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Head Louse Integrated Pest Management: A Primer for Parents and Teachers  
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July 1997  
6 pages

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# Head Louse Integrated Pest Management: A Primer for Parents and Teachers

by

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There are two general categories of lice: sucking and chewing. Both are parasites of vertebrate animals. Sucking lice are parasites of humans and the focus of this bulletin.

There are 490 species of sucking lice in the world and 56 species in the United States. Lice tend to be highly specific to their hosts—they do not switch from one host species to another with any regularity. Only two sucking lice are of any consequence to humans: the human louse or "cootie" and the crab louse. There are two subspecies of human lice: the head louse and the body louse. They look very similar. This publication addresses the head louse only. Body lice have become extremely rare in the United States, although they still occur on humans in other parts of the world. They are usually associated with hot or cold climates and conditions of poverty and poor hygiene. The chief difference between body lice and head lice is that body lice lay their eggs on the seams of clothing and live on the clothing and on the body. Head lice live primarily on the head and lay their eggs on strands of hair.

The relationship between humans and lice has had many twists and turns throughout

history. Accounts of lice are found in the Bible (Exodus 8:17) and in writings by Aristotle. Some cultures took extreme measures (e.g., body shaving) to rid themselves of lice, while other societies regarded lice as delicacies or status symbols. Prior to the 20th century, lice were responsible for millions of deaths in

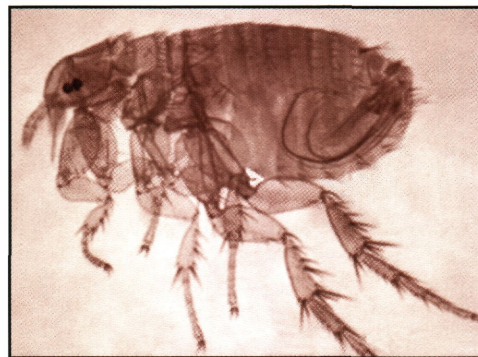
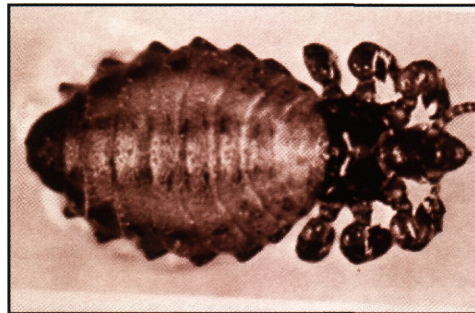


Figure 1. Head louse (top) and cat flea.

Europe and Asia. They carry typhus, trench fever and relapsing fever, serious diseases that are barely a part of the vocabulary of any culture today. Lice traveled with armies, and during the Bolshevik Revolution (1912-1917), three million Russians died from

typhus and relapsing fever alone. These diseases still occur in certain parts of the world where body lice occur. Generally speaking, the head louse and crab louse do not carry the bacteria that cause these diseases.

In the United States, lice are viewed as socially unacceptable and a sign of uncleanliness. Each year, elementary school teachers brace for the occurrence of head lice in the student population and the social turmoil that usually follows. Where do the lice come from? Why are they so readily passed in elementary schools, day care facilities and institutional housing? Is having head lice a sign that a home and/or a person is unclean? How can you prevent yourself or your child from contracting head lice, and what do you do if someone in the family does contract them? These questions and others will be addressed here.

## Symptoms and Disease Potential

Head lice are blood feeders. They feed daily. When feeding, the head louse injects saliva into the feeding wound to prevent clotting during the feeding

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episode. This feeding activity may cause dermatitis. The saliva irritates the skin and may cause considerable itching. Severe infestations may lead to scratching, secondary infections and a scarred, pigmented skin condition known as *pediculosis*. The lice defecate partially digested blood on the hair, which appears as small particles of "black dandruff".

## Identification

The head louse (*Pediculus humanus capitis*) is a small (2 to 3 mm), wingless insect with a flattened profile (Fig. 1). It is sometimes confused with the cat flea. Head lice range in color from yellowish-white to dark brown and tend to match the coloration of the host's hair. The legs end in conspicuous claws used to cling to hairs. The claws of the head louse are adapted for clinging to the thin hairs of the head. These lice are rarely found on the body because they can not maintain a grip on body and pubic hair, which is considerably thicker than head hair. Their mouthparts are adapted for piercing skin and sucking blood.

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The female head louse is usually larger than the male. The tip of the female's abdomen has a notched appearance. Its yellowish-white eggs, commonly referred to as "nits", are cemented to the base of the hair. Egg remnants remain firmly attached to the hair long after the immature louse has hatched (Fig. 2). As the hair continues to grow, the old egg remnant moves away from the surface of the scalp. Any egg found more than a centimeter from where the hair meets the scalp has almost certainly hatched, is infertile or died from some other cause.

