

What are Head Lice?

Human head lice (*Pediculus humanus capitus*) have been associated with humans for thousands of years. Head lice are minute (about the size of a sesame seed), wingless parasitic insects that must live on a person to survive. They survive by piercing the skin to feed on blood and are almost exclusively associated with hair on the neck and scalp (Figure 1).

Lice are flattened dorso-ventrally, or top to bottom, and have six jointed legs with specially adapted claws for holding on to hair (Figure 2). They can move about readily from hair to hair, but are most adept at clinging to prevent dislodgement. Head lice tend to adapt their color to their surroundings and may range in color from red to brown, gray, or black. Red colored head lice have likely recently fed. Because of their small size, flattened bodies, and color, they may be very difficult to see on someone's head.

The head louse feeds by using rasping teeth to penetrate scalp skin at the base of a hair or behind the ears. The louse then inserts its "straw-like" mouthparts into a blood vessel and feeds much like a mosquito. Over time, this feeding activity can be irritating to the skin and leads to the itching/scratching characteristic of the infestation. A louse can ingest several blood meals per day.

Figure 1.
Head lice feeding on a human scalp. Lice engorge and enlarge on blood and will become a reddish color when recently fed.

Figure 2.
A close up high-resolution image of an adult male head louse in its natural environment.

Figure 3.
Head lice eggs (nits) on a person's hair. Dandruff, hair casts, globules of hair spray, and scalp conditions such as psoriasis or eczema may easily be mistaken for nits.



Figure 3



Figure 1



Figure 2

Life Cycle of Head Lice

Nits/Eggs:

Head lice begin their lives as eggs, or “nits.” The female adult head louse may lay an average of five eggs per day.⁴ Eggs are attached singly to a hair shaft with a “glue” that is resistant to chemical and mechanical dislodgement (Figure 4). Eggs are normally cemented to the shaft of the hair very close to the scalp. Nits are oval or teardrop-shaped and may range in color from white, yellow, or tan to gray, depending upon age and whether or not the egg has hatched or been killed by head lice treatments. It is thought that eggs attached to hairs greater than one-quarter inch from the scalp have either already hatched, or will not hatch.

Nymphs:

Eggs spend seven to ten days incubating close to the scalp before hatching to release the first nymphal stage (Figure 5). Nymphal stage head lice look very much like a miniature adult louse (Figure 6). The newly hatched nymph will crawl and seek a place to feed immediately. There are three nymphal stages punctuated by molting (the shedding of exoskeleton or “skin”). The three nymphal stages last about 8-12 days.

Adults:

The final molt leads to an adult stage (Figure 6) where body growth stops and sexual maturation occurs. Adult head lice continue to feed on blood every three to six hours. There are separate sexes in head lice, and females must mate and be fertilized in order to produce viable eggs. A mated female can continue to produce eggs for the duration of her life, which is about 30 days. She can lay an average of five eggs daily during this period.

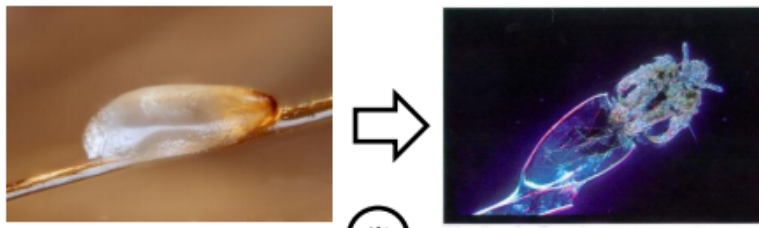


Figure 4

Figure 5

Adult louse
actual Size

Figure 4. Head lice eggs, or nits, are attached singly to hair shafts close to the scalp. They may be confused with dandruff or dried particles of hair spray or gel.

Figure 5. Head lice eggs will hatch into first stage nymphs in 7-10 days.

Figure 6. Head lice progress through three nymphal stages into the sexually mature adult stage. All stages of head lice feed on blood.



