Chlorsulfuron

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. WSDOT updated in 2017 to reflect current products and usage.

Introduction

Chlorsulfuron is an herbicide that controls select broadleaf weeds and undesirable grasses. Chlorsulfuron stops cell division in plant roots and shoots, which in turn causes plants to stop growing. It is the active ingredient in Telar. Chlorsulfuron is combined with Sulfometuron in Landmark and combined with Aminocyclopyrachlor in Perspective. The herbicide used by the Washington State Department of Transportation (WSDOT) for pre- and post-emergent (before and after growth begins) noxious and nuisance weed control.

WSDOT assessed the potential risks to humans, wildlife, and aquatic animals exposed to chlorsulfuron 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

The maximum yearly application of the active ingredient chlorsulfuron is about 0.12 pounds of active ingredient per acre. Applicators use truck-mounted handguns, hose reels, or backpack sprayers to apply chlorsulfuron from April to September. WSDOT workers applied 204 pounds of chlorsulfuron statewide during 2016.

Human Health Effects

The U.S. Environmental Protection Agency (EPA) classifies chlorsulfuron as toxicity class III (low toxicity) with a signal word of CAUTION (see Toxicity Category and Signal Word text box).

Acute toxicity: Chlorsulfuron has low toxicity if individuals accidentally eat, touch, or inhale residues (see Laboratory Testing text box). Chlorsulfuron is a mild eye and skin irritant but not a skin sensitizer.

Chronic toxicity: Chlorsulfuron causes moderate body weight and food consumption decreases when fed to rats and mice for 18 months to 2 years. Chlorsulfuron caused no adverse health effects when fed to dogs at high doses for 6 months. However, it did cause decreases in weight gain and changes in the blood when fed to dogs in high doses for one year.

Reproductive effects: Chlorsulfuron causes a decrease in female fertility when fed to rats in moderate doses over three generations. It caused no birth defects when fed to rats in high doses during pregnancy. Chlorsulfuron caused an increase in the number of resorbed (undeveloped) fetuses in females fed moderate...
doses. This is in conflict with a second study that showed no reproductive effects or birth defects in rabbits fed high doses.

**Carcinogenic effects:** Rats and mice fed moderate to high doses of chlorsulfuron for 18 months to 2 years show no increased incidence of tumors. The EPA classifies chlorsulfuron as having no evidence of carcinogenicity (causing cancer) based on a lack of evidence in rat and mouse studies. Multiple studies show that chlorsulfuron is not a mutagen.

*Fate in humans and animals:* Rats rapidly excrete chlorsulfuron in their urine and feces. Chlorsulfuron does not bioaccumulate (build up) in mammals.

**Wildlife Effects**

**Effects on Mammals:** Chlorsulfuron is practically nontoxic to mammals. The acute LD50 for rats fed chlorsulfuron ranges from 5,000 to 6,000 milligrams per kilogram (mg/kg) (see LD50/LC50 text box and Wildlife Toxicity Category table). Formulated Telar has low toxicity when exposed to the skin of rabbits with an LD50 of greater than 2,000 mg/kg. The active ingredient by itself is even lower in toxicity, with a skin contact LD50 of 3,400 mg/kg. Chlorsulfuron does not irritate skin and is moderately irritating to eyes.

**Effects on birds:** Chlorsulfuron is practically nontoxic to birds. The acute LD50 for mallard ducks and bobwhite quail is greater than 5000 mg/kg.

**Effects on fish:** Chlorsulfuron is practically nontoxic to fish and does not tend to bioaccumulate (build up) in fish.

**Effects on aquatic invertebrates:** Chlorsulfuron is practically nontoxic to aquatic (water) insects and does not tend to bioaccumulate.

