens.

Hydrolyzed

Refers to a compound which has undergone chemical reaction with water; hydrolysis is the reaction of a particular compound (e.g., a chemical warfare agent) with water to form new chemical compounds ("reaction products").

IC_{t50}

Inhalation dose of a chemical agent (vapor or aerosol) that produces a given, defined level of "incapacitation" in 50 percent of the exposed subjects (see ED₅₀, and consider "incapacitation" as the effect). (NOTE: There is no general consensus on a military definition of incapacitation. It can refer to behavioral manifestations, physiologic endpoints, or individual combat effectiveness, all of which may vary depending upon the task the individual soldier is expected to accomplish.)

ID₅₀

Dose of a liquid chemical agent needed to produce "incapacitation" in 50 percent of the exposed subjects (see note under IC_{t50}).

Idiosyncratic Reaction

A genetically determined abnormal reactivity to a chemical.

Igloo

A reinforced concrete, earth-covered shelter used for storing explosives and munitions.

Impervious

Providing protection by precluding penetration of a substance (as demonstrated by methods in Military Standard 282) for the useful life of the item concerned.

Improved (Chemical Agent) Point Detection System (IPDS)

This detection system is a new shipboard point detector and alarm that replaces the Chemical Agent Point Detection System. This system can detect nerve and blister agent vapors at low levels and automatically provides an alarm to the ship.

Incendiary

Primarily an antimaterial compound that generates sufficient heat to cause destructive thermal degradation or destructive combustion of material.

Individual Chemical Agent Detector (ICAD)

A miniature lightweight chemical warfare agent detector that can be worn by the individual. It detects and alarms to nerve, blood, choking, and blister agents and is intended for a variety of applications. It may be used as a point detector.

Industrial Chemical

Chemicals developed or manufactured for use in industrial operations or research, by industry, Government, or the academia. These chemicals are not primarily manufactured for the specific purpose of producing human casualties or rendering equipment, facilities, or areas dangerous for use by man. Hydrogen cyanide (AC), cyanogen chloride (CK), and phosgene (CG) and methylphosphonicdifluoride (DF) are considered industrial chemicals.

Interspecies Dose Conversion

The process of estimating equivalent doses between species (e.g., frequently a known animal dose is converted to estimate an equivalent human dose). The USEPA's cancer risk assessment guidelines generally recommend using the surface area approach unless there is evidence to the contrary. The dose as mg/kg of body weight/day divided by a 10-fold UF is generally used to convert between species for non-cancer effects of chemicals.

Joint Chemical Agent Detector (JCAD)

This detector will employ surface acoustic wave technology to detect nerve and blister agents. It will also allow detection of new forms of nerve agents.

Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD)

This detector is a fully coordinated joint service Research, Development, Test, and Evaluation program, chartered to develop a lightweight standoff chemical detector for the quad-services. It will be capable of scanning 360 degrees x 60 degrees, and automatically detecting nerve or blister agents at a distance up to 5 km. The system will be light, compact, and operate from a stationary position or on the move. The JSLSCAD Michelson interferometer employs a passive infrared system that will detect presence of chemical agents by completing a spectral analysis of target vapor agent chemical clouds. This detector is envisioned for employment on various platforms and in various roles, including fixed site defense, unmanned aerial vehicles, tank and other vehicles, and on board ships.

Joint Service Warning and Identification LIDAR Detector (JSWILD)

This detector is a joint effort chartered to develop a chemical warning and identification system for the quad-services. The JSWILD will be a lightweight, vehicle-mountable, contamination-monitoring system, which detects and quantifies all types of chemical agent contamination (including agent rain, vapors, and aerosols) in a standoff mode from a distance of 20 km. In addition, it will provide similar but short-range (1-5 km) capabilities in biological standoff detection as the LR-BSDS. It will operate from fixed sites and ground vehicles. The system has distance-ranging and contamination-mapping capabilities and transmits this information to a battlefield information network.

K Agents

Incapacitating agents.

Levinstein Mustard (H)

A blister agent. It contains about 30 percent sulfur impurities. The properties of H are essentially the same as HD except that sulfur impurities lessen its effectiveness and depress the freezing point by 2 to 5 degrees.

