NYU | STEINHARDT

Safety Matters

Safety in the Arts Topics: 4. Health Hazards

HEALTH HAZARDS OF CHEMICAL EXPOSURE

The health effects of hazardous chemicals are often less clear than the physical hazards.
Data on the health effects of chemical exposure, especially from chronic exposure, are often incomplete.
When discussing the health effects of chemicals, two terms are often used interchangeably - toxicity and hazard. However, the actual meanings of these words are quite different.

- **Toxicity** is the ability of a chemical substance to cause harm.
- **Hazard** is the likelihood that a material will cause harm under the conditions of use.

Thus, with proper handling, even highly toxic chemicals can be used safely. Conversely, less toxic chemicals can be extremely hazardous if handled improperly.

The actual health risk of a chemical depends on the toxicity and the exposure. No matter how toxic the material may be, there is little risk involved unless it enters the body. An assessment of the toxicity of the chemicals and the possible routes of entry will help determine what protective measures should be taken.

So, how do these chemicals get into our body?

Routes of Entry / Exposure (how materials enter the body):

Skin or Eye Contact

- One way for chemicals to enter the body is through **direct contact with the skin or eyes**.
- Chemical contact with eyes can be particularly dangerous, resulting in painful injury or blindness.
- Skin contact with a chemical may result in a burn or rash, or **absorption** into the bloodstream.
- The **absorption** of a chemical through intact skin is influenced by the health of the skin and the properties of the chemical. Skin that is dry or cracked or has lacerations offers less resistance.

Inhalation

- The **lungs are the most common route of entry for gases, vapors and particles**. Such materials may be transported into the lungs and harm the tissue or go enter the bloodstream.

Ingestion

- Although it is unlikely that anyone would accidentally eat a chemical, exposure may occur as a result of eating or drinking contaminated food or beverages or touching the mouth with contaminated hands.
- The possibility of exposure by this route may be reduced by not eating, drinking, smoking, or storing food in the areas where chemicals are used or stored and by washing hands thoroughly after working with chemicals, even when gloves are worn.

Injection

- The final possible route of exposure to chemicals is by **accidental injection**. Injection may occur through mishaps with syringe needles, or through accidents with broken glassware or other sharp objects, or through compressed air staplers & nailers that have been contaminated with chemicals.

Types of exposure:

It is important to distinguish between acute and chronic exposure and toxicity.

- **Acute** results from a **single, short exposure**. Effects usually appear quickly and are usually reversible.
- **Chronic** results from **repeated exposure over a long period of time**. Effects are usually delayed and gradual, and may be irreversible.
- For example, the acute effect of drinking alcohol is becoming drunk, while the chronic effect from drinking alcohol over a long period of time is cirrhosis of the liver.

Susceptibility of Individuals:

Some people may be more or less sensitive to chemicals, depending on several factors including eating habits, physical condition, obesity, medical conditions, drinking and smoking, and pregnancy.

Sensitization:

Over a period of time, regular exposure to some substances can lead to the development of an allergic rash, breathing difficulty, or other reactions. This phenomenon is referred to as sensitization. Over time, these effects may occur with exposure to smaller and smaller amounts of the chemical, but will disappear soon after the exposure stops. For reasons not fully understood, not everyone exposed to a sensitizer will experience this reaction. Examples of sensitizers include epoxy resins, nickel salts, isocyanates and formaldehyde.

Toxic:

Materials or substances in concentrations that are harmful to humans, animals or aquatic life.

- Heavy metals
  - Lead (pigment in paint and glazes)
  - Cadmium (pigment in paint and glazes)
  - Silver (photography)
  - Selenium photo toner
  - Cadmium, lead, zinc, copper from metalworking, metal-smiting, jewelry making
- Pesticides and preservatives
  - formaldehyde in particle board and plywood or in acrylic paint.
- Solvents
  - acetone, mineral spirits, MEK, turpentine, toluene.
  - Methylene chloride (highly toxic solvent/paint stripper—DO NOT USE AT NYU)
- Plastics and plastic monomers (forming, and decomposition).

Particularly Hazardous Substances

Carcinogens

Many chemicals have been evaluated for their ability to cause cancer. The latency period for most cancers range from twenty to forty years. The risk of developing cancer from exposure to a chemical increases with the length of exposure and with the exposure concentration.

The term **human carcinogen** is used when there is clear evidence of the ability to cause cancer in humans. **Suspected human carcinogen** refers to chemicals that have been shown to cause cancer in two or more animal species and are therefore suspect in humans.

Anyone who works with, or plans to work with carcinogens or suspected carcinogens must follow strict guidelines to minimize exposure. For a particular substance, consult the Toxicity Data section of the Safety Data Sheet

Reproductive Toxins

Reproductive Toxins are chemicals that affect the reproductive system, including **mutagens** (those which cause chromosomal damage), **teratogens** and **embryotoxins**. Embryotoxins may be lethal to the fertilized egg, embryo or fetus, may be teratogenic (able to cause fetal malformations), may retard growth or may cause post-natal functional deficits. Other reproductive toxins may cause sterility or may affect sperm motility.

Some chemicals may cross the placenta, affecting the fetus. A developing fetus may be more sensitive to some chemicals than its pregnant mother, particularly during the first twelve weeks of pregnancy, when the mother may not know she is pregnant. Proper handling of chemicals and use of protective equipment is especially important to reduce fetal exposure to chemicals.

Known human teratogens include organic mercury compounds, lead compounds, ionizing radiation, some drugs, alcohol ingestion, and cigarette smoking. Some substances which may cause adverse reproductive effects in males include 1,2-dibromo-3-chloropropane, cadmium, mercury, boron, lead, some pesticides, and some drugs. More than 800 chemicals have been shown to be teratogenic in animal models - many of these are suspected human teratogens.

Individuals who work with teratogens and who are contemplating pregnancy or are pregnant should review the toxicity of the chemicals in their workplace and may consult with EHS to determine whether any of the materials pose additional risk during pregnancy.

Asbestos

In some instances you may come across equipment, materials, or building materials that are asbestos containing.

- Older theater lighting fixtures & antique household lighting fixtures can contain asbestos materials.
- Talc and vermiculate can also be contaminated with asbestos in some cases.
- Many types of building materials can contain asbestos and minor renovations such as moving walls, removing plaster, drilling into floor tiles or any building materials should never be conducted without knowing if asbestos is contained in any such building material.

Asbestos containing materials are not hazardous unless they are disturbed (the asbestos particles may be inhaled if they become airborne).

- **Never drill, hammer, cut, saw, break, damage, move or disturb and asbestos-containing material.**

If you suspect any materials that you work with or use contain asbestos please reach out directly to EHS for confirmation.