

# Head Lice Management

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## The Problem

There are 6–12 million cases of head lice in the United States each year and are found in children belonging to all socioeconomic levels. Increased recent head lice infestations are probably related to head lice resistance to over-the-counter products, like NIX®, RID®, A-200®, Clear® and store brands with similar active ingredients (pyrethrins, pyrethroids). Pyrethroid products have been used widely for more than 30 years and were initially very effective. In 1999, a Harvard researcher found significant resistance in U.S. head lice. Other research has confirmed resistance in the United States and other countries where

pyrethroid products have been used for many years.

The bottom line: these products are not going to work very well and are unlikely to eliminate all head lice, even when used as directed on the label. Despite their lack of effectiveness, pyrethroid products are still being manufactured, sold and used by parents who don't realize these will not solve their child's lice problem.

## Head Lice Biology

Head lice are small, tan to brown-colored insects (Figure 1). Lice are



Photo by Barb Ogg

**Figure 1. Adult head lice are 1/10–1/8" long and are tan to grayish-white (highly magnified view).**

found close to the scalp and must feed frequently on blood. Eggs laid by adult female lice are glued to strands of hair about 1/4-inch from the scalp. Eggs hatch in 7–10 days. After hatching, the eggshell (nit) remains firmly attached to the hairshaft. This glue is so strong, nits cannot be easily removed. Researchers have found the glue is chemically similar to components in human hair, which makes it difficult to develop a safe

solvent to aid in nit removal.

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### "No-Nit" Policies Discouraged in Schools

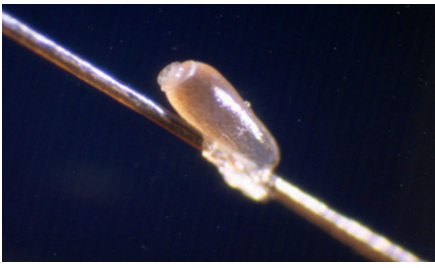
Two important associations — The American Academy of Pediatrics and the National Association of School Nurses — advocate "no-nit" policies instituted by schools should be discontinued. These groups maintain there is only a small risk to others when children have nits in their hair because in-school transmission is rare, although it may be more common among younger-age children where there is more head-to-head contact. The following facts support their positions:

- Female lice cement eggs to strands of hair about 1/4-inch from the scalp, which happens to be the best temperature for hatching. Because an egg is firmly attached to the hair shaft, it cannot be transferred to other people. The chance of getting lice from children with eggs is remote, even if eggs are viable.
- Newly hatched nymphs are likely to stay on the head; adult lice are more contagious and likely to transfer through head-to-head contact.
- Misdiagnosis of nits is common when conducted

by nonmedical personnel. Even experts use a good microscope to identify lice eggs. Viable eggs are brown. Once hatched, the spent eggshell, the nit, is white. Nits are easily confused with tiny white globs of hair product like gel, dandruff and hair casts.

- Nits found more than 1/2-inch from the scalp have probably either hatched or died.
- Head lice are a nuisance, but do not transmit diseases. The burden of unnecessary absenteeism to students, their families and communities far outweighs any risks associated with head lice.
- Head lice screening programs have not been shown to significantly reduce head lice in schools and have not been shown to be cost effective. By the time a child with an active lice infestation has been identified, he or she may have been infested for a month or more and the additional time spent at school poses little additional risk of transmission to others. Schools should wait until the end of the day to notify parents of their child's head lice infestation.

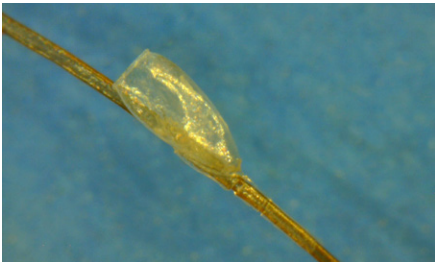
**Know how. Know now.**



**Figure 2. Eggs are glued to hair strands about 1/2-inch from the scalp (highly magnified view).**



**Figure 4. Look for signs of head lice by examining all areas of the scalp. Look for live lice and/or eggs.**



**Figure 3. Nits stay attached to the hair shaft even after hatching (highly magnified view).**

A viable egg (which will hatch) is brown (Figure 2) because there is a developing louse inside the egg. Once the egg hatches, the eggshell (still attached to the hairshaft) will be white, but at this time, there is no living louse inside the egg (Figure 3).

