

HEAD LICE

Integrated Pest Management in and around the Home

Many families with young children have at least one encounter with the head louse, *Pediculus humanus capitis*. Head lice can infest people of all ages, but children are prone to infestations because of their habit of playing in close contact, sharing hats, headphones, combs and brushes, sleeping bags, stuffed animals, and clothing. In fact, the problem of head lice can be so rampant among preschool and school-aged children that often schools must work in conjunction with many families to control an infestation. An individual family may be able to control head lice at home, but the child can be reinfested when he/she comes in contact with an untreated, infested child.

WHAT TO LOOK FOR

The most common symptom of infestation is intense itching on the back of

the head or neck. The itching occurs when the lice bite and suck blood from the scalp. Immediately examine children who repeatedly scratch their heads. Because lice can be hard to spot, examine individual hair shafts, especially at the nape of the neck and behind the ears. With a good light source, look for tiny, white eggs (nits) glued to the hair near the scalp (Fig. 1) and for small, quickly crawling, flat insects. Hatched and unhatched eggs can be differentiated with the aid of a magnifying lens: developing eggs are somewhat dark in color but after hatching the egg cases are white. Nits hatch about 7 to 11 days after being laid, so eggs further than ¼ inch away from the scalp have probably already hatched. An empty egg case can be distinguished from a flake of dandruff because it sticks to the hair, while other particles can be flicked or washed off.

LIFE CYCLE

Head lice spend their entire life on the hairy part of the head. The six-legged, wingless adult head louse is about the size of a sesame seed and ranges in color from tan to gray. Each of its six legs ends in a claw that is used to grasp the hair shaft. While head lice can crawl relatively quickly, they cannot hop, fly, or jump. Therefore, direct contact with an infested object or person is required to become infested. Because head lice live and breed completely in human hair, they only survive for about 1 to 2 days if they drop off a person. *They cannot live on family pets.*

The eggs of the louse are laid on the head hairs, usually at the junction of

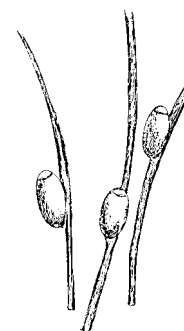


Figure 1. Louse eggs (nits) attached to hair shafts.

the scalp and hair shaft. The egg is coated with a gluelike substance that cements it to the hair. Most eggs are laid at night. Each female produces about three to five eggs in a 24-hour period and lives for about 7 to 10 days. Most of the eggs hatch within 7 to 11 days. To survive, a newly hatched louse must have a blood meal within minutes of birth. Developing lice, or nymphs, take about 7 to 10 days to mature; after an additional day, adult females start laying eggs (Fig. 2). Consequently, the total life span of a head louse from egg through adult averages about 25 days. Because people have a constant body temperature, female lice reproduce continuously throughout the year.

Head lice found in the United States prefer hair that is round in cross section. Hair that is ovoid in cross section, such as the extremely curly hair of African Americans, is not as attractive to lice that are adapted to round hair shafts. While head lice infestations are common in Africa, as in all continents,

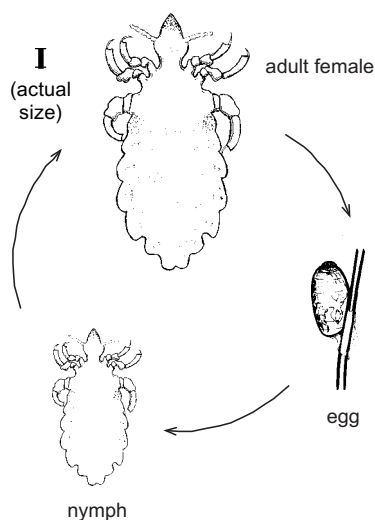


Figure 2. Life cycle of head louse.

African head lice have claws especially adapted for grasping oval hair shafts. The African variety of head lice is not common in North America and consequently African Americans are much less susceptible to infestations, but they can get head lice.

MANAGEMENT

Head lice are not known to transmit any infectious diseases from person to person. They are more of a nuisance than a health risk problem. It is very important that the methods used to control a head louse infestation not cause more of a problem than the head lice themselves. One major problem for a child with head lice is that they will not be allowed to attend school as long as nits can be found in their hair.

Nits are most effectively removed by combing the hair with a specially designed nit comb. Consider shampoo treatments only when active lice or viable eggs are observed. Although lice and their eggs may be seen without magnification, the viability of eggs cannot be judged without proper magnification and some knowledge of what hatched and unhatched eggs look like. For color photos of nits in various stages of development, see the Web site listed under "Online Resources."

