

# Purchasing for Pollution Prevention

## Lindane-Free Head Lice Prevention and Treatment

All chemical treatments used to kill head lice – called pediculicides – pose potential risks to human health and the environment. Lindane is a persistent chemical that can build up (bioaccumulate) in aquatic animals, and should be avoided because it poses especially serious health and environmental risks.<sup>1</sup>

### Do head lice treatments pose risks to human health?

- All pesticide treatments for head lice present *some* human health and environmental risks; however, not all pose the same level of risk.
- Researchers at the Harvard School of Public Health have concluded that “the greatest harm associated with head lice results from the well-intentioned but misguided use of caustic or toxic substances to eliminate the lice.”<sup>2</sup>

### Is lindane worse than other chemical lice treatments?

Lindane, found in prescription shampoos, soaps, and lotion for head and body lice, poses particularly serious risks to human health and the environment and should be avoided.

- Overuse of lindane can seriously affect the nervous system, causing seizures or convulsions.<sup>3</sup>
- FDA cautions that lindane products should only be used in cases where individuals are resistant to or cannot tolerate other treatments, and that patients weighing under 110 pounds may be at particular risk for neurological side effects such as seizure.<sup>4</sup>
- Lindane is a persistent chemical that can build up (bioaccumulate) in aquatic animals.<sup>5</sup>

### How can facilities reduce or eliminate the use of lindane and other pesticides for lice?

- **Prevention.** By implementing a strong prevention program, facilities may be able to use pesticide treatments only as a last resort.
- **Screening.** Screening for lice on admission can minimize lice infestations and eliminate prophylactic treatments for lice.
- **Non-chemical treatment.** Manual lice removal (combing and hair cuts) is the least toxic treatment method.

- **Alternative chemical treatments.** Safer, non-lindane treatments are as effective or more effective.

### Prevention

- **Screening.** In homeless shelters, correctional facilities, and hospitals/clinics, screening on intake can prevent unneeded use of pediculicides. Chemical treatments do not prevent head lice infestations.
- **Separation.** Separate infested individuals to prevent infection of others.
- **No-share policy.** Prevent sharing of items such as brushes, hats, clothing, towels, and bedding.
- **Washing.** Wash all potentially exposed linens and clothing in hot water (140° F or higher) and dry at high heat (155° F or higher).<sup>6</sup>
- **Educating.** Educate clients, inmates, and patients about preventing head lice
- **Vacuuming.** Vacuum rugs, furniture, and other surfaces in infested individuals’ living space daily until infestation is eliminated.<sup>7</sup>
- **Do not spray furniture and surfaces.** Lice cannot live long in carpets or furniture, as they must remain in contact with a human host to survive. Vacuuming and general cleaning are sufficient.

### Screening and Correct Diagnosis

- Ascertain whether the patient is infested with active head lice by using a lice comb. Raise the teeth of the comb toward the end of the hair, and comb all the way from the scalp to the end of the hair. After each combing, examine the teeth of the comb for live lice. Use a magnifying glass to aid in differentiating between lice, eggs, and debris such as dandruff. Diagnosis by combing has been shown to be more accurate than diagnosis through visual inspection of the hair only.<sup>8</sup>

- Magnification and use of identification photos (called a Critter Card), available through the National Pediculosis Association (<http://www.headlice.org/downloads/orderform.pdf>) and other organizations, can help differentiate viable nits from dead ones, which do not need treatment.
- When combing for head lice screening or treatment, be sure to use a “lice comb” listed by the FDA as an approved 510(k) medical device. Standard combs and brushes are not suitable for lice combing. Order these and other supplies in advance so they are readily accessible to all facilities.
- Misdiagnosis of lice infestation is very common. Nits are tiny yellowish-white oval eggs with a regular smooth surface tightly attached to the hair shaft. Live nits almost always appear on the hair shaft close to the scalp. They should not be confused with dandruff particles, which can adhere to or surround the hair shaft but are generally flat, with irregular edges, and can be readily dislodged.<sup>9</sup>

### **Non-Chemical Treatment: Manual Removal**

There is growing evidence that head lice are resistant to many pediculicides, particularly to those with lindane and permethrin/pyrethrin. Manual removal may slow the increase in resistance of lice to chemical treatments, and it can be repeated without fear of excessive exposure to pesticides.

To manually remove lice and nits:

- First comb or brush hair to remove tangles, then divide the hair into sections.
- Work under good light.
- A magnifying glass, tweezers, and safety scissors may help to locate and remove all viable nits.
- Using a lice comb, move carefully through each section of hair, checking for and removing lice and nits. Wipe nits and lice onto a tissue and place it in soapy water to be flushed following combing.
- Following use, soak plastic combs in hot water (130° F) with ammonia; metal combs can be boiled.
- Repeat this treatment daily until no more nits or lice are found.

