



# PUBLIC HEALTH STATEMENT

## Parathion

**Division of Toxicology and Human Health Sciences**

**January 2017**

This Public Health Statement summarizes the Agency for Toxic Substances and Disease Registry's findings on parathion, tells you about it, identifies the effects of exposure, and describes what you can do to limit that exposure.

The U.S. Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites make up the National Priorities List (NPL) and are sites targeted for long-term federal clean-up activities. U.S. EPA has found parathion in at least 20 of the 1,832 current or former NPL sites. The total number of NPL sites evaluated for parathion is not known. But the possibility remains that as more sites are evaluated, the sites at which parathion is found may increase. This information is important because these future sites may be sources of exposure, and exposure to parathion may be harmful.

If you are exposed to parathion, many factors determine whether you'll be harmed. These include how much you are exposed to (dose), how long you are exposed (duration), and how you are exposed (route of exposure). You must also consider the other chemicals you are exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

### **WHAT IS PARATHION?**

Parathion does not occur naturally in the environment. Parathion is the common name of an organophosphorus insecticide formerly used in the United States and is still available in some other countries for the control of sucking and chewing insects and mites in a wide variety of crops.

The pure chemical is a pale-yellow liquid with a faint phenol-like odor. Technical parathion is a pale-yellow to dark-brown liquid.

### **WHAT HAPPENS TO PARATHION WHEN IT ENTERS THE ENVIRONMENT?**

When released to the environment, parathion is degraded by photolysis (degradation by reacting with light), hydrolysis (reaction with water), and biodegradation (microorganisms in soil and water that

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degrade parathion). Measured photolysis half-lives in water (the time that it takes for half the amount of parathion in water to disappear) were approximately 2–3 weeks. Hydrolysis takes place more slowly, with a half-life of about 1–4 months depending upon temperature and the degree of acidity of the water. Parathion is not expected to bioaccumulate in fish and other aquatic organisms. The mobility of parathion in soils is expected to be low, so it is not expected to move from the soil surface to groundwater.

### **HOW MIGHT I BE EXPOSED TO PARATHION?**

Since parathion is no longer used as an insecticide in the United States, it is unlikely that you will be exposed to large amounts of it from produce grown in the United States. If you eat foods or drink water that contain parathion you may be exposed to low levels of it; however, since it is not used any longer in the United States, it is unusual to find it in air, water, soil, or food.

### **HOW CAN PARATHION ENTER AND LEAVE MY BODY?**

If you breathe air contaminated with parathion, some parathion will enter the lungs and may pass into the bloodstream. If you eat food or drink water contaminated with parathion, some will enter the bloodstream through the digestive tract. Contact with soil contaminated with parathion or with fruits or plants that have been sprayed with parathion will also result in some parathion entering the body through the skin. Studies in volunteers showed that absorption through the skin can vary greatly depending on which area of the skin is exposed. Once in the body, parathion distributes primarily to the liver where it is broken down into other chemicals (metabolites). Low levels of parathion and metabolites have been found also in other organs of exposed animals, including the kidneys, muscle, lungs, and brain. Less parathion will reach the liver if it is inhaled or there is skin contact than if it is ingested. Parathion is eliminated primarily via the excretion of metabolites in the urine. A small proportion of metabolites are eliminated through the feces. It can take several days to eliminate parathion from your body after a single exposure.

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### HOW CAN PARATHION AFFECT MY HEALTH?

Parathion is a nerve poison, and works by stopping your nervous system from turning off, leading to overload so the rest of your body cannot function. The health effects of parathion depend on how much parathion you are exposed to and the length of that exposure. Environmental monitoring data suggest that any parathion levels that the general public might encounter through contact with water, soil, or food are lower than levels that have caused health effects in animal studies.

People who ingested parathion either intentionally or in contaminated food, who were exposed during application of the pesticide to fields, or who entered areas that had been sprayed too soon after application of this substance suffered excessive eye watering and salivation, blurred vision, stomach cramps, diarrhea, difficulty breathing, tremors, and seizures, and some died. The same types of effects have been observed in animals exposed briefly to high levels of parathion.

Studies of agricultural workers suggested that long-term exposure (i.e., years) to low-to-moderate amounts of parathion may be associated with allergic asthma, hearing loss, alterations of the thyroid gland, depression, and diabetes. A study of Chinese male workers suggested that parathion may be associated with low sperm count. In all of these cases, the associations were weak and the subjects may have been exposed to other chemicals at the same time. Animal studies have shown that eating parathion-contaminated food over long periods may cause occasional diarrhea and tremors.

