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## Pesticide Resistant Head Lice

The head louse, *Pediculus humanus capitis*, is a tiny insect that causes significant problems. This human ectoparasite (a parasite that lives on the surface of its host) causes scalp itching, sleepless nights, and scratching that can lead to secondary skin infections. But more significant is the amount of stress, school days missed by students, and workdays missed by parents and guardians.



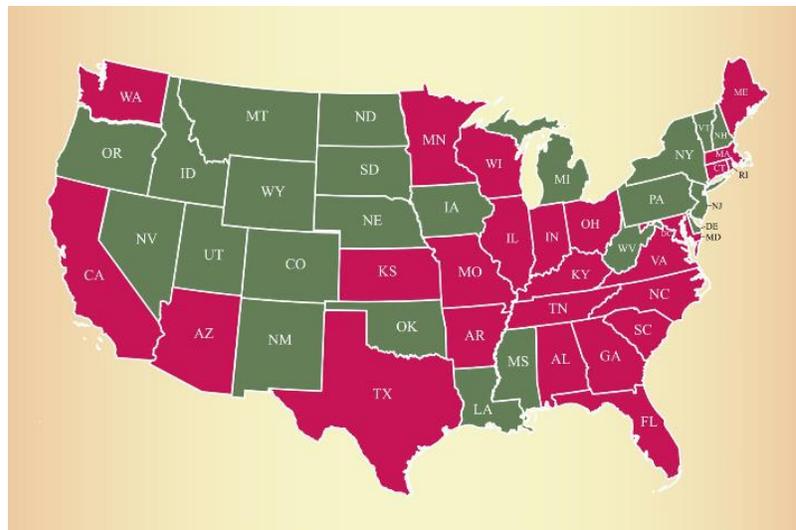
Head louse  
*Pediculus humanus capitis*  
Dani Barchana, Bugwood.org

Pediculosis, or "lousiness", is one of the most prevalent communicable conditions in the United States. Head lice can infest people of all ages, but children are prone to infestations due to their play activity and close physical contact. According to the [Centers for Disease Control and Prevention \(CDC\)](#), "an estimated 6 million to 12 million infestations occur each year in the United States among children 3 to 11 years of age."

**Back-to-school time** seems to be when the number of lice cases peak each year. According to a new paper (Yoon 2015) delivered at the American Chemical Society [Smithsonian.com](#) head lice are now tougher to control than ever.

In 25 states head lice have become highly resistant to the most commonly used lice shampoo treatments, including pyrethrins and the pyrethroid insecticide permethrin. In fact, most states (104 out of 109 samples) tested so far have lice that are resistant to these over-the-counter lice treatment options (Yoon 2015).

**[DON'T PANIC! YOU CAN STILL DITCH THE ITCH!!!](#)** But it's more important than ever to use an integrated pest management (IPM) strategy to battle this "lousy" pest. An IPM strategy would include an



Lice populations in the states colored pink have developed a high level of resistance to some of the most common head lice treatments. (Kyong Yoon, Ph.D.)

ongoing monitoring plan, the use of a comprehensive control approach, and evaluation of results. Using multiple complementary control tactics and paying careful attention to results is critical. Relying on a one-step / one-tactic “fix” has little chance of success.

**Include in your management strategy:**

- 1) **on-going head lice monitoring of family members,**
- 2) **laundering of bedding and clothing,**
- 3) **nit-combing,**
- 4) **dry-hair brushing,**
- 5) **use of hair conditioners,**
- 6) **use of hair-dryers,**
- 7) **prescription treatments.**

Additionally, there are new prescription treatment options, so investigate the pros and cons associated with each. Very effective prescription options include [Ulesfia®](#) (benzyl alcohol), and [Natroba™](#) (spinosad, and benzyl alcohol).

Pros: [Ulesfia®](#) and [Natroba™](#) are highly effective treatment options and can be used to treat head lice on children as young as 6 months old.

Cons: Both products contain benzyl alcohol, and are flammable. You should not use either if you are allergic to benzyl alcohol (relatively few people are). Benzyl alcohol products should not be used on infants younger than 6 months.

In general, most lice treatment products have limited ovicidal (egg-killing) activity, so two treatments are needed. **The second treatment is required to kill lice that hatch after the first treatment has occurred. Typically the second treatment follows 7 - 9 days after the first depending on the product used.** Skipping the second treatment often leads to re-establishment of head lice, and that necessitates an additional two treatments.



**Know Lice = No Lice**

- 1) Know what works
- 2) Know the limitations
- 3) Know how to use it



With September being National Head Lice Prevention Month, we are encouraging parents, teachers, and childcare professionals to be aware of this pest and know how to manage it.

Product names mentioned are registered trademarks. Any products, services, or organizations that are mentioned, shown, or indirectly implied in this publication do not imply endorsement by The University of Arizona.