## Life History, Ecology and Interaction with People

The head louse has become so specialized that it can exist only on or in close proximity to the human body. The female head louse cements her eggs to the base of a hair. The eggs usually incubate for five to 10 days before hatching. Immature lice hatch, grow and molt three times before becoming adults. The total life cycle takes about three weeks. Lice can not survive off the host for prolonged periods of time. In fact, they will die of starvation about two days after removal from the host.

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Head lice are less restricted by climatic factors than body lice. They occur in most human populations. Some factors, such as the lack of hygiene, will predispose people to infestation with head lice. However, infestations of head lice can occur even under hygienic conditions.

Transmission of head lice is a recurring problem in schools, day care facilities and institutions where lots of people are in close, daily contact. Anyone can become infested, although children between 5 and 12 years of age are the most frequently infested. One researcher found that 59 percent of infested children had other family members who were infested and that infestations were higher in children that shared lockers and rode school buses.

Head lice are spread by direct contact with an infested individual or indirect contact with articles of clothing or grooming articles. Head lice can infest clothing and other items that come in contact with the head (e.g., clothing, hats, scarves, combs or brushes, headphones, ribbons, helmets, etc.). *Lice cannot jump or fly from one host to another.*

## Integrated Head Louse Management

Integrated pest management (IPM) of head lice can be defined as using all the tools and strategies available to eliminate the pest and prevent its reoccur-

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rence. In short, follow the recipe and you will be successful. If you attempt shortcuts or do not follow the protocol completely, it will take longer to eliminate the problem and will increase the probability of reinfestation.

## Check for signs and symptoms of infestation

The medical term for a louse infestation is pediculosis. People with pediculosis often will exhibit signs of general tiredness, irritability and a body rash. Sometimes the only symptoms of a lice infestation will be restlessness and poor attention span. Everyone does not react the same to a louse infestation. Some people are not sensitive to the saliva and therefore do not itch. Constant scratching of the head or body may be a sign of a louse infestation. A local lesion is produced by the feeding activity of the louse. Saliva introduced during the feeding activity produces a red welt on the skin. Involuntary scratching of the bite site causes dermatitis of the area. As a result of the scratching, bite sites may become infected and exhibit a weeping, crusting sore. In extreme cases, the area around the bite site may become hardened and bronzed.

Primary diagnosis of a head louse infestation can be made by observing "black dandruff" falling from the head or present on the scalp. The presence of black powder on a pillow or a dirtier than normal pillow may be an early indication of a louse infestation. To confirm the presence or absence of head lice or nits (nits are usually easier to see), a

thorough examination of the head is necessary.

To examine a person for head lice, start at the nape of the neck and proceed toward the forehead, all the while parting the hair so that you can examine the base of the hair follicle. A good light source is recommended and a magnifying glass is helpful in differentiating nits from dandruff, lint and other debris. Nits will not

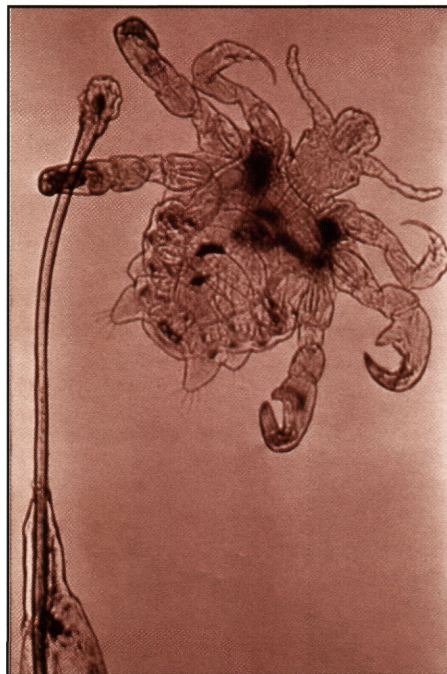


Figure 2.

pull off the hair shaft easily—they are firmly attached to it.

If you find lice on your child, you may wish to consult your family doctor, a pediatrician or a public health nurse.

## Treat the infestation

Head lice infestations may be treated with non-prescription or prescription medical insecticides. In the United States, several

insecticides are approved for use on humans. The most common are the insecticides lindane, permethrin and pyrethrins. Permethrin and pyrethrins compounds are commonly used in combination with piperonyl butoxide, a synergist. These products are most commonly formulated as shampoos and lotions (Table 1).

Several studies have evaluated insecticide effectiveness. Permethrin 1% cream rinse had a cure rate of better than 90 percent with one application in most studies. Treatments using lindane and pyrethrins were significantly less effective than permethrin, with a cure rate of less than 90 percent with a single application.