A study of agricultural workers suggested that exposure to parathion may be associated with increased risk of skin cancer. However, the evidence was not conclusive because it was based on a small number of cases. Parathion caused cancer of the adrenal cortex in rats. The U.S. Department of Health and Human Services (DHHS) has not classified parathion as to its carcinogenicity. The U.S. EPA has classified parathion as a Group C carcinogen (possible human carcinogen). The International Agency for Research on Cancer (IARC) has placed parathion in Group 2B (possibly carcinogenic to humans).

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### HOW CAN PARATHION AFFECT CHILDREN?

This section discusses potential health effects of parathion exposure in humans from when they're first conceived to 18 years of age.

Children who accidentally ate parathion or had skin contact with high amounts of parathion suffered the same effects seen in adults exposed to high amounts of parathion (excessive secretions, stomach cramps, diarrhea, tremors, and seizures). No long-term exposure studies of children are available. However, studies of other similar pesticides found that long-term exposure might result in nervous system problems in children.

We do not know whether parathion can cause birth defects in children. A study of women from an agricultural community in California did not find an association between exposure to parathion and growth of the fetus. However, the study did not conclusively demonstrate specific exposure to parathion; it was only assumed based on the presence of a chemical in the urine that could have come from the breakdown of parathion or other substances in the body. Studies in which pregnant rats and rabbits were given parathion by mouth did not find increases in birth defects.

### HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO PARATHION?

If your doctor finds that you have been exposed to significant amounts of parathion, ask whether your children might also be exposed. Your doctor might need to ask your state health department to investigate.

To prevent exposure and risk to the general population, the EPA terminated most production of parathion as of December, 2002, with the remaining production ending in 2003. The EPA also terminated the last registration for parathion products effective on December 21, 2006. Because of these actions and environmental degradation processes, it is likely that neither the general population nor workers are

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exposed to parathion in the United States. If you find an old products that contain parathion, you should dispose of it according to the labeled instructions.

### **ARE THERE MEDICAL TESTS TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO PARATHION?**

Parathion and its breakdown products (metabolites) can be measured in blood and urine. However, the detection of parathion or its metabolites cannot predict the kind of health effects that might develop from that exposure. Because parathion and its metabolites leave the body fairly rapidly, the tests need to be conducted within days after exposure.

One of parathion's degradation products, *p*-nitrophenol, has been widely used to determine exposure to parathion. However, *p*-nitrophenol is also a breakdown product of a similar pesticide, methyl parathion, and a product used in the production of some medicines, like acetaminophen. So the presence of *p*-nitrophenol in your urine cannot be used to indicate exposure to parathion without information on possible sources of exposure.

Where known parathion exposure occurred, measurements of *p*-nitrophenol helped doctors and public health officials obtain reference values so that they could determine whether people had been exposed to higher amounts of parathion than were found in the general population.

### **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).

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Regulations and recommendations can be expressed as “not-to-exceed” levels; that is, levels of a toxic substance in air, water, soil, or food that do not exceed a critical value usually based on levels that affect animals; levels are then adjusted to help protect humans. Sometimes these not-to-exceed levels differ among federal organizations. Different organizations use different exposure times (an 8-hour workday or a 24-hour day), different animal studies, or emphasize some factors over others, depending on their mission.

Recommendations and regulations are also updated periodically as more information becomes available. For the most current information, check with the federal agency or organization that issued the regulation or recommendation.

The EPA does not regulate or provide guidelines for parathion in drinking water. The FDA does not regulate parathion in food or drugs. OSHA has set a legal limit of 0.1 milligrams per cubic meter ( $\text{mg}/\text{m}^3$ ) for parathion in air averaged over an 8-hour work day. NIOSH has set a recommended limit of 0.05  $\text{mg}/\text{m}^3$  for parathion in air averaged over a 10-hour work day.

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

If you have any questions or concerns, please contact your community or state health or environmental quality department, or contact ATSDR at the address and phone number below. ATSDR can also provide publically available information regarding medical specialists with expertise and experience recognizing, evaluating, treating, and managing patients exposed to hazardous substances.

- Call the toll-free information and technical assistance number at 1-800-CDCINFO (1-800-232-4636) or
- Write to:  
Agency for Toxic Substances and Disease Registry  
Division of Toxicology and Human Health Sciences  
1600 Clifton Road NE  
Mailstop F-57  
Atlanta, GA 30329-4027

Toxicological profiles and other information are available on ATSDR's web site:  
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