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## Pediculosis

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## Introduction

Lice are obligate, parasitic insects that have no free-living stage in their life cycle. The three varieties that are parasitic to humans are *Pediculus humanus capitis* (head louse), *Pthirus pubis* (crab louse), and *Pediculus humanus* (body louse). Head lice are the most common lice.[1][2][3]

## Etiology

Body and head lice are 1 mm to 3 mm long, while the pubic louse is much shorter. The head louse is an obligate parasite that spends its entire life on the human host. Head lice feed exclusively on blood. Lice are unable to jump or fly, and transmission requires close contact. Transmission is thought to occur by head-to-head contact, sharing of headgear, or other direct contacts with fomites (inanimate objects that harbor the organism such as movie seats).[4][5]

## Epidemiology

Louse infestations affect hundreds of millions of people worldwide each year. They have been reported in all countries and all levels of society. It is estimated that *pediculus capitis* (head lice) affects 6 to 12 million people in the United States every year, but exact numbers are unknown as it is not a reportable disease. Outbreaks of head lice more commonly affect children 3 to 12 years old, with girls being affected more commonly than boys. In industrialized countries, small epidemics typically develop in schoolchildren whose tight social bonds allow for the rapid spread of the infestation. It is also common for several members of the same household to be affected. Infestations are more common in the warmer months, as well as in areas with higher humidity. Head lice cross all socioeconomic barriers, whereas body lice more commonly affect the homeless and displaced.[6][7]

## Pathophysiology

Patients frequently present with pruritis, typically from an immune-mediated hypersensitivity reaction. It may take 2 to 6 weeks to develop symptoms after the first exposure, while pruritis can develop after 1 or 2 days after re-exposure. The itching induces scratching, which can lead to secondary bacterial infection. This can ultimately lead to complications such as impetigo and pyoderma.[8]

## Histopathology

Histological analysis of the skin or hair is rarely required. However, sometimes a biopsy of the skin will reveal sharp wedges with an infiltrate of lymphocytes, excoriation marks, and intradermal hemorrhage.

## History and Physical

On physical examination, the diagnosis is confirmed by visualization of at least one louse on visual inspection. Use of a bright light, magnifying lens, or fine-toothed comb (lice comb) can aid in diagnosis. Misdiagnosis is common. Finding only nits on examination is not sufficient to confirm a current infestation, as nits can stay on hair for months after successful treatment. Additionally, dandruff, hair spray debris, and dirt particles can be confused with nits as false positives. When lice are found in one member of a family, all other family members in contact should also be examined for evidence of infestation.

Pubic lice are diagnosed by finding lice in the pubic hair and should prompt a screening for other sexually-transmitted diseases. The presence of body lice should be considered in patients with pruritis who live in crowded conditions and/or have evidence of poor hygiene.

## Evaluation

The diagnosis is made clinically in most cases. Sticky tape can be used over the infected area to pick up the adult lice and examine them under a microscope. The nits are oval-shaped and firmly attached to the hair shaft. A Wood lamp examination may reveal greenish-yellow fluorescence of the nits. Sometimes the pubic hair may reveal the presence of lice, and this is an indication for a workup of a sexually transmitted infection.[9][10] Scrapings are often done to rule out a fungal infection when the diagnosis is not clear.

## Treatment / Management

Historically, head lice have been removed by hand, by shaving affected areas, or by physical removal with a lice comb. Wet combing involves moistening the hair and combing the hair root-to-tip with a lice comb. Cure rates vary widely with this method.[11][12][13]

Pharmacologic treatment of lice focuses on two mechanisms: neurotoxicity resulting in paralysis of the louse and suffocation of the louse from topical application. It is important to recognize that available treatments kill lice but do not reliably destroy eggs. Repeat treatment is often required for complete eradication. A second treatment 7 to 10 days after the initial treatment is typically sufficient to eradicate most nonresistant lice.

Multiple topical pediculicides are considered first-line treatments for lice infestation. These include pyrethroids, malathion, lindane, benzyl alcohol, topical ivermectin, and spinosad.

Pyrethroids are one of the most frequently used treatments for lice among topical agents. Permethrin 1% is a synthetic pyrethroid and is widely used as a treatment and is available over-the-counter in the United States. Recent evidence suggests that resistance to permethrin has been increasing. It is retained on the hair after application and has a residual effect for up to 3 weeks, although a retreatment at 1 week is recommended. Although there is evidence of resistance, its generous safety profile with low toxicity makes it a favorable first-line agent.

Malathion 0.5% is an organophosphate cholinesterase inhibitor that causes respiratory paralysis in arthropods. It has a good margin of safety but has an unappealing odor and requires an 8 to 12-hour treatment period.

Lindane 1% is an organochloride that kills lice by respiratory paralysis. It is absorbed into the blood and slowly metabolized and should not be used repeatedly. This agent has a potential for neurotoxicity and has been taken off of the market in California. It may be used as a second-line agent in adults but should be avoided in children, the elderly, or adults weighing less than 50 kg.