There are four critical steps to controlling an infestation of head lice:

- the use of an effective head louse treatment;
- nit removal from the head (combing);
- removal of lice and nits from the household environment by vacuuming, washing, or freezing objects suspected of being infested; and
- daily head checks and nit removal until infestation is gone, followed by weekly head checks to detect reinfestation.

Head Lice Insecticidal Shampoos

Head lice shampoos contain insecticides and if they are not used properly can cause problems in and of themselves. In addition, resistance to the insecticides in the shampoos among populations of head lice is becoming an increasing problem. Most of the

over-the-counter products contain either pyrethrin or permethrin (NIX and Rid). In the past a popular product for the control of head lice was a product called Kwell, which contains the insecticide lindane. Lindane has been associated with a variety of adverse reactions suffered both by people being treated and by people applying the treatment. It is also a troublesome pollutant of wastewater and requires special treatment to be removed. While lindane is still available by prescription, pyrethrin and permethrin are safer, more effective, and less polluting than lindane.

When using a head louse shampoo, minimize body exposure by confining the insecticide to the head hair. Do not use it in the bath or shower, but wash the infested person's hair in a basin or sink so insecticide residues do not reach other parts of the body. The person doing the treatment should wear rubber gloves. Never apply an insecticide to anyone who has open cuts, scratches, or inflammations, and never use these materials on infants without consulting a doctor. In all cases, follow label directions completely and carefully.

While pyrethrin and permethrin are fairly effective, they do not kill all the eggs. In addition, they may not kill all the nymphs and adults, especially if the population is developing resistance to the insecticide. Lice should die within 10 to 30 minutes after treatment with pyrethrin or permethrin. If you find live lice after 30 minutes, suspect that resistance is occurring and discontinue use of that product. If you need a follow-up treatment at the recommended interval on the product label, use a pyrethrin if you used permethrin the first time, or vice versa, but do not resort to dangerous practices such as applying other insecticides, pet flea and tick shampoo, or materials such as kerosene!

You will still need to supplement shampoo treatment with combing the hair (as described below) and some cleaning of the house and personal effects likely to be infested. If you do

not remove nits with hair combing, the infestation will reoccur and the additional use of the treatment products will increase the treated person's exposure to these insecticides, as well as help select for resistance in the head louse population.

If you want to avoid insecticides entirely, you could try using soap shampoos that contain coconut or olive oils. Most soaps kill all stages of the louse except the egg. Four shampoos, each about 3 days apart, should kill most of the lice as each successive shampoo kills newly hatched nymphs. Always combine shampooing with daily combing and a cleaning of the environment.

Enzymatic treatments, including shampoos that claim to dissolve eggs, the cement that attaches eggs to the hair, or the exoskeleton of the adults, are also available to use against head lice. Although these materials are very appealing because of their relative nontoxicity, in university-conducted research trials none of them has yet proven to work as advertised.

While shampoos with coconut oil may help in controlling infestations of head lice, they are not effective as a repellent against lice to prevent infestation or reinfestation.

Hair Combing

Combing the hair to remove nits and lice that survived the shampoo treatment is the key to successfully controlling this pest. This process is time consuming but critical for success. If you do not completely remove all nits, reinfestation will most likely occur. This process should be repeated daily as long as nits and lice are still found on the head. Many people use nit combs to remove nits from the hair shaft. The most effective nit comb is a metal one specially designed for removing head lice and their eggs; plastic combs, even the ones that come with the lice shampoos, are not as effective. Metal lice combs can be found at drug stores or ordered from the National Pediculosis Association, Inc., listed in "References," which has a specially designed nit comb called the

LiceMeister™. The infested hair can also be cut out with small safety scissors.

The person to be treated should be seated near a good light source. The materials you will need for hair combing are

- a box of tissues and plastic bag;
- a good nit comb or a pair of safety scissors;
- a lamp that allows you to direct it to the area you are working on;
- hair clips to pin up the sections of hair that have been combed; and



Figure 3. Combing for head lice.

- something to entertain the person being treated—especially if it is a child.

Following the use of a head louse shampoo, use regular shampoo and conditioner to wash the hair (the hotter the water the better because lice are very vulnerable to high temperatures, but be careful not to hurt young children whose scalps are more sensitive to hot water than scalps of older people). Leave the conditioner in and towel dry the hair. Then comb the hair using a regular comb to remove snarls and the accumulation of any suds.

Starting at the crown of the head, separate out a section of hair that is about 1 inch by $\frac{1}{2}$ inch; hold it out from the head (Fig. 3). Insert the louse comb at the base of the hair section as close as possible to the scalp, and pull the comb slowly through the hair. Be sure to slant the comb so that the curved side of the teeth is towards the head. If you aren't using a comb, go through each small section of hair and use your fingernails to pull the eggs off the hair, or cut the individual hairs off. Use the tissues to clean any lice or debris from the comb following each combing or to collect nits and hair that are removed, and put the tissue in the plastic bag. Continue to comb the section of hair until you feel sure it is free of nits or lice, then pin it out of the way with a hair clip and start on the next section of hair. If the hair dries during the combing process, wet it again with water to reduce pulling and hair loss. When all the hair has been combed, rinse it thoroughly with water and then dry. After the hair is completely dry, check the entire head for stray nits and remove them individually.