If you want to read more about the resistant head lice, please view:

<http://www.smithsonianmag.com/science-nature/lice-can-resist-drugs-have-infested-half-states-us-180956308/?no-ist>

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## Manage Head Lice

### Head Lice Facts

Head lice don't have wings or powerful jumping legs, so they move around by clinging to hairs with specially adapted 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 - 6 hours so must remain in close contact with the host. They are unable to survive away from a human host for more than about 48 hours (thus, they cannot live within rugs, carpets, or vehicles). Head lice are not found on animals or household pets, and are not transmitted from pets to humans.



Tarsal claw

Lice eggs are called nits. Nits are oval in shape (1/16 inch long), and camouflaged with the host's own hair pigment. They are usually glued to hairs by female lice on the head near the scalp. Once they have hatched they appear white in color and are far more obvious to the observer. Nits are quite often found on hair around a person's ears and back of the head. Eggs will hatch in 7 - 10 days under normal conditions.



Head louse egg  
From Wikimedia Commons

Both nymphs (immatures) and adults have piercing-sucking mouthparts to pierce the skin for a blood meal. Within 24 hours of hatching, a nymph will take its first blood meal, and periodically thereafter as it develops in a period of 10 - 12 days into an adult (1/8 inch long). Females may live up to 40 days, laying 6 - 7 nits per day, up to a total of 50 - 100 eggs during their lifetime!



Head Lice nymphs and adults

The reaction of individuals to louse bites can vary considerably! Most often people previously unexposed to lice experience little irritation from their first bites. But many individuals become sensitized to the lice saliva that is injected when they feed, and itching is a common reaction to the constant biting. Reactions include reddening of the skin, itching, and overall inflammation. Broken skin due to constant itching leads to further treatment complications so catching infestations early is important.

### Checking for Head Lice

Periodic inspections for early detection of individual lice are far easier than dealing with advanced infestations. In fact, the problem of head lice can be so rampant among preschool and school-aged children that often schools must work in conjunction with many families to control an infestation. **During the early fall months (August to November) children should be inspected weekly by parents.** Inspect for head lice using the following steps:

1. Shampoo hair first.
2. Begin with good lighting for your inspection. A lamp or good natural light from a window

works.

3. Use a hand lens or magnifying glass to help detect nits and lice.
4. Remove tangles with a comb or hairbrush.
5. Divide the hair in sections and fasten the hair that is not being worked on.
6. Look for nits near the scalp. Eggs more than 1/2 inch away from the scalp are nearly always hatched or dead and **do not**, by themselves, indicate an active infestation or a need for treatment.
7. If, however, adults or lots of nits (more than 5 nits occurring in the area of a dime) are found, this is a call to action. Also check everyone in the household, including adults.



Headlice.org

### **Three things everyone should know**

- 1) **In any school classroom 1% head lice incidence is normal**
- 2) **If classrooms report 20 - 40% infestation levels, it is likely that someone is misdiagnosing head lice**
- 3) **No pesticide treatment of a classroom or school bus is necessary or beneficial**

### **Controlling Nits and Adult Lice**

There are four critical steps to controlling head lice infestations:

#### **1) Use an effective head louse treatment.**

**Head lice shampoos** contain insecticides and if they are not used properly they can be hazardous. When using a head louse shampoo, minimize body exposure by confining the insecticide to the head hair. Wash the infested person's hair in a basin or sink so insecticide residues do not reach other parts of the body.

#### **Never apply treatments to children in the bath or shower!**

The person applying the treatment should wear chemical resistant gloves. Never apply an insecticide to anyone who has open cuts, scratches, or inflammations, and never use these materials on infants without consulting a doctor. **In all cases, follow label directions completely and carefully.**

Ulesfia® (benzyl alcohol) is a non-neurotoxic, highly effective lotion used for the topical treatment of head lice infestation in patients 6 months of age and older. Like most treatments Ulesfia® is not ovicidal (does not kill the eggs), so 2 treatments are necessary. This product is a **prescription only treatment with no resistance issues reported, and currently one of the most effective products with minimal side-effects** (the most common side-effect being drying of the scalp). But it is flammable.

Some FDA approved prescription treatments are significantly more hazardous than others e.g., products that contain malathion and lindane as compared to benzyl alcohol based options. Both active ingredients are older pesticide options, and have been relatively ineffective for many

years. **Be informed before you visit your pediatrician, avoid high risk, and poorly performing control options.**

Many over-the-counter products sold in pharmacies and supermarkets contain pyrethrin and permethrin shampoos. As previously discussed there is widespread resistance to these ingredients. If effective, lice should die within 30 minutes of treatment. If you find live lice after 30 minutes, discontinue use of that product. Switch to a different kind of product that does not rely on the same active ingredient.

**Never resort to dangerous practices such as aerosol insecticides, or materials such as kerosene!**

If you want to avoid insecticides entirely, try using soap shampoos that contain coconut or olive oils. Begin with four shampoo applications, each about 3 days apart. Each successive shampooing kills newly-hatched nymphs.

**Hair-drying with a dryer on a warm heat setting, and hair-brushing are very effective ways of killing lice mechanically. Regular over-the-counter hair conditioners also help to kill lice. Lice combs effectively remove nits.**

## **2) Lice removal from the head by combing.**

**Special combs** are needed for nit removal and will be effective only if used diligently each day for up to two weeks. The LiceMeister® comb is a great choice and there are many others.