More studies are needed to fully assess the effectiveness of combing alone. Because lice are less mobile

when the hair is wet, combing wet hair may be more effective. Only one study has compared the effectiveness of wet combing with a chemical treatment (malathion), and this study showed that malathion plus combing was more effective than combing alone.<sup>10</sup>

### **Alternative Chemical Treatments**

Where facilities do not have sufficient staff to carry out repeated combing, or on occasions when manual methods do not successfully eliminate head lice, chemical treatments may be used to control head lice.

- Choosing the least toxic pesticide options available — in this case, pyrethrin- and permethrin-based lotions, soaps, or shampoos — and combining them with non-toxic control methods (combing, hair removal, vacuuming, laundering) will offer the least risk and highest degree of success.
- Eliminate the use of high-risk pediculicides containing lindane (available by prescription only).
- Order less toxic treatments in advance to help prevent staff from using lindane.
- When lice treatment with pesticides appears to have failed, it is important to consider all possible explanations before applying additional doses of shampoo or lotion, which may overexpose infested individuals. For example:
  1. Lice may not be the problem (misdiagnosis).
  2. Lice and nits may be present but dead.
  3. Treatment instructions may not have been followed exactly.
  4. Reinfestation may have occurred from furnishings, bedding, or other people.

### **What non-lindane chemicals are available for treatment?**

1. **Pyrethrins and permethrins**, which are more effective than lindane.<sup>11</sup> Institutional purchasers and individual facilities can order lice treatments with these active ingredients so that they are readily available when needed.
2. **Malathion**, which is not recommended for health and environmental reasons, but may be used as a second-line treatment when lice appear resistant to pyrethrins and permethrin.

### What's wrong with malathion?

- Malathion, available in one lice product, Ovide, is not recommended as a first-line treatment.
- Malathion is toxic to bees and fish.<sup>12</sup>
- The formulation used today is also highly flammable, posing an additional risk.<sup>13</sup>

### What are pyrethrins and permethrin?

Several over-the-counter head lice shampoos, soaps, and lotions have active ingredients containing *pyrethrins*, which are substances derived from the pyrethrum extract of chrysanthemum flowers. Others contain *permethrin*, a “synthetic pyrethroid” that mimics the effects of pyrethrins but breaks down much less readily. Most pyrethrin products also contain piperonyl butoxide (PBO), a synergist that increases the effectiveness of pesticides, making them more toxic to people as well.<sup>14</sup> Treatments for head lice generally contain pyrethrins at .33% or permethrin at 1%.

### Are pyrethrins and permethrin toxic?

All pesticides pose risks to human health and the environment. However, pyrethrins, permethrin, and piperonyl butoxide pose somewhat lesser health and environmental risks than lindane or malathion. Studies of oral exposure found permethrin to be 26 times less toxic than lindane and 3 times less toxic than natural

pyrethrins.<sup>15</sup> One study found that human skin is 20 times less permeable to permethrin than to lindane.<sup>16</sup> Nevertheless, these lindane-free alternatives should be used sparingly and with strict attention to product-dosing instructions. (See INFORM’s fact sheet “Lindane Alternatives: Human Health and Environmental Risks” for more information.)

### How effective are pyrethrin and permethrin treatments compared to other chemicals?

The results of studies of the comparative efficacy of different treatments vary based on the resistance patterns in the geographical region where the study was conducted, treatment compliance, and study methodology. The Cochrane Database of Systematic Reviews has found that “permethrin, synergised pyrethrin and malathion were effective in the treatment of head lice.”

#### EFFICACY RATES OF SELECTED STUDIES REVIEWED IN 1995

Pediculocide	Efficacy Rate
Permethrin 1% crème rinse	96%-100%
Pyrethrin 0.3% lotion	94%
Malathion 0.5% lotion	98%
Lindane 1% shampoo	43%-93%

### Are the alternatives more or less expensive than lindane?

Prices vary based on quantity and geographic location. This table provides average prices found in a 2002 Internet search. Lindane is more expensive than permethrin or pyrethrin treatment per dose.

