ToxGuide™ for
Disulfoton
C₈H₁₉O₂PS₃
CAS# 298-04-4
July 2021

Sources of Exposure

General Populations
- Significant exposure of the general population to disulfoton is not likely because its use as a pesticide in the United States was canceled in 2009. Leftover stock was permitted for sale until 2011, and pesticides containing disulfoton were used as recently as 2016.
- Inhalation and dermal exposure of the general population to disulfoton is low, and exposure in drinking water is likely negligible.
- People who live near manufacturing or processing sites, or hazardous waste sites containing disulfoton may be exposed to higher levels than the general population.
- Exposure to small amounts of disulfoton may occur from some foods, especially ones produced outside of the U.S. These levels are expected to be low.

Occupational Populations
- Occupational exposure is not as likely due to the cancellation of disulfoton.
- Previously, it was most likely to occur through inhalation of or dermal contact with pesticides containing disulfoton.
- Workers who manufacture, handle, or apply disulfoton or who are involved in disposing of disulfoton are at higher risk of exposure than the general populations.

Toxicokinetics and Biomonitoring

Toxicokinetics
- Disulfoton is well-absorbed through the gastrointestinal tract.
- Absorbed disulfoton is primarily distributed to the liver. It is also distributed to the kidneys, whole blood, red blood cells, plasma, fat, skin, muscles, brain, small intestine, pancreas, and bile.
- Disulfoton undergoes metabolism through oxidation reactions and hydrolysis. The urinary metabolites of disulfoton are diethyl phosphate (DEP), diethyl thiophosphate (DETP), diethyl dithiophosphate (DEDPT), and diethyl phosphorothiolate (DEPTh).
- Urine, feces, and expired breath are the main routes of excretion for disulfoton and its metabolites in animals. Excretion through breastmilk is unknown.

Biomarkers/Environmental Levels

Biomarkers
- Disulfoton and its metabolites can be measured in blood and urine to indicate exposure. However, the metabolites are not specific to disulfoton and can result from exposure to other organophosphates. Red blood cell cholinesterase can also be measured and is an indicator of an effect from exposure; however, this is not specific to disulfoton.

Environmental Levels
- These levels are from samples taken between 1974 to 2007 prior to the U.S. ban of disulfoton in 2009. Levels in environmental media today are expected to be much lower.

- Air
  - Outdoor air range: 0.0275–4.7 ng/m³
- Water
  - Ground water range: 0.39–6 µg/L
  - Surface water range: <0.002–4.9 ng/L
- Soil and Sediment
  - Range: <0.2–67 µg/kg
- Food
  - Crops range: 0.05–1.0 mg/kg
  - Fish tissue range: 0–46 ng/g

NHANES Biomonitoring
- No information on blood or urine levels of disulfoton in the U.S. population were identified. Metabolites, not exclusive to disulfoton exposure, have been detected in urine samples among the U.S. population.

Reference
### Chemical and Physical Information

**Disulfoton** is a colorless oil

- Disulfoton, also known as Di-Syston, is a systemic organophosphate insecticide and acaricide.
- Disulfoton is a manmade, non-naturally occurring oily liquid with low volatility and low water solubility.
- It has a sulfur-like odor, is colorless to yellow, and is expected to be short-lived in the atmosphere.

### Routes of Exposure

- **Inhalation** – Inhalation is a primary route of exposure for workers who apply disulfoton as a pesticide. Exposure via inhalation is otherwise not likely to occur since disulfoton has a short half-life in air, approximately 3 hours, and has low volatility.
- **Oral** – A minor route of exposure may occur through ingestion of foods contaminated with disulfoton.
- **Dermal** – Dermal contact is a potential route of exposure for workers. Children may also be exposed if playing in contaminated soils.

### Disulfoton in the Environment

- Disulfoton is not expected to be found in the environment at high levels due to its cancellation by the EPA in 2009.
- Previously, disulfoton was found in the atmosphere as a vapor with an estimated half-life in air of 3 hours. Volatilization from water is slow to negligible.
- In water, disulfoton adsorbs to suspended soils and sediments.
- Disulfoton was primarily measured in soils where mobility was slight to moderate. Small amounts could leach into groundwater or be absorbed up plant root systems.
- In the environment, disulfoton degraded or transformed with hydrolysis in air and water; photolysis, biodegradation, or biotic processes in water, soil, or sediment.
- Disulfoton does not bioaccumulate in fish or other aquatic species.

### Health Effects

- Neurotoxicity is the most sensitive endpoint in human and animals exposed to disulfoton following inhalation, oral, or dermal exposure. Neurotoxicity is primarily characterized by depressed acetylcholinesterase activity with signs of cholinergic toxicity.

### Children’s Health

- Children exposed to disulfoton would be expected to experience effects similar to those expected in adults. It is unknown if developmental effects seen in animals are expected in humans.

### Relevance to Public Health (Health Effects)

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

#### Minimal Risk Levels (MRLs)

**Inhalation**

- An intermediate-duration (15-364 days) inhalation MRL of 0.0006 mg/m³ was derived for disulfoton; this was adopted for the acute-duration (≤14 days) inhalation MRL.
- No chronic-duration (≥365 days) inhalation MRL was derived for disulfoton.

**Oral**

- An acute-duration (≤14 days) oral MRL of 0.0003 mg/kg/day was derived for disulfoton.
- An intermediate-duration (15-364 days) oral MRL of 0.00009 mg/kg/day was derived for disulfoton.
- A chronic-duration oral MRL of 0.00006 mg/kg/day was derived for disulfoton.