



Metsulfuron-methyl

Roadside Vegetation Management Herbicide Fact Sheet

This fact sheet was developed by Oregon State University and Intertox, Inc. to assist interested parties in understanding the risks associated with pesticide use in Washington State Department of Transportation's (WSDOT) Integrated Vegetation Management program.

Introduction

Metsulfuron-methyl is an herbicide used to control select broadleaf weeds, trees and brush, and some annual grasses. It stops cell division in the shoots and roots of the plant causing plants to die. Metsulfuron-methyl is the active ingredient (60%) in the herbicide products **Escort XP** and **Metsulfuron Methyl 60 DF** used by the Washington State Department of Transportation (WSDOT) for pre- and post-emergent (before and after growth begins) selective broadleaf treatment. Metsulfuron-methyl also has agricultural and forestry uses.

WSDOT assessed the potential risks to humans, wildlife, and aquatic animals exposed to metsulfuron-methyl in their Integrated Vegetation Management (IVM) program. Evaluating potential risks takes into account both the toxicity of a pesticide and the characteristics of possible exposure.

Application Rates and Use Patterns on Highway Rights-of-Way

Typical rights-of-way application rates for Escort range from 0.5 to 2 ounces of product per acre, or a maximum of about 0.075 pounds of metsulfuron-methyl per acre. Applicators use truck-mounted hand guns, hose reels, or side booms, to apply Escort from April to September. WSDOT workers applied an average of 100 pounds of metsulfuron-methyl per year statewide in 2004 and 2005.

Laboratory Testing: Before pesticides are registered by the U.S. Environmental Protection Agency (EPA), they must undergo laboratory testing for short-term (acute) and long-term (chronic) health effects. Laboratory animals are purposely fed doses high enough to cause toxic effects. These tests help scientists determine how chemicals might affect humans, domestic animals, or wildlife in cases of overexposure. Pesticide products used according to label directions are unlikely to cause toxic effects. The amount of pesticide that people and pets may be exposed to is low compared to the doses fed to laboratory animals.

Human Health Effects

The U.S. Environmental Protection Agency (EPA) classifies Metsulfuron methyl as toxicity class III (low toxicity) with a signal word of CAUTION. (See Toxicity Category and Signal Word table).

Toxicity Category and Signal Word

| | High Toxicity (Danger) | Moderate Toxicity (Warning) | Low Toxicity (Caution) | Very Low Toxicity (Caution) |
|------------------------|-----------------------------------|--|-----------------------------------|--|
| Oral LD50 | Less than 50 mg/kg | 50-500 mg/kg | 500-5000 mg/kg | Greater than 5000 mg/kg |
| Dermal LD50 | Less than 200 mg/kg | 200-2000 mg/kg | 2000-5000 mg/kg | Greater than 5000 mg/kg |
| Inhalation LC50 | Less than 0.05 mg/l | 0.05-0.5 mg/l | 0.5-2.0 mg/l | Greater than 2.0 mg/l |
| Eye Effects | Corrosive | Irritation persisting for 7 days | Irritation reversible in 7 days | Minimal effects, gone in 24 hrs |
| Skin Effects | Corrosive | Severe irritation at 72 hours | Moderate irritation at 72 hours | Mild or slight irritation |

Highlighted categories specify the range for metsulfuron-methyl use cited in this fact sheet.

Acute toxicity: Metsulfuron-methyl has low to very low toxicity if people eat, touch, or inhale residues. The technical material is very irritating but not corrosive to the eyes of laboratory rabbits, moderately irritating to the skin and not a skin sensitizer.

Chronic toxicity: Metsulfuron-methyl caused slight changes in body and organ weights, but no changes in cellular structure, when fed to rats at moderate to high doses for two years. Metsulfuron only caused a decrease in food consumption at the highest doses tested when fed to dogs for one year.

Reproductive effects: Metsulfuron-methyl did not affect reproduction or survivability of the offspring when fed to rats over two generations at moderate to high doses; the offspring had slightly lower growth rates. Metsulfuron-methyl did not cause birth defects when fed to rats during pregnancy. However, it did cause offspring deaths when high doses were fed to rabbits during pregnancy.

Carcinogenic effects: Rats fed metsulfuron-methyl for two years showed no increase in the number of tumors. Multiple studies of metsulfuron-methyl indicate that it is not a mutagen (causes mutation). The EPA has not evaluated this substance for evidence of its ability to cause cancer in humans.

Fate in humans and animals: Metsulfuron-methyl is broken down quickly and eliminated from the body. Rats eliminate low doses in 9 to 16 hours and high doses in 23 to 29 hours. Metsulfuron-methyl does not bioaccumulate (build up) in fish.

Wildlife Effects

Effects on mammals: Metsulfuron-methyl is practically nontoxic to mammals based on an acute oral LD50 of greater than 5,000 mg/kg in rats. The LD50 for rabbits exposed by skin contact ranges from >2,000 mg/kg to >8,000 mg/kg. (See LD50/LC50 text box and Wildlife Toxicity Category table).

Effects on birds: Metsulfuron-methyl is practically nontoxic to birds. The acute oral and dietary LD50 for mallards and bobwhite quail is >5,000 mg/kg.

Effects on fish: Metsulfuron-methyl is practically nontoxic to fish.

Effects on aquatic invertebrates: Metsulfuron-methyl is practically nontoxic to aquatic insects.