M8 Chemical Agent Detection Paper

A chemically treated, dye-impregnated paper, issued in a book of 25 sheets. It is designed to detect liquid V, G, and H agents. M8 paper will change colors to identify non-persistent G-type nerve (yellow), V-type nerve (black or dark green), or blister (red) agents. It is included in the M256A I Kit and in the M18A2 Chemical Agent Detection Kit.

M8A1 Automatic Chemical Agent Alarm (ACAA) System

The only remote continuous air-sampling alarm in the U.S. Army. This alarm will sample the air for the presence of nerve agent vapors (GA, GB, GD, or VX) only. It is capable of detecting nerve agent levels in 2 minutes or less. The system is an electrochemical, point sampling, chemical agent alarm that can be hand-carried, backpacked, or mounted on a tactical vehicle. It consists of the M43A1 detector, as many as 5 M42 alarm units, and various power supplies. The M8A1 will automatically signal the presence of the nerve agent in the air by providing troops with both an audible and visible warning. It requires an NRC license.

M9 Chemical Agent Detection Paper

A self-adhesive paper that can be readily attached to the body or to vehicles, shelters, and other equipment. It cannot distinguish the identity of agents. The agent sensitive dye will turn red upon contact with liquid nerve agents (G and V) and blister agents (H and L). The paper produced colored spots when in contact with nerve and blister agents.

M11 Portable Decontaminating Apparatus

A device containing DS-2 used to decontaminate small areas, such as the steering wheel or other equipment that soldiers must touch. It is filled with 1 1/3 quarts of DS-2.

M13 Portable Decontaminating Apparatus

The M13 is about the size of a 5-gallon gasoline can and is used to decontaminate vehicles and crew-served weapons larger than a .50-caliber piece.

M17 Lightweight Decontamination System (LDS)

The M17 is a portable pump and water-heating unit for producing hot water and steam. The system incorporates a 1,580-gallon collapsible water tank, two wand assemblies, connecting hoses, and a shower rail. It is issued to Army battalion-size units and to chemical decontamination companies and battalions.

M17 Protective Mask

This chemical and biological mask assembly includes the mask, the M15A1 carrier, two lens outserts, and the M1 waterproofing bag. It is made of molded rubber with filter elements in each cheek, plastic eye lenses, and a voice emitter outlet valve in the front. The A1 and A2 models include the capability to drink water while masked. The mask protects the wearer's face, eyes, and respiratory tract against field concentrations of chemical and biological agents.

M18A2 Chemical Agent Detector Kit

A kit used by technical escort teams and used in depots. It consists of portable tests capable of detecting selected choking and blood agents as well as nerve agents and blister (e.g., mustards, arsenicals, urticants) agents. It is used to detect and classify dangerous concentrations of toxic chemical agents in the air and liquid chemical agent contamination on exposed surfaces.

M-21 Remote Sensing Chemical Agent Automatic Alarm (RSCAAL)

A two-man portable tripod-mounted, automatic scanning, passive, infrared sensor which detects nerve and blister agent vapor clouds based on changes in the infrared energy emitted from remote objects, or from a cloud formed by the agent. The M-21 is line-of-sight dependent with a detection range up to 3 miles and a field of view of 1.5 degrees vertical and 60 degrees horizontal. It will be used for surveillance and reconnaissance missions and will search areas between enemy and friendly forces.

M22 Automatic Chemical Agent Alarm (ACADA)

An advanced, point-sampling, chemical agent alarm system employing ion-mobility spectrometry. It is man-portable, operates independently after system start-up, and provides an audible and visual alarm. The system detects and identifies nerve and blister agents. It also

provides communications interface for automatic battlefield warning and reporting. The M22 system replaces the M8A1 Alarm as an automatic point detector and augments the CAM as a survey instrument.

M34 Soil Sampling Kit

Materials used to sample soil, surface matter, and water.

