

Mechanisms of Toxic Agents

A substance can be considered toxic (poisonous) when a small quantity will cause injurious effects in the body of the average normal adult human. Almost all materials are injurious to living organisms to some extent. Overdoses of table salt fed accidentally to infants have caused their deaths. Water, which we drink, and nitrogen and oxygen, which we breathe, can cause injury or death in overdoses. There is a difference between being exposed to a toxic substance and contaminated by a toxic substance. *Exposure* is when a chemical, infectious material or other agent enters or is in direct contact with the body. *Contamination* occurs when the hazardous material remains on the clothing, hair, skin, or other part of a person. Exposure can occur without contamination, but contamination usually results from exposure. Certain persons have unusual susceptibilities to substances that produce violent or fatal reactions when absorbed in small amounts harmless to most other persons. Such substances are called *allergens*, and a person is said to have an allergy or to be allergic to the substance. Allergies have been reported to almost every known common material.

Attempts have been made to determine the dosages of toxicants that cause injury to the normal (nonallergic) adult, but this has met with limited success. Generally, the greater the toxicity of the substance, the faster the rate of absorption, and the warmer the temperature, the more rapid the occurrence of the injury. In addition to individual susceptibility, other conditions affect the severity of the injury caused by the toxin. These other conditions are the:

- Size and duration of the dose
- Route taken into the body
- Degree of toxicity
- Rate of absorption
- Environmental temperature
- Physical condition of the affected person

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Toxic agents cause injuries in different ways and have been categorized into seven types (see Figure 5-1): asphyxiates, irritants, systemic poisons, anesthetics, neurotics, corrosives, and carcinogens.

Asphyxiates

Although the term *asphyxia* is commonly thought to mean suffocation, it actually means *hypoxia* (lack of oxygen) and the presence of high carbon dioxide levels in the blood. Asphyxiates can be either "simple" or "chemical." Simple asphyxiates are generally considered to be those gases which dilute breathable air to such an extent that the blood receives an inadequate supply of oxygen. In other words, you are in an oxygen deficient atmosphere.

Some common asphyxiates are carbon dioxide and nitrogen. They are especially insidious because they are odorless and colorless. Hydrogen and helium are rarely asphyxiates because both are lighter than air and diffuse rapidly in the open. They tend to leak away rather than collect and displace air in an area. Nitrogen at room temperatures is slightly lighter than air, but at low temperatures, such as during leakage from tanks containing cryogenic nitrogen or where rapid expansion cools the gas, nitrogen becomes heavier than

Some Pathogens

mal. The harm or injury can be reversible or gan system or the entire organism. In other , if not right away, then at some time in the es have increased because of:

- pal, India
- d tank trucks)
- ndustrial plant workers
- chemicals in the community

By hazardous chemical is introduced into s are used more extensively in the process I concern and apprehension about their ef- nities. A major problem with toxic chemi- toxicity is not always obvious. It can take s of exposure to a particular chemical be- ably harm you right away, but 30 years of delay is known as *latency* and is a serious ;ausing) compounds. Many years after be- micals have been found to have insidious nd the environment. The chemicals dioxin ample of environmental contaminants and ased into society and the environment. The industrial workers against toxic materials is hat utilize toxic chemicals are at potential is just the process operators who are at risk- that instrumentation and analyzer techni- k to the toxic chemicals on the process unit re working among the piping and vessels, hat contains toxic chemicals.

s, a source of real diseases and concern for response and emergency medical care.

Addressing chemical hazards. Some of them,

Communication
Waste Management
Waste Operations and Emergency
Emergency Act
Loading and Unloading