Lice

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Of more than 200 species of 'sucking lice', only two infest humans: (1) *Pediculus humanus*, which is subdivided into two variants, head lice and body lice (*capitis* and *corporis*, respectively); and (2) *Phthirus pubis*, or pubic "crab" lice.

Lice are wingless, obligate blood-leeching ectoparasites. Lice cause significant cutaneous disease, but also are important medically as the vectors (via the body louse) for several infectious diseases:

- epidemic typhus (*Rickettsia prowazekii*);
- trench fever (*Bartonella quintana*); and
- relapsing fever (*Borrelia recurrentis*).

Head and body lice are morphologically similar, 2-4 mm in length, and grayish-white in color. Pubic lice are 1-2 mm in length (with an even greater transverse dimension) and have a 'crab' like appearance. Of note, head and body lice are capable of traveling at a rate of 23 cm/min, whereas the pubic louse travels at a rate of only 10 cm/day. All species produce oval eggs (nits) that are attached firmly to the base of a hair shaft (head and pubic lice) or to clothing (body louse-nits are viable up to one month and hatch when they encounter warmth of a host when clothes are worn again). Nits are difficult to remove without the use of tweezers or a fine-toothed nit comb. Nymphs emerge from the nits after 7-10 days and must feed within twenty-four hours to survive. After 2-3 weeks and three successive molts, the adult lice mate. Fertilized females may produce 250-300 eggs over the 20-30 days prior to death.

Head lice infest primarily scalp hair, usually in the temporal and occipital areas, and rarely involve facial or pubic hair. Body lice live on clothing (especially in seams), and leave clothing only to obtain a blood meal from the host. Pubic lice most commonly infest the genital area but also can involve the axilla, hair of face, eyelashes, eyebrows, other areas where coarse hair exists such as the legs and torso of men, and occasionally even scalp hair. Up to one third of those with pubic lice may have another sexually transmitted infection.

Lice Patrol. Pine Street Inn nurses Betsy Kendrick and Barbara McInnis found that humor is often the best approach to controlling unwanted infestations. Photo by James O'Connell MD

Prevalence and Distribution

Infestations occur in essentially every area of the world inhabited by humans. Major epidemics have occurred during times of war, overcrowding, or widespread inattention to personal hygiene.

Head lice infest individuals of all social and economic backgrounds. Infestations may reach epidemic proportions, especially among school children. In general, infestations are more common in white people than black people, females than males,

Body Lice. This gentleman seen at the Boston Night Center was infested with many generations of body lice. Body lice live on clothing, especially in the seams, and leave only to feed on the human host. Photo by James O'Connell MD

and children than adults. Of note, hair length is not an important risk factor for infestation.

Body lice infestations occur primarily in settings with low income, poor hygiene, and overcrowded living conditions (as seen with homeless individuals and refugees). Children are rarely infested except in colder climates in which clothing is not changed on a regular basis.

Pubic lice infestations are usually seen in adolescents. Occasionally, small children will have infestations of eyelashes, which, as some sources suggest, should warrant an investigation into the possibility of child sexual abuse. As noted in the introduction, pubic lice infestations often exist concurrently with other sexually transmitted infections.

Mode of Transmission

Head lice are transmitted via close personal (head-to-head) contact and sharing of hats, grooming implements (e.g. combs, brushes), and towels.

Body lice spread via contact with skin, clothing, or bed linens.

Pubic lice are transmitted primarily via sexual or skin contact, or contact with clothing or other fomites. There is a 95% chance of transmission with one sexual exposure.

Symptoms and Diagnosis

Pediculosis is diagnosed by visualizing viable nits, nymphs, or adult lice and is often aided by the use of a hand magnifier or microscope. Nits may simulate the scale of seborrheic dermatitis, hair casts, or artifact (e.g. hair spray), but they are very difficult to remove from the hair shaft.

Nits initially attach to the base of the hair shaft. As the hair grows, the length of infestation can be estimated by the distance of the nit from the base of the hair shaft. The bites of lice are painless, but the injected saliva causes intense itching and irritation. Individuals who are sensitized by previous infestations can develop urticaria and a maculopapular rash.

Severe pruritis or itching is the hallmark of all forms of lice infestation. This usually leads to repeated scratching of the skin, which leaves the skin excoriated and allows secondary bacterial infections. Lymphadenitis and fever may occur with chronic infestation.

