

Purchasing for Pollution Prevention

Lindane Alternatives: Health and Environmental Effects

All pesticides are designed to kill living organisms and involve some health risk to humans exposed to them. While the health and environmental effects of non-lindane pesticides may be less significant than those posed by lindane, these risks should nonetheless be kept in mind when deciding whether to use chemical treatments for lice (pediculicides) or scabies (scabicides). *Before using any pesticide treatments for lice and scabies, it is important to understand the risks associated with the different pesticide active ingredients.*

What are the alternatives to lindane for head lice and scabies?

- **Pyrethrins/Piperonyl butoxide.** Several over-the-counter head lice shampoos and lotions have active ingredients containing, or derived from, the pyrethrum extract of dried chrysanthemum flower.* Lice products contain pyrethrum extract in a 0.33% solution combined with piperonyl butoxide (PBO), a synergist that increases the effect of the pesticide.
- **Permethrin.** This “synthetic pyrethroid” mimics the structure of pyrethrum. Products with 1% and 5% permethrin are used to treat lice and scabies, respectively.
- **Malathion.** This broad-spectrum organophosphate pesticide is the active ingredient in some lice and scabies lotions. It is not commonly used, because it must be left on the head for approximately eight hours; other lice treatments work in about 10 minutes.

What are the human health risks of lindane alternatives?

PERMETHRIN AND PYRETHRINS

At the recommended dosage:

- Side effects can include dry patches, swelling, itching, rash, or redness.¹
- People with hay fever, asthma, and sensitivities to certain allergens have an increased risk from

pyrethrins; people have died from heart or respiratory failure after applying animal insecticide shampoo containing pyrethrins.²

Overexposure or misuse:

- Overexposure can cause nervous system effects such as dizziness, headache, nausea, muscle twitching, convulsions, and loss of consciousness.³

PIPERONYL BUTOXIDE (PBO)

At the recommended dosage:

- PBO inhibits the enzymes that help to break down toxins in the body, increasing the efficacy of pesticides by slowing their elimination from the body; this can make patients more vulnerable to their toxic effects.⁴

Overexposure or misuse:

- Piperonyl butoxide can cause irritation of the skin and eyes.⁵

MALATHION

At the recommended dosage:

- Side effects include scalp tingling, dandruff, and redness of the scalp and eyes.
- Ovide, the malathion treatment for head lice, contains highly flammable ingredients and may pose a fire risk. Patients should be cautioned to avoid heating the hair by using hair dryers or other appliances during treatment. Appropriate storage of flammable materials is required when storing large amounts of this product.⁶

* The whole extract of chrysanthemum is known as pyrethrum, while its component compounds are known as pyrethrins. In this fact sheet, pyrethrins refers to the whole class of natural extracts.

Overexposure:

- Overexposure can cause headache, dizziness, nausea, difficulty breathing, blurred vision, and loss of consciousness. No acute poisonings have been reported for malathion used as a pediculicide, only for agricultural use.⁷

What are the environmental risks of lindane alternatives?

PERMETHRIN AND PYRETHRINS

- Both of these pesticides are very toxic to bees, fish, and other aquatic organisms.
- Pyrethrins can break down after only a few hours when exposed to air and sunlight, but their residues have been found to last from two weeks to two months indoors.
- Permethrin is more persistent than natural pyrethrins.⁸

PIPERONYL BUTOXIDE (PBO)

- PBO is moderately toxic to fish and highly toxic to some other aquatic organisms.
- Through its suppression of detoxification processes, PBO can increase the toxicity of numerous pesticides.
- PBO has a half-life ranging from a few hours in air to 3 days in soil. In aqueous environments, its half-life is less than two days.⁹

MALATHION

- Malathion is highly toxic to bees, and certain fish species.
- This pesticide breaks down fairly readily in soils, with a half-life of 1 to 25 days.
- It can persist up to six weeks in water, depending on conditions.¹⁰

Notes

- ¹ Jones, Kimberly N., and Joseph C. English III, "Review of Common Therapeutic Options in the United States for the Treatment of Pediculosis Capitis," *Clinical Infectious Diseases*, 2003, Volume 36, 1355-1359.
- ² Wax, P.M., and R.S. Hoffman, "Fatality Associated with the Inhalation of a Pyrethrin Shampoo," *Clinical Toxicology*, Volume 32, 457-460, 1994; Wagner, S.L., "Fatal Asthma in a Child After Use of an Animal Shampoo Containing Pyrethrin," *West Journal of Medicine*, Volume 173, 86-87, 2000.
- ³ US Agency for Toxic Substances and Disease Registry, "ToxFAQs for Pyrethrins and Pyrethroids," <http://www.atsdr.cdc.gov/tfacts155.html>.
- ⁴ US Agency for Toxic Substances and Disease Registry, Draft Toxicological Profile for Pyrethrins and Pyrethroids, 2001, <http://www.atsdr.cdc.gov/toxprofiles/tp155.html>.
- ⁵ National Pesticide Information Center, "Piperonyl Butoxide," fact sheet, <http://ace.orst.edu/info/npic/factsheets/pbotech.pdf>.
- ⁶ Jones, Kimberly N., and Joseph C. English III, "Review of Common Therapeutic Options in the United States for the Treatment of Pediculosis Capitis," *Clinical Infectious Diseases*, 2003, Volume 36, 1355-1359.
- ⁷ US Agency for Toxic Substances and Disease Registry, "ToxFAQs for Malathion," 2001, <http://www.atsdr.cdc.gov/tfacts154.html>; Jones, Kimberly N., and Joseph C. English III, "Review of Common Therapeutic Options in the United States for the Treatment of Pediculosis Capitis," *Clinical Infectious Diseases*, 2003, Volume 36, 1355-1359.
- ⁸ US Agency for Toxic Substances and Disease Registry, Draft Toxicological Profile for Pyrethrins and Pyrethroids, 2001, <http://www.atsdr.cdc.gov/toxprofiles/tp155.html>.
- ⁹ National Pesticide Information Center, "Piperonyl Butoxide," fact sheet," <http://ace.orst.edu/info/npic/factsheets/pbotech.pdf>.
- ¹⁰ Extension Toxicology Network, Pesticide Information Profiles, Malathion, revised June 1996, <http://ace.ace.orst.edu/info/extoxnet/pips/malathio.htm>.