M40/M42 Chemical/Biological Protective Mask

This is the standard protective mask. The mask consists of a silicone face piece with in-turned periphery, binocular eye lens system, and elastic head harness. Other features include front and side voice emitters, allowing for better communications, drink tube, clear, and tinted inserts and filter canister with NATO standard threads. The mask protects against chemical and biological agents, toxins, radioactive fallout particles, and battlefield contaminants. The M40/42 Series field protective masks will replace the M17 (general purpose), M25 (vehicle crewman), and M9 (heavy-duty) masks.

M-90 Automatic Agent Detector (AMAD)

An automatic nerve and mustard agent detector that detects agents in vapor form. It transmits an alarm by radio to a central alarm unit. It is currently used by the Air Force.

M90 DIA Chemical Agent Detector (CAD)

A man-portable instrument designed to determine and indicate the hazard from nerve or blister (mustard) agent vapors present in the air. Hazard levels are indicated in high, medium, and low concentrations. This detector is programmable, with the capability to add new agents as they are developed. It is operable over a multitude of operational platforms including day or night conditions. It can be used to verify clean areas, perform area surveys, identify contamination, and verify the effectiveness of decontamination operations. The M90 is currently fielded within the Air Force.

M-93 and M-93A1 FOX

This reconnaissance system provides NBC protection, warning, and sampling equipment integrated into a high speed, high mobility armored carrier with collection protection for its crew. The system contains a CAM, a chemical agent detector alarm, a radiation detection device, a navigation system, secure communications, and an area marking system. The system provides combat information on the presence of NBC hazards and can operate in all areas, in adverse weather and under all types of battlefield conditions.

M256A1 Chemical Agent Detector Kit

A portable and disposable chemical agent detector kit consisting of 12 individually packaged samplers/detectors and a packet of M8 detector paper. It is used at squad, crew or section level to detect and identify field concentrations of nerve, blister or blood agent vapors. It is usually used to determine when it is safe to unmask in about 15 to 20 minutes, to locate and identify chemical hazards, and to monitor decontamination effectiveness.

M258A1 Skin Decontamination Kit

A kit issued to each soldier containing wipes with solutions that will neutralize most nerve and blister agents.

M272 Water Testing Kit

A lightweight portable kit used to detect and identify dangerous levels of common chemical warfare agents in raw and treated water in about seven minutes. It is a test water sampler and is not a continuous monitor. Each kit conducts 25 tests for each agent.

M291 Skin Decontamination Kit

This kit is used to decontaminate the soldier's hands, face, ears, and neck. Packets in the kit consist of a foil-laminated fiber material containing a reactive resin. It replaces the M258A1 Skin Decontamination Kit.

Maximum Credible Event

The worst single event that could occur at any time with maximal release of chemical agent from a munition, bulk container, or process as a result of an unintended, unplanned, or accidental occurrence. The event must be realistic with reasonable probability of occurrence.

Merck Index

Includes basic information on several thousand compounds that are important in general chemical and biochemical practice.

Metabolic Products

The breakdown products of the chemical processes in living organisms that convert food into new tissues and energy; they are also products or reactions which tend to detoxify nonfood chemicals.

Mini-Cam

Miniature chemical agent monitor.

Miosis

The excessive smallness or contraction of the pupil of the eye. The pupil is unable to dilate and remains contracted; thus, performance of tasks, navigating on foot, identifying or engaging targets, or driving vehicles is practically impossible. Miosis is often accompanied by pain, headaches, and pinpointing of the pupils.

Monitoring

The continued or periodic act of seeking to determine whether a chemical agent is present.

Most Probable Event

The worst potential mishap most likely to occur during routine handling, storage, maintenance, or surveillance operations, which results in the release of agent and exposure to personnel.

Mustard Agents

A category of blister agents including the sulfur mustards (H, HD) that are chlorinated thioethers, and the nitrogen mustards (HN-1, HN-2, HN-3) that are derivatives of ammonia.

Napalm

An incendiary mixture typically made of polystyrene, benzene, and gasoline and used in flame weapons.

Neat Agent Equivalent

The actual volume of chemical agents that will be formed when two separate volumes of an agent's precursors are mixed. The resulting chemical agent is deemed to be pure for purposes of accountability and for determining storage limits.

