1. PUBLIC HEALTH STATEMENT FOR PARATHION

Overview
We define a public health statement and show how it can help you learn about parathion.

Introduction
A public health statement summarizes information about a hazardous substance. The information is taken from a toxicological profile developed by the Agency for Toxic Substances and Disease Registry’s (ATSDR’s) Division of Toxicology and Human Health Sciences (DTHHS). A toxicological profile is a thorough review of a hazardous substance.

This toxicological profile examines parathion. This public health statement summarizes the DTHHS’s findings on parathion, describes the effects of exposure to it, and describes what you can do to limit that exposure.

Parathion at hazardous waste sites
The U.S. Environmental Protection Agency (U.S. EPA) identifies the most serious hazardous waste sites in the nation. U.S. EPA then includes these sites the National Priorities List (NPL) and targets it for federal clean-up activities. U.S. EPA has found parathion in at least 21 of the 1,699 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 number of sites at which parathion is found may increase. However, this is not likely since parathion is no longer manufactured or used in the United States. This information is important; these future sites may be sources of exposure, and exposure to parathion may be harmful.

Why a parathion release can be harmful
When a contaminant 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. But such a release doesn’t always lead to exposure. You can only be exposed to a contaminant when you come in contact with it. That contact—and therefore that exposure—can occur when you breathe, eat, or drink the contaminant, or when it touches your skin.

Even if you’re exposed to parathion, you might not be harmed. Whether you are harmed will depend on such factors as the dose (how much), the duration (how long), and how you are exposed. Harm might also depend on whether you’ve been exposed to any other chemicals, as well as your age, sex, diet, family traits, lifestyle, and state of health.

***DRAFT FOR PUBLIC COMMENT***
A Closer Look at Parathion

Overview
This section describes parathion in detail and how you can be exposed to it.

What is parathion?
Parathion does not occur naturally in the environment. Parathion is the common name of a formerly used organophosphorus insecticide 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.

How is parathion used?
Parathion was often repeatedly applied by fan or boom sprayers or by aircraft on a wide variety of orchard, row, and field crops.

It was sold under common trade names including Alkron, Folidol, E-605, Fostox E, Phoskil, SNP, Sopraphion, Thiophos, and Vitrex.

Where is parathion found?
Parathion’s previous production and use as a pesticide resulted in its release into the air, water, and soil.

<table>
<thead>
<tr>
<th>Possible Sources</th>
<th>Outcome</th>
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<tbody>
<tr>
<td>Ambient and indoor air</td>
<td>Low levels of parathion may still be present in air samples, particularly in agricultural regions. When parathion was still being used as a registered pesticide in the United States, a range of ambient air concentrations of 0.017 to 0.089 micrograms per cubic meter (μg/m³) were reported.</td>
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<tr>
<td>Surface water and groundwater</td>
<td>Parathion in the past was infrequently detected in water samples. Parathion was not detected in any surface water samples collected during 1999–2000 as part of the U.S. Geological Survey (USGS) National Water-Quality Assessment (NAWQA) Program, in which samples were collected from 34 sites located throughout the Yakima River Basin, Washington.</td>
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<tr>
<td>Agricultural soil</td>
<td>Low levels of parathion may still be present in soils where it was formerly used as an insecticide.</td>
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</table>
Other media (food and fish) | In a survey of U.S. produce conducted from 1989 to 1991, parathion was detected in 13 of 6,970 produce samples, including apples, grapefruit, lemons, limes, oranges, peaches, and strawberries. It was also detected in 2% of the Total Diet Study foods between 1984 and 1986. As parathion is no longer in use and it degrades in the environment, its frequency of detection in foods should be considerably lower.

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How Parathion Can Affect Your Health

**Overview**
This section looks at how parathion enters your body and potential parathion health effects found in human and animal studies.

