

What is captan?

Captan is man-made [fungicide](#) used to control a range of fungal diseases.¹ The pesticide was first registered in 1951.² Captan can be used to control plant diseases such as black rot, early and late blight, and downy mildew, among others.³

What are some products that contain captan?

There are about 100 [products](#) available that contain captan.⁴ These products may come as dusts, powders, or liquids and may need to be mixed before use.²

Captan products can be found in farm and home settings. Products with captan are commonly applied to edible crops such as apples, peaches, strawberries, and almonds.⁵ Ornamental plants, turf, and seeds may also be treated with captan.² Captan may be applied aerially, with hand-held sprayers, dusters, or other large equipment.² Captan cannot be used in certified [organic](#) production.⁶

Always [follow label instructions](#) and take steps to minimize exposure. If any exposures occur, be sure to follow the First Aid instructions on the product label carefully. For additional treatment advice, contact the Poison Control Center at 1-800-222-1222. If you wish to [discuss a pesticide problem](#), please call 1-800-858-7378.

How does captan work?

Captan works by coming into contact with a fungus and interrupting a key process in its life cycle. It can be toxic to many different fungal diseases. Captan is non-systemic, which means it is not expected to move through plants.²

How might I be exposed to captan?

You may be exposed to captan by getting it on your skin or eyes, breathing it in, or accidentally eating a product. You may be exposed to very small amounts of captan in your diet from [residues on foods](#).² The U.S. Environmental Protection Agency (US EPA) sets limits for these residues based on risks to human health.

You may contact captan when touching treated plants or being in the yard after home use.² Following label instructions can reduce your level of exposure. Captan tends to stay on the surface of foods so peeling and [washing](#) treated foods can also reduce your exposure.^{2,7}



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Polytechnic State University at San Luis Obispo

What are some signs and symptoms from a brief exposure to captan?

Captan can be harmful to eyes. Concentrated captan has been shown to cause permanent eye damage in rabbits.² Captan is very low in toxicity if it is eaten.² After eating large quantities of captan, common symptoms may include diarrhea and vomiting.⁸ In one instance of a person consuming captan on purpose, symptoms included nausea, weakness, arm numbness, and lower chest pain. Symptoms showed up two hours after ingestion.⁸



Captan is low in toxicity if it is put on the skin or inhaled.³ Exposure to captan may cause irritation of the skin and respiratory system.⁹ Captan can cause some skin sensitivity.²

What happens to captan when it enters the body?

Captan quickly breaks down into chemicals such as THPI* in the digestive system.² When humans consumed captan, blood levels of THPI peaked 10 hours after ingestion. Almost all THPI was gone from the body after 96 hours.¹⁰ In a rodent feeding study, 92 to 94% of the dose was excreted in urine and feces after 96 hours (4 days).¹¹

One study showed low skin absorption when captan was applied to human arms.¹² Another study estimated less than one percent of captan would be absorbed through skin.¹³ The US EPA assumes dermal absorption of captan to be less than one percent (0.4%) per hour of contact.²

In feeding studies, captan was quickly broken down in bodies of cows, goats, and hens. Livers, kidneys, and muscle tended to have more breakdown products than fat. Very small amounts of captan's breakdown products have been found in goat milk and chicken eggs.⁷

Is captan likely to contribute to the development of [cancer](#)?

Captan is not likely to cause cancer from skin exposure because it is not absorbed well through the skin.^{14,15}

The link between captan and cancer depends on how much a person is exposed. High enough doses that damage the intestines and respiratory track carry a higher risk of cancer**.¹⁴ EPA estimates very low cancer risk from small, daily exposures over a lifetime. This estimate includes typical exposures in work settings, the home, and from very small amounts in our diet.^{2,14}

In long-term studies, rats and mice were fed high doses of captan every day for 1.5 to 2.5 years. These studies resulted in increased intestinal tumors in mice. There was also an increase in unusual kidney tissue growth in male rats. Female rats had an increase in uterine cancer.² Cancer in these animals is thought to be triggered by the highly reactive but short-lived breakdown product thiophosgene.^{14,15} Another major breakdown product of captan called THPI is not likely to cause cancer.²

*THPI: tetrahydrophthalimide

**EPA classifies captan's cancer risk as "likely to be carcinogenic to humans following prolonged, high-level exposures causing cytotoxicity and regenerative cell hyperplasia in the proximal region of the small intestine (oral exposure) or the respiratory tract (inhalation exposure), but not likely to be a human carcinogen at dose levels that do not cause cytotoxicity and regenerative cell hyperplasia".^{14,16}

Captan was not found to damage genes in live animals. However, some changes in cells were seen when exposed to captan in a lab.¹⁴

Has anyone studied non-cancer effects from long-term exposure to captan?