Neat Chemical Agent

A non-diluted, full-strength (as manufactured) chemical agent in any concentration in excess of those designated exempt. A chemical agent manufactured by the binary synthesis route will also be considered a neat agent regardless of purity.

Nerve Agent

Organic esters of phosphoric acid used as a chemical warfare agent because of their extreme toxicity (tabun (GA), sarin (GB), soman (GD), GF, and VX). All are potent inhibitors of the enzyme, acetylcholinesterase, which is responsible for the degradation of the neurotransmitter, acetylcholine. Symptoms result from excess accumulation of acetylcholine in neuronal synapses or myoneural junctions. Nerve agents are readily absorbed by inhalation and/or through intact skin.

Neutralent

Those materials remaining from the chemical neutralization of agents.

Neutralization

Altering the chemical, physical, and toxicological properties to render the chemical agent ineffective for use as intended.

Nitrogen Mustard

A form of blister agent that includes HN-1, HN-2, and HN-3.

Nonlethal Agents

Chemical agents that can incapacitate but which, by themselves, are not intended to cause death.

Nonpersistent Agent

Chemical agent that when released dissipates and/or loses its capability to cause casualties after 10 to 15 minutes.

Nonstockpile Chemical Materiel

The Army has five categories of non-stockpile chemical warfare materiel—

a. *Binary chemical weapons* form lethal chemical agents by mixing two less toxic chemicals. Army policy requires that the components of binary weapons only be loaded together into a munition immediately prior to use on the battlefield, thus forming the lethal chemical agent during flight to the target.

b. *Buried chemical warfare materiel* includes any buried materiel. Land burial was a principal means of disposing of hazardous materials for many years. In most cases, the materiel was burned or chemically neutralized prior to burial.

c. *Recovered chemical weapons* include items recovered during range-clearing operations from chemical burial sites, and from research and development testing. Recovered chemical warfare materiel is over packed and either stored on site or transported and stored at a permitted Department of Defense site following recovery from range-clearing operations and burial.

d. *Former production facilities* include government facilities that produced chemical weapons and agents prior to the signing of the Chemical Weapons Convention. These facilities produced chemical agent, precursors, and components for chemical weapons or were used for loading and filling munitions.

e. *Miscellaneous chemical warfare materiel* includes unfilled munitions, support equipment, and devices designed to be used with chemical weapons. These include complete assembled rounds without chemical fill, with or without bursters and fuzes; simulant-filled munitions; inert munitions; dummy munitions; bursters and fuzes; empty rock warheads and motors; projectile cases; and other components of metal and plastic parts.

<http://www-pmcd.apgea.armylmil/text/NSCMP/index.html>

Occupational Environment Controls

The basic principles for controlling the workplace environment are substitution, isolation, and ventilation.

On-Scene Commander

A general officer that has operational control of emergency response forces and supervises all on-site operations at the scene of a chemical accident. Also referred to as Service Response Force Commander.

On-Scene Coordinator

The person designated to direct cleanup efforts under the NCP.

Organic Solvent

An organic chemical compound that dissolves another to form a solution. Examples include alcohols, turpentine, kerosene, benzene, chloroform, acetone, carbon tetrachloride, and toluene.

Persistent Agent

Chemical agents that do not hydrolyze or volatilize readily (e.g., VX and HD.)

Phosgene

Carbonyl chloride; a colorless liquid below 8.2 degrees Celsius, but an extremely poisonous gas at ordinary temperatures; it is an insidious gas, since it is not immediately irritating, even when fatal concentrations are inhaled.

Phytotoxin

A toxin derived from a plant. An example is ricin from the castor bean.

Potentially Exposed Worker

An individual who works in an agent-operating area where agent levels—

- a. Exceed the protective capability of the personal protective equipment.
- b. Are detectable and there is a breach of personal protective equipment or engineering controls.

Precursor

Any chemical reactant that takes part at any stage in the production by whatever method of a toxic chemical. This includes any key component of a binary or multicomponent chemical system.

