
NPTN General Fact Sheets are designed to answer questions that are commonly asked by the general public about pesticides that are regulated by the U.S. Environmental Protection Agency (US EPA). This document is intended to be educational in nature and helpful to consumers for making decisions about pesticide use.

National
Pesticide
Telecommunications
Network

DDT

(General Fact Sheet)

For more technical information please refer to the Technical Fact Sheet

The Pesticide Label: Labels provide directions for the proper use of a pesticide product. *Be sure to read the entire label before using any product.* A signal word, on each product label, indicates the product's short-term toxicity.

CAUTION - low toxicity

WARNING - moderate toxicity

DANGER - high toxicity

What is DDT?

- DDT¹ is an organochlorine² insecticide that was first synthesized in 1874 (1, 2).
- DDT was a commonly-used pesticide for insect control in the United States until it was canceled in 1972 by the United States Environmental Protection Agency (EPA).

Why was DDT used?

- DDT was initially used by the military in WW II to control malaria, typhus, body lice, and bubonic plague (1). Cases of malaria fell from 400,000 in 1946 to virtually none in 1950 (3). DDT is still used today in South America, Africa, and Asia for this purpose.
- Farmers used DDT on a variety of food crops in the United States and worldwide. DDT was also used in buildings for pest control.
- The reason why DDT was so widely used was because it is effective, relatively inexpensive to manufacture, and lasts a long time in the environment (2).

Is DDT still used?

- DDT can still legally be manufactured in the U.S., but it can only be sold to, or used by, foreign countries. In the U.S. the only exceptions for DDT use are for public health emergencies involving vector (insect) diseases and control of body lice (4).
- DDT was canceled because it persists in the environment, accumulates in fatty tissues, and can cause adverse health effects on wildlife (5). In addition, resistance occurs in some insects (like the house fly) who develop the ability to quickly metabolize the DDT (1).

How does DDT work?

- DDT affects the nervous system by interfering with normal nerve impulses (2).

How toxic is DDT?

Animals

- DDT is slightly to moderately acutely toxic to mammals, including people, if eaten. See box on **Laboratory Testing**.
- DDT is poorly absorbed through mammalian skin, but it is easily absorbed through an insect's outer covering known as an exoskeleton (2).
- Laboratory animals exposed to DDT develop hyperexcitability, tremors, incoordination, and convulsions (1). See boxes on **Toxicity Category** and **LD 50/LC50**.

Laboratory Testing: Before pesticides are registered by the U.S. EPA, they must undergo laboratory testing for short-term and long-term 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 pesticides 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.

- Animals given potentially fatal doses of DDT develop liver lesions and those given DDT over a long period of time develop liver changes (1).

Toxicity Category (Signal Word) (6)

	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
Inhalation LC50	Less than 0.2 mg/l	0.2 - 2 mg/l	2 - 20 mg/l	Greater than 20 mg/l
Dermal LD50	Less than 200 mg/kg	200 - 2000 mg/kg	2000 - 5000 mg/kg	Greater than 5000 mg/kg
Eye Effects	Corrosive	Irritation persisting for 7 days	Irritation reversible within 7 days	No irritation
Skin Effects	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation at 72 hours

Humans

- People exposed to DDT while working with the chemical or by accidental exposure report a prickling sensation of the mouth, nausea, dizziness, confusion, headache, lethargy, incoordination, vomiting, fatigue, and tremors (2).

Does DDT cause reproductive or birth effects?

Animals

- Dogs fed DDT in low doses do not have reproductive effects (1).
- Rats become sterile after being fed DDT (7).
- Mice fed low levels of DDT have embryos that fail to attach to the uterus and irregular reproductive cycles (7). The offspring of mice fed DDT have a higher mortality rate (1).