Figure 6

Image: Centers for Disease Control/James Gathany

Head Lice Myths and Facts



Definitions	
Infestation = having multiple insects present and reproducing, in this case, on a human head	
Lice = more than one louse	
Louse = small insect that lives on the scalp (singular)	
Nits = eggs, dead or alive, of a louse	
Parasite = an organism that lives off another, i.e. lice surviving on the blood of humans	
Pediculosis = having an infestation of lice	
Myth	Fact
<i>It is easy to get lice.</i>	Lice are spread by head-to-head contact and are much harder to get than a cold, the flu, ear infections, pink eye, strep throat or impetigo.
<i>Avoiding lice is important, as they are dirty and spread disease.</i>	Lice do not spread any known disease, nor are they impacted by hygiene.
<i>Head lice are very sturdy creatures and can survive many days off a human head in furniture, linens, or clothing.</i>	Head lice need a blood meal every few hours in addition to the warmth and humidity of the human scalp to survive. When off the human body, in optimal conditions, they cannot survive for more than 24 to 36 hours.
<i>Nits (lice eggs) can fall off a person's head, hatch, and cause another person to get lice.</i>	Nits are glued to the hair shaft by a cement-like substance and are very hard to remove. When a nymph is hatched, it must quickly have the warmth and food source of a head to survive.
<i>Cutting a person's hair will prevent head lice infestations.</i>	The length of a person's hair does not prevent head lice infestations.
<i>You can get head lice from sitting at a desk next to someone who is infested with head lice.</i>	Head lice are spread through direct head-to-head contact. The lice do not hop, jump, or fly, so sitting near someone with head lice does not increase the risk of getting the lice.
<i>Lice are commonly spread throughout schools.</i>	Transmissions in schools are rare. It is more common to get head lice from family members, overnight guests, and playmates who spend a lot of time together.
<i>Lice are commonly spread through hats, helmets, or headphones.</i>	Although the spreading of lice through hats, helmets, or headphones is possible, it is rare . It is more common for transmission to occur from pillows, hairbrushes, or bedding. Transmission primarily occurs through head-to-head contact.

Myth	Fact
<i>Schools and child-care facilities should screen all children for head lice, so everyone can be treated and the spread of head lice will be prevented.</i>	Having regularly scheduled mass screenings does not reduce the incidence of head lice.
<i>“No-nit” policies reduce the risk of head lice in schools and child-care facilities.</i>	Research shows “no-nit” policies do not decrease the number of cases of head lice. They do increase the risk of incorrect diagnosis of head lice, the number of days children are out of school, and negative social stigma associated with head lice. They also may hinder academic performance.
<i>You can get lice from your dog or other pets.</i>	Head lice are specific to humans. You can get human lice only from other humans. You cannot give your pets lice.

“Lice are spread by head-to-head contact and are much harder to get than a cold, the flu, ear infections, pink eye, strep throat or impetigo.”



Image ©naturalchoiceliceremoval.com

Transmission of Head Lice

Head lice are transmitted by:

- Person-to-person transmission (direct contact) – The majority of transmissions of head lice occur by direct head-to-head contact with an infested person. Most of the time this is a close friend or relative.
- Vector transmission (indirect contact) – This type of transmission may occur through the sharing of bedding, or by using personal items such as combs, brushes, scarves, hair ornaments, or hats of an infested person. Although transmission via indirect contact is possible, it is rare.



Common ways of transmission through head-to-head contact include:

- Slumber parties
- Shared beds
- Sport activities
- Reading circles

Without head-to-head contact, these ways of transmission are highly unlikely:

- School buses
- Hats, helmets, or headphones
- Gym mats
- Sitting at a desk

Anyone can get head lice, but some people are at greater risk than others. Those people include:

- Children between the ages of 3 and 11 years
- Girls are more likely to get head lice than boys, possibly because of their play styles and sharing of personal items.⁵
- People with long or short hair can contract head lice. Although all races can get head lice, studies show that children of African-American descent are less likely to become infested.⁵



Quick Facts

1. Head lice are adept at moving from hair-to-hair because of their specialized “claws.” They **cannot jump, fly, or crawl great distances over hard surfaces.**
2. Head lice **cannot survive long away from a human head.** A nymph or adult louse that falls from its host will perish within a couple days under the most optimal conditions. Louse eggs do not hatch at normal room temperatures; they require the higher temperatures associated with a human body.

