



PUBLIC HEALTH STATEMENT ACRYLONITRILE

CAS#: 107-13-1

Division of Toxicology

December 1990

This Public Health Statement is the summary chapter from the Toxicological Profile for Acrylonitrile. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™ is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-888-422-8737.

This Statement was prepared to give you information about acrylonitrile and to emphasize the human health effects that may result from exposure to it. The Environmental Protection Agency (EPA) has identified 1,177 sites on its National Priorities List (NPL). Acrylonitrile has been found at 3 of these sites. However, we do not know how many of the 1,177 NPL sites have been evaluated for acrylonitrile. As EPA evaluates more sites, the number of sites at which acrylonitrile is found may change. The information is important for you to know because acrylonitrile may cause harmful health effects and because these sites are potential or actual sources of human exposure to acrylonitrile.

When a chemical is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment as a chemical emission. This emission, which is also called a release, does not always lead to exposure. You can be exposed to a chemical only when you come into contact with the chemical. You may be exposed to it in the environment by breathing,

eating, or drinking substances containing the chemical or from skin contact with it.

If you are exposed to a hazardous substance such as acrylonitrile, several factors will determine whether harmful health effects will occur and what the type and severity of those health effects will be. These factors include the dose (how much), the duration (how long), the route or pathway by which you are exposed (breathing, eating, drinking, or skin contact), the other chemicals to which you are exposed, and your individual characteristics such as age, sex, nutritional status, family traits, life style, and state of health.

1.1 WHAT IS ACRYLONITRILE?

Acrylonitrile is a colorless, liquid, man-made chemical with a sharp, onion or garlic-like odor. Acrylonitrile is used mostly to make plastics, acrylic fibers, and synthetic rubber. Because acrylonitrile evaporates quickly, it is most likely to be found in the air around chemical plants where it is made. Acrylonitrile breaks down quickly in the air. It has been found in small amounts in the water and soil near manufacturing plants and hazardous waste sites. In water, acrylonitrile usually breaks down in about 1 to 2 weeks, although this can vary depending on conditions. For example, high concentrations of acrylonitrile (such as might occur after a spill) tend to be broken down more slowly. In one case, measurable amounts of acrylonitrile were found in nearby wells 1 year after a spill.

1.2 HOW MIGHT I BE EXPOSED TO ACRYLONITRILE?

Unless you live near a factory where acrylonitrile is made or near a hazardous waste site that contains

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acrylonitrile, you are unlikely to be exposed to acrylonitrile in the air you breathe or the water you drink. Concentrations of acrylonitrile in average air samples are too low to be measured, and most water samples also have no measurable acrylonitrile. Measurable amounts of acrylonitrile are found primarily near factories and hazardous waste sites. Concentrations in the air near a factory producing or using acrylonitrile average less than 1 part per billion (ppb). Extremely small amounts of acrylonitrile may be found in water near some factories that make or use it, but acrylonitrile rapidly breaks down and disappears from water. Plastic food containers that are made from acrylonitrile are regulated by the Food and Drug Administration (FDA) such that only 0.17 ppb can enter food; therefore, acrylonitrile intake from food packaging would be extremely low. Because acrylonitrile has been found in water and soil in some hazardous waste sites that contain this chemical, residents living very close to waste sites might possibly be exposed to acrylonitrile by breathing the air or drinking contaminated groundwater.

1.3 HOW CAN ACRYLONITRILE ENTER AND LEAVE MY BODY?

Acrylonitrile can enter your body if you breathe its vapors or eat or drink acrylonitrile-contaminated food or water. Acrylonitrile can pass through your skin, but how much gets through is not known. Inside the body, acrylonitrile is broken down into other chemicals, including cyanide. Most of these breakdown products are removed from the body in the urine. Overall, most acrylonitrile is removed from the body within 24 hours, but approximately 25% of what is taken in becomes attached to materials inside cells of the body.