Captan is low to moderate in toxicity for long-term, chronic exposures.^{2,17} In a two-year study, rats were fed high doses of captan daily. At the second highest dose tested, male rats had enlarged livers. Also, both male and females had higher kidney weights and decreased body weights.² In a one-month feeding study, dogs were given moderate to high doses of captan daily. All groups had vomiting, less weight gain, and ate less, but no other signs were reported.¹⁷

Scientists have studied the effects of captan on fetal development. For each of the following studies, effects were only seen in the young at or above doses where the parents also showed health effects. In one study, pregnant rabbits were fed captan for two weeks. At the middle dose tested, there were some young with unusual skeletal changes. At the highest dose tested, there were lost pregnancies and changes in newborn weights. When pregnant hamsters were fed high doses of captan, they lost more pregnancies and the young had slow bone development.²

Captan is not likely to interact with the [endocrine system](#).¹⁸ It does not interact with the estrogen, androgen, or thyroid pathways.

Are children more sensitive to captan than adults?

Studies do not show that children are more sensitive to captan than adults.² However, young children may act in ways that put them at greater risk of being exposed. For example, they may spend more time near the floor. They may also be more likely to place their hands in their mouths after touching treated surfaces.

What happens to captan in the environment?

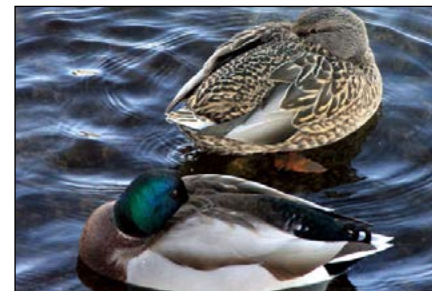
Captan has a low potential to make fumes or [volatilize](#).³ It also breaks down quickly in soils. The [half-life](#) in soil ranges from less than 1 to 4 days and up to 24 days in field studies.^{1,19} In one study, 99% of captan applied to a soil was broken down after 7 days.² [Movement of captan in soil](#) ranges from slightly mobile to mobile. However, field studies tend to show that captan is only slightly mobile.¹ After captan was applied to a soil surface, it was not found deeper than 6 to 12 inches.^{2,7}

Captan breaks down slightly faster in water than in soil. The half-life of captan in clean water is between 5 and 19 hours.^{2,7} Captan breaks down slightly slower without light.²

The half-life of captan residues on leaf surfaces ranges from 10 to 43 days.² Captan on treated apples, tomatoes, and lettuce mainly stays on the surface of leaves and fruits.⁷ In one study, mixing captan with oil slightly increased leaf absorption (to about 2%).²⁰

Can captan affect fish or other [wildlife](#)?

Captan is practically non-toxic to birds. Ducks fed large amounts of captan for eight days tended to eat less food and lost weight. Captan is moderately toxic to very highly toxic to fish. However, it is unlikely to build up in fish because it breaks down so quickly in water. Captan is moderately to very highly toxic to aquatic organisms like water fleas, mysid shrimp, and oysters.¹



The major breakdown products of captan in water are nearly non-toxic to water fleas. Some evidence suggests they are also nearly non-toxic to rainbow trout.¹

Captan is practically non-toxic to bees from short-term contact with the pesticide.¹ In one study, captan was applied to an almond orchard during bloom. No negative effects were seen in the hives or single bees for the two-month monitoring period.²¹

In an earthworm study, worm reproduction rates were lower in soils with high enough amounts of captan. However, captan did not affect survival of mature earthworms.²²

Where can I get more information?

For more detailed information about captan please visit the list of [referenced resources](#) or call the National Pesticide Information Center, Monday - Friday, between 8:00am - 12:00pm Pacific Time (11:00am - 3:00pm Eastern Time) at 1-800-858-7378 or visit us on the web at npic.orst.edu. NPIC provides objective, science-based answers to questions about pesticides.

