

## IPM for Head Lice in Schools

### Introduction

Today, the management of head lice continues to be a major task for parents, school personnel, and health care professionals worldwide. The growing resistance of lice to pediculicides (lice-killing insecticides), combined with a surprising willingness of many parents to tolerate head lice, is turning a manageable problem into a major nuisance.

Head lice are most often found on school children between the ages of three and ten, less often on older children or adults. The eggs, or nits, of head lice are glued tightly to hairs, most often around the back of the ears and at the nape of the neck. The adults are found in these and other areas of the head, including the eyelashes, and more rarely on other body hairs.

Since there is increased resistance to some of the most common insecticidal products, reliance on a chemical approach is often not effective and not recommended. Sound management of head lice involves prompt diagnosis and the use of non-chemical physical treatments (i.e., combing with a nit comb). Insecticidal treatments may be used as a last resort, but combing is still the key to successful treatment of head lice.

### Identification and Biology

The head louse, *Pediculus humanus capitis*, is dependent on human blood for survival and spends its entire life on the human head. If it does move onto other surfaces, it must return to the head within a few hours to survive. At room temperature, lice can survive only 24 hours without blood, and they cannot complete their life cycle on pets.

Head lice can move fairly rapidly but cannot jump or fly. The adult head louse is 1/16 inch to 1/8 inch long, and ranges from tan to grayish-white in color. Each of its six legs ends in a claw that is used to

grasp the hair shaft. The nits are laid near the junction of the scalp and the hair shaft. The eggs are oval-shaped and are attached to the hair with a very tough glue. Each female produces about 6 to 8 eggs in a 24-hour period, and these are laid mostly at night.



Head Louse

The eggs hatch within 7 to 11 days. Once hatched, developing lice take 8 or 9 days to become adults; after an additional day, the adult female can start laying eggs. Thus, about 16 days in all are required for an egg to give rise to a female capable of laying more eggs. Adults live for up to 30 days.

### Transmission of Head Lice

Most head lice are probably transmitted when an infested person comes into close contact with another. For example, when children sleep or sit together, enough time and opportunity is provided for a louse to walk from head to head. Lice and their eggs can also be transferred between people via infested brushes, combs, caps, hats, scarves, coats, bedding, towels, and upholstered furniture.

### Damage

Although the symptoms of head lice are irritating, medical personnel have generally considered head lice to be little more than a nuisance. While a louse bite itself is painless, the louse's saliva usually causes an allergic reaction that produces itching (although

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some people may not experience the itching for several weeks). If itching is severe, the lice probably have been present for some weeks. Scratching that breaks the skin creates entryways for germs and lice feces and can lead to swollen glands and secondary infections such as impetigo. Severely infected individuals may experience fever and feel tired and irritable.

## Detection and Monitoring

Frequent head scratching may be the first sign of lice. Adult lice may be present on the head or in the eyebrows and eyelashes, and with careful observation, the eggs can be seen. A magnifying glass will help in distinguishing between nits and dandruff. Eggs are oval-shaped and attached only to one side of the hair shaft. The eggs themselves stay glued to the hair even after they hatch and cannot be removed as easily as a piece of dandruff or other debris. Since eggs stay attached to the hair, it is also important to determine whether or not the egg has hatched. Nits start out as a yellowish to gray color and darken to a tan or coffee color before they hatch. Hatched eggs are white. Eggs that are shrunken or indented will not hatch.

Originally, scientists believed that eggs that were 1/4 inch or more away from the scalp would all be hatched or dead, and therefore, it wasn't necessary to examine eggs that might be farther down the hair shaft. Recent research shows that this is not always true, particularly in warmer climates and possibly on individuals who always wear some type of head covering.

## Management Options

Lice can be controlled without resorting to insecticidal shampoos, but this depends on thorough combing of the hair with a special lice comb. Since reinfestation from playmates is common (regardless of the treatment used), parents may wrongly assume that the first treatment wasn't strong enough and turn to something more toxic. To minimize reinfestation, schools are urged to adopt a "No Nit" policy (see below) and to educate teachers and students, but especially parents, in how to find, control, and prevent head lice.

### Education

Most people view lice with disgust. Panicked parents who would not normally expose their children to potentially hazardous materials will apply pesticides in haste, sometimes well beyond the recommended

frequency and dosages. Education can help to overcome these obstacles to non-toxic lice control.

It is crucial that teachers, children, and parents have some rudimentary information about head lice before an outbreak occurs. The school can send an information sheet home with children when school begins in the fall and after long vacations. The sheet can include some facts about lice and information on how to detect them (see Appendix H for a sample).

Encourage parents to look for head lice weekly as just another part of personal hygiene. Have teachers in the lower grades talk to students about head lice at the beginning of the school year. Young children generally are not hesitant to talk about head lice—for them, it's just another learning experience. Remind them repeatedly not to share combs, brushes, caps, hats, scarves, head pieces from costumes, etc.

