**Hazardous Materials: Managing the Incident, Fourth Edition**

**Chapter 2: Health and Safety**

**Chief Concepts**

* Personnel protection is the number one priority at any hazmat incident. Toxicology is the health and safety concern of every emergency responder, including study of chemical and physical agents that produce adverse responses in the biological systems with which they interact. Chemical agents include gases, vapors, fumes, and dusts, while physical agents include radiation, hot and cold environments, noise, and so forth.
* Toxicity is defined as the ability of a substance to cause injury to a biological tissue. In humans this generally refers to unwanted effects produced when a chemical has reached a sufficient concentration at a particular location within the body.
* Exposure + Toxicity = Health Hazard
* Chemical exposures and their health effects are commonly described as acute or chronic. Acute exposures describe an immediate exposure, while chronic exposures are low exposures repeated over time.
* Common methods of exposure are inhalation, ingestion, skin absorption, direct contact, or injection.
* Health effects of a hazardous material can be described in terms of how a hazmat attacks the body. A local effect implies an effect at the point of contact—for example, a corrosive burn to the skin, eye irritation, etc. A systemic effect occurs when a chemical enters the bloodstream and attacks target organs and other internal areas of the human body.
* The human body can be subject to seven types of harm events—thermal, mechanical, poisonous, corrosive, asphyxiation, radiation, and etiological.
* Units of measurement for determining the relative toxicity and health exposure of a chemical substance or compound are lethal dose and lethal concentration.
* Exposure values are only guidelines and interpretations—NOT absolute boundaries between safe and dangerous conditions. Examples of common exposure values are threshold limit value (TLV), permissible exposure limit (PEL), immediately dangerous to life and health (IDLH), and emergency response planning guidelines (ERPG).
* Radiation that doesn’t hit anybody doesn’t hurt anybody! Always keep the acronym “ALARA” in mind when considering radiation exposures—keep the exposure As Low As Reasonably Achievable.
* Heat stress is a significant concern when wearing any type of impermeable protective clothing. Physical reactions to heat include heat rash, heat cramps, heat exhaustion, and heat stroke. Heat stroke is a true medical emergency.
* Heat stress can be managed through both administrative controls (e.g., acclimatizing or conditioning the body to working in hot environments, work/rest scheduling, rehab, and fluid replacement) and the use of PPE cooling options.
* Medical surveillance is the cornerstone of an effective employee health and safety management system and site safety practices and procedures. Objectives include to determine whether an individual can perform his or her assigned duties (i.e., “fi t for duty”), including the successful use of personal protective clothing and equipment; and (2) to detect any changes in body system functions caused by physical and/or chemical exposures.
* A written PPE program is required under OSHA 1910.120(q) (5) and should include hazard assessment; medical monitoring; equipment selection and use; training; and inspection,
* maintenance, and storage. A written respiratory protection program is also required under OSHA 1910.134(c)(1).
* Safety is an attitude, a behavior, and a culture, and MUST be an inherent part of all operations from the development of SOPs to the selection of PPE. The fundamental operating philosophy of every emergency response organization should be, “If we cannot do this safely, then we will not do it at all.”
* Establishing an Incident Safety Officer and developing a written Site Safety Plan are key elements in ensuring the health and safety of personnel operating at a hazmat incident.
* Medical monitoring is defined as an ongoing, systematic evaluation of individuals at risk of suffering adverse effects from stress and/or exposure to heat, cold, or hazardous environments. The objectives of medical monitoring are (1) to obtain baseline vital signs, and (2) to identify and preclude from participation all individuals at increased risk for sustaining injury or illness. It is one element of a comprehensive medical surveillance program that starts with a baseline and periodic “fi t for duty” medical examination.