ENY-296

UF UNIVERSITY of FLORIDA
IFAS Extension

Head Lice[1]

R. W. Baldwin and F. M. Oi[2]

The human head louse, *Pediculus capitis* DeGeer (Figure 1), infests 10-12 million people each year in the United States. Pediculosis or "lousiness" is one of the most prevalent communicable conditions in this country. Lice are primarily transferred from person to person by direct contact or by several people using the same combs, brushes, hats, costumes, athletic equipment, towels, or bedding. Human head lice are not found on animals or household pets and are not transmitted from pets to humans. Because of children's play activity and close contact, head louse infestations are usually found on children, but can also spread to adults. The head louse is not considered to be a serious vector of disease in the United States, although severe infestations may cause irritation, scratching, and subsequent invasion of secondary infection from bacteria and lice feces. Itching from large numbers of bites may make the infested individual feel tired, irritable and feverish, thus the term "feeling lousy."

Figure 1. Head louse, *Pediculus capitis* DeGeer. Credits: James Castner, University of Florida

Biology

Lice have three pairs of legs, which makes them true insects. Lice do not have wings or powerful jumping legs so they move about by clinging to hairs with claw-like legs. Head lice prefer to live on the hair of the head although they have been known to wander to other parts of the body. Head lice feed every 4 to 6 hours; therefore, they must remain in close contact with the host. While a louse may fall onto other surfaces, they cannot survive off of humans for more than 24 hours. Therefore, they do not live for long within rugs, carpet, furniture or school buses.

The eggs of lice are called nits. They are oval, white and cylindrical in shape (0.5-1.0 mm or ~ 1/32 inch long). The eggs of head lice are usually glued to

1. This document is ENY-296 (IG142), one of a series of the Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Originally authored by C. Scherer, P. G. Koehler, and F. M. Oi. Publication date: August 1997. Revised: June 2007. Please visit the EDIS Website at **http://edis.ifas.ufl.edu.**

2. R.W. Baldwin and F. M. Oi, assistant extension scientists, Entomology and Nematology Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

hairs near the scalp. To protect the eggs from extremes in light and temperature, the female will commonly glue the eggs behind the ears and along the nape of the neck. Under normal conditions, the eggs will hatch in 7-10 days. The newly hatched lice which escape from the egg must feed within a few hours or they will die. Immature lice will take blood meals and molt three times before becoming sexually mature adults. A newly hatched louse will mature in 10-12 days to an adult (2.5-3 mm or ~ 1/8 inch in length).

A female louse can lay 6-7 eggs (nits) per day. She may lay up to 140 eggs during her lifespan. Adults cannot survive more than about 24 hours without a blood meal. The nymphs and adults all have piercing-sucking mouthparts which pierce the skin for a blood meal.

The reaction of individuals to louse bites can vary considerably. Persons previously unexposed to lice experience little irritation from their first bite. After a short time, up to a few weeks, individuals may become sensitized to the bites and react with a general allergic reaction including reddening of the skin, itching, and overall inflammation. Subsequent infestations usually cause itching and redness within 24-48 hours. Some individuals never exhibit symptoms.

Prevention of Head Lice

Children should be encouraged to not share combs, hats, and other personal belongings. Daily washing and changing of clothes will also help discourage lice; however, head lice should not be solely associated with uncleanliness since they may be easily transferred from person to person. Sometimes head lice infestation can be traced back to children sharing equipment such as batting helmets or headphones. Periodic inspections will aid in early detection of individual lice which are more easily controlled than advanced infestations where dozens of mature lice and possibly hundreds of nits are present. During the early fall months (August - November) children should be inspected weekly because "back-to-school" seems to be when lice are most commonly transmitted. This results in widespread infestations by December and January. September is National Head Lice Prevention Month.

Treatment of Head Lice

Because of the biology of the human head louse and its increasing resistance to available pediculicides (insecticides that kill lice), no single treatment is likely to be effective in the eradication of lice. An integrated approach including preventative measures, inspection, manual louse and nit removal, cleaning the environment, and the careful use of pediculicides is the best approach to managing the infestation. Note that there is no pediculicide product available that kills 100% of the louse eggs.

Best Inspection Practices

- Use good lighting during your inspection. A lamp or good natural light from a window will work well.
- Use a hand lens or magnifying glass (10x). Magnification may help detect nits and lice.
- Shampoo hair. If you are going to use a lice treatment product following your inspection and nit removal, do not use a product with conditioners in it. See product label for more specific details.
- Remove tangles with a comb or hairbrush.
- Divide the hair in sections and fasten the hair that is not being examined.
- If lice or nits are discovered, all family members and other contacts (babysitters, cousins, playmates, teachers, etc.) should be inspected.
- Ideally, inspections and nit removal should be done daily for at least two weeks.
- Proceed to Best Nit Removal Practices Section.

If you are a health care professional screening many children for head lice, a magnifier lamp may be helpful. The magnifier and lamp are integrated into one unit. They can be purchased from suppliers of scientific equipment, office furniture, art and quilting

supply stores. You will also want to use disposable gloves and wooden screening sticks to maintain proper hygiene from head to head.

