# Trifluralin

### Hazard Summary

Trifluralin is used as a herbicide. No information is available on the acute (short-term), chronic (longterm), reproductive, developmental, or carcinogenic effects of trifluralin in humans. Decreased weight gain and effects on the blood and liver were observed in dogs chronically exposed to trifluralin in their diet. Skeletal abnormalities and depressed fetal weight were observed in the offspring of rodents exposed via gavage (experimentally placing the chemical in the stomach). Increased incidences of urinary tract tumors and thyroid tumors were observed in rats exposed to trifluralin in their diet. Trifluralin did not produce statistically significant increases in tumors in other studies. EPA has classified trifluralin as a Group C, possible human carcinogen (cancer-causing agent).

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS) (3), which contains information on oral chronic toxicity and the RfD, and the carcinogenic effects of trifluralin including the unit cancer risk for oral exposure, and EPA's Health and Environmental Effects Profile for Trifluralin. (4)

#### Uses

• Trifluralin is a herbicide used to control annual grasses and some broadleaf annual weeds on a variety of crops, shrubs, and flowers. It is used mostly on cotton, as well as on soybeans and some fruits and vegetables. (4)

### Sources and Potential Exposure

- Occupational exposure to trifluralin may occur by inhalation or dermal contact during its production, formulation, or application as a herbicide. Dermal exposure by farmworkers may also occur long after initial exposure, as it has been found to be adsorbed to clothing even after numerous washings. (1)
- Trifluralin may be released to the environment in fugitive emissions during its production and in wastewater effluent. It is also released to the ambient environment during its application as a herbicide and may be released to surface water as a result of agricultural runoff. (1)
- The general population may be exposed to trifluralin by dermal and inhalation exposure from lawn products and by ingestion of contaminated agricultural products or the ingestion of fish caught in contaminated waters. (1)

### Assessing Personal Exposure

• No information was located regarding the measurement of personal exposure to trifluralin.

# Health Hazard Information

Acute Effects:

- Information is not available on the effects of acute exposure of humans to trifluralin.
- Acute animal tests in rats, mice, and rabbits have demonstrated trifluralin to have moderate acute toxicity by inhalation and low to moderate acute toxicity by oral or dermal exposure. (2)

Chronic Effects (Noncancer):

- No information is available on the chronic effects of trifluralin in humans.
- Decreased weight gain, changes in hematological parameters, and increased liver weight were observed in dogs chronically exposed to trifluralin in their diet. (3)
- Liver and kidney effects have been reported in other animal studies. (3)
- EPA has not established a Reference Concentration (RfC) for trifluralin. (3)
- The Reference Dose (RfD) for trifluralin is 0.0075 milligrams per kilogram body weight per day (mg/kg/d) based on increased liver weights and an increase in methemoglobinemia in dogs. The RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfD, the potential for adverse health effects increases. Lifetime exposure above the RfD does not imply that an adverse health effect would necessarily occur. (3)
- EPA has high confidence in the study on which the RfD is based because it is of good quality; high confidence in the database because additional studies are supportive and of good quality; and, consequently, high confidence in the RfD. (3)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of trifluralin in humans.
- Skeletal abnormalities were observed in the offspring of mice exposed via gavage. (4)
- In rats and rabbits exposed via gavage, depressed fetal weight was observed. (1,3)

Cancer Risk:

- No information is available on the carcinogenic effects of trifluralin in humans. (3)
- Increased incidences of urinary tract tumors (renal pelvis carcinomas and urinary bladder papillomas) and thyroid tumors (adenomas/carcinomas combined) were observed in rats exposed to trifluralin in their diet. Trifluralin did not produce statistically significant increases in tumors in four other dietary studies in rodents. (3)
- Trifluralin is structurally similar to ethalfluralin, a carcinogen in the rat; both compounds produce a common urinary metabolite in rats that produces nonneoplastic renal pathology. (3)
- N-Nitroso-di-n-propylamine (NDPA), an unavoidable contaminant in trifluralin-containing products, has been found to be carcinogenic in rodents. (4)
- EPA has classified trifluralin as a Group C, possible human carcinogen. (3)
- EPA uses mathematical models, based on human and animal studies, to estimate the probability of a person developing cancer from drinking water containing a specified concentration of a chemical. EPA calculated an oral unit risk estimate of  $2.2 \times 10^{-7}$  (µg/L)<sup>-1</sup>. EPA estimates that, if an individual were to drink water containing trifluralin at an average concentration of 5.0 micrograms per liter (µg/L) over his or her entire lifetime, that person would theoretically have no more than a one-in-a-million increased chance of developing cancer as a direct result of drinking water containing this chemical. Similarly, EPA estimates that drinking water containing 50.0 µg/L would likely result in not greater than a one-in-a-hundred thousand increased chance of developing cancer, and water containing 500.0 µg/L would result in not greater than a one-in-ten-thousand increased chance of developing cancer. For a detailed discussion of confidence in the potency estimates, please see IRIS. (3)
- EPA has also calculated an oral cancer slope factor (CSF) of 0.0077  $(mg/kg/day)^{-1}$ . (3)

# **Physical Properties**

- The chemical formula for trifluralin is C H F N O , and its molecular weight is 335.3 g/mol. (4)
   Trifluralin occurs as a yellow-orange crystalline solid or crystals that are slightly soluble in water. (4,5,6)
- The odor threshold has not been established.
  The vapor pressure for trifluralin is 1.99 x 10<sup>-4</sup> mm Hg at 29.5 °C, and the log octanol/water partition coefficient (log  $K_{ow}$ ) is reported to be 5.3. (4)

Conversion Factors:

To convert concentrations in air (at 25 °C) from ppm to  $mg/m^3$ :  $mg/m^3 = (ppm) \times (molecular weight of the gradient states and the states are states as the states are states as the states are states as the states are states are states as the states are states a$ compound)/(24.45). For trifluralin: 1 ppm = 13.71 mg/m<sup>3</sup>. To convert concentrations in air from  $\mu g/m^3$  to  $mg/m': mg/m' = (\mu g/m') \times (1 mg/1,000 \mu g).$ 

#### Health Data from Oral Exposure



#### Trifluralin

 $LD_{50}$  (Lethal Dose \_\_\_\_\_\_)--A calculated dose of a chemical in water to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.

LOAEL--Lowest-observed-adverse-effect level.

NOAEL--No-observed-adverse-effect level.

The health values cited in this factsheet were obtained in December 1999.

Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA. b

Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers

are nonregulatory values provided by the Government or other groups as advice.

The LOAEL and NOAEL are from the critical study used as the basis for the EPA RfD.

Summary created in April 1992, updated January 2000

#### References

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