Probit Analysis

Application of the methods of Bliss to determine the slope and various effective dosage levels (e.g., $LC_{t_{50}}$, LD_{50} , $LC_{t_{16}}$, LD_{16} , $LC_{t_{84}}$, LD_{84} , $LC_{t_{05}}$, LD_{05} , etc.) for quantal dose-response data.

Prostration

A complete physical or mental exhaustion; extreme exhaustion or powerlessness.

Protection Factor

The ratio of the concentration outside the personal protective equipment to the concentration inside the personal protective equipment. Measurement sites are critical for proper determination (e.g., for a protective mask, the measurements inside the mask would be made at a subject's breathing zone, and the measurements outside the mask would be made in a corresponding zone).

Reagent

A chemical substance used to produce a chemical reaction.

Red Phosphorus/Butyl Rubber Smoke

The military application of phosphorus smokes for environmental screening can contain either white phosphorus or red phosphorus in various matrices (e.g., felt, butyl rubber, or polymer epoxy binders). The compositions of the various phosphorus smokes are similar, being composed primarily of polyphosphoric acid with less than 1 percent trace levels of organic compounds. The purpose of the butyl rubber is to reduce the cloud-pillar effect found with pure red phosphorus. In Army field use, red phosphorus smoke is deployed explosively from

grenades and mortar shells. It is used in grenades to provide a partial self-protection system for armored vehicles. It is also the major ingredient in mortar rounds used to generate smoke.

Relative Risk (sometimes referred to as Risk Ratio)

The ratio of incidence or risk among exposed individuals to incidence or risk among non-exposed individuals.

Release

Controlled or uncontrolled escape of chemical agent(s) into the environment. Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles containing any hazardous substance or pollutant or contaminant).

Remedial Actions

Activities taken to restore a contaminated site to its pre-contaminated condition. In contrast to removal actions, these are longer-term actions, including cleanup, treatment, and neutralization of contamination and access control or permanent relocation of residents, if necessary. Remedial actions are coordinated by the remedial project manager. U.S. Department of the Army Pamphlet 50-6, *Chemical Accident or Incident Response and Assistance (CAIRA) Operations*, treats remedial actions as taking place in a "non-emergency atmosphere," and describes the goal as returning the chemical accident or incident site to "technically achievable and acceptable conditions."

Removal Actions

Immediate, short-term response activities for cleanup and removal of hazardous materials, assessment of the release, and actions to protect the public such as temporary relocation (CERCLA, and NCP; Code of Federal Regulations, Part 300, et seq., Title 40). Removal operations are coordinated by the on-scene coordinator.

Reproductive Effect

A toxic effect of a substance that is evident in the second or third generation of exposed grandparents.

Respond

Removal, remedy, or remedial actions.

Reversible versus Irreversible Toxicity

Reversible toxic effects are those that can be repaired, usually by a specific tissue's ability to regenerate or mend itself after chemical exposure, while irreversible toxic effects are those that cannot be repaired.

Rhinitis

The inflammation of the mucous membrane of the nose.

Riot Control Agents

Compounds widely used by governments for domestic law enforcement purposes and which produce transient effects on man that disappear within minutes after removal from exposure.

Safety Assessment Report (SAR)

A formal summary of the safety data collected during the design and development of the system. In this summary, the material developer summarizes the hazard potential of the item, provides a risk assessment, and recommends procedures or other corrective actions to reduce these hazards to an acceptable level.

Safety Controls

Mandatory, procedural safeguards approved by the Secretary of the Army and determined to be necessary per safety studies and reviews. Safety controls ensure maximum safety of chemical agents throughout the life of the chemical weapon. Controls will be consistent with operational requirements.

Safety Objectives

Criteria for comparing and judging measures for adequacy. Safety objectives incorporate the safest measures consistent with operational requirements.

Sample Data Collection (SDC)

A method for obtaining information on the performance and maintainability of an item of equipment. Data are obtained directly from observations made in the field. An effort is made to see that the sample from which feedback is obtained represents the total population.

Sarin

Isopropyl methylphosphonofluoridate; it is a non-persistent organophosphate nerve agent also known as GB. Its chemical formula is $C_4H_{10}FO_2P$. It is a colorless liquid or vapor with almost no odor in its pure state. Symptoms include pupil constriction, blurred or dimmed vision, pain in eyeballs; chest tightness, difficulty in breathing; sweating, salivation, increased bronchial secretions, bradycardia, hypotension, vomiting and diarrhea, bronchoconstriction, and urinary and fecal incontinence.