**Environmental Fate**

The half-life for chlorsulfuron ranges from 1 to 3 months in soils with a

**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.

**Toxicity Category and Signal Word**

<table>
<thead>
<tr>
<th>Toxicity Category</th>
<th>High Toxicity (Danger)</th>
<th>Moderate Toxicity (Warning)</th>
<th>Low Toxicity (Caution)</th>
<th>Very Low Toxicity (Caution)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral LD50</td>
<td>Less than 50 mg/kg</td>
<td>50-500 mg/kg</td>
<td>500-5000 mg/kg</td>
<td>Greater than 5000 mg/kg</td>
</tr>
<tr>
<td>Dermal LD50</td>
<td>Less than 200 mg/kg</td>
<td>200-2000 mg/kg</td>
<td>2000-5000 mg/kg</td>
<td>Greater than 5000 mg/kg</td>
</tr>
<tr>
<td>Inhalation LC50</td>
<td>Less than 0.05 mg/l</td>
<td>0.05-0.5 mg/l</td>
<td>0.5-2.0 mg/l</td>
<td>Greater than 0.2 mg/l</td>
</tr>
<tr>
<td>Eye Effects</td>
<td>Corrosive</td>
<td>Irritation persisting for 7 days</td>
<td>Irritation reversible in 7 days</td>
<td>Minimal effects, gone in 24 hrs</td>
</tr>
<tr>
<td>Skin Effects</td>
<td>Corrosive</td>
<td>Severe irritation at 72 hours</td>
<td>Moderate irritation at 72 hours</td>
<td>Mild or slight irritation</td>
</tr>
</tbody>
</table>

Highlighted categories specify the range for chlorsulfuron use cited in this fact sheet.

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.
typical half-life of 40 days (see Half-life text box). Soil microbes break down chlorsulfuron. Breakdown is faster in moist soils and at higher temperatures.

Chlorsulfuron has a high potential to contaminate groundwater, but current WSDOT application rates and use patterns are not likely to cause significant contamination.

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. Based on these exposure scenarios, chlorsulfuron poses a negligible risk of adverse non-cancer effects to workers or the public (see Human Cancer/Non-cancer text box and Human Risk Classifications under Conditions of Average Exposure table). There is no evidence to support that chlorsulfuron causes cancer.

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 chlorsulfuron residues with their skin or eyes or when they inhale chlorsulfuron vapors or particulates. WSDOT’s current application rates and use patterns for chlorsulfuron pose a negligible risk to wildlife. Estimated dietary doses for rats, mice, and meadow voles are approximately 1,300 to 11,700 times lower than the rat LD50 of 2,341 mg/kg. The estimated dietary exposures for bobwhite quail, marsh wrens, and American robins are approximately 1,300 to 15,800 times lower than the bobwhite quail and mallard duck LD50 of 5,000 mg/kg. Chlorsulfuron does not bioaccumulate in wildlife.

Aquatic Risk Assessment
WSDOT takes extra precautions applying herbicides near open water, wetlands, and wellhead protection zones. However, contamination may result from application drift, rainfall runoff, or residue leaching through the

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

<table>
<thead>
<tr>
<th>Hazard Quotient (Non-cancer Risk)</th>
<th>Cancer Risk</th>
<th>Potential Risks and Management Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1</td>
<td>Less than 1 in 100,000</td>
<td>Negligible</td>
</tr>
<tr>
<td>Between 1 and 10</td>
<td>Between 1 in 10,000 and 1 in 100,000</td>
<td>Low</td>
</tr>
<tr>
<td>Between 10 and 100</td>
<td>Between 4 in 1,000 and 1 in 10,000</td>
<td>Moderate</td>
</tr>
<tr>
<td>Greater than 100</td>
<td>Greater than 4 in 1,000</td>
<td>High</td>
</tr>
</tbody>
</table>

Note: Highlighted categories specify the range of potential risk for specific exposure scenarios involving chlorsulfuron.
soil into groundwater. Fish and water insect exposure to diuron occurs primarily through direct contact with contaminated surface waters. Chlorsulfuron is practically nontoxic to fish and aquatic insects (see Wildlife Toxicity Category table). Chlorsulfuron does not bioaccumulate (build up) in fish and aquatic insects; the risk to fish that eat exposed aquatic insects or other contaminated food sources is low. The risks associated with WSDOT's current application rates and use patterns for chlorsulfuron are low 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)