Symptoms of Head Lice

Parents, teachers, and other care givers should be aware of the signs and symptoms of a head lice infestation because young children may not be able to express their discomfort directly. The following symptoms should raise the level of suspicion for a head lice infestation:

- Itching (“pruritis”): Caused by an allergic reaction to lice bites. When lice feed, they inject a small amount of saliva into the skin. Over time, the host can develop an immune reaction to the saliva which results in inflammation and itching. It may take four to six weeks for this reaction to occur in people infested for the first time. However, itching may not be present in all cases.
- Sores on the head: Rarely, scratching can lead to abrasions on the skin, allowing bacteria to enter and possibly lead to infection. In severe cases, lymph nodes around the head, neck and underarms can become swollen.
- Tickling sensation: Lice movements in the hair may be felt by some infested individuals.
- Sleeplessness and irritability: Lice are more active at night, possibly disrupting sleep.

Some people with head lice infestations have no symptoms. A lack of symptoms does not mean a lack of head lice. See page 8 for how to screen an asymptomatic person for head lice.



Head lice infestation may sometimes be characterized by the presence of scabs or scars on the scalp from itching. In the above photo, nits are also evident on hair shafts.

Image: Dermnet

Detecting Head Lice

Inspection/Head-Check

Head lice may be brought home after a person has had direct head-to-head contact with someone who has an active head lice infestation. This is most often a close family contact or friend. Lice may spread rapidly to others throughout the home because of the close contact of family members. Whenever one person in the family has been identified to have lice, everyone living in the home should be checked. Any friends, family members, or other people who have had close head-to-head contact with the infested person over the previous week should be notified so they can be checked for head lice as well.

Careful inspection of the hair and scalp is necessary to see if a person has head lice.

Supplies needed for a head lice inspection include:

- **Time** – The person who is inspecting for head lice needs to conduct a careful and thorough search. Times may vary, but this process may take over ten minutes per person.
- **Strong source of natural light, high intensity lamp, or strong flashlight** – Nits reflect ultraviolet light, so natural light (near a window or outside) are the best. If natural light is not available, convenient, or sufficient, a lamp (>60-watt bulb) or strong flashlight (LED recommended) can be used.
- **Magnifying glass (with a light source if possible)(optional)** – Nits are small and may be difficult for some people to see. Newly hatched and adult head lice are also tiny, crawl fast through hair, avoid light, and may be difficult to see in contrast with certain hair colors. A magnifying glass may assist in focusing on a small area and detecting movement. It may also be helpful for people with problems focusing at close distances.
- **Fine-toothed comb (lice comb) or other disposable hair parting tool (optional)** – To examine the base of the hair nearest the scalp, most examiners will need to use a tool to part and lift the hair. If more than one person is being inspected, new tools should be used for each individual. The inspectors should wash hands between checking individuals for general hygiene.
- **Disposable gloves (optional)** – There is no evidence showing that head lice are spread through hand contact; however, some organizations or facilities may mandate barrier precautions for hygienic reasons. If gloves are used, they should be changed between each inspection.
- **Transparent tape (optional)** – If a head lice infestation is suspected and the person conducting the inspection is having difficulty identifying the insect, transparent tape may be used to capture and seal the insect for further identification by someone trained to identify head lice.



Inspection Method

Head lice are best identified by inspecting the hair and scalp for live lice or nits (eggs attached to the hair shaft close to the scalp). The standard for identifying head lice is finding a live louse on the head. Lice and nits are most often found at the nape of the neck and above and behind the ears.

- Carefully part the hair and examine the hair and scalp for nits or crawling lice.
- Begin by inspecting the nape of the neck and the area behind the ears. If nothing is seen in these areas, continue to inspect the rest of the head.
 - Most recently laid nits will be opaque, white, shiny, and located on a hair shaft within one-quarter inch of the scalp. Empty nit cases are more visible and are dull yellow in color.
 - Dandruff, hair casts, globules of hair spray, and scalp conditions such as psoriasis or eczema may easily be mistaken for nits. To differentiate between nits and other debris, remember that hair debris is easily detached or loosened from the hair shaft, and nits are firmly attached to the hair and are not easily removed. Nits are also usually found one-quarter inch or more from the scalp due to hair growth following the initial attachment. By the time the hair has grown sufficiently for the egg case to be one-half inch from the scalp, the egg has either hatched or is non-viable.
 - Nits or lice in the eyelashes or eyebrows indicate possible infestation with other species of lice. Specimens should be submitted to a laboratory for full identification, and the case referred to a private physician or local health department, as a different form of treatment will be required.

