

1. PUBLIC HEALTH STATEMENT

This Statement was prepared to give you information about 2,4,6-trinitrotoluene and to emphasize the human health effects that may result from exposure to it. The Environmental Protection Agency (EPA) has identified 1,397 sites on its National Priorities List (NPL). 2,4,6-Trinitrotoluene has been found in at least 20 of these sites. However, we do not know how many of the 1,397 NPL sites have been evaluated for 2,4,6-trinitrotoluene. As EPA evaluates more sites, the number of sites at which 2,4,6-trinitrotoluene is found may change. This information is important for you to know because 2,4,6-trinitrotoluene may cause harmful health effects and because these sites are potential or actual sources of human exposure to 2,4,6-trinitrotoluene.

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 2,4,6-trinitrotoluene, 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.

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1.1 WHAT IS 2,4,6-TRINITROTOLUENE?

2,4,6-Trinitrotoluene is a yellow, odorless, solid manufactured compound that does not occur naturally in the environment. It is made by combining toluene with a mixture of nitric acid and sulfuric acid. 2,4,6-Trinitrotoluene is also known by other names such as symtrinitrotoluene, TNT, and 1-methyl-2,4,6-trinitrobenzene. 2,4,6-Trinitrotoluene is produced in the United States only at military arsenals. It is not produced commercially. 2,4,6-Trinitrotoluene is an explosive used in military shells, bombs, and grenades, in industrial uses, and in underwater blasting. For more information on the chemical and physical properties of 2,4,6-trinitrotoluene, see Chapter 3. For more information on its production and use, see Chapter 4.

1.2 WHAT HAPPENS TO 2,4,6-TRINITROTOLUENE WHEN IT ENTERS THE ENVIRONMENT?

2,4,6-Trinitrotoluene enters the environment in waste waters and solid wastes resulting from the manufacture of the compound, the processing and destruction of bombs and grenades, and the recycling of explosives. The compound moves in surface water and through soils to groundwater. In surface water, 2,4,6-trinitrotoluene is rapidly broken down into other chemical compounds by sunlight. Microorganisms in water and sediment break down the compound more slowly. Small amounts of 2,4,6-trinitrotoluene can accumulate in fish and plants. For more information on what happens to 2,4,6-trinitrotoluene when it enters the environment, see Chapter 5.

1.3 HOW MIGHT I BE EXPOSED TO 2,4,6-TRINITROTOLUENE?

You may be exposed to 2,4,6-trinitrotoluene as a result of its movement from chemical waste disposal sites to drinking water. Children may also be exposed through eating contaminated soil. Most exposure would result from drinking contaminated water, breathing contaminated

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air, or eating contaminated foods such as fruits and vegetables. 2,4,6-Trinitrotoluene has been measured at waste disposal sites in groundwater at 0.32 parts of 2,4,6-trinitrotoluene per million parts of water (ppm) and in soil at up to 13,000 ppm. We have no data on levels in air or foods. 2,4,6-Trinitrotoluene can be taken up by plants from contaminated soil and is probably present in the air as a result of disposal by burning at military sites. Therefore, intake of air and homegrown fruits and vegetables by people living near military sites may also be sources of exposure to 2,4,6-trinitrotoluene.

Worker exposure to 2,4,6-trinitrotoluene is possible as a result of its use in the production of bombs and grenades. Most workplace exposure results from breathing in 2,4,6-trinitrotoluene dust or vapor and contact with dust on the skin. For additional information on how you can be exposed to 2,4,6-trinitrotoluene, see Chapter 5.

1.4 HOW CAN 2,4,6-TRINITROTOLUENE ENTER AND LEAVE MY BODY?

2,4,6-Trinitrotoluene rapidly and completely enters your body when you breathe in air or drink water that is contaminated with this chemical. We have no information on how much 2,4,6-trinitrotoluene enters your body when it gets on your skin. We do know that it enters your body more slowly through the skin than when it is taken into your mouth.

