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toxics release inventory

Chemical Profile

Environment Division

Hydrogen Chloride

What is hydrogen chloride?
Hydrogen chloride (HCl) is a slightly yellow gas that has a pungent, irritating odor. Hydrogen chloride gas easily dissolves in water and the resulting solution is hydrochloric acid. Our stomachs produce hydrochloric acid to digest food.

Hydrochloric acid is an important industrial chemical. About 3.5 million tons of hydrochloric acid are manufactured for industrial use each year in the United States. It is used to fabricate iron and steel, clean and electroplate metals, etch circuit boards, and make solvents, bleaches, chloride salts, fertilizers, dyes, textiles, and rubber.

How is hydrogen chloride released by electric utilities?
Trace amounts of chloride are present in coal and oil. When electric utilities burn these fuels in their power plants, chloride is released in very small amounts. Some of this chloride combines with hydrogen to form hydrogen chloride.

Some coal-burning power plants use pollution control devices to remove sulfur from gases leaving their stacks. These devices also remove about 97% of the hydrogen chloride from stack gas before it reaches the air. Chloride-bearing wastes captured by pollution control devices are usually sent to ash ponds or land disposal sites.

Hydrogen chloride from power plants is about 80% of all the hydrogen chloride from human activities released into the air each year in the United States. Almost all hydrogen chloride from power plants comes from burning coal. The U.S. Environmental Protection Agency (EPA) estimates that U.S. power plants burning coal release about 150,000 tons of hydrogen chloride into the air each year.

Is hydrogen chloride also released by other sources?
Most hydrogen chloride released into the air by natural sources comes from volcanoes. Smaller amounts come from forest fires, weathering rocks, and dust.

Hydrogen chloride released into the environment by human activities outside the utility industry comes mainly from industrial boilers that burn coal and oil, incinerators that burn refuse, automobiles that burn gasoline, and plants that manufacture aluminum, plywood, and particle board. Industries reporting to EPA released 32,670 tons of hydrogen chloride into the environment in 1996. Nearly all was released into the air.

What happens to hydrogen chloride after it is released by electric utilities?
Hydrogen chloride released into the air from power plants easily dissolves in airborne water to form dilute hydrochloric acid. Some of this hydrochloric acid forms tiny liquid droplets or thin films on tiny dust particles. As droplets and particles incorporate more water, the hydrochloric acid they contain becomes more dilute. By the time these droplets and particles reach surface soil and water by settling to the ground or washing out of the air in rain and snow, the hydrochloric acid they contain is very dilute. The amount of hydrochloric acid that stays in the air or falls to the ground depends on local wind, rain, and moisture in the air.

How might people be exposed to hydrogen chloride?
People are commonly exposed to trace amounts of hydrochloric acid when they breathe airborne droplets or particles that contain it. Industrial workers may be exposed to concentrated hydrogen chloride fumes or hydrochloric acid solutions.

What are the potential effects of hydrogen chloride on human health?
Concentrated hydrogen chloride fumes can irritate people's eyes, skin, and breathing passages, and can damage body tissues over time. Direct contact with concentrated hydrochloric acid solutions can burn the skin. However, there is no evidence that common exposures to dilute hydrochloric acid in airborne droplets or particles can harm human health. Also, hydrogen chloride has not been found to cause cancer.

How likely is it that utility releases pose a risk to human health?

It is unlikely that hydrogen chloride from power plants poses a significant risk to human health. In its 1998 Report to Congress, EPA evaluated potential exposures to hydrogen chloride from nearly 600 U.S. power plants. It concluded that the amount of hydrogen chloride released into the air by power plants would never reach unhealthy levels at any location in the United States.

How is hydrogen chloride regulated?

The Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health have set limits on the amount of hydrogen chloride in workplace air.

Where can I get more information about hydrogen chloride?

EPA has a fact sheet on hydrochloric acid that is available on the Internet at www.epa.gov/ttnuatw1/hlthef/hydrocl.html

Those interested in detailed information about hydrogen chloride from power plants may read EPA's report, *Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units.* This Final Report to Congress, issued in March 1998, is published by the EPA Office of Air Quality Planning and Standards and Office of Research and Development. It is available on the Internet at http://www.epa.gov/ttn/oarpg/t3rc.html

This Toxics Release Inventory Chemical Profile is available by email at tricoord@epri.com. Funders of the Environment Division may download it from the Internet at http://www.epriweb.com/eg/funders/tri/index.html

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