



PUBLIC HEALTH STATEMENT

METHYL PARATHION

CAS#: 298-00-0

Division of Toxicology

September 2001

This Public Health Statement is the summary chapter from the Toxicological Profile for Methyl Parathion. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-888-422-8737.

This public health statement tells you about methyl parathion and the effects of exposure. The 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 the sites targeted for long-term federal cleanup activities. Methyl parathion has been found in at least 16 of the 1,585 current or former NPL sites. However, the total number of NPL sites evaluated for this substance is not known. As more sites are evaluated, the sites at which methyl parathion is found may increase. This information is important because exposure to this substance may harm you and because these sites may be sources of exposure.

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 are exposed to a substance only when you come in contact with it. You may be exposed by breathing,

eating, or drinking the substance, or by skin contact. If you are exposed to methyl parathion, many factors determine whether you'll be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with it. You must also consider the other chemicals you're exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

1.1 WHAT IS METHYL PARATHION?

Methyl parathion is a pesticide that is used to kill insects on crops. Usually, it is sprayed on the crops. Methyl parathion comes in two forms: a pure form of white crystals and a technical-grade solution (brownish liquid), which contains methyl parathion (80%) and inactive ingredients in a solvent. The technical-grade methyl parathion smells like rotten eggs or garlic. Methyl parathion is a manufactured chemical, so it is found in the environment only as a result of its manufacture or use. Methyl parathion has been manufactured in the United States since 1952 and has been used to kill insects on many types of crops since this time. Because methyl parathion can be dangerous to humans, the EPA has restricted how it can be used and applied. Methyl parathion must be sprayed on crops from the air or from the ground in certain ways to minimize the danger of being exposed, and only trained people are allowed to spray methyl parathion. Methyl parathion is no longer used on food crops commonly consumed by children, and the maximum amount of methyl parathion that can be present as a residue on specific crops is regulated (see Section 1.9). In these ways, exposure to methyl parathion can be controlled and accidental exposures can be prevented.

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1.2 WHAT HAPPENS TO METHYL PARATHION WHEN IT ENTERS THE ENVIRONMENT?

Once methyl parathion is introduced into the environment from spraying on crops, droplets of methyl parathion in the air fall on soil, plants, or water. While most of the methyl parathion will stay in the areas where it is applied, some can move to areas away from where it was applied by rain, fog, and wind. Methyl parathion stays in the environment from a few days to several months. It is degraded to other chemical compounds by water, sunlight, and bacteria found in soil and water. On soil, methyl parathion sticks to the soil, and then is rapidly degraded by bacteria. It generally does not leach through the ground and end up in the groundwater. In water, methyl parathion breaks down quickly by the action of the water, bacteria in the water, and sunlight. In water and air, methyl parathion is broken down by sunlight to form a more toxic product called methyl paraoxon. If concentrated amounts of methyl parathion are present in soil, such as at landfills and hazardous waste sites, methyl parathion does not degrade as fast.

1.3 HOW MIGHT I BE EXPOSED TO METHYL PARATHION?

Most people are not exposed to methyl parathion in the air they breathe or on things they touch, unless they live next to areas being sprayed. The people who are at the greatest risk of being exposed to methyl parathion are those who work with this chemical. These include farm workers, chemical sprayers, and people who work in factories that

make methyl parathion. They are exposed to methyl parathion on things they touch where it can pass through their skin, or by breathing it after it has been sprayed. Overexposure to methyl parathion may cause severe poisoning or death. Persons may be exposed to dangerous amounts if they go into fields too soon after spraying. The people most likely to be exposed to methyl parathion can be protected by wearing special clothing and breathing equipment and by staying out of sprayed fields for at least 2 days.

Individuals can also be exposed if they live near landfills where methyl parathion has been dumped or near water containing methyl parathion that washes off nearby land or that is accidentally spilled. The greatest amounts of methyl parathion are expected to be present near or on the farms where methyl parathion is used. After spraying, some methyl parathion can be transported by the wind or fog to areas away from where it is used, but the amounts present at these locations are not expected to be at dangerous levels. In 1988, one location in Mississippi had groundwater that contained 88 parts of methyl parathion per billion parts of water (ppb). More recent studies of water samples taken near where methyl parathion was sprayed indicate methyl parathion is not found in the groundwater. The risk of exposure to methyl parathion from drinking groundwater appears to be low, but the EPA is currently examining this issue.

Methyl parathion is approved only for use on crops. The maximum amount of methyl parathion residue allowed by the Food and Drug Administration (FDA) and EPA on crops used as food is 0.1–1 ppm. The FDA has monitored the food supply for

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pesticides for a number of years. FDA purchases many kinds of foods through Market Basket Surveys and analyzes them for residue levels of pesticides. These FDA studies allow scientists to estimate the daily intake of pesticides. Generally, the FDA monitoring studies conclude that the U.S. food supply contains only very small amounts of pesticides that are not a concern. However, there have been some reports of the illegal use of methyl parathion inside homes.