1.4 HOW CAN ACRYLONITRILE AFFECT MY HEALTH?

The effects of acrylonitrile on your health depend on how much you take into your body and whether you are exposed for a short or long period of time. If the levels of acrylonitrile are high enough, or if the exposure is for a long enough period of time, acrylonitrile can cause death. Small children are more likely to be affected than adults. In several cases, children died following exposures that adults found only mildly irritating. It should be noted that specific levels of acrylonitrile causing death were not reported.

Exposure to large amounts of acrylonitrile for a short period of time, as might occur in the case of an industrial accident, results mainly in effects on the nervous system. Symptoms can include headache and nausea. At higher concentrations of acrylonitrile there may be temporary damage to red blood cells and the liver. These symptoms disappear when the exposure is stopped.

Direct contact of your skin with acrylonitrile will damage the skin so that it may blister and peel. Exposure of the skin to high concentrations of acrylonitrile in the air may irritate the skin and cause it to turn red. The redness may last for several days.

The U.S. Department of Health and Human Services has determined that acrylonitrile may reasonably be anticipated to be a carcinogen. Long-term exposure to acrylonitrile in air or water may increase your chances of getting cancer. Humans who are repeatedly exposed to acrylonitrile in the workplace for many years may have a higher-than-average chance of developing lung cancer, although

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this is not clearly established. In animals, exposure to acrylonitrile in the air or in drinking water has been found to increase the number of tumors occurring in the brain, salivary glands, and intestines.

Birth defects have been seen in animals exposed to high concentrations of acrylonitrile in the air or drinking water. Reproductive effects have been seen in animals given acrylonitrile in drinking water for three generations. However, no birth defects or effects on reproduction have been reported in humans.

1.5 WHAT LEVELS OF EXPOSURE HAVE RESULTED IN HARMFUL HEALTH EFFECTS?

In humans, breathing acrylonitrile at a concentration of 16 parts of acrylonitrile per million parts of air (ppm) causes headaches, nausea, and disorientation. This concentration is close to that at which acrylonitrile can be smelled in air (about 21 ppm). Breathing acrylonitrile in air for long periods of time and at high concentrations can cause death. The actual concentrations of acrylonitrile and breathing times which cause death have not been measured. There is no information on human health effects from eating or drinking acrylonitrile. Acrylonitrile can be smelled at a concentration of 19 ppm when dissolved in water.

In animals, drinking water that contains 142 ppm of acrylonitrile has caused nervous system disorders leading to death. Birth defects and effects on reproduction have occurred in animals that breathed acrylonitrile in air at levels of 80 ppm or drank it in water at 180 ppm.

1.6 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO ACRYLONITRILE?

There is a test that can detect acrylonitrile in blood. In addition, the major breakdown products of acrylonitrile by the body (termed metabolites) can be measured in urine. Some breakdown products that can be measured are specific to acrylonitrile. However, one breakdown product of the body (cyanide) that is commonly measured is not specific to acrylonitrile exposure, and the results can be affected by cigarette smoking. Because special equipment is needed, these tests cannot be performed routinely in your doctor's office. There is not enough information at present to use the results of such tests to predict the nature or severity of any health effects that may result from exposure to acrylonitrile.

1.7 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The EPA recommends that levels in lakes and streams should be limited to 0.058 parts of acrylonitrile per billion parts of water (0.058 ppb) to prevent possible health effects from drinking water or eating fish contaminated with acrylonitrile. Any release to the environment greater than 100 pounds of acrylonitrile must be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a limit of 2 ppm over an 8-hour workday, 40-hour workweek.

The National Institute of Occupational Safety and Health (NIOSH) recommends that average

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workplace air should not exceed 1 ppm acrylonitrile averaged over a 10-hour period.

The federal recommendations have been updated as of July 1999.

1.8 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your community or state health or environmental quality department or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333

Information line and technical assistance:

Phone: 888-422-8737
FAX: (770)-488-4178

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses resulting from exposure to hazardous substances.

To order toxicological profiles, contact:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: 800-553-6847 or 703-605-6000

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 1990. Toxicological profile for Acrylonitrile. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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