What is triclopyr?
- Triclopyr is a selective systemic herbicide used to control unwanted woody and herbaceous weeds (1).
- Triclopyr is sold predominately as a triclopyr triethylamine salt (TEA) or triclopyr butoxyethyl ester (BEE) (1).

How is triclopyr used?
- Triclopyr was first registered in 1979 for non-crop areas and forests. In descending order of amounts applied (1987 to 1995), triclopyr is currently registered for use on pasture and rangeland, forests, rights-of-way, rice, and lawns. (1). See Laboratory Testing box.
- Triclopyr TEA is formulated as soluble and emulsifiable concentrates, liquids, granulars, wettable powders, pellets, or formulation intermediates. Triclopyr BEE is formulated as emulsifiable concentrates, ready-to-use liquids or formulation intermediates (1).

Laboratory Testing: Before pesticides are registered by the U.S. EPA, they must undergo laboratory testing for short-term (acute) and long-term (chronic) health effects. Laboratory animals are purposely fed high enough doses to cause toxic effects. These tests help scientists judge how these chemicals might affect humans, domestic animals, and wildlife in cases of overexposure. When pesticide products are used according to the label directions, toxic effects are not likely to occur because the amount of pesticide that people and pets may be exposed to is low compared to the doses fed to laboratory animals.

What are some products that contain triclopyr?
- Garlon, Turflon, Pathfinder, Access, Brush-B-Gon, Confront, and Crossbow (3).
- Products that contain triclopyr often contain other herbicide active ingredients such as 2,4-D and clopyralid. All pesticide active ingredients are listed on the front of the product label (2, 3).
What is the mechanism of action for triclopyr?

- Triclopyr is a selective systemic herbicide that mimics the effects of plant hormones (auxins) (2).

What is the acute toxicity of triclopyr?

Oral
- Triclopyr is low in toxicity via the oral route. In rats, the acute oral LD50 of triclopyr TEA and BEE forms is 1847 mg/kg and 830 mg/kg respectively (1). See boxes on Laboratory Testing, LD50/LC50, and Toxicity Category.

Dermal
- Both forms of triclopyr are non-irritating to the skin of rabbits, with an LD50 greater than 2000 mg/kg. However, dermal sensitization occurs from each form applied to the skin of guinea pigs (1).
- The TEA form of triclopyr (44.4% active ingredient) is corrosive to the eyes of rabbits. The BEE form of triclopyr (97.1% active ingredient) causes only minimal eye irritation (1).

Inhalation
- Inhaled triclopyr is low in toxicity to rats (1). The LC50 of triclopyr TEA is greater than 2.6 mg/L and the LC50 is greater than 4.8 mg/L for triclopyr BEE (1).

Signs of Toxicity - Animals
- Triclopyr is slightly irritating to the skin and eyes (1).
- No reports of systemic poisoning resulting from ingestion of triclopyr were found.

Signs of Toxicity - Humans
- Triclopyr has a low rate of absorption and is rapidly eliminated and, therefore, has a very low potential to become acutely toxic through dermal exposure (4).
- No reports of systemic poisoning resulting from ingestion of triclopyr were found.

Is triclopyr a carcinogen?

Animals
- There is no evidence that triclopyr causes unscheduled DNA synthesis or acts as a mutagen (1).
- In feeding studies with mice and rats, no compound-related tumors are observed in male animals. However, there is a significant increase in the presence of mammary gland adenocarcinomas in female mice and rats fed triclopyr at 36 mg/kg/day for 2 years (1).

U.S. Environmental Protection Agency, Office of Pesticide Programs, Label Review Manual, Chapter 7: Precautionary Labeling
http://www.epa.gov/oppfod01/labeling/lrm/chap-07.htm
Humans

- The Carcinogenicity Peer Review Committee (CPRC) at the U.S. EPA classified triclopyr as a group D carcinogen, that is, not classifiable as to human carcinogenicity (1). See box on Cancer.

Does triclopyr cause reproductive or teratogenic effects?

Animals

- Developmental effects from oral exposure to triclopyr during pregnancy occur at 100 mg/kg/day in rabbits and 300 mg/kg/day in rats for the BEE and TEA forms of triclopyr, respectively. Rabbits produce a decreased number of live fetuses and have an increased incidence of fetal death. The fetuses exhibit a lack of ossification in their digital bones and an increase in the percentage of fetuses with 13 ribs. Rats demonstrate a decrease in mean fetal body weight and increased incidences of fetal and litter skeletal anomalies (1, 5).

- The developmental Lowest Observable Effects Level (LOEL) for the BEE form is 100 mg/kg and the No Observable Effect Level is 30 mg/kg. (1). The TEA developmental LOEL is 300 mg/kg and the NOEL is 30 mg/kg.

- In a two-generation study where rats were fed triclopyr at a rate of 200 and 250 mg/kg/day, the animals exhibited significant decreases in parental body weight and weight gain, mean litter size and number, and the number of live pups and pup weight (1, 5). Parental toxicity was observed at 25 mg/kg/day with no effects observed in the offspring (1).