Screening and Signaling Smokes

Compounds that produce an obscuring smoke when burned, hydrolyzed, or atomized; they are used to limit observation and to reduce the effectiveness of aimed fire. Signaling smokes are similar to screening smokes, except that signaling smokes generally are colored and are used for visual communication. The standard colors are green, red, violet, and yellow.

Self-Aid

Administration of a chemical agent antidote to one-self upon experiencing early symptoms of chemical agent poisoning.

Service Response Force (SRF)

A Department of the Army-level emergency response organization, commanded by a general

officer, capable of performing and sustaining the CAIRA mission. This force consists of a staff and specialized teams from various agencies and organizations involved in the response to and recovery from a chemical accident/incident.

Service Response Force Commander (SRFC)

A general officer of the Army with chemical background who has been dispatched by Headquarters, Army Materiel Command, to the scene of a chemical accident or incident. Upon arrival, the SRFC assumes responsibility for all operations at the accident scene and commands all emergency forces.

Severe Effects

Effects for the nerve agents that include systemic effects such as vomiting, involuntary urination and/or defecation, tremors, collapse, or convulsions. Note that dosages producing these effects may not be significantly different from dosages producing lethality.

Shipboard Chemical Agent Point Detection System (CAPDS)

A fixed system capable of detecting nerve agents in vapor form using a baffle tube ionization spectrometer. This CAPDS obtains a sample of external air, ionizes airborne vapor molecules, and collects them on a charged plate after eliminating lighter molecules via the baffle structure. The system is installed in an upper superstructure level and provides ships with the capability to detect nerve agents. It will be activated when ships enter high threat areas and during operation in littoral waterways. The system is installed on most surface combatant's ships.

Simulant

A chemical that appears and acts like an agent.

Slope

The probit or Bliss Slope of the graph of the probit of the response vs. the log of the dose.

Slope Factor

A plausible, upper bound estimate of the probability of a response-per-unit intake of a chemical over a lifetime. The slope factor is used to estimate an upper bound probability of an individual developing cancer as a result of a lifetime of exposure to a particular level of a potential carcinogen.

Smoke

Solid or liquid particles 0.3 to 0.5 μ in diameter. A suspension of particles in a gaseous medium. A substance used in warfare for screening purposes.

Soman

The chemical Pinacolyl methyl phosphonofluoridate, methyl-1, 2, 2-trimethylpropyl ester. It is a nerve agent known as GD; its chemical formula is $(\text{CH}_3)_3\text{CCH}(\text{CH}_3)\text{OPF}(\text{O})\text{CH}_3$. It is a colorless liquid with a fruity or camphor odor. It undergoes "aging" very quickly, rendering oxime therapy useless and making poisoning with this agent more difficult to treat. Symptoms include pupil constriction, blurred and dimmed vision, pain in eyeballs; chest tightness, difficulty

in breathing; sweating, salivation, increased bronchial secretions, bradycardia, hypotension, vomiting and diarrhea, bronchoconstriction, and urinary and fecal incontinence.

Source Emissions

All intentional, uncontrolled releases of nerve agents GA, GB, GD, and VX to include stack emissions.

Standard Glove

All gloves covered by a military specification for example, toxicological agent protective and gloveset glove.

Stockpile

Bulk chemicals and chemical munitions.

Sulfur Mustard

A blister agent also known as H (or HD) for distilled mustard. Bis(2-chloroethyl) sulfide. The chemical formula is $C_4H_8Cl_2S$. It presents both a respiratory and percutaneous hazard, forcing military personnel to don not only gas masks but also protective overgarments. They are persistent and present long-term hazards, further hindering victims by forcing them to decontaminate.

Super Tropical Bleach (STB)

A mixture of calcium oxide and bleaching powder used as a decontaminating agent.