Head lice. As noted earlier, head lice are typically confined to the scalp. Severe pruritis leads to excoriation and secondary bacterial infection manifested by weeping and crusting of the scalp, matting of hair, tender occipital and cervical lymphadenopathy, and fever. Alopecia may accompany pyoderma.

Body lice. This type of louse is usually not seen until a person has been heavily infested. Numerous nits are typically found in clothing seams, especially around the crotch, armpits, belt line, and collar. Body lice cause a pruritic dermatitis that primarily involves the trunk or torso and consists of small erythematous macules and papules. As with other types of lice, repeated scratching leads to excoriation of the skin and secondary bacterial infection. Fever, malaise, and fatigue can occur with severe infesta-

tions. Post-inflammatory hyper-pigmentation is common. Left untreated, infestation with body lice may result in multiple hyperpigmented plaques with scaling skin, a condition known in the past as "vagabond's disease".

Pubic lice. Pubic lice are unique among sexually transmitted diseases (STDs) because the diagnosis can be made from physical examination alone. These lice most commonly infect the pubis and usually do not move far from the initial site of contact. However, these lice may infest other places on the body that have short and thick hair, such as the thighs, truck, perianal area, as well as the beard and mustache. Children may rarely have pubic lice on the eyelashes and the periphery of the scalp.

In a study by Meinking and Taplin, sixty percent of homeless individuals with pubic lice had lice in areas in addition to or exclusive of the pubis. Involvement of extragenital areas may complicate the diagnosis of pubic lice. As with head and body lice, marked pruritis causes scratching that leads to excoriation of the skin and secondary bacterial infection. This can lead to pyoderma, lymphadenopathy, and fever. The cutaneous findings of pubic lice are usually less severe than with head and body lice. Characteristic but uncommon, maculae cerulae are asymptomatic transient blue- or slate-colored macules (less than 1 cm in diameter) on the torso, thighs, or upper aspect of the arms (possibly related to hemoglobin degradation products of the host or to anticoagulant secretions from the louse). Eyelash infestation may simulate seborrheic, infectious, or eczematous blepharitis.

Treatment and Complications

The treatment of lice infestation requires the treatment of clothing and other fomites. This includes bed linens, towels, and hair care utensils such as brushes and combs. These objects should be laundered with hot water, dry cleaned, isolated for 1-2 weeks, or treated with pediculocides.

Individuals infested with lice are treated with one of several agents able to destroy the lice:

- permethrin cream rinse, although the ovicidal activity is incomplete;
- lindane (gamma benzene hexachloride) (Kwell™);
- natural pyrethrins with piperonyl butoxide.

Neither lindane nor the natural pyrethrins are ovicidal and therefore require retreatment in 7-10 days in order to kill the hatching nymphs.

Pediculus capitis. Under the microscope this adult head louse resembles a prehistoric creature. Photo courtesy of the National Pediculosis Association

Head Lice

Head lice infestations may be treated with 1% permethrin (a synthetic pyrethroid, e.g. Nix™) cream rinse. The hair should first be washed with shampoo. Then the hair and scalp should be saturated with the permethrin cream rinse. Allow this to sit for 10 minutes before rinsing with water. Such treatment is sufficient in 90% of cases. After treatment, the nits should be removed with a fine-toothed comb. Permethrin cream rinse has been shown to be equally, if not more, effective than lindane in controlled studies and has much lower toxicity. If adult lice are observed after 7-10 days, the treatment should be repeated.

Infestations may also be treated with natural pyrethrins containing piperonyl butoxide (extracts of the plant chrysanthemum, e.g. RID™). RID™ is applied undiluted to the scalp until saturated for a total of ten minutes. Hair is washed with shampoo and towel dried, and nits are removed with a nit comb. A second treatment may be applied in 7-10 days to kill nymphs hatched from eggs that survived the first treatment. Natural pyrethrins have low mammalian toxicity but may cause a reaction in those allergic to chrysanthemums or ragweed. Also, they may contain refined kerosene or petroleum distillates that cause eye irritation. Eyes should be flushed thoroughly with tap water in the case of contact. Synthetic pryethroids have greater pediculocidal activity than the natural agents.