Benzyl alcohol 5% solution was approved in 2009 as a topical suffocation treatment that prevents lice from closing their respiratory spiracles. It appears to have an efficacy comparable to pyrethrins.

Spinosad 0.9% is a topical pediculicidal agent that was approved in 2011. It works by provoking hyperexcitation, causing death by paralysis. It was found to have twice the eradication rate of permethrin at 14 days and is effective after a single dose. It may be beneficial for patients not adherent to other therapies.

The only currently used oral treatment for pediculosis is ivermectin. Ivermectin also has a risk of neurotoxicity. It has demonstrated effectiveness in clinical trials but is not FDA-approved for the treatment of pediculosis. It may be an appropriate second-line therapy when the lice are resistant to topical treatments.

Body lice are eradicated through proper hygiene and laundering or application of insecticide to affected clothing. Pubic lice are commonly susceptible to agents used to treat head lice, although they vary in sensitivity.

Because lice can be present on inanimate fomites, heating infested clothing and bedding with hot water is necessary to destroy all stages of lice. The heat necessary for the destruction of lice and nits is 52 degrees Celcius for 30 minutes. Lice have been found to become heat resistant through hormonal mechanisms, sometimes tolerating temperatures over 100 degrees Celcius.

## Differential Diagnosis

- Dandruff
- Seborrhea
- Superficial fungal infection
- Eczema
- Folliculitis
- Scabies
- Impetigo

## Prognosis

The prognosis of louse infestations is generally good. The medications are very effective in eradicating nymphs and mature lice when used appropriately. Treatment failure can be the result of several causes including lack of ovicidal activity, failure to remove live nits, non-compliance-especially with retreatment in 7-10 days, inadequate application of the pediculicide (i.e., duration, amount), failure to treat close contacts, insufficient environmental eradication, and drug resistance to the pediculicide. Some patients may contract a louse-borne infection such as trench fever, typhus, or relapsing/recurrent fever, but these are rare.

## Complications

- Social embarrassment
- Loss of school days
- Loss of skin integrity leading to secondary bacterial infection
- Typhus
- Trench fever
- Relapsing/recurrent fever

## Deterrence and Patient Education

Treatment failure is frequently the result of noncompliance. Patients should be educated about the appropriate methods to apply the medications, including the amount to be used and the duration of treatment. They should also be made aware of the importance of re-treatment in 7-10 days. Additionally, patients and caregivers should be counseled that their infested bedding, clothing, and towels should be washed in hot water and dried on the high heat setting. Parents and children should be instructed to not share headgear such as hats and hair bows. Steps to help prevent body lice re-infestation after eradication include proper body hygiene, clothing changes weekly at a minimum, and proper clothing laundering. Sexual partners of patients with pubic lice should be treated as well.

## Pearls and Other Issues

Head lice infestation can lead to mental strain and distress in patients as popular media portray affected individuals as unclean. Lice have existed for thousands of years, and pediculosis remains a prevalent disease. Treatment failure is common and usually due to inappropriate treatment, lack of compliance, failure to remove live nits, sharing personal care products, failure to treat close contacts, resistance to the drug, and failure to clean up the environment.

## Enhancing Healthcare Team Outcomes

Pediculosis is a major public health problem affecting millions of people and is best managed with an interprofessional team approach. The problem is encountered in many schools, and unfortunately, many children often present late, and the cycle of infestation continues in the home. While lice are managed by clinicians in the emergency department and in primary care, the nurse and pharmacist play a critical role in lice management and prevention outside the hospital, as part of the interprofessional healthcare team. The key is the education of patients and parents who need to know that all individuals in the family need to be examined and treated. Even family members who have no lice but share

personal care products or even share a bed need prophylactic treatment. There is solid evidence that education can lower lice infestation in schools. Education is far more important than having "no nit" school policies. The pharmacist should emphasize the importance of treatment compliance and provide the parents with detailed information about how and when to use the medication. Nurses should perform monitoring and followup on subsequent visits, verify compliance, and answer questions, reporting any concerns that arise to the prescriber. To minimize head lice infestations, the child and parent must be told not to share combs, brushes, hats, or scarves. While shaving of hair is an effective treatment, it is not acceptable today. Further, if pubic lice are found, then both partners need treatment, and they should be investigated for other sexually transmitted infections. Finally, parents should be educated on how to wash clothing, linens, and other garments. All these steps are best enacted by a cohesive interprofessional team approach. [Level 5][9][14] The treatment of lice is very effective with high cure rates, especially when mature lice are identified. However, the current treatment does not kill eggs, and repeat treatment is often required. The frequent use of lice treatment is also known to cause severe itching, which can lead to skin breakdown and secondary bacterial infections. A major problem with lice today is social embarrassment. [Level 3][11][15]

## Continuing Education / Review Questions

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## Figures



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