

1. PUBLIC HEALTH STATEMENT

This statement was prepared to give you information about titanium tetrachloride and to emphasize the human health effects that may result from exposure to it.

The Environmental Protection Agency (EPA) has identified 1,416 hazardous waste sites as the most serious in the nation. These sites make up the National Priorities List (NPL) and are the sites targeted for long-term federal clean-up activities. Titanium tetrachloride has not been found in any of the sites on the NPL. However, the number of NPL sites evaluated for titanium tetrachloride is not known. As EPA evaluates more sites, the number of sites at which titanium tetrachloride is found may change. This information is important because exposure to titanium tetrachloride may cause harmful health effects. However, since titanium tetrachloride breaks down rapidly in the environment, it is unlikely that you would be exposed to it at disposal sites.

When a substance 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. This release does not always lead to exposure. You can be exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking substances containing the substance or by skin contact with it.

If you are exposed to a substance such as titanium tetrachloride, many 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, lifestyle, and state of health.

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1.1 WHAT IS TITANIUM TETRACHLORIDE?

Titanium tetrachloride is a colorless to pale yellow liquid that has fumes with a strong odor. If it comes in contact with water, it rapidly forms hydrochloric acid, as well as titanium compounds. In 1990, approximately 1.5 million tons of titanium tetrachloride were produced in the United States.

Titanium tetrachloride is not found naturally in the environment and is made from minerals that contain titanium. It is used to make titanium metal and other titanium-containing compounds, such as titanium dioxide, which is used as a white pigment in paints and other products, and as an intermediary to produce other chemicals.

Chapter 3 contains more information on the physical and chemical properties of titanium tetrachloride, and Chapter 4 contains more information on its production and use.

1.2 WHAT HAPPENS TO TITANIUM TETRACHLORIDE WHEN IT ENTERS THE ENVIRONMENT?

Titanium tetrachloride enters the environment primarily as air emissions from facilities that make or use it in various chemical processes or as a result of spills. If moisture is present in the air, titanium tetrachloride reacts with the moisture to form hydrochloric acid and other titanium compounds, such as titanium hydroxide and titanium oxychlorides. The end-products produced when titanium tetrachloride reacts with water are titanium dioxide and hydrochloric acid. The hydrochloric acid may break down or be carried in the air. Some of the titanium compounds may settle out to soil or water. In water, they sink into the bottom sediments. They may remain for a long time in the soil or sediments. Some other titanium compounds, such as titanium dioxide, are also found in the air and water. See Chapters 4 and 5 for more information on what happens to titanium tetrachloride in the environment.

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1.3 HOW MIGHT I BE EXPOSED TO TITANIUM TETRACHLORIDE?

Titanium tetrachloride has not been found in water, soil, food, or air except in the workplace. Because titanium tetrachloride breaks down so rapidly in the environment, you would probably not be exposed to it unless you worked in a facility that made or used it, or you were exposed to it as a result of a spill. If you work at such a facility, you may breathe in air that contains it or breathe fumes of hydrochloric acid. You could also breathe in particles of titanium dioxide or titanium metal dust. If titanium tetrachloride spills, you may get it on your skin. In 1980, about 2,100 workers may have been exposed to titanium tetrachloride in the workplace. Since titanium tetrachloride breaks down rapidly in the environment, it is unlikely that you would be exposed to it at disposal sites.

No other information has been found on the presence of titanium tetrachloride in air, water, soil, or foods that would suggest that you may be exposed to it from these sources. See Chapter 5 for more information on the potential for exposure to titanium tetrachloride.

1.4 HOW CAN TITANIUM TETRACHLORIDE ENTER AND LEAVE MY BODY?

The fumes from titanium tetrachloride can easily enter your body if you breathe air that is contaminated with it. In your nose and lungs, these fumes may cause burns. Particles that contain titanium may remain in your lungs or nearby tissue. Titanium tetrachloride and its breakdown products do not appear to enter other parts of your body. See Chapter 2 for more information on how titanium tetrachloride may enter and leave your body.

1.5 HOW CAN TITANIUM TETRACHLORIDE AFFECT MY HEALTH?

To protect the public from the harmful effects of toxic chemicals and to find ways to treat people who have been harmed, scientists use many tests.

One way to see if a chemical will hurt people is to learn how the chemical is absorbed, used, and released by the body; for some chemicals, animal testing may be necessary. Animal

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testing may also be used to identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method to get information needed to make wise decisions to protect public health. Scientists have the responsibility to treat research animals with care and compassion. Laws today protect the welfare of research animals, and scientists must comply with strict animal care guidelines.

Titanium tetrachloride can be very irritating to the skin, eyes, mucous membranes, and the lungs. Titanium tetrachloride is corrosive because it reacts strongly with water to produce hydrochloric acid. The reaction products, especially hydrochloric acid, cause the harmful health effects and burns that can occur after exposure to titanium tetrachloride. Breathing in large amounts of titanium tetrachloride can injure the lungs seriously enough to cause death. We do not know how much of the compound is necessary to cause death. After short-term exposure to titanium tetrachloride, less serious respiratory system effects can include coughing and tightness in the chest. More severe effects can include chemical bronchitis or pneumonia, and congestion of the mucous membranes of the upper respiratory tract. These effects can cause long-term effects such as the narrowing of the vocal cords, windpipe, and upper airways. Although there are no data on swallowing titanium tetrachloride, it is likely that eating large amounts of this chemical could also cause death.

Accidental exposure to liquid titanium tetrachloride can result in skin burns and can cause permanent damage to the eyes if they are not protected.

Some laboratory animals that breathed titanium tetrachloride fumes for 2 years developed lung tumors of a special type. However, there is no evidence that chronic exposure to titanium tetrachloride causes cancer in humans. There is not enough information to determine if titanium tetrachloride causes birth defects or affects reproduction. Titanium tetrachloride has not been classified for its carcinogenic properties. For more information on the health effects of titanium tetrachloride, see Chapter 2.

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

There is no medical test to indicate whether you have been exposed to titanium tetrachloride. However, you can be tested for the presence of titanium dioxide or titanium metal, which are breakdown products of titanium tetrachloride. This test uses electron microscopes to examine lung tissue for particles that contain titanium. This test is not specific for titanium tetrachloride exposure, but it does indicate exposure to some titanium-containing substances.

Also, the test does not indicate whether you may have potential health effects resulting from such exposure or the amount of titanium compound to which you were exposed. See Chapters 2 and 6 for more information on determining exposure to titanium tetrachloride.

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

The federal government develops regulations and recommendations to protect public health. Regulations can be enforced by law. Federal agencies that develop regulations for toxic substances include the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA).

Recommendations provide valuable guidelines to protect public health but cannot be enforced by law. Federal organizations that develop recommendations for toxic substances include the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH).

Regulations and recommendations can be expressed in not-to-exceed levels in air, water, soil, or food that are usually based on levels that affect animals, then they are adjusted to help protect people: Sometimes these not-to-exceed levels differ among federal organizations because of different exposure times (an 8-hour workday or a 24-hour day), the use of different animal studies, or other factors.

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Recommendations and regulations are also periodically updated as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for titanium tetrachloride include the following:

- Releases of more than 1 pound of titanium tetrachloride must be reported to EPA.
- Maximum levels have not been established for titanium tetrachloride exposure in the workplace.

See Chapter 7 for more information on the regulations and guidelines that have been established for titanium tetrachloride.

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 E-29
Atlanta, GA 30333
(404) 639-6000

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.