Questions about identifying lice or nits should be referred to a health care professional familiar with head lice, such as a school nurse or local health department. Lice may be submitted to a laboratory in a clean/dry container or on a piece of transparent tape. Pieces of hair with possible nits attached may be snipped and submitted to a laboratory in the same manner. In Michigan, identification may be obtained through:

- Local or state health department
- Michigan State University Extension office
- Healthcare provider



Mass screenings are NOT recommended! Schools and child-care facilities should designate an individual or individuals who will be trained to inspect and assess for head lice on a private and confidential basis.



Management and Treatment

Head lice infestations have been occurring for thousands of years, and although numerous efforts have been tried to prevent them from occurring, nothing has proven to be 100 percent successful. However, when they do occur, head lice infestations can be managed. It is important not to panic and/or to cause undue stress for those infested and others around them.

If head lice are suspected, it is recommended the individual be inspected by a school nurse, a public health nurse, or a medical provider.⁶ It is recognized that not all families, schools, or child-care facilities have access to a school nurse, a public health nurse, or medical provider. In those situations, it is recommended that schools and child-care facilities designate an individual or individuals who will be trained to inspect and assess for head lice on a private and confidential basis.

Management activities include treating close contacts with head lice, and the elimination of lice and nits from the living environment and personal items.

Treatment should be considered only if lice or viable eggs are observed. Once a head lice infestation is determined, there are several treatment options to choose from. Methods include:

1. Treatment with pediculicides (substances used to treat lice)
2. Manual removal
3. Alternative or natural methods

Treatment with Pediculicides

Pediculicides are substances or agents used to kill head lice. There are many medicated products available for treatment of head lice, and they normally come in the form of shampoos. Most are available over the counter, but some are by prescription only and may be reimbursable through insurance. **All products must be used strictly in accordance with label directions to ensure effectiveness and prevent adverse reactions from overuse or misuse.** When used properly, their effectiveness has been reported to be 80-95 percent. Repeat treatment with the pediculicide in 7 to 10 days may be needed if indicated on the product label. (See Treatment Failure section, page 11)





Important Things to Know About Pediculicides:

- **Never treat unless there is definite evidence of head lice.**

Pediculicides are to be used for the treatment of head lice only when there are active lice or viable nits present in the hair, or when individuals share the same bed with someone who has live lice or viable nits (AAP, 2010). They should not be used as routine shampoo or conditioner.

- **These products do not prevent someone from getting head lice.**
- No product is 100 percent effective at getting rid of lice and their eggs.
 - Head lice infestations will be resolved more quickly by manually removing or combing nits within one quarter inch of the scalp after treatment. This will prevent eggs not killed during treatment from hatching. Nits further than one quarter inch from the scalp have likely hatched or are not viable.
 - A second treatment may be required as recommended on the product label.
- Non-prescription pediculicidal products generally are effective and safe if used according to the manufacturers' directions. **To ensure proper treatment, follow all recommendations and directions on the label.** All safety precautions listed on the product label should be observed.
- **Pediculicidal products are for external use only, and should only be applied to the scalp. These products are harmful if swallowed or inhaled. If accidental ingestion does occur, contact poison control at (800) 222-1222.**

Treatment Failure

None of the current pediculicides are 100 percent ovicidal (effective at killing nits), and resistance has been reported with pyrethrins and permethrin⁷ products. This is not unusual, as insects can develop resistance to products over time. Resistance will vary from one community to another.

When faced with a persistent case of head lice, consider several possible explanations, including:

- Misdiagnosis (no active infestation or misidentification)
- Noncompliance (not following treatment protocol or directions per manufacturer's label)
- Re-infestation (lice re-acquired after treatment)
- Failure to treat all affected family members or close contacts at the same time
- Resistance of lice to the pediculicide

Many cases of suspected resistance represent either misdiagnosis of old nits as active cases or a re-infestation. Individuals who are chronically infested and have been treated multiple times with pyrethroid shampoos are more likely to have resistant cases.

