

## Sources of Exposure

## Toxicokinetics and Normal Human Levels

## Biomarkers/Environmental Levels

# ToxGuide™ for Malathion



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U.S. Department of Health and  
Human Services  
Public Health Service  
Agency for Toxic Substances  
and Disease Registry  
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### General Populations

- The general population is not likely to be exposed to high levels of malathion.
- Exposure to malathion predominantly occurs through ingestion of contaminated food or water.
- People living near areas where malathion is sprayed have a greater risk of being exposed through dermal contact with contaminated plants and soils, inhalation of mist formed during application, and ingestion of residues in food or water.

### Occupational Populations

- Workers involved in the production, formulation, handling, and application of malathion are likely to have the highest levels of exposure.
- Farm workers who enter treated fields prior to the passage of the appropriate restricted entry intervals may also be exposed to high levels of malathion.

### Toxicokinetics

- Ingested and dermally applied malathion are readily absorbed, but little is known about the fate of inhaled malathion.
- Once absorbed, malathion can distribute to many organs and tissues. It is broken down into malaoxon in the liver.
- Malathion and its metabolites do not tend to accumulate in the body and are excreted in the urine within a few days.

### Normal Human Levels

- No data available.

### Biomarkers

- Malathion and its metabolites in tissues and body fluids can be used as biomarkers of exposure. Detection in urine must be within a few days of exposure due to rapid elimination from the body.

### Environmental Levels

#### *Air*

- Median concentration in outdoor air in samples collected along the Mississippi River was 0.23 ng/m<sup>3</sup> with a range of 0.14–4.6 ng/m<sup>3</sup>.

#### *Sediment and Soil*

- Malathion levels in soil samples from residential areas after aerial spraying was estimated to be 1.4 µg/g in subsurface soil (1 cm) and 14.1 µg/g in surface soil.

#### *Water*

- Concentrations in groundwater in 3 states ranged from 0.007 to 6.17 µg/L.

### Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2003. Toxicological Profile for Malathion. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

## Chemical and Physical Information

## Routes of Exposure

## Relevance to Public Health (Health Effects)

### Malathion is a Liquid

- Malathion is a colorless liquid in pure form and a brownish-yellow liquid with a garlic smell when part of a technical grade solution. It is manufactured and does not occur naturally in the environment.
- Malathion is an organophosphate pesticide that is used to kill insects on agricultural crops, on stored products, on golf courses, in home gardens and indoor sites where trees and shrubs are grown. It is also used to kill mosquitoes and Mediterranean fruit flies (medfly).
- In addition, malathion has been used to kill fleas on pets and to treat head lice on humans.

- Inhalation – Minor route of exposure for the general population.
- Oral – Predominant route of exposure for the general population through ingestion of contaminated food or water.
- Dermal – Minor route of exposure for the general population. Predominant route of occupational exposure.

### Malathion in the Environment

- Malathion enters the environment from spraying on crops or for public health use in urban/residential or nonresidential areas.
- Most of the malathion will stay where it is applied, but some may be distributed to other locations by rain, fog or wind.
- Malathion is usually broken down in the environment within a few weeks. It does not stick to soil and is rapidly broken down in soil and water by bacteria. Movement into groundwater is not significant.
- If present on dry soil or on man-made surfaces, malathion does not break down as quickly as it would in other media.
- Although malathion can be bioconcentrated, it is rapidly metabolized or depurated and is not likely to be biomagnified in the food chain.

Health effects are determined by the dose (how much), the duration (how long), and the route of exposure.

### Minimal Risk Levels (MRLs)

#### Inhalation

- An MRL of 0.2 mg/m<sup>3</sup> has been derived for acute-duration inhalation exposure (≤14 days).
- An MRL of 0.02 mg/m<sup>3</sup> has been derived for intermediate-duration inhalation exposure (15–364 days).
- No MRL was derived for chronic-duration inhalation exposure (≥1 year).

#### Oral

- No MRL has been derived for acute-duration oral exposure (≤14 days).
- An MRL of 0.02 mg/kg/day has been derived for intermediate-duration oral exposure (15–364 days).
- An MRL of 0.02 mg/kg/day has been derived for chronic-duration oral exposure (≥1 year).

### Health Effects

- The main target of malathion toxicity is the nervous system. Malathion's primary metabolite, malaoxon, inhibits acetylcholinesterase. Resulting effects include difficulty breathing, chest tightness, vomiting, cramps, diarrhea, watery eyes, blurred vision, salivation, sweating, headaches, dizziness, loss of consciousness, and death.
- Intermediate syndrome (delayed neuropathy) has been reported in humans as a result of acute exposure to high amounts of malathion. Toxicity is characterized by weakness in several motor cranial nerves, weakness in neck flexors and proximal limb muscles, and respiratory paralysis.
- There is evidence that exposures below the level that causes nervous system effects result in few or no health problems.
- Animal studies have shown that malathion can be transferred across the placenta and in breast milk.

### Children's Health

- Children are expected to be affected by malathion poisoning in the same manner as adults.