Head lice cannot fly or hop like fleas, but they can crawl quickly through the hair at a rate of 9 inches per minute.

An adult female head louse lays an average of six to seven eggs per day and the average life span is about 32 days. Immature lice pass through three stages before becoming adults, which takes another eight to nine days. One pregnant adult female can produce enough offspring so a significant infestation can occur within a month. A child having a significant infestation has been infested for at least a month or more. People are most contagious when they have adult lice on their head. A newly-hatched nymph rarely leaves the head.

Head lice require warm, humid environment of the human scalp for survival. They feed frequently and quickly become dehydrated if they fall off their host. It is unlikely head lice will survive more than 24-hours after falling off their host.

Only a live louse defines an infestation. No treatments should be done unless live lice have been found.

## Inspection

If a child is scratching his/her head or if there has been a report of head lice in a classroom or play group, look for signs of head lice (Figure 4).

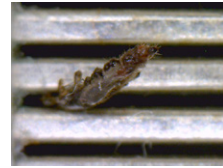
- **Feces** — Look for lice feces on the scalp, which are tiny black specks. If you see them, examine the rest of the head for live lice.
- **Eggs** — Female lice typically attach eggs 1/4-inch from the scalp. There can be from a few to several hundred nits in a child's hair. Use a magnifying glass and a good light to help distinguish between nits and dandruff. Eggs are oval-shaped and glued securely to only one side of the hair shaft. The nit stays attached to the hair shaft even after hatching or if it dies. Eggs are often found above the ears or at the nape of the neck, but can be anywhere.
- **Live lice** — Part the hair with a rat-tailed comb. Check all areas of your child's scalp, especially at the nape of the neck and around the ears; these are favorite spots for lice. But, also check the crown and other areas. Studies have shown even trained professionals often miss live lice because immature lice are so small and hard to see. It is important to remove even the tiniest lice.

## Use an Electronic Comb to Detect/Remove Live Lice

There is an electronic comb on the market, called the Robi Comb™ (manufactured by LiceGuard™) which will detect live head lice. It runs on one AA battery. When turned on, it emits a high pitched hum. If lice are caught between the tines of the comb,



**Figure 5. An electronic comb can be used for detecting and removing live lice.**



**Figure 6. An adult louse caught in an electronic comb.**

the humming stops (Figures 5 and 6). We have used this comb and have found it to capture even the tiniest lice. When the humming stops, check the electronic comb for lice and check the hair for live lice. This comb will not detect eggs.

The manufacturer claims lice trapped in the teeth are electrocuted, but we have not always found this to be true. The electronic comb should only be used on dry hair. Avoid direct contact with ears, eyes and mouth. Be sure to read and follow directions for safe use of this comb.

Use an electronic comb every two days. Remove all lice detected by the comb and within two weeks all hatching should be complete. Without adult lice, egg laying cannot take place. This comb can be used as a monitoring tool on dry hair following insecticidal treatments to make sure live lice have been eliminated.

The cost of this comb is about \$30; it can be found at many pharmacies or over the Internet.

## Combing with a Nit Comb

This is the oldest method of lice control; it is inexpensive and completely safe (Figure 7). When done properly, it takes time and requires patience on the part of parent and child. A 2005 study published in the British Medical Journal, showed wet combing; using a fine-toothed nit comb after lubricating hair with conditioner, was more effective than pyrethroid or malathion treatments.

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## Insecticidal Treatments

To reduce the number of live lice on your child's head, the following insecticidal treatments are available for treating head lice.

### Over-the-Counter Products:

- Pyrethrins (permethrin): (Products: Nix, Rid, A-200, Pronto and others) When used correctly, these over-the-counter products are pretty safe; only a few children will exhibit minor problems such as itching, a minor rash or an allergic reaction. But, recent studies have shown only 40% of lice will be killed, even when two treatments are used. Some manufacturers provide combs with their product and direct parents to comb to remove nits/lice not killed by the treatment.
- Sodium Chloride: (Product: Lice-Freee®) Researchers who have looked at this product did not find it to be effective. Because this product is considered to be a non-pesticidal product, the manufacturer does not have to provide data to the FDA to show it is effective.

