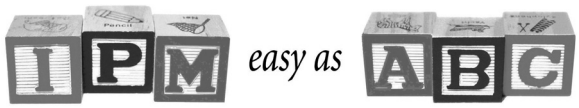
Chapter 12

IPM for Head Lice



Introduction

Today, the management of head lice continues to be a major task for parents, child care and 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 over-the-counter (OTC) insecticidal products, sole 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, but combing is still the key to successful treatment of head lice.

Identification and Biology

The head louse, *Pediculus humanus capitis*, (Figure 12-1) is dependent on human blood for survival and spends its entire life on the human head. If it is accidentally displaced onto other surfaces, it must return to the head within a few hours to survive. At room temperature, lice survive less than 24 hours without blood, and they cannot complete their life cycle on pets.

Photo: UNL Extension in Lancaster County

Figure 12-1. Head Louse

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. Insecticide resistant lice may be darker in color. Each of its six legs ends in a claw that is used to grasp the hair shaft. The nits are laid about 1/4-inch from the scalp. The eggs are oval-shaped and are glued to the hair shaft. The glue is so strong the egg cannot be easily dislodged, even after it has hatched. Each female produces about 6 to 8 eggs in a 24-hour period, and these are laid mostly at night.

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. Only about 16 days 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

Experts believe most head lice are transmitted when an infested person comes into close contact with a non-infested person. For example, when children or family members sleep or sit closely together, lice may transfer from one person to another. Older literature says lice can also be transferred via infested brushes, combs, caps, hats, scarves, coats, and bedding, , but studies have not been able to find significant numbers of lice on intermediate objects, so experts believe head-to-head contact is the most frequent way lice are transmitted. Parents or health care workers who understand this can focus their energies on removal of lice from the infested person's head and not spend excessive amounts of time vacuuming and laundering.

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

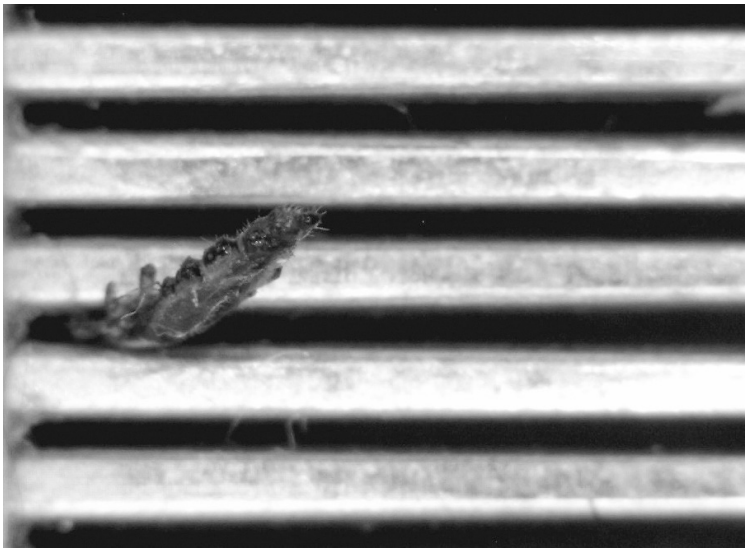


Photo: UNL Extension in Lancaster County

Figure 12-2. Head louse caught in a comb

Detection and Monitoring

Frequent head scratching may be the first sign of lice. Under close examination, parents will see lice close to the scalp 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.

Management Options

Lice can be controlled without resorting to insecticidal treatments with the use of a nit comb (Figure 12-2) to remove lice and eggs. Because lice are resistant to OTC (over-the-counter) products, combing of the hair must be used to eliminate the lice infestation even if these products are used.

There are two reasons for children to become reinfested. The first, and most likely scenario, is because the lice were not successfully eliminated after initial treatments. The first stage lice are extremely small and hard to see. An electronic comb, used on dry hair, can be helpful in detecting live lice to double-check the effectiveness of treatments and combing. Even the smallest lice will get caught in the tines of the electronic comb. The second scenario is when infested playmates or other family members continue to transfer lice to the child. When children continue to have lice, parents may wrongly assume that the first treatment wasn't strong enough and turn to something more toxic, not realizing combing is an effective non-chemical approach.