#### COMPARATIVE COSTS OF CHEMICAL TREATMENTS FOR HEAD LICE

Treatment	Brand Names (not exhaustive)	Product Cost	Cost per Dose
Nit combs	LiceMeister	\$9.95	NA
1% permethrin	Nix	\$10.88	\$5.44
0.33% pyrethrins/4% piperonyl butoxide	RID, A-200, Bio-Sentry, End-Lice, Innogel Plus, Licetrol	\$14.84	\$7.42
1% lindane	Generic (formerly Kwell)	\$12.04	\$12.04
.5% malathion	Ovide	\$37.00	NA

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## Notes

- <sup>1</sup> US Agency for Toxic Substances and Disease Registry, "Toxicological Profile for Alpha-, Beta-, Gamma-, and Delta-Hexachlorocyclohexane," 1999, <http://www.atsdr.cdc.gov/toxprofiles/tp43.html>.
- <sup>2</sup> Harvard School of Public Health, Head Lice Information statement from Richard Pollack, PhD, Laboratory of Public Health Entomology, <http://www.hsph.harvard.edu/headlice.html>.
- <sup>3</sup> US Agency for Toxic Substances and Disease Registry, "Toxicological Profile for Alpha-, Beta-, Gamma-, and Delta-Hexachlorocyclohexane," 1999, <http://www.atsdr.cdc.gov/toxprofiles/tp43.html>.
- <sup>4</sup> US Food and Drug Administration, "Lindane Shampoo and Lindane Lotion: Questions and Answers," 2003, <http://www.fda.gov/cder/drug/infopage/lindane/lindaneQA.htm>; US FDA, "FDA Public Health Advisory: Safety of Topical Lindane Products for the Treatment of Scabies and Lice," <http://www.fda.gov/cder/drug/infopage/lindane/lindanePHA.htm>.
- <sup>5</sup> US Agency for Toxic Substances and Disease Registry, "Toxicological Profile for Alpha-, Beta-, Gamma-, and Delta-Hexachlorocyclohexane," 1999, <http://www.atsdr.cdc.gov/toxprofiles/tp43.html>.
- <sup>6</sup> Speare, Rick, *et al.*, "Head Lice On Pillows, and Strategies to Make a Small Risk Even Less," *International Journal of Dermatology*, 2003, Volume 42, 626–629.
- <sup>7</sup> US Centers for Disease Control, "Treating Head Lice," fact sheet, [http://www.cdc.gov/ncidod/dpd/parasites/headlice/factsht\\_head\\_lice\\_treating.htm](http://www.cdc.gov/ncidod/dpd/parasites/headlice/factsht_head_lice_treating.htm).
- <sup>8</sup> Mumcuoglu, Kosta, *et al.*, "Louse Comb Versus Direct Visual Examination for the Diagnosis of Head Louse Infestations," *Pediatric Dermatology*, 2001, Volume 18, Number 1, 9-12.
- <sup>9</sup> Pollack R.J., Kiszewski A., Spielman A., "Overdiagnosis and consequent mismanagement of head louse infestations in North America," *Pediatric Infectious Disease Journal*, 2000, Volume 19, 689-693.
- <sup>10</sup> Roberts, R.J., *et al.*, "Comparison of Wet Combing with Malathion for Treatment of Head Lice in the UK: A Pragmatic Randomised Controlled Trial," *The Lancet*, 2000, Volume 356, 540-544.
- <sup>11</sup> 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; Vander Stichele, Robert H., *et al.*, "Systematic Review of Clinical Efficacy of Topical Treatments for Head Lice," *British Medical Journal*, 1995, Volume 311, 604-608, <http://bmj.com/search.dtl>.
- <sup>12</sup> US EPA, "Overview of Malathion Risk Assessment," 2000, <http://www.epa.gov/pesticides/op/malathion/overview.htm>; Brenner, L., "Malathion," *Journal of Pesticide Reform*, 1992, Volume 12, Number 4, 19-27, <http://www.pesticide.org/malathion.pdf>.
- <sup>13</sup> U.S. Centers for Disease Control, Division of Parasitic Diseases, "Treating Headlice With Malathion," fact sheet, 1999, [http://www.cdc.gov/ncidod/dpd/parasites/lice/factsht\\_malathion.htm](http://www.cdc.gov/ncidod/dpd/parasites/lice/factsht_malathion.htm).
- <sup>14</sup> US Agency for Toxic Substances and Disease Registry, *Draft Toxicological Profile for Pyrethrins and Pyrethroids*, 2001, <http://www.atsdr.cdc.gov/toxprofiles/tp155.html>.
- <sup>15</sup> 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.
- <sup>16</sup> Franz, T.J., *et al.*, "Comparative Percutaneous Absorption of Lindane and Permethrin," *Archives of Dermatology*, 1996, Volume 132, Number 8, 901-905.
- <sup>17</sup> Dodd, C.S., "Interventions for treating headlice," *Cochrane Database of Systematic Reviews*, 2001, Volume 3, CD001165.
- <sup>18</sup> Vander Stichele, Robert H., *et al.*, "Systematic Review of Clinical Efficacy of Topical Treatments for Head Lice," *British Medical Journal*, 1995, Volume 311, 604-608, <http://bmj.com/search.dtl>.