### Prescription Medications (In order of when they were approved by FDA):

- Malathion (0.5%): (Product: Ovide®). Malathion was used in European countries for many years before it became available in the United States in 1999. It should not be used on children under six years of age. Malathion is an organophosphate insecticide. This prescription product has an unpleasant odor and is flammable. But, the biggest drawback to using this product is the way it is to be used. Label directions say to apply the lotion to hair for 8–10 hours before rinsing it out. Some studies have shown there is efficacy for reduced treatment time, but parents are always taking a chance it won't be 100% effective when they don't follow treatment directions. So far, head lice have not been shown to be resistant to malathion in the United States.
- Benzyl alcohol (5%). Product Ulesfia®) was approved by FDA in

2009. It kills lice, but not eggs, so a second treatment may be needed seven days after first treatment to kill hatched nymphs. Ulesfia lotion is to be applied to dry hair, saturating the hair and scalp. Manufacturer guidelines for the amount of Ulesfia needed is based on the child's hair length. After 10 minutes, the lotion should be rinsed off with water. The hair may be shampooed immediately after the lotion has been rinsed off. Directions recommend use of a nit comb to remove nits. A clinical study showed 76.2% of subjects after treated with the benzyl alcohol lotion were lice-free two weeks after last treatment.

- Spinosad (0.9%). Product: Natroba®) was approved by FDA for head lice in 2011 for the treatment of children four years of age and older. The active ingredient, spinosad, is a chemical derived from bacteria found in soil collected inside an abandoned rum distillery on the Virgin Island. It is a topical

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## How to Use a Lice Comb to Remove Lice and Nits

**1. Getting ready** — Collect the following:

- Fine-toothed comb designed for nit removal. A metal comb is less flexible than plastic ones and may be more effective at removing nits.
- Bobby pins or hair clips (for long hair).
- A large towel to place around the child's shoulders during combing.
- Box of facial tissue.
- Wide bowl of water with a squirt of dishwashing liquid.
- Oil or conditioner to keep the hair lubricated.

Note: Combing should be done in a well-lighted area. Seat the child so her/his head is just below eye level. It might be a good idea to have something fun to entertain the child which does not require much physical activity. Consider reading, modeling clay, coloring or games/videos/dvd.

### 2. Preparing the hair

Cover the hair with any type of salad oil or conditioner to keep the hair



Photo by Barb Ogg

**Figure 7. When combing, hold the mass of hair with one hand. With the other hand, hold the lice comb in a slanting position with the teeth toward the head.**

wet so combing is easier. Remove tangles with a regular hair comb.

**3. Combing** — Separate a mass of hair about the width of the metal lice comb. It is important to separate the hair into small sections so you can more easily see lice and nits.

Hold the mass of hair with one hand. Insert the lice comb as close to the scalp as possible and gently pull the comb slowly through the hair several times. Check the hair careful-

ly. Comb one section at a time and check each section again. Pin the hair in a curl flat against the head.

Dip the comb in the soapy water and use the tissue to remove lice and debris. Make sure the comb is clean before you use it on the hair again. Continue combing.

Because lice can move around the head, it may be necessary to repeat combing.

**4. Cleaning Up** — Flush the contents of the bowl down the toilet. Shampoo the hair at least twice to remove the oil. When hair is dry, check for stray nits and remove those hairs individually with a pair of small, pointed scissors.

It is VERY important to remove all of the eggs (nits). Soak the lice comb for 15 minutes in hot ammonia water (1 tsp ammonia to 2 cups hot water). Or, boil the metal comb in plain water for 15 minutes. Use an old toothbrush to clean the comb. The comb can now be used on another family member.

suspension treatment to be applied to the head for 10 minutes and washed out. A second treatment will be necessary if live lice are observed seven days after the first treatment. In two clinical trials, 86% of children were lice free after one or two Natroba treatments.

- Ivermectin (0.5%): (Product: Sklice®) Sklice was approved for use in 2012 by FDA against head lice. It is a one-time use topical lotion. It is expensive and insurance companies may not cover the cost. Results of a study published in *New England Journal of Medicine*: on day two after a single application, 94.9% of subjects were lice free, but after 15 days, only 74.8% of them were lice free. This suggests eggs were not controlled by the one-time treatment.

