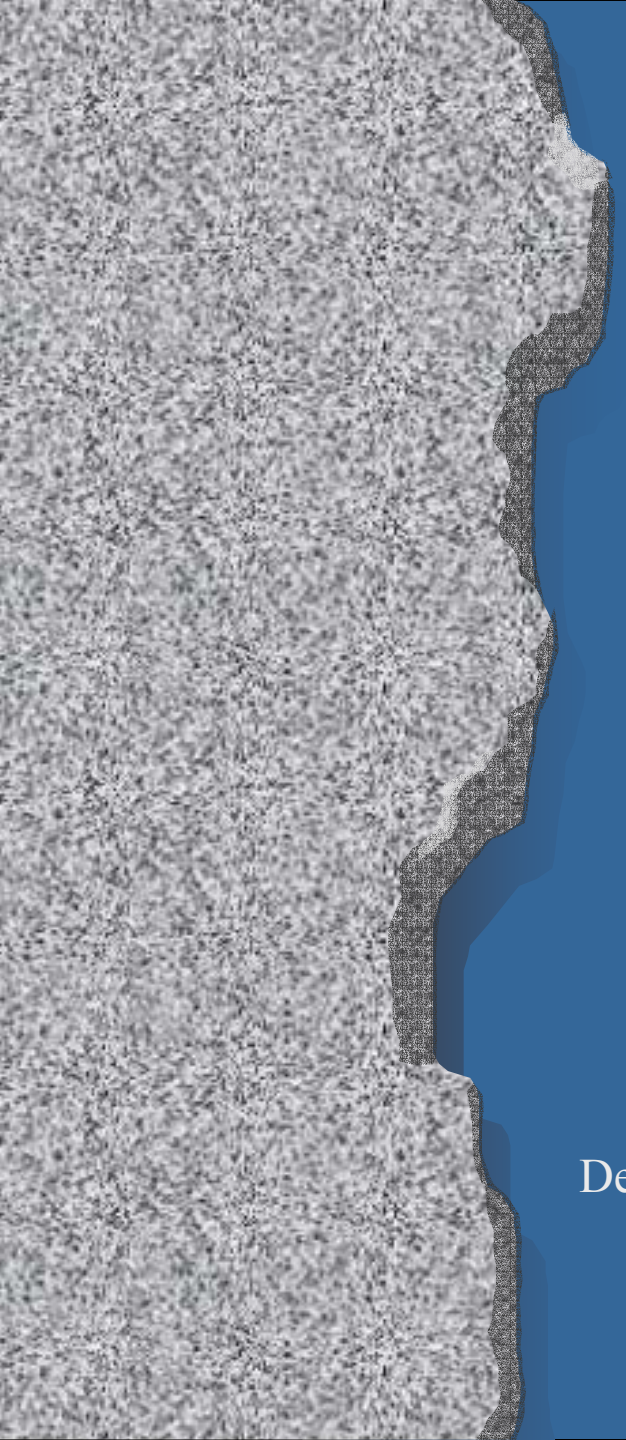

What are Toxic Chemicals?

Developed by the Toxics Use Reduction Institute

Toxic Chemicals

- Toxicity is a physical characteristic of a chemical. It is a measure of the biological potency of a poison.
- A toxic chemical is a substance that displays poisonous properties and has the potential to cause harm to living organisms.
- Among chemicals there is a wide difference in the amount or dose that will result in health problems.

Toxic Chemical Properties

- Exposure and related health effects often depend on the nature of the substance in question:
  - Is it solid, liquid, or gas?
  - Is it flammable?
  - Is it reactive?

    (Will it explode, “flame up”, or react in some other way when in contact with air, water or other chemicals?)
  - Is it corrosive?
  - Is it poisonous in some way?

Establishing Toxicity

- Toxicity of a chemical is usually established through laboratory experiments in which test animals are exposed to varying doses of a chemical to observe the resulting health effects or response. This relationship is called the dose-response relationship.
- These lab studies are the basis for estimating the toxicity of chemicals to humans. The validity of theses estimates contain assumptions that make exposure level determination difficult and controversial.

Chemical Exposure

- No matter how toxic a chemical may be, it cannot cause an effect in a living organism unless it comes into contact with that organism
- Exposure is the amount of chemical an individual or population comes in contact with during a given amount of time
- Exposure depends on many site- and chemical-specific factors

How are we exposed?

- Breathing vapors
- Contact with skin or eyes
- Ingestion (eating and drinking)

Chemical Exposure

- Health impacts of chemical exposure fall under two broad categories:
  - Acute exposure- an immediate effect
    - Burns from acid
  - Chronic exposure- effects that build up over a period of time
    - Cancer from working with asbestos

Measuring Toxicity

- There are several measures of toxicity:
  - Lethal Dose-50%(LD_{50}) refers to the chemical dose that must be administered in laboratory tests in order to kill 50 percent of the test population.
  - Reference Doses are EPA estimates of the daily exposure to the human population that are likely to be without appreciable risk of deleterious effects during a lifetime.
  - Environmental Toxicity includes measuring LC_{50} (Lethal Concentration for 50 percent) of a target group, i.e. aquatic or mammalian test populations.

Measuring Toxicity

- Immediately Dangerous to Life and Health(IDLH) values represent the maximum concentration from which one could escape within 30 minutes without impairing symptom or irreversible health effects. Cancer causing chemicals do not have IDLH levels

- Occupational Exposure Limits are guidelines for measuring, and thereby controlling exposure in the workplace. These limits are based on 8 hour/day, 5 day/week exposure. The limit represents the level of exposure that wont cause harm.
  - Permissible Exposure Limits (PEL's) are an Occupational Safety and Health Administration (OSHA) standard and are legally binding for businesses.
  - Threshold Limit Values (TLV's) are generally more stringent and are promoted by the American Conference of Governmental Industrial Hygienists(ACGIH).

Sources of Chemical Data

- The toxicological and physical characteristics of common chemicals can be found by referring to a "Material Safety Data Sheet"(MSDS).
- Under the "Right to Know" law, product manufacturers are required to provide these upon request.
- An MSDS will provide you with:
  - The levels at which a chemical can cause you harm
  - What the health effects are if exposed
  - What the chemical's physical properties are
  - What can protect you from harm if working with the chemical
  - How to respond to an accident involving the chemical