When an outbreak occurs, the school can send home a packet that includes information on how to control lice and a note alerting parents that children will not be allowed back into school until their hair is free of nits—the "No Nit" policy (see below). See Appendix H for a sample information packet.

It is our experience that sometimes only a small group of families is responsible for the frequent reinfestation of an entire class. It is important to understand that there are some parents who do not regard head lice as a serious problem at all. Many cultures outside the United States accept head lice as a minor, constant inconvenience and do not assume that head lice can be eliminated when infestations occur. Families with this attitude may need to be convinced of the importance of cooperation.

### "No Nit" Policy

The National Pediculosis Association (P.O. Box 610189, Newton, MA 02161; 617/449-NITS), a nonprofit organization that provides education on safe ways to manage head lice, recommends that schools establish a "No Nit" policy, which means that children are denied re-admission to the classroom until their heads are free of lice eggs. This recommendation is based on the fact that most parents and teachers cannot easily tell the difference between an egg that is viable and one already hatched. By tolerating nits, children are allowed to return to school and unwittingly spread head lice to others.

When a "No Nit" policy is adopted, each principal should designate at least one member of the school staff to receive training from the school nurse or

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other public health official in the detection of lice and nits.

### **Store Garments Separately**

Transmission can be reduced through proper storage of hats and other garments that may carry stray female lice. Head lice are a particular problem among children in childcare programs, kindergarten, and the early grades of grammar school. Facilities should be equipped with separate lockers or “cubbies” for each child. Headgear, scarves, and other outer clothing that comes into contact with the hair should be stored separately, one cubbyhole for each child. It is crucial that the parent or teacher explain the importance of this behavior clearly. If separate lockers or cubbies are impossible, cloth bags that close at the top with a drawstring are another alternative. At the very least, children should be assigned a hook on the wall to use throughout the school year. There is evidence that assigned hooks can reduce the spread of lice through a classroom.

If, during head lice outbreaks, cubbies or lockers are unavailable, sturdy plastic bags can be used. Place identifying decals on individual bags so children know which is theirs. Bags containing clothing should be doubled over and wrapped with a twist tie. This process should be supervised to make sure the children are doing it properly. Torn bags should be replaced immediately.

### **Housekeeping**

The rugs and upholstered furniture in classrooms with lice outbreaks should be thoroughly vacuumed. If lost and found articles are stored in the classroom, they can be separated by placing them in individual plastic bags and then sealed.

### **Treatments**

This must be left to the parents, but the school can provide them with accurate information on how to comb for lice and nits, and on the proper use of insecticidal shampoos. The Sample Information Packet in Appendix H provides this information.

### **Physical Controls**

It is possible to eliminate a lice problem using the following physical controls without resorting to more toxic chemicals. Success depends on several factors, including the determination of parents, existence of good relations between the parent and child, and the length and texture of the child’s hair.

### **Combing**

Combing is the most important aspect of head lice control. Combing removes nits from the hair and helps to find adult lice. Unfortunately, there is no safe solvent for the powerful glue that holds the nits to the hair, and though insecticides may kill some eggs, they do not kill them all. Box 11-A provides detailed instructions on combing that should be followed carefully, using a comb with specially tooled metal teeth designed to remove head lice and their eggs from the hair. Metal lice combs are available from pharmacists. Fine-toothed plastic combs may be too flexible to be effective, even though they may be sold along with various insecticides for the control of head lice.

There is no denying that the combing process demands time and patience from parents and children; however, many parents tell us that their children grow to enjoy the process and even look forward to it because it feels good, and the child is the center of the parent’s attention.

Based on the life cycle of the female head louse, and assuming the child is not immediately reinfested, the combing process should be repeated every 5 to 7 days during the period when head lice are a problem at the school. If the child becomes reinfested before a week has elapsed, the combing must to be repeated as needed to remove lice and nits. Parents should refrain from using pesticides with these cases of immediate reinfestation; instead, use only the combing method to remove lice and nits.

### **Salad Oil**

The use of salad oil is sometimes recommended to smother adult lice, but personal experience has shown us that lice can survive in hair covered with oil even when it is left on overnight. Do not count on oil to kill adults or nits. Oil can be very useful in combing, however. Oil prevents the hair from tangling and makes combing much easier. In this respect, oil works better than shampoo or conditioner and doesn’t dry out during the combing process. Washing the hair twice with any ordinary shampoo will remove all traces of the oil.

### **Washing Clothing and Bedding**

Since lice may wander from the head to the pillow or to headwear, washing these items at the time the child is first diagnosed and treated is a good idea. Putting clothing or bedding through a wash cycle with hot water and ordinary detergent in a washing machine and then drying in a hot dryer is sufficient. Anything that cannot be washed can be stored in large, sealed plastic bags for 2 weeks.