Taking an integrated pest management approach including the use of multiple management options is critical to controlling head lice because **20 to 30% of lice can still be alive after shampoo treatments** (and survival can be much higher if you are tackling pesticide resistant lice). Note: using a lice comb to remove the nits requires a significant time investment each day, depending on the thickness and curliness of the hair. *Time for a movie or family board game evening.* Remove head lice and nits from the head using the following steps:

1. Have your child sit comfortably under good light.
2. After gently removing tangles and dividing hair into manageable portions, comb hair from scalp to the end of the hair.
3. Dip nit-comb in a container of hot soapy water then slowly pull the comb from the scalp to the ends of the hair, and re-dip the comb in the soapy water to drown lice and remove nits.
4. Look through that same section of hair for remaining nits and lice. Repeat if necessary.
5. Systematically comb through all hair.
6. Clean nit removal comb with hot soapy water. An old tooth brush can help dislodge nits and lice that get caught in the teeth of the comb.
7. Rinse any soap residue from the child's head and finish with lots of hair conditioner.

## **3) Removal of lice and nits from the household environment.**

Once an infestation is detected, all worn clothes should be washed in hot soapy water. Pillowcases, sheets, blankets and other bedding material should also be washed and placed in the clothes dryer until completely dry. The dryer will kill the lice and their eggs. Any non-washable items should be dry cleaned or sealed in a plastic bag and placed in the freezer at 5 degree F or lower for 2 days (this is a good option for headphones and other non-washable items). Vacuuming the home will remove shed hair that has nits attached. Remember if the lice

are off the body for 48 hours they will die, so simply leaving things that cannot be laundered (very large stuffed animals, duvets, furniture, etc.) in a bag or off-limits for 48 hours will do the trick.

**4) Daily head checks and nit removal until the infestation is gone, followed by weekly head checks to detect any reestablishing lice. Continue head checks of the whole family.**

More information regarding head lice management:

Head Lice <http://pediatrics.aappublications.org/content/135/5/e1355.full.pdf>

Head Lice (Sep. 2005) [http://cals.arizona.edu/urbanipm/pest\\_press/index.html](http://cals.arizona.edu/urbanipm/pest_press/index.html)

The National Pediculosis Association,<sup>®</sup> Inc.: <http://www.headlice.org/>

IPM Action Plan for Head Lice <http://www.extension.org/pages/20989/school-ipm-action-plan-for-head-lice#.Uh4-YBYSMY5>

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## Bed Bug Battle – We Want to Hear From You

The University of Arizona and several partnering research institutions are working to battle the bed bug resurgence in the United States. Researchers hope to determine the real impact and social cost of bed bugs, the risks to individuals and society, as well as the significant causes of infestations.

We hope you will complete an online bed bug survey. This voluntary survey should take about ten minutes. The survey is available in English and Spanish. There is no compensation available for your participation. Your answers are anonymous and confidential while you contribute information that will help us battle the pesky parasites.

**Who should take this survey? Everyone!**

English version of Bed Bug survey: <http://www.surveymonkey.com/s/DGLQS52>

Spanish version of Bed Bug survey: <https://es.surveymonkey.com/s/F5NZXJK>

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## Upcoming Webinars and Events

**Attend Free Sessions of the [Green Strides Webinar Series](#). View archived webinars [here](#).**

**Signature Program Initiative - IPM Workshops.** Presented by University of Arizona and sponsored by UA Extension. Office of Pest Management (OPM) CEUs will be granted to licensed pesticide applicators. Dates are as follows:

- October 26, Monday, Pima County Cooperative Extension Office, Tucson, AZ.

- October 29, Thursday, Maricopa County Cooperative Extension Office, Phoenix, AZ.
- November 10, Tuesday, Pinal County Cooperative Extension Office, Casa Grande, AZ.

This workshop is a part of the State Signature Program Initiative Project: Enabling Schools to Practice and Implement Integrated Pest Management - Expansion of IPM in a Child's World. **The purpose of this workshop is to provide information on:** Bed bugs in schools and homes; Head lice; Mosquitoes and related disease threats; Stinging outdoor pests; Pesticide safety; UA School IPM Program; and Turf insects. **This workshop is for:** Facilities managers, Buildings and grounds managers and staff, Food service staff, Nurses, Custodians, Administrators, IPM Coordinators, Residents, Pest Management Professionals, and Master gardeners.

Event details and to register for any of the classes contact Shaku Nair, University of Arizona Cooperative Extension, [nairs@email.arizona.edu](mailto:nairs@email.arizona.edu).

For more information about the EPA Schools program, visit:  
<http://www.epa.gov/schools/>

For more information about the Community IPM, visit:  
<http://www.extension.org/pages/23359/urban-integrated-pest-management-community-page>



For more information about School IPM in Arizona, visit:  
<http://cals.arizona.edu/apmc/westernschoolIPM.html>

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