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References

1. *Registration Review Problem Formulation for Captan*; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, U.S. Government Printing Office: Washington, DC, 2013.
2. *Amendment to the 1999 Captan Reregistration Eligibility Decision (RED)*; U.S. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention, U.S. Government Printing Office: Washington, DC, 2004.
3. Tomlin, C. D. S. Captan. *The Pesticide Manual, 17th ed.*; British Crop Protection Council: Alton, Hampshire, UK, 2015; pp 156-157.
4. *NPIC Product Research Online (NPRO): Captan*; National Pesticide Information Center, Corvallis, OR, 2017.
5. *BEAD Chemical Profile for Registration Review: Captan*; U.S. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention, U.S. Government Printing Office: Washington, DC, 2012.
6. The National List of Allowed and Prohibited Substances; *Code of Federal Regulations*, Part 205.601, Title 7, 2018.

7. Pesticide Residues in Food-2000. *Report of the Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment (JMPR): Captan*; Food and Agriculture Organization of the United Nations and World Health Organization Core Assessment Group: Geneva, Switzerland, 2000; pp 121-35.
8. *Hazardous Substances Databank for Captan*; U.S. Department of Health and Human Services, National Institutes of Health, National Library of Medicine: Bethesda, MD, 2016.
9. Roberts, J. R.; Reigart, J. R. Fungicides. *Recognition and Management of Pesticide Poisonings 6th ed.*; U.S. Environmental Protection Agency, Office of Pesticide Programs, U.S. Government Printing Office, Washington DC, 2013; p 149.
10. Berthet, A.; Bouchard, M.; Danuser, B. Toxicokinetics of Captan and Folpet Biomarkers in Orally Exposed Volunteers. *J. Appl. Toxicol.* 2011, 32, 194–201.
11. Pesticide Residues in Food-1995. *Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment (JMPR): Captan*; Food and Agriculture Organization of the United Nations and World Health Organization Core Assessment Group: Geneva, Switzerland, 1995.
12. Berthet, A.; Bouchard, M.; Vernez, D. Toxicokinetics of Captan and Folpet Biomarkers in Dermally Exposed Volunteers. *J. Appl. Toxicol.* 2011, 32, 202–209.
13. Heredia-Ortiz, R. Toxicokinetic Modeling of Captan Fungicide and Its Tetrahydrophthalimide Biomarker of Exposure in Humans. *Toxicol. Lett.* 2012, 213, 27–34.
14. *Captan: Human Health Risk Scoping Document in Support of Registration Review*; U.S. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention, U.S. Government Printing Office: Washington, DC, 2013.
15. Wilkinson, C. F.; Arce, G.; Gordon, E. B. *Scientific Analysis of the Data Relating to the Reclassification of Captan under EPA's New Guidelines for Carcinogenic Risk Assessment*; Toxicology Excellence for Risk Assessment (TERA): Washington, DC, 2004.
16. *Chemicals Evaluated for Carcinogenic Potential*; U.S. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention, U.S. Government Printing Office: Washington, DC, 2016.
17. Pesticide Residues in Food - 2004. *Report of the Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment (JMPR): Captan*; Food and Agriculture Organization of the United Nations and World Health Organization Core Assessment Group: Geneva, Switzerland, 2004; pp 42–43.
18. *EDSP Weight of Evidence Conclusions on the Tier 1 Screening Assays for the List 1 Chemicals*; U.S. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention, U.S. Government Printing Office: Washington, DC 2015.
19. *The Pesticide Properties Database (PPDB): Captan*; Agriculture & Environment Research Unit (AERU), University of Hertfordshire: Hertfordshire, UK, 2017.
20. Bondada, B. R.; Sams, C. E.; Deyton, D. E.; Cummins, J. C. Oil Emulsions Enhance Transcuticular Movement of Captan in Apple Leaves. *Crop Prot.* 2007, 26, 691–696.
21. Everich, R.; Schiller, C.; Whitehead, J.; Beavers, M.; Barrett, K. Effects of Captan on Apis Mellifera Brood Development under Field Conditions in California Almond Orchards. *J. Econ. Entomol.* 2009, 102 (1), 20–29.
22. Alves, P. R. L.; Cardoso, E. J.B.N.; Martines, A. M.; Sousa, J. P.; Pasini, A. Earthworm Ecotoxicological Assessments of Pesticides Used to Treat Seeds under Tropical Conditions. *Chemosphere* 2013, 90, 2674–2682.