1.4 HOW CAN METHYL PARATHION ENTER AND LEAVE MY BODY?

Methyl parathion can enter your body if you eat food or drink water containing it; if you swim, bathe, or shower in contaminated water; if you touch recently sprayed plants or soil; if you touch contaminated soil near hazardous waste sites; or if you breathe air that contains methyl parathion, such as near factories or recently sprayed farm fields (or in recent accounts of the illegal use of methyl parathion, if you breathe air or touch contaminated surfaces inside homes where methyl parathion has been used to kill insects). By any means of exposure, methyl parathion goes into your body quickly and gets into your blood. From your bloodstream, methyl parathion goes to your liver, brain, and other organs. Your liver changes some of methyl parathion to a more harmful chemical called methyl paraoxon. Both methyl parathion and methyl paraoxon can bind to enzymes of your nerves within minutes or hours. Your liver breaks down methyl parathion and methyl paraoxon into less harmful substances. These less harmful substances leave your body in urine within hours or days.

1.5 HOW CAN METHYL PARATHION AFFECT MY HEALTH?

Methyl parathion interferes with the normal way that the nerves and brain function. Exposure to very high levels of methyl parathion for a short period in air or water may cause death, loss of consciousness, dizziness, confusion, headaches, difficult breathing, chest tightness, wheezing, vomiting, diarrhea, cramps, tremors, blurred vision, and sweating. Some people who have been exposed to substances similar to methyl parathion have experienced changes in mental state that lasted several months after exposure to high levels of these substances ended. If people are exposed to levels of methyl parathion below those that affect nerve function, few or no health problems seem to occur. There is no evidence that methyl parathion causes birth defects in humans or affects the ability of humans to produce children. There is also no proof that methyl parathion causes cancer in people who are regularly exposed, such as farmers and pesticide applicators.

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 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

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research animals with care and compassion. Laws today protect the welfare of research animals, and scientists must comply with strict animal care guidelines.

Animal studies show effects of methyl parathion similar to those seen in people. In addition, short-term high exposure of animals to methyl parathion caused decreased heart rate. This may be the result of methyl parathion's effects on the nerves that control the heart. Methyl parathion decreased the ability of animals to fight infections in some studies, but not in others. It is not known whether any of these effects occur in people. It is not known whether methyl parathion affects the ability of animals to reproduce. Studies in animals have not shown that methyl parathion causes cancer.

1.6 HOW CAN METHYL PARATHION AFFECT CHILDREN?

This section discusses potential health effects from exposures during the period from conception to maturity at 18 years of age in humans. Children are likely to be exposed to methyl parathion in the same ways as adults, mainly by eating foods or drinking milk or water that contain residues of this chemical. Because of their smaller weight, children's intake of methyl parathion per kilogram of body weight may be greater than that of adults. The FDA and EPA permit residues of pesticides to be present in crops used as food, and these amounts are considered to be safe. The EPA, however, has recently used stricter regulations and has canceled the use of methyl parathion on food crops commonly eaten by children. As a result, the exposure of children to methyl parathion from foods will be very small.

Children are affected by methyl parathion in the same manner as adults. Exposure to high levels of methyl parathion, even for short periods, may result in changes in the nervous system, leading to headaches, dizziness, confusion, blurred vision, difficulty breathing, vomiting, diarrhea, loss of consciousness, and death (see also Section 1.5 for a more complete description of how methyl parathion affects human health). It is not known whether children are more sensitive to the effects of methyl parathion than adults. There is some indication that young rats may be more sensitive than adults to nervous system effects.

There is no evidence in humans that methyl parathion causes birth defects. Birth defects have not been seen when methyl parathion was given to animals by mouth, but minor birth defects did occur in one study in which high doses were injected into pregnant animals. It is not known whether these effects occur in people. It is unlikely that people would be exposed by breathing, touching, or eating as much methyl parathion as was injected in the animal studies. Animal studies have also shown that methyl parathion can be transferred from a pregnant mother to the developing fetus. Methyl parathion caused changes in the behavior of young animals whose mothers were given methyl parathion during pregnancy, and this effect needs to be studied more. Methyl parathion has been detected in small amounts in breast milk, but only in a few localities in central Asia. Studies of mother animals fed methyl parathion show that methyl parathion can be transferred into their milk and their nursing newborn babies.

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1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO METHYL PARATHION?