While we have no data to substantiate the effectiveness of products that claim to highlight nits (making inspection is easier), we feel it is important to note that they are included in treatment kits. For example, "Neon Nits" (makers of Clear Lice System, Care Technologies, Inc.) claims to turn nits neon pink after application for easier inspection.

Cleaning the Environment

Once an infestation is detected through inspection, all clothes should be washed in hot soapy water (150°F). Pillow cases, sheets, blankets and other bedding material should also be washed and placed in the clothes dryer on the "high heat" cycle for at least 20 minutes to kill the lice and their eggs. Carpets, furniture, car seats and any non-washable items such as children's toys should be thoroughly vacuumed and the vacuum bag immediately discarded outside of the home. Anything that cannot be vacuumed should be tightly sealed in plastic bags for at least 7-10 days to kill all stages of lice.

Best Nit Removal Practices

- After removing tangles and dividing hair into manageable portions, use a louse comb to remove nits and lice. Using a regular comb will not remove nits. Removing nits is a careful process where the hair is combed from root to tip with a special fine-toothed louse comb. Plastic combs are ineffective, so use metal louse combs.
- Dip comb in a container of hot soapy water to remove lice and nits.
- Look through that same section of hair for remaining nits and lice and repeat combing section, if necessary.
- Repeat all steps until all hair is systematically combed.
- Clean nit removal comb, clips, brushes and other tools with hot soapy water, or if using a metal comb, rubbing alcohol. An old tooth brush may help dislodge hair, nits and lice that may be caught in the teeth of the comb. Plastic combs and toothbrush should be sealed in a plastic bag and discarded after use.
- Areas around the nit combing area should be vacuumed and the vacuum bag immediately discarded.
- Nit removal is key to controlling head lice because 20 to 80% of nits survive shampooing with pyrethrin or permethrin-based products.

Nits are difficult to remove because they are glued onto the hair. There are several products available that claim to loosen nits. Many products are included in lice treatment kits. Data are not available to substantiate claims of effectiveness of many products.

- RID products include an "egg and nit comb-out gel."
- Clear Lice Elimination System also sells a "natural lice egg remover" in the form of a "vegetable-derived enzyme mousse."
- Vinegar and water mixed in a 1 to 1 ratio is commonly applied to the head and allowed to soak for 30 to 60 minutes.

Although difficult to wash out, alternative treatments using vegetable oil, mayonnaise or petroleum jelly are also reported to make combing nits out easier.

Chemical Control

Pediculicides available in the United States include prescription lindane and malathion and over-the-counter (OTC) pyrethrins and permethrin. Note that lindane is an organochlorine that will accumulate in human tissue, and if misused, may be toxic to the nervous system. Malathion is an organophosphate which must remain on the head for 8-12 hours. The carrier is highly flammable, so care must be taken during application. Caution must be exercised when using prescription products and the label should be followed exactly. The OTC pyrethrins include generic products as well as those listed in Table 1. Many insecticides, including some pediculicides will degrade over time and excess

material should not be stored, but properly discarded after application.

Best Head Lice Treatment Practices

Table 1 lists over-the-counter products available for head louse control. Please read the product labels carefully, and pay careful attention to warnings and disclaimers. Table 2 lists some prescription products available for head louse control.

Prescription only products containing 1% lindane come in topical shampoos, creams, and lotions under the names of Kwell, Kildane, and Scabene. These products have the potential to adversely affect the human central nervous system if used incorrectly. These products do not kill nits effectively and there are worldwide reports of resistance.

Several other products such as Elimite (5% permethrin; Allergan, Irvine, CA) and Eurax (10% crotamiton; Westwood-Squibb Pharmaceuticals, Buffalo, NY) have been listed on some websites as possible treatments for head lice. However, these products are not approved by the FDA at this time for lice control.

Suffocant Treatment as an Alternative

There is little scientific evidence to support the effectiveness of suffocant treatments, so we are not making a recommendation for their use. However, people turn to alternative treatments when they feel conventional treatments do not work, when they have toxicity concerns with conventional treatments, or they cannot afford conventional treatments. Suffocants such as oil, mayonnaise or petroleum jelly have been applied to the hair in an effort to suffocate head lice. In general, suffocants are used by:

- Applying generously to the hair.
- Covering the hair with a shower cap for several hours. Do not use this method of covering the hair overnight, as it is a suffocation hazard to the person being treated.
- Shampooing hair to remove most of the suffocant.
- Removing nits and lice as discussed in Best Inspection Practices and Best Nit Removal Practices.
- Washing hair thoroughly with shampoo to remove remaining suffocant.

Caution: If you are planning to use a treatment containing a pesticide, it is NOT recommended that you use the suffocant method concurrently. Oils can increase the penetration of pesticide product through the skin over prolonged periods of time.

One small study submerged lice in olive oil for one hour (6 lice) and two hours (6 lice). Survival was compared to lice that were not submerged (6 lice). All lice that were not submerged or were submerged for 1 hour survived. Two of the 6 lice submerged for 2 hours died. This is a very small test and the researchers cautioned against extrapolating the data to infestations on humans, but clearly lice can tolerate some suffocants(Spielman 2000).