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## Vacuuming

Clothing can also be vacuumed to remove stray nits and wandering lice. Upholstered furniture and rugs can be vacuumed, too, but, in general, head lice do not leave the head, and there is no need to go into a frenzy of laundering and cleaning. The time and energy spent in washing clothes and cleaning the home environment would be far better spent combing out nits, and educating the child and other parents, teachers, and children with whom the child associates.

Additional Resources: An 8-10 minute videotape, *Removing Head Lice Safely*, from University of Nebraska Cooperative Extension demonstrates this combing technique. This video is available in English, Spanish and Arabic. Contact: Lancaster County Extension Office 402-441-7180. Internet: <http://www.lancaster.unl.edu>

## Chemical Controls

### Ordinary shampoo

Certain fatty acids in soaps have insecticidal properties, but shampoos are detergents, and you cannot count on shampoo to kill young or adult lice. Although it might seem possible to drown lice while shampooing the hair, personal experience has shown us that adult lice can survive through two consecutive shampooings even when the hair is not rinsed for an hour after the second shampooing.

### Shampoos with Pediculicides

We do not recommend the use of insecticides except as a last resort in extreme cases. The scalp has many blood vessels that are close to the skin, making it easy for toxic substances to be absorbed directly into the bloodstream. Absorption is greater when the skin is warm, and the blood vessels are dilated.

For many years, lindane (commonly referred to as Kwell®), an organophosphate insecticide, was the treatment of choice; it is still recommended by medical personnel who have not taken the time to acquaint themselves with its potential health hazards to humans. Lindane is absorbed through the skin into the bloodstream; once absorbed, it can be carried throughout the body to tissues and organs. In pregnant women, it can travel across the placenta to the developing fetus. Lindane is available only by prescription. We do not recommend its use at any time. The chronic overuse of lindane has resulted in lice resistant to Kwell so it is not only hazardous but also somewhat ineffective.

The over-the-counter insecticides include pyrethrum, pyrethrins, and permethrin. A few years ago, scientists reported that lice in the US have developed resistance to these most readily available products. This is another reason to use combing as the primary control method.

Ovide® is a product that has been available in the U.S. for several years. The active ingredient in this lotion is 0.5 percent malathion, an organophosphate insecticide. This product is available in the US only by prescription. Head lice resistance to malathion was reported several years ago in Britain where this product has been used for a number of years, but this product may be more effective against lice until it has been used extensively over a number of years. Problems with this product include an unpleasant odor and its flammability (the carrier is isopropyl alcohol). Another big problem is that the label mandates that the child's hair must be allowed to air dry for 8-12 hours before shampooing.

Insecticidal products must be used in accordance with their EPA-approved label directions. Never re-treat with the chemical more frequently than the label allows. The following cautions should be added to those already on the label:

- Never treat pregnant or nursing women, infants, or children under two with pediculicides.
- Minimize body exposure. Confine the exposed area to the head hair. Do not treat the eyebrows or get the pediculicide near the eyes. Do not use in the bathtub or shower stall; use a basin or sink so pesticide residues do not reach other parts of the body. Wear rubber gloves to protect yourself if you shampoo yourself or someone else.
- Minimize frequency of use. Frequent, repeated use of pediculicides, especially lindane, is dangerous. Never use insecticides at higher doses or at a greater frequency than listed on the label. If insecticides are not working, it can mean either product failure or lice resistance. Return to combing.
- Never treat anyone with open cuts, scratches, or head or neck inflammations. Check for cuts, scratches, or inflammation before treatment; do not use insecticides if such conditions are found.
- Store insecticides out of reach of young children, ideally in a locked cabinet. Treat insecticides as you would any other poison.
- Do not use any head lice insecticide preventively. Before you undertake any

## Box 11-A How to Comb for Head Lice

### A. You will need:

- Salad oil.
- A special metal lice comb. These are available in drugstores (ask your pharmacist to order one if you cannot find a metal comb). The plastic combs that are included in some lice treatment packages may not be effective.
- A wide bowl of water with a squirt of dishwashing detergent added. This water is used to kill nits (eggs) and lice combed from the head.
- A box of facial tissue.
- A strong lamp with a flexible arm that allows you to rotate it to direct the light wherever you are working. (If it is possible to do the combing in the daylight near a window, it will be much easier to see the adult lice and the nits.)
- If the hair is long, many large bobby pins or hair clips, to pin up sections of hair that have been combed.
- A large towel to place around the child's shoulders during combing.
- Two comfortable seats, one for the child and one for you. You want the child to be just below your eye level.
- Something entertaining for the child to do that does not require much physical activity, such as reading, drawing, playing with plastic clay, or watching videos.
- If the child has very long hair, which takes more time and tries the patience of the child, two people can work together on different parts of the head.

