

# Volatile Organic Compounds Health Effects Fact Sheet November 2000



Colorado Department  
of Public Health  
and Environment

## WHAT ARE VOLATILE ORGANIC COMPOUNDS (VOCs)?

- Volatile Organic Compounds (VOCs) are a group of chemicals that contain organic carbon, and readily evaporate – changing from liquids to gases when exposed to air. Volatile Organic Compounds are usually in such solvents as paint wastes, dry cleaning chemicals, furniture stripper, carburetor cleaners and other solvents and waste sludges.
- Volatile Organic Compound Contamination in the environment is mainly the result of the historic disposal practices of industrial wastes containing these solvents. Many of them have been considered *hazardous materials* since the early 1970s, when the first environmental laws were enacted. Landfills, in particular, complied with these laws by adjusting their criteria for acceptance of appropriate landfill material, and excluded most industrial waste containing solvents.
- If used for drinking, cooking, bathing, or irrigation at relatively low concentrations, there is a possibility of exposure to Volatile Organic Compounds by: ingestion (if it is swallowed flowing from a garden hose, for example); respiration; or absorption through the skin. The amount of exposure is related to the concentration in water, and other factors.
- Volatile Organic Compounds generally do not stick (adsorb) to soils at low concentrations, and readily evaporate from water and soil when the water is used for irrigation purposes.

## HOW ARE HUMAN HEALTH EFFECTS OF VOLATILE ORGANIC COMPOUNDS DETERMINED?

The potential for human health effect is related to dose and exposure pathway. That is, the amount of the chemical taken into the body over time. Dose is estimated, based on the concentration of the chemical in the water. Human health effects are also related to routes of exposure, or exposure pathways. The three primary routes of exposure for humans are:

- Ingestion (swallowing),
- Respiration (lungs), and
- Dermal absorption (through the skin).

If the exposure pathway is incomplete---no human contact---there will be no exposure.

For most common chemicals, the U.S. Environmental Protection Agency (EPA) establishes standards (or acceptable levels) for drinking water that are called "Maximum Contaminant Levels" (or MCLs). These Levels are based on available health effects data, and other factors (technology, for example), for each chemical, and are designed to protect municipal drinking water supplies, and ensure public safety.

Although Maximum Contaminant Levels are not used to regulate privately owned wells, the available standards are commonly used to evaluate the quality of water in them. Colorado Ground Water Standards set limits for concentrations of various chemicals in water supplies not known to be slated for domestic use. These standards currently are comparable to the Maximum Contaminant Levels. Drinking water standards are set to

protect against the possibility of health effects from these chemicals. As long as the chemical concentration in water used for in-home purposes remains below drinking water standards, health effects are unlikely to occur.

## WHAT ARE THE HUMAN HEALTH EFFECTS ASSOCIATED WITH VOLATILE ORGANIC COMPOUNDS?

Many Volatile Organic Compounds may produce health effects if humans are exposed to high enough concentrations. Most available toxicity information is based on animal testing. These results are the basis for determining human health effects, and serve as the basis for setting drinking water and air quality standards.

In general, long-term exposure to low concentrations of Volatile Organic Compounds in water or air, at or above regulatory standards—such as Maximum Contaminant Levels, may result in liver or kidney effects. These effects may include elevation of serum enzyme levels, mild cellular changes and changes in lipid metabolism. At somewhat higher concentrations, breathing some of these contaminants may cause irritation of the respiratory tract. The reproductive and developmental effects of these contaminants have been poorly studied.

Chloroform, trichloroethylene (TCE), dichloroethylene (DCE), and perchloroethylene (PCE) have been evaluated for their carcinogenic potential. Although health scientists disagree whether these chemicals might produce cancer in humans, public health officials have taken a cautious approach and have set conservative standards accordingly.