2,4,6-Trinitrotoluene in your blood travels throughout your body to all of your organs. When 2,4,6-trinitrotoluene reaches your liver, it breaks down and changes into several different substances. Not all of these substances have been identified, and we do not know whether they are harmful or not. Most of these substances travel in your blood until they reach your kidneys and then leave your body in your urine. Studies in animals show that almost all of the 2,4,6-trinitrotoluene that enters the body breaks down and leaves the body in the urine within 24 hours. Chapter 2 contains more information on how 2,4,6-trinitrotoluene enters and leaves your body.

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1.5 HOW CAN 2,4,6-TRINITROTOLUENE AFFECT MY HEALTH?

Workers involved in the production of high explosives experienced many harmful health effects as a result of exposure to 2,4,6-trinitrotoluene at their jobs. These effects included disorders of the blood, such as anemia, and abnormal liver function. However, the levels of 2,4,6-trinitrotoluene in the workplace air at the time these effects were seen ranged from less than 0.01 to 1.49 milligrams of 2,4,6-trinitrotoluene per cubic meter of air (mg/m^3). Some of the concentrations measured are higher than the level currently allowed in the workplace ($0.5 \text{ mg}/\text{m}^3$). Similar effects on the blood and the liver have been observed in animals that either breathed or were fed 2,4,6-trinitrotoluene. In addition, studies show that animals forcefed 2,4,6-trinitrotoluene for an intermediate-duration (from 15-364 days) may have enlargement of the spleen and other harmful effects on the immune system. When people have prolonged skin contact with 2,4,6-trinitrotoluene, they may develop an allergic reaction of the skin to this chemical, such as itching and irritation. In addition, long-term exposure to 2,4,6-trinitrotoluene has been associated with the development of cataracts in people.

No information is available to indicate whether 2,4,6-trinitrotoluene causes birth defects. However, studies in animals that were treated with high doses of 2,4,6-trinitrotoluene have shown that it can cause serious effects on the male reproductive system. The available information for determining whether 2,4,6-trinitrotoluene causes cancer in humans is inadequate. However, rats that ate 2,4,6-trinitrotoluene for long periods developed tumors of the urinary bladder. Based on this study with rats, EPA has classified 2,4,6-trinitrotoluene in Group C, a possible human carcinogen.

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1.6 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO 2,4,6-TRINITROTOLUENE?

There are tests to determine if you have been exposed to 2,4,6-trinitrotoluene. These tests measure 2,4,6-trinitrotoluene or its breakdown products in your blood and urine and have been used to test exposed workers. Detection of the breakdown products in your urine is a clear indication that you have been exposed. The complex and expensive equipment needed to perform these tests is generally available only at specialized laboratories. Another simpler, but less specific, test of 2,4,6-trinitrotoluene exposure is a change in the color of your urine to amber or deep red. This change results from the presence of breakdown products and may indicate that you have been exposed to 2,4,6-trinitrotoluene. None of these tests can predict whether a person exposed to 2,4,6-trinitrotoluene will experience any health effects related to the exposure. For more information on tests for exposure, see Chapters 2 and 6.

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

The government has developed regulations and guidelines for 2,4,6-trinitrotoluene. These are designed to protect the public and workers exposed to 2,4,6-trinitrotoluene from potential harmful health effects of the chemical. Since 2,4,6-trinitrotoluene is explosive, flammable, and toxic, EPA has designated it as a hazardous waste. The Department of Transportation (DOT) regulates the transport of 2,4,6-trinitrotoluene because it is a hazardous material. DOT specifies that when 2,4,6-trinitrotoluene is shipped, it must be wet with at least 10% water (by weight) and it must be clearly labeled as a flammable solid (HSDB 1994).

The Occupational Safety and Health Administration (OSHA) regulates levels of hazardous materials in the workplace. The maximum allowable amount of 2,4,6-trinitrotoluene in workroom air during an 8-hour workday, 40-hour workweek, is 0.5 mg/m^3 . The National Institute for Occupational Safety and Health (NIOSH) recommends that the concentration in

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workroom air be limited to 0.5 mg/m^3 for up to a 10-hour workday during a 40-hour workweek (NIOSH 1992). For more information on federal regulations about 2,4,6-trinitrotoluene, see Chapter 7.

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, Georgia 30333

This agency can also tell you where to find the nearest occupational and environmental health clinic. These clinics specialize in the recognition, evaluation, and treatment of illnesses resulting from exposure to hazardous substances.