### B. Preparing the Hair

Cover the child's hair with salad oil (any kind will do). This will prevent the hair from tangling and make it very easy to use the lice comb. (The oil may also smother some of the young and adult lice, but you cannot count on it.) Oil has the advantage of not drying out if the combing takes a long time. After you finish combing, wash and shampoo the hair twice to remove the oil.

### C. The Combing

1. Seat the child so that his or her head is just slightly below your eye level.
2. Brush or comb the hair (use a large-toothed regular comb) to remove snarls.
3. Separate a mass of hair that is slightly wider than the width of your lice comb and about 1/2 to 3/4 inch in the other direction. Separating the hair into such small sections is important so that you can more easily see nits and adult lice.
4. Hold the mass of hair with one hand. With the other hand, hold the lice comb in a slanting position with the curved side of the teeth toward the head.
5. Insert the comb into the hair as close to the scalp as possible, since the eggs are first laid within 1/2 inch of the scalp. Pull the comb slowly through the hair several times.

6. Comb one section at a time and check each section to make sure it is clean, then pin it out of the way, curling it flat against the head.
7. Whenever you comb out nits or live lice, dunk the comb in the soapy water. Make sure the lice and nits are off the comb before you use it on the hair again. Frequently remove the hair and other debris from the comb with a tissue. When the tissue becomes soiled, place it in the bowl of soapy water. When the bowl is full, flush its contents down the toilet and refill the bowl with soapy water.
8. When all the hair has been combed, wash out the oil by shampooing twice.
9. Once the hair is completely dry, check the entire head for stray nits and remove those hairs individually with a pair of small, pointed scissors (like nail scissors).

### D. Cleaning up

1. Soak the lice comb in hot ammonia water (1 teaspoon of ammonia in two cups of hot water) for 15 minutes. Metal combs can also be boiled in plain water for 15 minutes. It is important to clean combs before they are used on additional children.
2. Scrub the teeth of the comb with an old toothbrush to remove debris. Remove dirt lodged between the teeth of the comb with dental floss or a small stiff brush.
3. Boil the towels for 10 minutes or wash them in a washing machine in hot, soapy water and follow with a hot dryer.

Note: There is no safe solvent for the glue that the female louse uses to attach her eggs to the hair even though there are products that make such claims. Combing is the only sure way to remove nits from hair.

### **WARNING:** *If you must use a shampoo that contains an insecticide,*

- Do not leave the shampoo on any longer than the time specified and do not use it more frequently than indicated on the label. Follow the directions exactly.
- Do not use on the eyebrows or allow any shampoo to get into the eyes.
- Do not use on pregnant women or nursing mothers.
- Do not use on children under 2 years.
- Do not use on anyone with open cuts or scratches or with head or neck inflammations.
- Do not use in a shower or bath where the pesticide can reach other parts of the body. Shampoo hair over a basin or sink.
- Use gloves to do the shampooing.
- Do not count on lice shampoos to kill nits. You must comb to get them out.
- Never use any head lice shampoos preventively. Before you treat, make sure that live lice or eggs are present.
- Return to combing if the lice shampoo is not working; it may mean product failure or that the lice have become resistant to the pesticide.
- Store these shampoos out of the reach of children, ideally in a locked cabinet.

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treatment, make sure live head lice or viable eggs are present.

- Do not use any head lice insecticide preventively. Before any head lice treatment is used, make sure live head lice or viable eggs are present. Studies have shown that even health professionals often misdiagnose head lice cases. Since the first stage lice and nits are so small, lice and nits can be missed by inspections. In addition, children are sometimes identified as being infested when lice or nits are not present. Nits can be confused with dried hair gel, dandruff, hair casts and dust particles. Remember, viable nits are gray when laid and turn coffee colored before they hatch. A white nit is usually dead. A magnifying glass may be helpful. An electronic comb, the Robi Comb®, may be useful in monitoring. It detects live lice but will not detect nits.

### **Lice Sprays**

Never, under any circumstances, should lice sprays be used. Lice cannot live in the environment, and lice sprays unnecessarily expose everyone to harmful pesticides. Use a vacuum cleaner if you are concerned about lice on furniture or on floors.

### **Resources**

For management practices and pesticide recommendations on head lice control, see the publications available from UNL Cooperative Extension, located in most counties, or from Communications and Information Technology, Box 830918, University of Nebraska, Lincoln, NE 68583-0918, or see them on-line at: <http://www.ianr.unl.edu/pubs/>.

Educational resource guides, *Quick Guide to Removing Head Lice Safely* and video tapes, *Removing Head Lice Safely* are available in English, Spanish, and Arabic; and a head lice picture gallery are available at: <http://lancaster.unl.edu/enviro/pest/insect.htm>.