Although Permethrin 5% lotion has been tried for suspected resistant cases, it is unlikely that an increased concentration or prolonged application time would be effective in cases of true resistance to Permethrin 1%. Studies have shown that resistance to permethrin is not dose-dependent.⁷

Nit Removal after Treatment with a Pediculicide

Because none of the pediculicides are 100 percent ovicidal, manual removal of nits after treatment may be done to reduce worries of another lice infestation or for cosmetic reasons.



SAFETY AND PRECAUTIONS



Pediculicides are substances that kill live lice and can be dangerous if misused or overused.

Do not use pediculicide products if the following conditions are present. In these instances, consult a school nurse or other healthcare professional for safe alternative treatments:

- Known sensitivity to any component of a product (read package insert thoroughly).
- A child younger than the age recommended on the product label. For very young infants and children, lice and nits may need to be removed manually using a lice comb. (see page 15 for nit removal instructions)
- The person has an infestation of the eyebrows or eyelashes. Many lice medications cannot be used near the eyes. This can also be indicative of a pubic or body louse infestation.

The following people should consult their healthcare provider before treating themselves or another person for head lice using a pediculicide:

- Pregnant women and nursing mothers.
- Individuals with cancer.
- Individuals with asthma or other breathing difficulties (some pediculicidal products can cause breathing difficulties or asthmatic episodes in some individuals).
- Individuals who are allergic or sensitive to ragweed or chrysanthemums may have allergic reactions to some of the pediculicides.



Always read the medication/product label before applying medication to the head. If there are questions about contraindications or product safety, contact your healthcare provider.

Manual Removal of Lice and Nits

Manually removing lice and nits may be effective at quickly resolving a head lice infestation. Pediculicide treatment may not be 100 percent ovicidal. For this reason, removing viable eggs may prevent the need for a second treatment. Whether using a pediculicide or manual removal as a stand-alone treatment, the more lice and nits that are combed from the hair, the faster the infestation will be resolved.



To manually remove lice after pediculicide treatment or as a stand-alone treatment:

1. Work in an area with good visibility and light, such as from a lamp or natural sunlight through a window.
2. Make sure a standard comb moves through the hair without difficulty before attempting to use a fine-toothed lice comb. Combing may be easier if the person's hair is slightly wet.
3. Part the hair into sections and hold sections in place with rubber bands or hair clips.
4. Sit behind the person and use a bright light (and magnification if available) to inspect and comb through the hair, one small section at a time. Remove nits using the comb, fingernails, or by cutting the strands of hair.
5. Clean the louse comb frequently to remove any caught lice or eggs using soapy water or paper towel. It may require several hours each night for several nights to successfully remove all nits and lice. An entertaining video may help keep children occupied during this exercise.
6. Combing may be repeated daily until no lice are seen. Continue monitoring for two to three weeks.

Many types of fine-toothed combs may be included within packages of pediculicides, or they may be purchased from most drug stores or internet retailers. The effectiveness depends on their composition (metal or plastic) and construction (length and spacing) of the comb teeth, the texture of the hair to be combed, combing technique, and the time and care expended in the effort.

Electronic combs may be useful for detection (if vision is limited), since they emit a sound when a live louse is present.



Cleaning of Personal Items and Environment

Head lice are spread most commonly by direct head-to-head (hair-to-hair) contact. However, much less frequently they are spread by sharing clothing or belongings. The risk of getting infested by a louse that has fallen onto a carpet or furniture is very small. Head lice survive less than 1-2 days if they fall off a person and cannot feed; nits cannot hatch and usually die within a week if they are not kept near body temperature.⁹ Items that have been in contact with the head of the person with infestation in the 24-48 hours **before treatment** should be considered for cleaning.

Check everyone in the household at the same time



Check everyone in the household at the same time, prior to cleaning the environment. This includes grandparents, younger and older siblings, and parents. Statistics have suggested that 60 percent of people with head lice don't know they have them and have no symptoms. They may be unintentionally infecting others and continuing the cycle.

Launder any personal items that could be infested with head lice



Personal items to be laundered include clothing, bedding, towels, cloth toys, etc. Items should be washed for at least 10 minutes in hot water and/or dried on high heat for at least 30 minutes. For items that cannot be washed, seal in a plastic bag and store for 14 days at room temperature or 24 hours in below freezing temperatures.

