# Hazardous chemicals: routes of entry

*Hazards: depend upon the chemical which enters and route of entry. In worst cases: acute toxicity, chronic respiratory illness, chemical burns, skin/eye damage, CNS damage, death.*

For a chemical to harm a person's health, it must first come into contact with or enter the body, and it must have some biological effect on the body. There are four major routes by which a chemical may enter the body:

- **Inhalation** (breathing) of contaminated air is the most common way that workplace chemicals enter the body. Once inhaled, chemicals are either exhaled or deposited in the respiratory tract. Upon contact with tissue in the upper respiratory tract or lungs, chemicals may cause health effects ranging from simple irritation to severe tissue destruction. The chemical can also go onto affecting organs that are sensitive to the chemical.
    - Gases, vapors, mists, dusts, fumes and smoke
- **Absorption** Skin (or eye) contact. Chemicals which pass through the skin are nearly always in liquid form. Organic and alkaline chemicals can soften the keratin cells in the skin and pass through this layer to the dermis, where they are able to enter the blood stream. Areas of the body such as the forearms, which may be particularly hairy, are most easily penetrated by chemicals since they can enter down the small duct containing the hair shaft. Chemicals can also enter through cuts, punctures, or scrapes of the skin since these are breaks in the protective layer. Contact with some chemicals such as detergents or organic solvents can cause skin dryness and cracking. There can also be hives, ulcerations or skin flaking. All these conditions weaken the protective layer of the skin and may allow chemicals to enter the body.
- **Ingestion** (swallowing or eating) Chemicals can enter the stomach either by swallowing contaminated mucus which has been expelled from the lungs, or by eating and drinking contaminated food. Food and drink are most frequently contaminated by contact with unwashed hands, gloves, or clothing, or by being left exposed in the workplace. Nail-biting and smoking can also contribute to exposure.
- **Injection** is the fourth way chemicals may enter the body. While uncommon in most workplaces, it can occur when a sharp object (e.g., needle) punctures the skin and injects a chemical (or virus). The chemical (or virus) is then in the body and can make its way into the bloodstream where it can damage organs or other tissue. High pressure liquids can also cause injections of chemicals into the body (e.g. hydraulic fluid).

### Safe work practices when working with chemicals

- Know the chemicals you are working with. Read the SDS to understand the safe handling procedures and what to do if you come into contact with the chemical.

- Eliminate chemical hazards where possible. Substitute a less hazardous chemical in place of a more hazardous chemical. Do not use extremely hazardous chemicals unless absolutely necessary.
- Engineer chemical hazards out of the workplace. Engineering controls include ventilation such as fans, barriers to create distance or a shield from chemicals, filters, etc.
- Wear the correct PPE to protect yourself from the chemical. PPE such as respirators, goggles, a face shield, chemical gloves, and a lab coat are some examples to create barriers between your body and a chemical.
- Don't forget to wash and rinse chemical residue and dusts from your hands and clothing and keep contaminated items out of reach of children until they are cleaned/washed. This is particularly important when working with chemicals such as lead or hexavalent chromium dusts.

**Site specific requirements:**

**Employee participants:**

**Date:**