#### **Not Recommended:**

- Lindane: Lindane is an organochlorine insecticide. It has been used in the United States for lice for 60 years or more. Head lice have been shown to be resistant to lindane so its effectiveness is questionable. The American Academy of Pediatrics (AAP) no longer recommends it as a pediculocide. Although lindane shampoo 1% is approved by the FDA, overuse or misuse can cause neurotoxic reactions, so its use has been discouraged. Because of these adverse effects, we don't recommend lindane.

## **Alternative Treatments**

In an effort to find an easy, safe treatment, many parents seek alternative treatments, like mayonnaise, olive oil, vinegar, essential oils, enzymes and combinations. Anecdotal reports are abundant on the internet and sometimes even medical personnel are persuaded these inexpensive home remedies will be effective. But, studies have shown lice can survive in hair covered with olive oil, mayonnaise and even petroleum jelly — even when it is left on the hair overnight. These alternative treatments have no scientific basis for treatment.

Shampooing with ordinary shampoo won't kill lice. Lice can survive through two consecutive shampooings, even when the hair is not rinsed for an hour after the second

shampooing. Lice don't drown easily. Research has shown lice can survive when immersed in water for 14 hours at 86–98°F. There are no special shampoos which will prevent lice.

## **Aerosols and Sprays**

Parents who look at head lice products in the drugstore, often see aerosols being sold there. But these products are unnecessary because live head lice are unlikely to survive after 24-hours on environmental surfaces. Likelihood of killing lice with these products is so low it doesn't justify expense of these pesticides. It also doesn't make sense in hiring a pest control company in schools, childcare facilities or homes. Environmental treatments are not recommended. Use a vacuum cleaner instead.

## **Desiccation Device**

The LouseBuster® is a custom-made, hot-air blower, designed to maintain a controlled temperature (138°F) and airflow greater than a standard blow dryer. One study showed 94.8% mortality of eggs and lice after one 30-minute treatment of hot air. Head lice and eggs were collected from hair after treatment and evaluated for mortality. Researchers found dead lice on subjects' smocks and drop clothes, apparently blown out of hair. This research study was peer reviewed but conducted by researchers with a potential conflict of interest as they were the developers of this device. The LouseBuster costs \$2,000–\$2,500 and requires special training to operate.

## **About Re-infestations**

Sometimes parents have used head lice products and combed, only to find their child has another head lice infestation. Sometimes, their child did not become re-infested from other children; instead, the parents likely did not completely eliminate the lice with the initial treatment. Missing just a few tiny lice will be enough to restart the infestation.

To prevent re-infestation, continue to examine all family members, including parents, and treat only if live lice are found. It may be helpful to use an electronic comb periodically to check for live lice.

## **Laundering**

Because head lice do not survive long off the host, they are not likely to be found on bedding or clothing. But, you can kill lice by laundering washable items in hot, soapy water in a washing machine. They will also die if heated in a hot dryer for 30 minutes. If time is limited, it is more beneficial to spend time removing lice from the child's head, rather than laundering, vacuuming or other cleaning activities. Items such as stuffed animals and pillows which are not washable can be heated in a dryer.

## **Combs and Brushes**

Some studies have shown lice are not dislodged by the use of regular combs and brushes, but it is good to be cautious when lice are a problem. Instruct children not to share combs, brushes, hats or other articles of clothing at school, play or other activities.

## **Cutting Hair**

Children with long, hanging hair will probably get lice more often than children with short hair because lice have claws which help them grasp and quickly climb up hair from an infested child to another. For children with repeated infestations of head lice, a short, stylish hair style may make inspecting and combing easier. Pulling hair back into a pony tail may be helpful in reducing risk of transfer.

### **FOR MORE INFORMATION**

For more information about head lice treatments and policies, check out:

- UNL Extension in Lancaster County's Web site, "Head Lice Resource You Can Trust," at <http://lanaster.unl.edu/enviro/pest/Lice.htm> has an 8-minute video "Removing Head Lice Safely," an educational resource "Quick Guide for Removing Head Lice Safely" and other resources.
- American Academy of Pediatrics. 2010. <http://pediatrics.aappublications.org/content/126/2/392.full.pdf+html>
- Association of School Nurses. 2010. <http://www.nasn.org/Portals/0/positions/2011pspediculosis.pdf>
- Centers for Disease Control. <http://www.cdc.gov/parasites/lice/head/epi.html>

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