**How parathion enters your body**
Parathion can enter your body from the air, water, food, or soil.

<table>
<thead>
<tr>
<th>Possible Sources</th>
<th>Possible Exposure Pathway</th>
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<tr>
<td><strong>Air</strong></td>
<td>If you breathe air containing parathion, you may absorb it into your body through the lungs.</td>
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<tr>
<td><strong>Water and food</strong></td>
<td>Parathion in food or water can be absorbed from the digestive tract.</td>
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<tr>
<td><strong>Soil</strong></td>
<td>If you touch soil contaminated with parathion or fruits or plants that have been sprayed with it, some small amount may enter the body through the skin.</td>
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**Where parathion goes in your body**
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, lung, and brain. Less parathion will reach the liver if it is inhaled or there is skin contact than if it is ingested.

**How parathion leaves your body**
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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**Parathion health effects**
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.

**Short-term exposure effects**
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.

**Long-term exposure effects**
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 and hearing loss. 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.

**Parathion and cancer**
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 3 (not classifiable as to its carcinogenicity to humans).

See Chapters 2 and 3 for more information on health effects of parathion.
Children and Parathion

Overview
This section discusses potential health effects of parathion exposure in humans from when they’re first conceived to 18 years of age, and how you might protect against such effects.

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**Exposure effects for children generally**
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.

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**What about birth defects?**
We do not know whether parathion can produce 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.

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**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 or unborn baby might also be exposed. Your doctor might need to ask your state health department to investigate.

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**Production and use terminated**
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 exposed to parathion in the United States.
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Medical Tests to Determine Parathion Exposure

Overview
We identify medical tests that can detect whether parathion is in your body, and we recommend safe toxic-substance practices.

Parathion can be measured in blood and urine
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.

For more information on the different substances formed by parathion breakdown and on tests to detect these substances in the body, see Chapters 3 and 7.

Federal Government Recommendations to Protect Human Health

Overview
One way the federal government promotes public health is by regulating toxic substances or recommending ways to handle or to avoid toxic substances.

The federal government regulates toxic substances
Regulations are enforceable by law. The U.S. EPA, the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA) are some federal agencies that have adopted toxic substances regulations.
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The federal government recommends safe toxic substance practices

The Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH) have made recommendations about toxic substances. Unlike enforceable regulations, these recommendations are advisory only.

Toxic substance regulations

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.

Some regulations and recommendations for parathion include:

<table>
<thead>
<tr>
<th>Federal Organization</th>
<th>Regulation or Recommendation</th>
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<tbody>
<tr>
<td>U.S. Environmental Protection Agency (U.S. EPA)</td>
<td>The EPA does not regulate or provide guidelines for parathion in drinking water.</td>
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<tr>
<td>Food and Drug Administration (FDA)</td>
<td>The FDA does not regulate parathion in food or drugs.</td>
</tr>
<tr>
<td>Occupational Safety and Health Administration (OSHA)</td>
<td>OSHA set a legal limit of 0.1 milligrams per cubic meter (mg/m³) for parathion in air averaged over an 8-hour work day.</td>
</tr>
<tr>
<td>National Institute for Occupational Safety and Health (NIOSH)</td>
<td>NIOSH has set a recommended limit of 0.05 mg/m³ for parathion in air averaged over a 10-hour work day.</td>
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</tbody>
</table>

Additional Information

Overview

Where to find more information about parathion.

Who to contact

If you have any more questions or concerns, please contact your community or state health or environmental quality department, or contact ATSDR at the address and phone number below.
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**Additional information from ATSDR**

ATSDR can provide publicly available information regarding medical specialists with expertise and experience recognizing, evaluating, treating, and managing patients exposed to hazardous substances.

**Where to obtain toxicological profile copies**

Toxicological profiles are also available online at www.atsdr.cdc.gov. For more information:

- 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 30333

For-profit organizations should request final toxicological profile copies from:

National Technical Information Service (NTIS)  
5285 Port Royal Road  
Springfield, VA 22161  
Phone: 1-800-553-6847 or 1-703-605-6000  
Web site: http://www.ntis.gov/