Specially designed combs, called nit combs, can also be purchased. These combs are designed to free the nits from the shafts of individual hairs. They can be quite effective when used properly. They are also useful in detecting lice. There is anecdotal evidence that suggests that applying baby or mineral oil to the head before bedtime and washing the oil out the following morning can be an effective treatment. The oil may suffocate immature and adult lice.

After you select a louse control product or have one prescribed by a physician, carefully read and understand all the product directions and follow the directions exactly. If the product needs to remain in the hair for a specified period, time the application. Leaving it on too long can cause adverse reactions (most products contain an insecticide).

ticide). **Be sure that the product does not come in contact with the eyes, mouth, ears or nose.**

It is best to apply the shampoo or cream rinse over a sink so that the hair hangs down the back of the head, not over the face. Place a towel over the face for protection. By treating the hair over the sink, you, the applicator, are able to control where the product is applied and the amount applied. Do not apply in the shower because the insecticide is washed over the exposed body and may enter the eyes, nose and mouth. In addition, the insecticide is then present in the shower or bathtub. **REMEMBER: These products contain insecticides and should be used with great care.** These products may cause skin irritation and itching. Don't mistake this for a sign of reinfestation. Consult a physician if the irritation persists.

After applying the product, comb the hair to look for nits. Nits will be found on the hair shafts near the scalp. Place a chair in a well lighted area with plastic underneath to catch any lice or nits that fall from the head. Section the hair and systematically work through each section, removing all nits. Some products provide a nit comb to help in this process. If not, use a fine-toothed comb to separate the hair strands and pull each nit along the length of the hair to remove it. When finished, roll up the plastic and place it in an outdoor garbage can. Soak all combs and brushes in hot water (140 to 160 degrees F) for at least

10 minutes to kill any nits or lice. Remove all clothing and wash in **hot water** and dry in a **hot dryer for at least 20 minutes.**

In addition to treating the person known to have lice, examine the entire family for signs of lice and treat accordingly. Launder all linens, bedding, clothing, hats, scarves, etc. Pillows and other non-washable items (e.g., stuffed animals) may be put into closed garbage bags and stored in a cold area (freezing or colder) for two weeks to kill any remaining lice and nits. After vacuuming, remove the bag and immediately dispose of it into a closed garbage bag. This clean sweep of the house and all occupants should take place on the same day to prevent reinfestation from a yet-to-be cleaned source. Conduct a follow-up inspection the next day. Keep a head louse IPM checklist in the medical cabinet for reference (Table 2).

## Preventive measures

The spread of lice can be prevented by educating people in how lice are transmitted. Because lice do not fly, jump or run, people are responsible for their transport and transmission. What can be done to minimize the risk to yourself, your family, school or day care facility? First, educate yourself about what lice are, how to recognize a louse

infestation, how they are transmitted, and how to protect yourself and your family.

For you and your family, this means not only maintaining and monitoring your body and your home, but making periodic checks for signs of lice. Teach your children not to put on other people's hats or scarves, and not to share their combs, brushes, hats or scarves. Do not use insecticidal shampoos and lotions as a preventive measure. These products work only on the lice and have no preventive value. They needlessly expose you and your family to insecticides.

What can be done at schools, day care centers and other institutions (Table 3)? The use of lockers limits the exposure of students' garments to numerous potential sources of lice. However, in most primary schools, coats and hats are hung on hooks and piled on shelves. Spacing hooks so that coats do not touch and placing hats, gloves, scarves, etc., in coat sleeves will help to limit contact. Staff members need to be aware of the signs and symptoms of head lice to note any person exhibiting these characteristics.

A person who is suspected of having lice needs to be evaluated for evidence of infestation. This process must be handled in a delicate and confidential manner. A student removed from class for inspection may be labeled as "having cooties."

The use of periodic head examinations for the entire school may be necessary to avoid labeling some students. The handling of head lice in any of these situations is of utmost concern. Schools and day care organizations should ask parents to notify them if they find head lice on their children. However, if this causes their child to suffer humiliation, parents may not report the problem, thereby allowing it to grow until there is a serious outbreak. Many schools have a "no nit" policy, which prohibits students who have nits from returning to school even after treatment. Training of all personnel in what to look for and how to handle children with lice is critical in the handling of a very delicate issue. Public relations is a **major issue** in dealing with an outbreak of head lice.

Lice have been with us for a very long time and will undoubtedly continue to be with us. We can take steps to limit their accessibility to us by becoming aware of the ways that they are transmitted and breaking the transmission cycle. Until people are better educated about lice and how to prevent transmission, lice will continue to be a recurring problem. Though they're not present in a large percentage of the population in the United States, they are present and, under the right circumstances, ready to move onto new hosts.