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

The only approved use of methyl parathion is on crops, including crops used as foods. Effective December 31, 1999, the EPA cancelled the use of methyl parathion on many kinds of crops used as foods because of a concern for exposure risks to children and to workers. This action will reduce the risks to families of methyl parathion exposure from food. The general population is not likely to be exposed to large amounts of methyl parathion. The populations living in the areas where methyl parathion is used on crops, however, may be exposed to greater amounts of methyl parathion. Methyl parathion is often detected in foods and air samples collected where methyl parathion is used. People who live close to areas of methyl parathion use also may be exposed to larger amounts of methyl parathion, because small amounts of the pesticide will move from the place where it is used to nearby areas. These exposures may include such things as touching contaminated plants, breathing the mist formed from the sprayed chemical, drinking contaminated water, or eating recently sprayed fruits and vegetables. People who are most likely to receive the highest exposures are those who work in the factories that make methyl parathion, workers who spray it on crops, and farmers. Entry of methyl parathion into the body

after contact with the skin is expected to be the major exposure pathway for those working in these operations. Breathing the mist containing methyl parathion may also occur.

Families can reduce the risk of exposure to methyl parathion in the soil, on plants, or in the air by staying away from fields that have been recently sprayed. If families wait at least 4–5 days before entering sprayed fields, then the amount of methyl parathion present in the air or on plants is expected to be small. Families should also be aware that sometimes methyl parathion has been illegally sprayed inside the home to kill insects. Your children may be exposed to methyl parathion if an unqualified person applies pesticides containing it around your home. In some cases, the improper use of pesticides banned for use in homes has turned homes into hazardous waste sites. Make sure that any person you hire is licensed and, if appropriate, certified to apply pesticides. Your state licenses each person who is qualified to apply pesticides according to EPA standards and further certifies each person who is qualified to apply “restricted use” pesticides. Ask to see the license and certification. Also ask for the brand name of the pesticide, a Material Safety Data Sheet (MSDS), the name of the product’s active ingredient, and the EPA registration number. Ask whether EPA has designated the pesticide “for restricted use” and what the approved uses are. This information is important if you or your family react to the product. If you buy over-the-counter pesticide products to apply yourself, be sure the products are in unopened pesticide containers that are labeled and contain an EPA registration number. Carefully follow the instructions on the label. If you plan to spray inside,

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make sure the pesticide is intended for indoor use. If you feel sick after a pesticide has been used in your home, consult your doctor or local poison control center.

1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO METHYL PARATHION?

Several medical tests can determine whether you have been exposed to methyl parathion. The first medical test measures methyl parathion in your blood or measures 4-nitrophenol, which is a breakdown product of methyl parathion, in your urine. These tests are only reliable for about 24 hours after you are exposed because methyl parathion breaks down quickly and leaves your body. These tests cannot tell whether you will have harmful health effects or what those effects may be. The next medical test measures the levels of a substance called cholinesterase in your blood. If cholinesterase levels are less than half of what they should be and you have been exposed to methyl parathion, then you may get symptoms of poisoning. However, lower cholinesterase levels may also only indicate exposure and not necessarily harmful effects. The action of methyl parathion may cause lower cholinesterase levels in your red blood cells or your blood plasma. Such lowering, however, can also be caused by factors other than methyl parathion. For example, cholinesterase values may already be low in some people, because of heredity or disease. However, a lowering of cholinesterase levels can often show whether methyl parathion or similar compounds have acted on your nerves. Cholinesterase levels in red blood cells can stay low for more than a month after you

have been exposed to methyl parathion or similar chemicals.

1.9 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. 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 methyl parathion include the following: NIOSH recommends that a person not be exposed in the workplace to more than 0.2 mg/m³ of methyl

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parathion for a 10-hour workday, 40-hour workweek.

According to EPA, the following levels of methyl parathion in drinking water are not expected to cause effects that are harmful to health: 0.3 mg/L for 1 or 10 days of exposure for children, 0.03 mg/L for longer term exposure for children, and 0.002 mg/L for lifetime exposure of adults.

It is illegal to use methyl parathion indoors. Methyl parathion is approved only for use on agricultural crops. In 1999, EPA canceled the use of methyl parathion on many food crops, particularly those consumed by children, such as apples, peaches, pears, carrots, and peas, and also canceled nonfood uses such as ornamental plants and nursery stock uses. Methyl parathion use is still allowed on other crops eaten by people or by farm animals. A maximum of 0.1–1 ppm of methyl parathion is allowed in or on the other crops (fruits, vegetables, nuts, and grains) that may be eaten by people.

1.10 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 F-32
Atlanta, GA 30333

Information line and technical assistance:

Phone: 888-422-8737
FAX: (770)-488-4178

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.

To order toxicological profiles, contact:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: 800-553-6847 or 703-605-6000

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2001. Toxicological profile for methyl parathion. Update. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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