

## 1. PUBLIC HEALTH STATEMENT

This Statement was prepared to give you information about thallium 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). Thallium has been found in at least 18 of these sites. However, we do not know how many of the 1,177 NPL sites have been evaluated for thallium. As EPA evaluates more sites, the number of sites at which thallium is found may change. This information is important for you to know because thallium may cause harmful health effects and because these sites are potential or actual sources of human exposure to thallium.

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 chemical such as thallium, 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 THALLIUM?

Pure thallium is a soft, bluish-white metal that is widely distributed in trace amounts in the earth's crust. In its pure form, it is odorless and tasteless. It can be found in pure form or mixed with other metals in the form of alloys. It can also be found combined with other substances such as bromine, chlorine, fluorine, and iodine to form salts. These combinations may appear colorless to white or yellow. Thallium remains in the environment since it is a metal and cannot be broken down to simpler substances.

Thallium exists in two chemical states (thallous and thallic). The thallous state is the more common and stable form. Thallous compounds are the most likely form to which you would be exposed in the environment. Thallium is present in air, water, and soil. We do not know how much time it takes for thallium to move from one medium to another.

Thallium is used mostly in the manufacture of electronic devices, switches, and closures. It also has limited use in the manufacture of special glasses and for medical procedures that evaluate heart disease. Up until 1972 thallium was used as a rat poison, but was then banned because of its potential harm to man. Thallium is no longer produced in the United States.

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All the thallium used in the United States since 1984 has been obtained from imports and thallium reserves.

More information on the properties and uses of thallium and how it behaves in the environment may be found in Chapters 3, 4, and 5.

### 1.2 HOW MIGHT I BE EXPOSED TO THALLIUM?

You can be exposed to thallium in air, water, and food. However, the levels of thallium in air and water are very low. The greatest exposure occurs when you eat food, mostly home-grown fruits and green vegetables contaminated by thallium. Small amounts of thallium are released into the air from coal-burning power plants, cement factories, and smelting operations. This thallium falls out of the air onto nearby fruit and vegetable gardens. Thallium enters food because it is easily taken up by plants through the roots. Very little is known on how much thallium is in specific foods grown or eaten. Cigarette smoking is also a source of thallium. People who smoke have twice as much thallium in their bodies as do nonsmokers. Although fish take up thallium from water, we do not know whether eating fish can increase thallium levels in your body. It has been estimated that the average person eats, on a daily basis, 2 parts thallium per billion parts (ppb) of food. Even though rat poison containing thallium was banned in 1972, accidental poisonings from old rat poison still occur, especially in children.

Thallium is produced or used in power plants, cement factories, and smelters. People who work in these places can breathe in the chemical or it may come in contact with their skin. Information on the amount of thallium in workplace air in the United States could not be found. Hazardous waste sites are also possible sources of exposure to thallium. An average of 23 ppb of thallium in surface water and 11 ppb in groundwater have been found at hazardous waste sites. Since thallium compounds mix easily in water, you can be exposed if you live near a chemical waste site where thallium emissions have contaminated the water. An average of 1.7 parts of thallium per million parts (ppm) of soil was found at hazardous waste sites. Since thallium sticks to soil, you can be exposed at hazardous waste sites if you swallow or touch contaminated soil. Thallium-contaminated dust in the air can also be swallowed after it is cleared from the lungs. Thallium is naturally found in soil at levels from 0.3 to 0.7 ppm.

More information on how you might be exposed to thallium is given in Chapter 5.

### 1.3 HOW CAN THALLIUM ENTER AND LEAVE MY BODY?

Thallium can enter your body when you eat food or drink water contaminated with thallium, breathe thallium in the air, and when your skin comes in contact with it. When thallium is swallowed most of it is absorbed and rapidly goes to various parts of your body, especially the kidney and

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liver. Thallium leaves your body slowly. Most of the thallium leaves your body in urine and to a lesser extent in feces. It can be found in urine within 1 hour after exposure. After 24 hours, increasing amounts are found in feces. It can be found in urine as long as 2 months after exposure. About half the thallium that enters various parts of your body leaves them within 3 days.

The significant, likely routes of exposure near hazardous waste sites are through swallowing thallium-contaminated soil or dust, drinking contaminated water, and skin contact with contaminated soil. More information on how thallium enters and leaves the body is given in Chapter 2.

### 1.4 HOW CAN THALLIUM AFFECT MY HEALTH?

Thallium can affect your nervous system, lung, heart, liver, and kidney if large amounts are eaten or drunk for short periods of time. Temporary hair loss, vomiting, and diarrhea can also occur and death may result after exposure to large amounts of thallium for short periods. Thallium can be fatal from a dose as low as 1 gram. No information was found on health effects in humans after exposure to smaller amounts of thallium for longer periods. Birth defects observed in children of mothers exposed to small amounts of thallium did not occur more often than would be expected in the general population. The length of time and the amount of thallium eaten by the mothers are not known exactly. As in humans, animal studies indicate that exposure to large amounts of thallium for brief periods of time can damage the nervous system and heart and can cause death. Animal reproductive organs, especially the testes, are damaged after drinking small amounts of thallium-contaminated water for 2 months. These effects have not been seen in humans. No information was found on effects in animals after exposure to small amounts of thallium for longer periods of time. No studies were found on whether thallium can cause cancer in humans or animals.

More information on the health effects of thallium in humans and animals can be found in Chapter 2.

### 1.5 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO THALLIUM?

Reliable and accurate ways to measure thallium in the body are available. The presence of thallium in the urine and hair can indicate exposure to thallium. Tests of your urine can detect thallium up to 2 months. The normal amount of thallium in human urine amounts to less than 1 ppm and 5-10 ppb in human hair. Although thallium can be measured in blood, this tissue is not a good indicator of exposure since thallium stays there too short a time. We do not know yet whether thallium levels measured in the body can be used to predict possible health effects.

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More information on how thallium can be measured in exposed humans is presented in Chapters 2 and 6.

### **1.6 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?**

The federal government has set standards and guidelines to protect individuals from the possible effects of excessive thallium exposure. The EPA has determined a water quality criteria level of 13 ppb in surrounding waters to protect humans from the harmful effects of drinking water and eating food containing thallium.

The Occupational Safety and Health Administration (OSHA) has established an occupational limit of 0.1 mg of soluble thallium compounds per cubic meter of workplace air (mg thallium/m<sup>3</sup>/skin) for an 8-hour workday over a 40-hour workweek. "Skin" indicates that measures must be taken to prevent skin exposure to thallium.

Additional information on governmental regulations regarding thallium can be found in Chapter 7.

### **1.7 WHERE CAN I GET MORE INFORMATION?**

If you have any more questions or concerns not covered here, please contact your state health or environmental department or:

Agency for Toxic Substances and Disease Registry  
Division of Toxicology  
1600 Clifton Road, E-29  
Atlanta, Georgia 30333

This agency can also provide you with information on the location of the nearest occupational and environmental health clinic. Such clinics specialize in recognizing, evaluating, and treating illnesses that result from exposure to hazardous substances.