**Table 1: Some products commonly used for treating people with lice.**

Product (Company)	Active ingredient	Product type
Nix (Burrough-Wellcome Co.)	1% permethrin	Lotion
Kwell (Reed & Carnick)	Lindane	Shampoo
A-200 Pyrinate (Hoquil Pharma.)	0.33% Pyrethrins	Shampoo
RID (Pfizer)	0.33% Pyrethrins	Shampoo
Pronto (Del Pharma.)	0.33% Pyrethrins	Shampoo
Chase's Personal Insecticide (Chases Products Co.)	0.22% Pyrethrins	Lotion
Barc Liquid (Del Pharma.)	0.18% Pyrethrins	Lotion
Pronto Lice, Tick and Flea Killing Spray (Del Pharma.)	0.4% Phenothrin	RTU* Spray
Pediculosis Control (Agrevo Environmental Health)	0.3% Pyrethrins	Lotion
Pyrenone Lice Spray (Agrevo Environmental Health)	0.4% Pyrethrins	RTU* Spray
Pyrenone Lice Killing Shampoo (Agrevo Environmental Health)	0.33% Pyrethrins	Shampoo
LICEX (Qualis Inc.)	0.3% Pyrethrins	Lotion
LICETROL 600 (Republic Drug Co., Inc.)	0.3% Pyrethrins	Lotion
PYRINYL II Liquid	0.3% Pyrethrins	Lotion

RTU=

\*Ready to use

## Table 2. Head Louse IPM Treatment Checklist



1. Check all family members for the presence of lice and nits in the hair. Do this under a good light source. A magnifying glass may help you to see the nits. Section the hair and examine each hair follicle for the presence of nits attached to the base of the follicle.
2. If any family members have lice, select a louse control product. Table 1 lists several products that are available by prescription and over the counter. Read and understand all the instructions on the product label.
3. When applying a louse shampoo or conditioner, have the person who is receiving the treatment lie or sit in a reclining position with his/her hair hanging down below the head and not hanging down over the face. You may want to lay a child on the counter with his/her head over the sink so you can control the shampooing. These products usually require contact with the hair for 4 to 10 minutes before rinsing. Place a towel over the face to help prevent the shampoo from coming into contact with the face.
4. After rinsing and towel drying the hair, comb and section it. It is recommended that you do the combing and nitpicking with the child sitting in a chair located over a sheet of plastic to catch any nits or lice that fall from the head. Starting at the nape of the neck and using the packaged nit comb or other fine-toothed comb, examine each section of hair carefully for the presence of nits. Remove nits by pulling them the length of the hair follicle. All nits need to be removed from the head before most schools will allow children back into school. Many products do not kill nits. If not removed, they will hatch and reinfest.
5. After treatment, carefully roll up the plastic and dispose in a garbage bag. Collect all combs, brushes and hair attachments (berets, ponytail bands, etc.). Be sure to check in purses and book bags. Soak them in hot water (140 to 160 degrees F) for at least 10 minutes. Collect all hats, scarves, baseball caps and coats and launder in hot water and dry at least 20 minutes in a hot dryer. Wash all linens (sheets, pillowcases, towels) in hot water and dry in a hot dryer. Collect all non-washable items (stuffed animals, coats, comforters, afghans, quilts, etc.) and either have them dry-cleaned or place them in sealed garbage bags. Place the garbage bags in a cold area for two weeks to kill any lice or eggs.
6. Vacuum all the furniture (chairs, couch, pillows, mattresses) and the floors. Once everything has been vacuumed, remove the vacuum bag and place it in the outdoor garbage.
7. Your home environment should now be free of all lice life forms. Conduct a follow-up inspection the next day.
8. Teach your children not to put on other children's hats, etc., or share combs and brushes and to recognize signs of lice.
9. Do not use louse shampoo regularly as a preventive measure. These products work only against lice that are present and have no protective value. Do not needlessly expose your family to pesticides.

## Table 3: Head Louse IPM Checklist for Schools and Day Care Facilities.

- \* Space coat hooks so coats will not touch each other. Tuck hats into sleeves, pockets or backpacks.
- \* Discourage dress-up centers where children try on hats or clothes.
- \* Store naptime supplies (mats, towels, pillows) in individual cubbies and send the articles home frequently for washing.
- \* Vacuum carpet areas daily.
- \* Encourage assigned seating on the school bus.
- \* Discourage sharing of personal items. Give each child his/her own comb or brush.
- \* Institute a routine screening program.
- \* Send children home if they are found to have an infestation.
- \* Inform all parents when infestations are discovered in school/day care and encourage them to inspect their children.
- \* Incorporate a "no-nit" policy. Check children for nits when they return to school each year.
- \* Encourage adults to check each other for lice and nits.
- \* Discourage the use of pesticide sprays and fumigation.
- \* Educate personnel on the signs and symptoms of head lice infestation.
- \* Consult a physician.



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