LD50/LC50: Acute toxicity is commonly measured by the lethal dose (LD) or lethal concentration (LC) that causes death in 50 percent of treated laboratory animals. LD50 indicates the dose of a chemical per unit body weight of an animal and is expressed as milligrams per kilogram (mg/kg). LC50 is the concentration of a chemical per volume of air or water and is expressed as milligrams per liter (mg/L). Chemicals are highly toxic when the LD50 or LC50 value is small and practically nontoxic when the value is large. However, the LD50 and LC50 do not reflect potential health effects such as cancer, birth defects, or reproductive toxicity that may occur at levels of exposure below those that cause death.

Wildlife Toxicity Category

| Risk Category | Mammals | Birds | Fish or Aquatic Insects |
|----------------------|---|-------------------------------------|-------------------------------|
| | Acute Oral or Dermal LD ₅₀ (mg/kg) | Acute Oral LD ₅₀ (mg/kg) | Acute LC ₅₀ (mg/L) |
| Practically nontoxic | >2,000 | >2,000 | >100 |
| Slightly toxic | 501-2,000 | 501-2,000 | >10-100 |
| Moderately toxic | 51-500 | 51-500 | >1-10 |
| Highly toxic | 10-50 | 10-50 | 0.1-1 |
| Very highly toxic | <10 | <10 | <0.1 |

Highlighted categories specify the range for metsulfuron-methyl use cited in this fact sheet.

Environmental Fate

The half-life of metsulfuron-methyl ranges from 14 to 180 days with a typical time of 30 days. (See Half-life text box). Breakdown is faster in moist, warm soils. It is highly mobile in the environment and has the potential to contaminate groundwater. Plants rapidly take up metsulfuron-methyl at the roots and through the leaves. It moves throughout the plant, but it does not last.

Half-life is the time required for half of the compound to degrade.

- 1 half-life = 50% degraded**
- 2 half-lives = 75% degraded**
- 3 half-lives = 88% degraded**
- 4 half-lives = 94% degraded**
- 5 half-lives = 97% degraded**

Remember: the amount of a chemical remaining after a half-life will always depend on the amount of the chemical originally applied.

Human Health Risk Assessment

WSDOT evaluated several human exposure scenarios, including adults and children eating drift-contaminated garden vegetables or children directly touching drift-contaminated berries or sprayed vegetation. For each exposure scenario, WSDOT evaluated conditions of average exposure and extremely conservative conditions of maximum exposure. Metsulfuron-methyl poses a negligible risk of adverse non-cancer effects to WSDOT workers and the public under conditions of average and maximum exposure. All hazard quotients are below 1. (See Human Cancer/Non-cancer text box and Human Risk Classification Under Conditions of Average Exposure table).

Human Cancer/Non-cancer Risk Classification:

Scientists estimate non-cancer health risks by generating a hazard quotient (HQ). This number is the exposure divided by the toxicity. When the HQ is less than 1, exposures are unlikely to cause any adverse health effects. When the HQ is greater than 1, potential non-cancer health effects may be possible. Risk assessments for chemicals that cause cancer (carcinogens) estimate the probability of an individual developing cancer over a lifetime. Cancer risks estimated in this way are very conservative, and actual cancer risks are likely to be much lower. Cancer risk estimates of less than 1 in 100,000 are within the range considered negligible by most regulatory agencies.

Human Risk Classifications Under Conditions of Average Exposure

| Hazard Quotient (Non-cancer Risk) | Cancer Risk | Potential Risks and Management Priority |
|-----------------------------------|--------------------------------------|---|
| Less than 1 | Less than 1 in 100,000 | Negligible |
| Between 1 and 10 | Between 1 in 10,000 and 1 in 100,000 | Low |
| Between 10 and 100 | Between 4 in 1,000 and 1 in 10,000 | Moderate |
| Greater than 100 | Greater than 4 in 1,000 | High |

Note: Highlighted categories specify the range of potential risk for specific exposure scenarios involving metsulfuron methyl.

Wildlife Risk Assessment

Wildlife risk assessment considers pesticide behavior in the environment and routes of exposure. Indirect exposure to mammals and birds can occur when they eat contaminated prey or vegetation. Direct exposure can occur when mammals and birds contact pesticide residues with their skin or eyes or when they inhale vapors or particulates. WSDOT's current application rates and use patterns for glyphosate pose a negligible to low risk to mammals. The estimated dietary exposure to rats, deer mice, and meadow voles range from 5,800 to 50,000 times lower than the rat LD50 of >5,000 mg/kg. The risk from WSDOT's current application practices for metsulfuron-methyl is negligible for birds. The estimated dietary exposure to bobwhite quail, marsh wrens, and American robins are approximately 2,700 to 31,600 times lower than the bobwhite quail LD50 of >5,000 mg/kg.

Aquatic Risk Assessment

WSDOT takes extra precautions applying herbicides near open water, wetlands, or wellhead protection zones. However, contamination may result from application drift, rainfall runoff, or residue leaching through the soil into groundwater. Fish and aquatic insect exposure to metsulfuron-methyl occurs primarily through direct contact with contaminated surface waters. WSDOT's current use of metsulfuron-methyl poses a low risk to fish and aquatic insects in all areas of the state.

Additional Resources

- National Pesticide Information Center 1-800-858-PEST (7378) and <http://npic.orst.edu>
- Extension Toxicology Network (EXTOXNET) <http://extoxnet.orst.edu>
- Washington State Department of Transportation, Roadside Maintenance Branch 1-360-705-7865
- Washington Department of Agriculture, Pesticide Management Division 1-877-301-4555 (toll free)