To clean up, soak the comb in hot soapy ammonia water for 15 minutes or boil it for 15 minutes (only the metal ones). An old toothbrush is useful in removing the debris that is lodged in the teeth of the comb, as is dental floss. The plastic bag should be sealed and disposed of.

It is not necessary to cut a person's hair if they become infested with lice. How-

ever, the shorter the hair, the easier it is to comb for lice. If successive treatments for lice have been made and the infestation persists, or if you want to control the infestation quickly, this is an option to consider.

Cleaning Your Home

It is important to wash the clothing and bedding of the infested person at the time he or she is initially treated. Head lice will be killed if infested articles are washed in hot water (at least 140°F) and dried in a hot dryer. If an article can't be washed, have it dry cleaned. Another alternative that works well for headgear such as earphones and bike helmets is to place them in a plastic bag and put them in a freezer. If the freezer is 5°F or lower, all lice and eggs should be dead within 10 hours. Also clean other personal items such as stuffed animals, car seats—any object that might have come in contact with the infested person's head. Vacuuming carpets and upholstery will effectively remove hair containing nits in these areas. While it is important to clean objects that come in contact with the head, in general lice stay on the head. Therefore it is not necessary to go into a frenzy of house cleaning and it is especially not necessary to use any insecticide to spray rooms or objects. Time and effort are much better spent combing nits and lice from the hair.

Contacting Friends and the School

It is important to contact anyone your child has had close contact with in the recent past to let them know of a head louse infestation. The reason for this is simple: the infestation came from somewhere, and if the source or other recently infested people are not treated, your child can become reinfested when contact is renewed. That means you will need to go through all of the above treatment procedures again.

Nits are laid at the junction of the scalp and hair shaft, and they hatch in 7 to 11 days. The average growth rate of human hair in children is 0.4 mm per day, so by the time the nit has hatched it has moved about 2 to 3 mm away from the scalp. Therefore, nits further than $\frac{1}{4}$

inch from the scalp have probably hatched and are no longer viable. For this reason, the "no nit" policy in place at many schools does not have a biological basis, but most schools do not have personnel with expertise in distinguishing the viability of nits.

If head louse infestations are occurring at your child's school, check your child's head nightly using a metal lice comb and a good light source. The earlier an infestation is discovered, the easier it will be to treat. Avoid unnecessary treatments with head louse insecticides; use them only when lice or louse eggs have been found on a child's head to minimize the child's exposure to these materials. Also, the use of pesticide products can be harsh on a child's hair and very drying to the scalp, which in turn can cause an in-

crease in dried scalp flakes and dandruff that might be mistaken for nits. Remember, nits are glued to the hair shaft and are not easily removed; they are oval-shaped and glued at an angle to the side of the hair. If in doubt, use a good magnifying lens to verify a suspected nit or louse (and compare what you find to the photos on the Web site listed under "Online Resources") because pesticide treatment is not appropriate for hair debris.

REFERENCES AND RESOURCES

Ebeling, W. 1975. *Urban Entomology*. Oakland: Univ. Calif. Agric. Sci. pp. 455-459.

Hitchcock, J. C., R. M. Davis, and V. Kramer. March 1996. Head lice (*Pediculus humanus capitis*): A heady, nitpicky,

and lousy problem. *Calif. Morbidity*. Berkeley: Div. Communicable Disease Control.

National Pediculosis Association, Inc., P.O. Box 610189, Newton, MA 02161. Phone: 617-449-NITS. Online: <http://www.headlice.org>
To order a nit comb call 1-888-542-3634.

Wilson, B. 1995. Ectoparasites. In Mandell G. L., J. E. Bennett, and R. Dolin, eds. *Principles and Practice of Infectious Diseases*. New York: Churchill Livingstone, pp. 2558-2560.

Online Resources

Pollack, R. J. Head lice information. www.hsph.harvard.edu/headlice/photos.html

For more information contact the University of California Cooperative Extension or agricultural commissioner's office in your county. See your phone book for addresses and phone numbers.

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To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products that are not mentioned.

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WARNING ON THE USE OF CHEMICALS

Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in the original labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Confine chemicals to the property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked.

Do not place containers containing pesticide in the trash nor pour pesticides down sink or toilet. Either use the pesticide according to the label or take unwanted pesticides to a Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Household Hazardous Waste Collection site nearest you. Dispose of empty containers by following label directions. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

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