Humans

- No data was found on the effects of triclopyr on human reproduction or development.

Could chronic exposure to triclopyr cause health effects?

Animals

- Triclopyr administered in the diet of both male and female rats for 13 weeks at 20 mg/kg results in degeneration of the proximal tubules within the kidney (1).

- There are no significant changes in the body weight, food consumption or blood chemistry of beagle dogs fed up to 2.5 mg/kg/day of triclopyr over 183 days or in those dogs fed up to 5.0 mg/kg day over 1 year (1).

- Triclopyr causes a decrease in body weight, food consumption, blood chemistry, and liver histopathology in beagle dogs fed 20 mg/kg body weight over 228 days. There are also significant increases in male liver and female kidney weights (1).

Humans

- No human data was found on teratogenic or reproductive effects of triclopyr.

What is the fate of triclopyr in the body?

Animals

- The elimination half-life of triclopyr in rats is 3.6 hours (1). See box on Half-life.

- In beagle dogs, triclopyr has an elimination half-life of 7.2 hours (6).
The elimination half-life of triclopyr in the rhesus monkey is 6.3 hours (6).

In rats, greater than 90% of triclopyr ingested is recovered unchanged in the urine or feces within 24 to 72 hours. Some of the remaining triclopyr is found in fatty tissue and the ovaries of females when the experiments were concluded. Some of the triclopyr is metabolized into 3,5,6-trichloro-2-pyridinol (TCP) which is also a metabolite of chlorpyrifos (1,7). Researchers noted similar findings in the beagle dog (6).

**Humans**

- Greater than 80% of the triclopyr ingested by six human volunteers appeared unchanged in the urine within 48 hours. From these data the half-life of triclopyr was determined to be 5.1 hours in humans (4). See box on [Half-life](#).
- Triclopyr was applied at a rate of 3.7 mg/kg body weight to the forearm of human volunteers for 8 to 12 hours and approximately 1.7% of the dose was absorbed. Less than 0.5% of triclopyr ingested by the volunteers was detected as TCP in the urine (4).

**What is the environmental fate of triclopyr?**

**Soil**

- In soil, triclopyr has a half-life ranging from 1.1 to 90 days depending on soil type (1, 8). Several resources have reported a 46 day half-life for triclopyr (2, 8, 9). The half-life of the major metabolite, TCP, is 30 to 90 days (2).
- In soil, both forms of triclopyr degrade into several intermediates before ultimately degrading into carbon dioxide (CO$_2$) (1).

**Water**

- Triclopyr in water is predominantly degraded by exposure to sunlight, with half-lives ranging from 1 to 10 days depending on water conditions, such as turbidity. Triclopyr is stable in water without sunlight (1, 10).

**Air**

- The vapor pressure of triclopyr is 0.2 mPa at 25 ºC (2).

**Plants**

- Triclopyr’s half-life in plants ranges from 3 to 10 days. The main metabolite is 3,5,6-trichloro-2-methoxypyridine (2).

**Does triclopyr affect wildlife?**

**Birds**

- Both forms of triclopyr are slightly to practically non-toxic to birds such as quail (for BEE, LD50 = 735 to 849 mg/kg), mallard ducks (for TEA, LD50 = 2055 mg/kg), and zebra finch (for BEE, LD50 = 1,627 to 2,277 mg/kg) (1, 11).

**Fish and Aquatic Life**

- Triclopyr TEA is practically non-toxic (LC50 > 100 ppm) to bluegill sunfish (*L. macrochirus*), rainbow trout (*O. mykiss*), and fathead minnow (*P. promelas*) in acute studies. Triclopyr BEE is moderately to highly toxic (LC50 0.1 to ≤ 10 ppm) to these same species under similar conditions (1).
- The major metabolite, TCP, is moderately toxic to fish (LC50 >1 to ≤12) including several species of salmon and the previously mentioned fish species (1).
- The elimination half-life in crayfish (*P. Clarki*) is 7 to 17 days. There is no evidence for bioaccumulation in this aquatic invertebrate (12).
- Triclopyr TEA is practically non-toxic to *Daphnia magna* (waterflea) with an LC50 of 1,496 mg/L, while triclopyr BEE is slightly to moderately toxic with an LC50 of 1.7 to 12 mg/L (1).
Levels of triclopyr TEA that elicit reproductive impairment in the waterflea under laboratory conditions are not expected in freshwater systems with current labeled rates (TEA concentrations greater than 80.7 mg/L) (1).

Triclopyr TEA is practically non-toxic to slightly toxic to several aquatic invertebrates acutely exposed (e.g., oyster (C. virginica) LC50 = 58 mg/L, shrimp (P. pugio and P. duoraram), LC50 = 326 to 895 mg/L, and crab (U. pugilator), LC50 >1000 mg/L) (1).

Terrestrial Invertebrates

Triclopyr is practically non-toxic to honey bees (A. mellifera) in acute contact exposure (LD50 > 100 µg/bee) (1).

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References

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