Education

Most people view lice with disgust. Panicked parents who would not normally expose their children to potentially hazardous materials may 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 child care directors, school administrators, nurses, teachers, children, and parents have some rudimentary information about head lice before an outbreak occurs. A school or child care center 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 the "Head Lice Information Packet" section in this chapter for a sample. Encourage parents to look for head lice weekly as just another part of personal hygiene. Have teachers in the lower grades or child care centers 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 child care center or 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. 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 or child care director should designate at least one member of the staff to receive training from the school nurse or 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 child care 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 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 or child care facility 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 later in this chapter 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. The "How to Comb For Head Lice" section of this chapter 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.

If there is a lice outbreak at school or child care, parent should check their child's hair every day or two. An electronic comb is ideal for lice detection. If the child is reinfested, the combing must to be done and repeated as needed to remove lice and nits.

Salad Oil or Hair Conditioner

The use of salad oil is sometimes recommended to smother lice, but studies have shown 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 or conditioner prevents the hair from tangling and makes combing much easier. 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.

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 lice and nits.

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, 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 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 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 easily 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 Extension on-line at: *http://www.ianrpubs.unl.edu*.

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

Head Lice Information Packet for Schools and Child Care Centers

This Sample Information Packet contains the following:

1. Facts about Head Lice
2. Recommendations for How to Treat Head Lice
3. How to Comb for Head Lice
4. Sample Letter from School or Child Care to Parents

These materials may be reproduced by any school or child care center in part or as a whole and may be modified to suit particular situations.

Facts about Head Lice (Pediculosis)

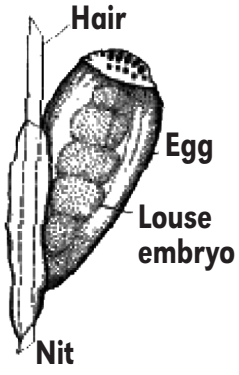
People have many false ideas about head lice.

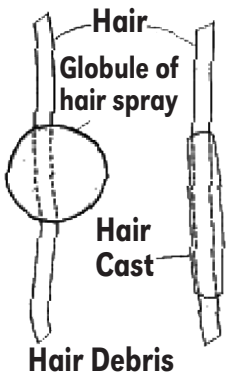
1. Head lice are not a reason for panic or extreme measures.
2. Head lice are not a sign of uncleanliness.
3. Head lice do not favor any particular socio-economic level —they attack rich and poor alike.
4. Head lice are not something to be ashamed of.
5. Head lice do not carry serious diseases.
6. Head lice cannot jump or fly.
7. Head lice cannot live on pets.

Head lice infest the hair, suck blood from the scalp, lay their eggs (commonly known as nits) on the hair shafts, and cause itching and some additional discomfort when present in large numbers.

Lice are usually transmitted from one person to another by head-to-head contact. It is possible, but less likely, that they may also be transmitted by sharing personal items like combs, hair brushes, hats, or other articles of clothing on which infested strands of hair or adult lice are present.

Below are drawings of an adult louse (1/8" long, yellowish-grey), a nit (1/3" long), and hair debris that can be mistaken for nits. The eggs are white when they are first laid and darken to a coffee color before they hatch.





Notice that nits are always oval-shaped and attached to only one side of the hair shaft, usually close to the scalp.

They are attached with very strong glue and cannot be as easily removed as dandruff and other hair debris. There is no safe solvent for this glue.

The female lays 6-8 eggs/day. It takes 7 to 11 days for the eggs to hatch and another two weeks to develop into reproducing adults. Adults live for up to 30 days and spend their entire life on the human head. If they do move to other surfaces, they must return to the head within a few hours to survive.

In order to prevent multiplication and spread, the adults and the nits must be killed.

We encourage you to add a quick, weekly inspection for head lice to your regular personal hygiene routine for children between the ages of 6 and 10 (younger if the child is attending pre-school or a child care center). If lice are reported at a school or child care center, increase lice inspections to once every two or three days. A magnifying glass can help you to see the nits. An electronic comb, the Robi Comb®, can be helpful to monitor children. This comb detects live lice, even very tiny ones. It will not detect nits.