LD50/LC50: A common measure of toxicity is the lethal dose (LD50) or lethal concentration (LC50) which causes death (resulting from a single or limited exposure) in 50 percent of the treated animals. LD50 is generally expressed as the dose in milligrams (mg) of chemical per kilogram (kg) of body weight. LC50 is often expressed as mg of chemical per volume (e.g., liter (l)) of medium (i.e., air or water) the organism is exposed to. Chemicals are considered highly toxic when the LD50/LC50 is small and practically non-toxic when the value is large. However, the LD50/LC50 does not reflect any effects from long-term exposure (i.e., cancer, birth defects or reproductive toxicity) which may occur at doses below those used in short-term studies.

- One of the breakdown products of DDT, DDE³, causes thinning of eggshells in birds (8).

Humans

- Scientists have no data indicating DDT causes reproductive problems or birth defects in humans.

Exposure: Effects of DDT on human health and the environment depend on how much DDT is present and the length and frequency of exposure. Effects also depend on the health of a person and/or certain environmental factors.

Does DDT cause cancer?

Animals

- Mammals exposed to DDT develop liver tumors and have an increased risk of liver tumors (1).
- In one study where female and male mice consumed doses of DDT for life, the males were twice as likely to develop liver tumors (1).

Humans

- The EPA has categorized DDT as a B2 carcinogen (9). This means that DDT has been shown to cause cancer in laboratory animals, but there is inadequate or no evidence which shows that it may cause cancer in humans (1). See box on **Cancer**.
- A group of workers studied for 19 years employed at a DDT manufacturing facility did not develop cancer (1).
- Studies have shown that there is no correlation between an increased risk of breast cancer in women exposed to DDT (10, 11, 12, 13, 14).

Cancer: The U.S. EPA has strict guidelines that require testing of pesticides for their potential to cause cancer. These studies involve feeding laboratory animals large daily doses of the pesticide over most of the lifetime of the animal. These animals are compared with a group of animals that did not receive the chemical. Animal studies help show whether a chemical is a potential human carcinogen. If a pesticide does not cause cancer in animal tests, then the EPA considers it unlikely the pesticide will cause cancer in humans.

Does DDT accumulate in humans?

Fat Stores

- DDT tends to accumulate in the fatty tissues of insects, wildlife, and people, but produces no known toxic effects while it is stored in the fat (2).
- DDT is metabolized into various breakdown products in the body including DDE, DDD⁴, and DDA⁵.
- When fat stores are used during periods of starvation the breakdown products of DDT are released into the blood where they may be toxic to the liver and the nervous system (2).
- Once DDT has accumulated in the body, it is excreted in the urine, feces, or breast milk. Breast milk is often used to measure a population's exposure to DDT.

Biomagnification

- Because of DDT's chemical properties it has the tendency to accumulate in animals. As animals lower on the food chain are eaten by other animals higher up, DDT becomes concentrated in the fatty tissues of predators (8, 15). This continues until the primary predator of the food chain receives the highest dose, which may lead to adverse health effects. Once the use of DDT was discontinued in the U.S., its concentration in the environment and animals decreased.

What happens to DDT in the environment?

- DDT is highly persistent in the environment. The soil half-life for DDT is from 2 to 15 years (16). See box on **Half-life**.
- The half-life of DDT in an aquatic environment is about 150 years (17).

What effects does DDT have on wildlife?

- DDT is slightly to moderately toxic to birds when eaten (16). DDE decreases the reproductive rate of birds by causing eggshell thinning and embryo deaths (15).
- DDT is highly toxic to aquatic animals (15). DDT affects various systems in aquatic animals including the heart and brain (15).
- DDT is highly toxic to fish (15). Fish have a poor ability to detect DDT in water (15).
- DDT moderately toxic to amphibians like frogs, toads, and salamanders. Immature amphibians are more sensitive to the effects of DDT than adults (15).

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

¹ DDT is dichlorodiphenyl**trichloroethane**

² Organochlorines are chemical compounds that contain hydrogen, carbon, chlorine, and, sometimes, other atoms.

² DDE is dichlorodiphenyl**dichloroethylene**

³ DDD (TDE) is dichlorodiphenyl**dichloroethane**

⁴ DDA is 2,2-bis(4-chlorophenyl)-acetic acid

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