Vacuum



Items that should be vacuumed include bare mattresses, carpets, floors, stuffed animals, coat collars, hats, couches, chairs, and car upholstery. There is no need to discard the vacuum bag after cleaning, except for aesthetic purposes. Head lice cannot survive without a blood meal.

Inspect hairbrushes, combs, hair ties, and barrettes



For washable accessories, wash and dry (on high heat) for at least 30 minutes. Soak combs, brushes and barrettes in water hotter than 130°F. If items cannot be exposed to high heat, soak them in Lysol® or rubbing alcohol for one hour.



DO NOT spray or “fog” a home with insecticides or pediculicides. They are not necessary to control head lice and may be harmful if used in a poorly ventilated area. The CDC, the AAP, and the Michigan Department of Community Health strongly discourage the use of these spray products for the control of head lice.

Quick Guide for Managing Head Lice

Management and treatment of head lice includes:

1. Careful inspection and screening of the hair and scalp to identify lice and/or nits correctly.
2. Use of a pediculicidal (head lice) product if live lice or viable nits are found.
3. Cleaning of personal items and the environment.
4. Repeat treatment with the pediculicidal product following the label instructions. If the label does not provide a guide for a second treatment, repeat treatment nine days following the initial treatment.



1. Careful inspection of the hair and scalp to identify lice and/or nits correctly.

Lice are tiny insects (about the size of sesame seeds) ranging in color from red to brown, yellow, tan, gray, white, or black. They attach their eggs (nits) to the hair shaft near the scalp with a glue-like substance. The nits are small, about the size of a knot of thread, and can be white, tan, pale gray, or yellow in color. Nits can be hard to see, so it is important to take your time and separate the hair into thin sections. The nits are most commonly found at the nape of the neck and behind the ears, but can be anywhere, so check the entire head.

A person is infested with head lice if live lice or nits on the hair shaft closer than one quarter inch from the scalp are found.

All individuals living with an infested person, as well as those who have head-to-head contact with the person, should be screened for lice.

2. Use of a pediculicidal (head lice) product if live lice or viable nits are found.

When someone is infested with head lice, he or she should be treated with a medicated hair product that will kill the lice (a pediculicide). Pediculicides are not meant to be used for prevention.

There are many lice treatment products available, which can be found at area drug stores or grocery stores. Most non-prescription pediculicidal products contain permethrin 1% or pyrethrin (such as Nix or RID¹¹). Permethrin 1% is recommended as the first choice of treatment. Once you have selected a product, it is very important that you follow the label directions on the product EXACTLY to treat those who are infested.

Treat only those people with live lice or nits less than one quarter inch from the scalp. The American Academy of Pediatrics recommends treating anyone who shares the same bed with those who are infested.

Prescription pediculicides are also available. For further information on pediculicidal products, contact your local public health department, healthcare provider, clinic, or pharmacy.



Before using the product, review all safety statements on the label. Do not use the product if any of the precautions apply to you or the person being treated. Consult with a healthcare provider for further instructions. Using a head lice treatment product will not prevent you from getting head lice.

Quick Guide for Managing Head Lice (continued)

3. Cleaning of personal items and the environment.

No special cleansers, sprays, or chemicals are needed for cleaning your home.

Soak hair care tools in hot water (130°F) for at least 10 minutes. Heat may damage some plastic combs and brushes. Place these items in a sealed bag for two weeks.

To kill lice and nits, machine-wash all washable clothing and bed linens that have been used by the infested person(s) during the two days before treatment. Use the hot water cycle during the washing process. Dry laundry using high heat for 30 minutes.

Washing clothes to remove lice and nits is only necessary on the day of treatment and does not need to be repeated daily.



Another option is to place the item in a hot dryer for 30 minutes, if the recommended care label approves use of dryers.

Articles that cannot be machine washed, or placed in a hot dryer can be vacuumed, dry cleaned, or stored in a sealed plastic bag for two weeks.

Floors, carpets, upholstered furniture, pillows, and mattresses should be vacuumed to pick up any hairs that may have living lice or nits attached to them.



4. Repeat treatment with the pediculicidal product following the label instructions. If the label does not provide a guide for a second treatment, repeat treatment nine days following the initial treatment if live lice or nits within one quarter inch of the scalp are found.



The use of lice sprays for the house can be dangerous and is not recommended.