Recommendations for Treating Head Lice

In order to bring the current head lice problem under control, the following procedures are recommended:

1. Inspect your child's head. If you find lice or eggs (commonly called nits), continue reading. If you find no lice or nits, you don't need to do anything; however, continue to check your child's head weekly and more often if friends or school mates have lice.
   (a) Separate the hair with a rat-tailed comb.
   (b) Check all areas of your child's scalp, especially at the back of the neck and behind the ears — these seem to be the favorite spots for lice.
   (c) Adult lice are found close to the scalp. Nits are attached to the hair 1/2 to 1 inch away from the scalp. Nits may be found farther out on the hair strands in long-standing cases. There may be anywhere from a few to several hundred nits in a child's hair.

2. If you find lice or nits, coat the hair with salad oil and comb out the lice and nits with a special metal lice comb. You can buy these combs in a pharmacy. Do not use the plastic combs provided with some pesticidal shampoos; they can allow nits and lice to slip through unnoticed (if you cannot find a metal lice comb, ask your pharmacist to order one).

   Refer to the section entitled "How to Comb for Head Lice" for combing instructions.

   You can get rid of lice just by combing. It is not necessary to use pesticidal products. In fact, these shampoos are recommended only as a last resort in extreme cases. And, because head lice are resistant to most over-the-counter products, these readily available products, used alone, will probably not solve a head lice problem.
   - Do not use shampoos with pesticides on infants or children under 2 years, or on pregnant or nursing women.
   - Do not use these shampoos on anyone with open cuts, scratches, or head or neck inflammations.
   - Do not use in the shower or bath; use over a basin or sink. Expose only the scalp to the pesticide.
   - Never use lice shampoos to prevent lice infestations. Check the child's head first. If there are no lice, don't treat.
   - Do not use extra shampoo or leave the shampoo on the hair for longer than the directions specify, and do not use on the eyebrows or allow any shampoo to get into the eyes.
   - Store these products out of the reach of children, ideally in a locked cabinet.

3. Comb, Comb, Comb! *This is the only way to remove the nits.* Repeat the combing every week until you find no more lice or nits. Be forewarned that if the child has very long or very curly hair this process will be time consuming. You may want to consider cutting the hair.

4. Examine all members in the household. If lice are found, treat other members of the family.

5. Do not use the lice spray included in some of the lice shampoos. Lice cannot live very long, (probably less than 24 hours) in the environment and sprays unnecessarily expose everyone to pesticides.

6. Wash bed linens and recently worn clothes in hot, soapy water in a washing machine and dry in a hot dryer. This does not have to be repeated daily. The washing is only necessary when you treat the child or when he/she is re-infested. Articles that cannot be washed can be vacuumed or placed in a plastic bag and sealed for 2 weeks. This will kill all lice and nits.

7. Clean combs and brushes by soaking them in 1 teaspoon of ammonia and 2 cups of hot water or heating them in a pan of hot water for 5-10 minutes.

8. If your time is limited, it is much more important to comb the child's hair than to spend time washing clothes and linens and vacuuming your house.

9. Check hair the morning following treatment to be sure it is nit-free before allowing your child to return to school.

10. Until the lice epidemic has passed, school personnel will be examining children's heads frequently. Any child with nits or lice will not be allowed to attend school.

11. If your child is re-infested, comb the hair again with the lice comb rather than applying pesticidal shampoo. Use these products only as a last resort.

12. Instruct children and adults not to share combs, brushes, hats, and other articles of clothing that might be contaminated with strands of hair.

REMEMBER:

It takes time to comb all the nits out of the hair, BUT this must be done, and done frequently, until the hair is free of evidence of lice and nits.

- Combing is an inconvenience, but remains a parental responsibility and only total parent cooperation and follow-through will stop the spread of lice.
- You will probably find that your child actually enjoys the combing.

How to Comb for Head Lice

NOTE: We do not recommend shampooing with a lice shampoo that contains a pesticide except in extreme cases and as a last resort.

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). Do not use the plastic combs that are included in some lice treatment packages. These are not 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. To remove oil after you finish combing, shampoo the hair twice.

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. A comb can be cleaned either way
2. Scrub the teeth of the comb with a nail brush or an old toothbrush to remove debris. Remove dirt lodged between the teeth of the comb with dental floss or a small stiff brush.
3. Wash towels in a washing machine in hot, soapy water, followed by drying in 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 with a pesticide,*

- **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.
- **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.