

Sources of Exposure

Toxicokinetics and Normal Human Levels

Biomarkers/Environmental Levels

ToxGuide™

for

Guthion

$C_{10}H_{12}N_3O_3PS_2$

CAS# 86-50-0

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U.S. Department of Health and
Human Services
Public Health Service
Agency for Toxic Substances
and Disease Registry
www.atsdr.cdc.gov

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General Populations

- The general population may be exposed via guthion-contaminated air, water, or food. However, there is little potential for high level exposure of the general population because guthion is a restricted use pesticide.
- Significant inhalation and/or dermal exposure are likely only near areas where guthion is used.
- Oral exposure mainly occurs by eating foods containing guthion residue, particularly fruits and vegetables that have been sprayed. Ingestion of contaminated drinking water is expected to be low for the general population.

Occupational Populations

- Occupational exposure may occur at facilities that produce guthion or in working environments where guthion is used as an insecticide.

Toxicokinetics

- Guthion is readily absorbed from the lungs, gastrointestinal system, and skin.
- Absorbed guthion is rapidly distributed throughout the body, but does not accumulate significantly in body tissues.
- Guthion is rapidly metabolized by oxidative desulfuration, hydrolysis, and dearylation to form the metabolites dimethylphosphate (DMP), dimethylthiophosphate (DMTP), and dimethyl phosphorodithioic acid (DMDTP), which are excreted in the urine.

Normal Human Levels

- No data available.

Biomarkers

- Urinary levels of metabolites DMP, DMTP, and DMDTP.
- Plasma and erythrocyte cholinesterase activity levels.
- None of these biomarkers are specific to guthion.

Environmental Levels

Air

- Typically below the level of detection in ambient outdoor air; has been measured at concentrations up to 4 ppb in close proximity to agricultural application sites.

Sediment and Soil

- Typically detected only in close proximity to areas where guthion is produced, used, or discarded.

Water

- Up to 0.5 ppb measured in surface water near agricultural sites where guthion is used.
- Not typically detected in drinking water sources.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological Profile for Guthion. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

Chemical and Physical Information

Routes of Exposure

Relevance to Public Health (Health Effects)

Guthion is a Solid

- Guthion is a restricted use broad spectrum organophosphate insecticide formulation containing azinphos-methyl as the active ingredient.
- Pure guthion is a colorless to white, odorless, crystalline solid at ambient temperature; technical grade guthion is a cream to yellow-brown granular solid.
- Guthion has been used on a variety of orchard fruits, cotton, almonds, sugarcane, and other crops; many of these uses have recently been cancelled and all remaining uses are scheduled to be phased out September 30, 2012.

- Inhalation – Predominant route of exposure for workers during production, handling, and application.
- Oral – Predominant route of exposure for the general population from ingestion of contaminated drinking water and particularly food containing guthion residue.
- Dermal – Predominant route of exposure for workers during production, handling, and application.

Guthion in the Environment

- Guthion can be released into the environment during its production and use as a pesticide.
- Guthion is found in all environmental compartments with no pronounced tendency to partition to a particular compartment.
- Guthion is not highly persistent in the environment; mobility in soil and sediment is moderate to low.
- In air, guthion is relatively quickly degraded by photolysis and reaction with hydroxyl radicals; the estimated half-life is a few hours.
- Guthion released to surface water or soil is subject to biodegradation, photolysis, and hydrolysis.
- The half-life of guthion ranges from approximately 3 to 50 days in surface water and 32 to 150 days in soil.
- Guthion is not expected to bioconcentrate or bioaccumulate.

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 0.02 mg/m³ has been derived for acute-duration inhalation exposure (≤14 days).
- An MRL of 0.01 mg/m³ has been derived for intermediate-duration inhalation exposure (15–364 days).
- An MRL of 0.01 mg/m³ has been derived for chronic-duration inhalation exposure (≥1 year).

Oral

- An MRL of 0.01 mg/kg/day has been derived for acute-duration oral exposure (≤14 days).
- An MRL of 0.003 mg/kg/day has been derived for intermediate-duration oral exposure (15–364 days).
- An MRL of 0.003 mg/kg/day has been derived for chronic-duration oral exposure (≥1 year).

Health Effects

- The primary target of guthion toxicity is the nervous system.
- Low-level exposure to guthion may result in acetylcholinesterase (AChE) inhibition in the absence of clinical signs of toxicity. At higher levels of exposure AChE inhibition may result in cholinergic signs and symptoms including impaired respiration, abnormal heart rate, muscle twitching, anxiety, drowsiness, confusion, and coma; these are typical signs of organophosphate and carbamate pesticide poisoning.

Children's Health

- In general, children are expected to be affected by guthion poisoning in the same manner as adults.
- Decreases in fetal growth, nervous system damage, and reduced survival were observed in animals exposed via their pregnant mothers, but only at doses that also caused harmful health effects in the mothers.