Frequently Asked Questions

1) What's the difference between pyrethrins and permethrin?

Pyrethrins are naturally occurring compounds extracted from plants. Insects possess mechanisms to quickly break down pyrethrins. Therfore, the synergist piperonyl butoxide is usually added to the formulation to inhibit the insect's ability to break down the pyrethrins.

Permethrin is a synthetic based on the chemical structure of pyrethrins, but is much more effective. Permethrin has much longer residual activity and does not require the use of a synergist.

2) Can lice be transferred from my dog or cat to my children?

No. Head lice are specific to humans. They can only survive on a human host. If a head louse is removed from its host, it will generally die within a day.

3) How big are lice?

An adult head louse is approximately 2.5-3.5 mm (~ 1/8 inch) long. A louse egg, or "nit" is roughly 0.5-1.0 mm (~ 1/32 inch) long.

4) I've heard that head lice are resistant to some of the lice treatments; is this true?

In some locations there have been reports of potential resistance to several different pediculicides (lice killing agents). Experts are currently researching this issue and are trying to determine to what extent resistance exists. The best way to avoid this situation is to follow the directions on the product label closely. Improper application of pediculicides has significantly contributed to the presence of resistance in lice.

5) How long do lice live?

A louse egg hatches about 10 days after being glued to a hair shaft. Upon hatching, a louse will molt three times over a 10-12 day period before molting into a mature adult. An adult louse can live up to 40 days. Therefore, one louse can live about 2 months, however, most do not survive this long.

6) How long after my child contracts lice will I be able to detect them?

It only takes one adult female louse to begin an infestation. A female louse can lay several eggs each day. Within a couple of weeks a child may have dozens of immature lice living on his/her head. The more lice present, the more quickly the child will begin feeling an "itchy" scalp which would usually lead to an inspection by a parent or school official. Looking for one louse or one nit might be difficult but dozens should be readily apparent through close inspection.

References

Frankowski, B. L., L. B. Weiner. 2002. Head Lice. Pediatrics 110: 638-643. (A clinical report by the American Academy of Pediatrics, Committee on School Health and the Committee on Infectious Diseases, issued September 2002.)

Spielman, A. 2000. Head Lice Information. Harvard School of Public Health. http://www.hsph.harvard.edu/headlice.html.

Table 1. Over-the-counter products availble for managing head lice.

Product Name	Manufacturer	**Website** (as of June 2007)
A-200[1, 2] (33% pyrethrins and 4% piperonyl butoxide (PBO))	Hogil Pharmaceutical Corp., Purchase, NY	http://www.hogil.com/a200.htm
HairClean 1-2-3[3] (plant oil)	Quantum Health, Eugene, OR	http://www.quantumhealth.com/hc_content.asp
Nix[4] (1% permethrin)	Pfizer Consumer Health Care Group, New York, NY	http://www.nixlice.com/ca/lice-treatment-products.cfm
Pronto[1, 2] (33% pyrethrins and 4% piperonyl butoxide (PBO))	Del Laboratories, Uniondale, NY	http://www.prontokillslice.com/
RID[1, 2] (33% pyrethrins and 4% piperonyl butoxide (PBO))	Bayer, Morristown, NJ	http://www.ridlice.com/products.shtml

[1]Kit can include comb for nit removal, gloves for washing hair, etc.
[2]Most are shampoos that should be left in the hair for 10 minutes before rinsing. Rinse head over a sink with cool water to minimize product exposure. Rinsing in the shower increases exposure because shampoo is distributed as water runs down body. Hot water increases exposure because it may increase penetration through skin. May require a second treatment 7 to 10 days later because 20 to 30% of nits can survive the initial treatment. Use gloves while washing hair with these products. Remove nits.
[3]Contains Coconut oil, anise oil and ylang ylang oil, isopropyl alcohol. Data cited in Meinking, T. A. 1999. Infestations. Curr. Probl. Dermatol. 11:73-120. These data indicate that HairClean 1-2-3 is as effective as Nix.
[4]Wash hair with non-conditioning shampoo. Work creme rinse into hair and leave on for 10 minutes. Creme rinse residue is supposed to last in hair up to 10 days, thus killing emerging nymphs. Remove nits.

Table 2. Prescription only products for managment of head lice.

Product Name	Manufacturer	Website
Kwell (1% Lindane)	Morton Grove Pharmaceuticals, Inc., Morton Grove, IL	http://www.mgp-online.com/products/productlist.asp
• Apply Kwell to dry hair using disposable gloves. • Leave for four minutes then add warm water to lather. • Rinse immediately, towel dry and remove nits.		
Ovide (0.5% Malathion)	Medicis Pharmaceutical, Phoenix, AZ	http://www.medicis.com/products/index.html
• Apply Ovide lotion to dry hair. • Allow hair to dry naturally. This product contains alcohol and it is flammable. • Shampoo hair after 8 to 12 hours or as directed by physician. • Remove nits.		