Piperonyl Butoxide

(General Fact Sheet)
Please refer to the Technical Fact Sheet for more technical information.

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 potential hazard.

<table>
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<th>CAUTION - low toxicity</th>
<th>WARNING - moderate toxicity</th>
<th>DANGER - high toxicity</th>
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What is piperonyl butoxide?

- Piperonyl butoxide is a synergist used in a wide variety of pesticides (1). Synergists are chemicals that lack pesticidal effects of their own but enhance the pesticidal properties of other chemicals (2). Piperonyl butoxide is used in pesticides containing chemicals such as pyrethrins, pyrethroids, rotenone, and carbamates (1, 3). See the Pesticide Label box above.

- Researchers developed piperonyl butoxide in 1947 using naturally-occurring safrole as a key raw material (1, 3).

- Piperonyl butoxide is a colorless to pale yellow liquid. It does not dissolve in water and is stable to breakdown by water and ultraviolet light. Researchers consider piperonyl butoxide to be noncorrosive (4).

How does piperonyl butoxide work?

- Piperonyl butoxide inhibits breakdown of pesticides by insects (3, 5). Without piperonyl butoxide, an insect may degrade a pesticide before an effect can occur. The addition of piperonyl butoxide to a pesticide reduces the amount of pesticide required to be effective (2).

What types of products contain piperonyl butoxide?

- Pesticides for indoor home use such as dusts, sprays, and foggers
- Pesticides for gardens, lawns, and decorative plants
- Agricultural pesticides for food and nonfood crops
- Mosquito control products
- Termite treatments
- Veterinary pesticide products
- Animal ear tags and pest strips
- Pesticides for human clothing, bedding, and mattresses
How toxic is piperonyl butoxide?

Animals

- Piperonyl butoxide is low to very low in toxicity when eaten by mammals (6). See boxes on Laboratory Testing, LD50/LC50, and Toxicity Category.
- Piperonyl butoxide is very low in toxicity when inhaled by rats (6, 7).
- Piperonyl butoxide is low to very low in toxicity to mammals when absorbed by the skin (3, 6, 7). Guinea-pigs exposed to piperonyl butoxide showed no signs of skin sensitivity (7).
- Researchers exposed the eyes of rabbits to piperonyl butoxide and all eye irritations that developed fully recovered (7).
- The liver is the target organ for piperonyl butoxide (6).
- Researchers applied piperonyl butoxide to the skin of male and female rabbits for three weeks. They noted skin redness and swelling at the application sites (6).
- Researchers fed dogs capsules containing piperonyl butoxide for one year. All dogs dosed at the highest level died; those dosed at the lowest level exhibited no effects (6, 7, 8).

Humans

- Researchers gave eight male human volunteers, aged 22 to 57, a single oral dose of piperonyl butoxide. They monitored the volunteers for 31 hours and observed no changes in the volunteers’ metabolism (3, 6).
- Researchers applied a commercial pesticide that contained piperonyl butoxide to the forearms of human volunteers. The volunteers showed no evidence of toxicity (10).

Does piperonyl butoxide cause reproductive or birth defects?

Animals

- Researchers fed male and female rats piperonyl butoxide before the rats mated. They continued feeding them the chemical during mating, pregnancy, and nursing periods. Researchers detected no negative reproductive effects on the rats. They did detect that both adult and young rats that were fed the highest doses of the chemical had lower body weights (7).
The offspring of pregnant rats that were fed piperonyl butoxide through stomach tubes did not have birth defects (6, 7).

**Humans**
- Data are not available from accidental poisonings, work-related exposures, or other human studies regarding the reproductive and developmental toxicity of piperonyl butoxide.

### Does piperonyl butoxide cause cancer?

**Animals**
- Researchers detected an increased occurrence of liver tumors at the highest dose tested in male and female mice fed diets containing piperonyl butoxide (6, 7, 11). Researchers consider the mice tumors a low hazard and unlikely to represent a human cancer risk from piperonyl butoxide exposure (11).

- Researchers observed no evidence of cancer in male and female rats fed diets containing piperonyl butoxide (6, 7, 11).

- Researchers often test chemicals for their ability to change the genetic material of an organism as an indication of their potential to cause cancer. Evidence exists that piperonyl butoxide does not change genetic material (6, 7, 12).

**Humans**
- The U.S. EPA classifies piperonyl butoxide as a group C carcinogen (13). This means that piperonyl butoxide is considered a possible human carcinogen based on limited evidence of cancer in laboratory animals. See box on Cancer.

- Data are not available from work-related exposures or other human studies regarding the ability of piperonyl butoxide to cause cancer.

### What happens to piperonyl butoxide in the environment?

- Researchers evaluated the disappearance of piperonyl butoxide in soil and water and determined that the chemical is short-lived in the environment. Piperonyl butoxide has a moderate to low potential to contaminate groundwater (14).

- Piperonyl butoxide released as a liquid in the air is removed by settling to the ground. When released as a gas, piperonyl butoxide rapidly degrades in air (15).

### What effects does piperonyl butoxide have on wildlife?

- Researchers consider piperonyl butoxide moderately toxic to fish and highly toxic to other aquatic organisms. It is not likely to accumulate in fish (16).

- Piperonyl butoxide is low to very low in toxicity when eaten by birds (16).

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References