T

Bis[2-(2-chloroethylthio)ethyl] ether. The chemical formula is $C_8H_{16}Cl_2OS_2$. T is a sulfur, oxygen and chlorine compound similar in structure to HD. When T is added to HD, the resulting mixture has enhanced physiological and physical effects, making it a more effective chemical warfare agent.

Tabun

Ethyl N,N-dimethylphosphoramidocyanidate. This is a non-persistent organophosphate nerve agent also known as GA. Its chemical formula is $C_5H_{11}N_2O_2P$.

Tear Gas

Chemical compound that causes a flow of tears and irritation of the skin. It is widely used for training, riot control, and situations where long-term incapacitation is unacceptable.

Technical Escort

Individuals technically qualified and properly equipped to accompany designated materiel that requires a high degree to safety and security during shipment.

Temporary Exclusion Area

The area immediately surrounding chemical agent material that has been removed from its secure container, storage structure, storage area, or other authorized storage configuration.

Toxic Chemical

Any chemical that through its chemical action on life processes can cause death, temporary incapacitation or permanent harm to humans or animals. This includes all such chemicals, regardless of their origin or of their method of production, and regardless of whether they are produced in facilities, in munitions, or elsewhere.

Toxicity Data

a. **Quantal Data:** Specifies the number of animals affected as a function of dose rate (e.g., mg/kg/day) for a single type of effect. The number of animals with tumors or that die from a chemical exposure is an example. Quantal data are often reported as an incidence (percent response) and, thus, can be used to construct a dose-response curve.

b. **Continuous Data:** Represents the change in some measured value of a biological indicator (e.g., organ weights, triglyceride levels in the liver, and serum enzyme measurements) as a function of dose rate. Continuous data can be used to construct a dose-effect curve.

c. **Graded Data:** Specifies the form of severity of adverse effects as a function of dose rate without reference to the number of animals affected or to a continuous measure of one parameter. Graded data often are presented as categories (liver necrosis, lung lesions) or as judgments of severity. Fatty infiltration of the liver, single-cell liver necrosis, and liver necrosis are examples of sequence of severity judgments. Graded data can be used to construct a dose-severity curve.

Toxicity Value

A numerical expression of a substance's dose-response relationship that is used in risk assessments. The most common toxicity values used in Superfund program risk assessments are reference doses (for non-carcinogenic effects) and slope factors (for carcinogenic effects).

Toxicological Effects

a. **Additive:** Situation in which the combined effect of two chemicals is equal to the sum of the effect of each agent given alone (e.g., $2+3=5$).

b. **Synergistic:** Situation in which the combined effect of two chemicals is much greater than the sum of the effect of each agent given alone (e.g., $2+3=20$).

c. **Potentiation:** Situation in which one substance does not have a toxic effect, but when it is added to another chemical, it makes the latter much more toxic (e.g., $0+3=10$).

d. **Antagonism:** Situation in which two chemicals given together interfere with each other's actions or one interferes with the action of the other chemical (e.g., $4+6=8$, $4+0=1$, $4+4=0$).

Training Agent and Compounds

An agent authorized for use in training to enhance proficiency for operating in a chemical environment.

Unitary Chemical Munitions

Munitions designed to contain a single-component chemical agent for release on a target.

Urticant

Category of blister agents with a disagreeable, penetrating odor, causing an immediate severe burning sensation, intense pain and a feeling of numbness.

U.S. Army Nuclear and Chemical Agency (USANCA)

The mission of USANCA is to provide expert technical support and assistance to all Army elements worldwide and to other U.S. Government and NATO agencies engaged in NBC programs.

Vesicant

Causing blisters or vesicles.

Vesicating Agent

Agent that acts on the eyes and lungs and blisters the skin.

Vesication

The process of blistering.

Vomiting Agent

Compound that produces a strong pepperlike irritation in the upper respiratory tract, with irritation of the eyes and tearing; causes violent, uncontrollable sneezing, cough, nausea, vomiting, and general discomfort. Effects last from 30 minutes to several hours.

XM21 Remote Sensing Chemical Agent Alarm (RSCAAL)

A passive infrared device used to detect and identify chemical agent clouds. It can perform reconnaissance and point or area surveillance missions.

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