Lindane 1% shampoo (e.g. Kwell™) is the only agent requiring a prescription. After a ten minute application to the scalp, the hair is rinsed and towel dried leaving the hair tangled and difficult to comb. Nevertheless, nits should be removed with a fine-toothed comb. Again, if adult lice are observed within 7-10 days, the treatment may be reapplied. Lindane offers no particular advantage over other agents. The potential for toxicity is frequently mentioned; however, the short exposure time required in the treatment of pediculosis minimizes

Shelter Treatment of Lice. Vye, an aide at Long Island Shelter, prepares to treat a guest infested with lice. The shelter clinics can provide a key public health function in the prevention and treatment of infestations. Photo by James O'Connell MD

the amount of systemic absorption and essentially eliminates this possibility.

Nit removal can be facilitated by dipping the fine-toothed comb in a solution of equal proportions of vinegar and water. After use, all combs and brushes should be soaked in pediculocide or boiled in water for up to one hour.

Household members should be treated at the same time. Clothing, bed linens, towels, and headgear should be machine-washed and dried (hot cycle) or dry-cleaned. Items that cannot be washed can be stored in plastic bags in a warm room (75-85°F/23.8-29.4°C) for two weeks (eggs hatch and nymphs starve). Brushes and combs may be discarded or washed in hot water (130°F/54.4°C) for 10-20 minutes or coated with pediculocide for 15 minutes and then cleaned in hot soapy water. Floors and furniture should be vacuumed to remove any hairs that may have been shed containing viable nits.

Pruritis may persist for weeks. Persistent pruritis may be treated with antihistamines such as hydroxyzine (Atarax™). Use of medium to high potency topical corticosteroids is controversial. Secondary bacterial infections of skin should be treated with antibiotics as indicated. Lindane (Kwell™) has potential neurotoxicity and should not be used in the following situations: immediately following a warm bath; in individuals with extensive dermatitis; in infants and young children; in pregnant or lactating women; or in persons with seizure disorders or other neurologic disorders. Most cases of lindane neurotoxicity have occurred when this medication was applied improperly or used repeatedly.

Resistance to lindane (Kwell™) and permethrin (Elimite™) has been reported. Ivermectin (Stromectol™) 200 ug/kg as a single oral dose can be used for head lice treatment failures (does not affect viability of nits). Ivermectin should not be used with children who weigh less than 15 kg.

Body Lice

The initial treatment of body lice is somewhat controversial. Because most body lice live on clothing, many clinicians do not treat infested individuals with medication, while others choose Elimite cream or Kwell lotion. Either of these can be applied for 8-12 hours, and may eradicate any lice or nits that linger on the body hair. In either case, clothing and bed linens must be discarded or decontaminated by laundering in the hot cycle for 15-30 minutes, dry cleaning, dusting clothing with 1% malathion powder or 10% DDT powder, or by storing clothes for two weeks at 75-85°F.

Pubic Lice

Individuals with pubic lice may be treated with either permethrin (Elimite™, Acticin™, Nix™) or pyrethrin (A200™, RID™). Lindane is no longer recommended for pubic lice. The preparation should be applied to infested and adjacent hairy areas (especially the pubic mons and perianal regions) as well as the thighs, torso, and axillary regions in hairy individuals. Neglecting to treat these areas is a common cause of treatment failures. Infested eyelashes can be treated with petrolatum 2-5 times a day for 8-10 days (followed by removal of nits), 1% yellow oxide of mercury ointment four times a day for two weeks, or 0.25% physostigmine ophthalmic ointment two times a day for three days. Clothing, bed linens, and other fomites should be laundered at a high temperature or dry-cleaned. Sexual contacts should be treated simultaneously. Notably, individuals with HIV/AIDS tend to have more severe infestations and to be unresponsive to conventional treatment.

Prevention and Control

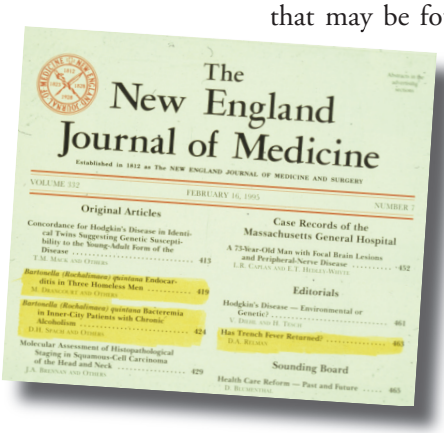
Infestations of head lice may be prevented by addressing overcrowded living conditions, by avoiding the sharing of hats, combs and brushes, and by periodic screening (e.g. of students).

Body lice infestations may be prevented with improved personal hygiene, including the frequent changing of clothes.

Infestations of pubic lice may be prevented if sexual or close body contact with an infested individual is avoided.

Summary

Lice are wingless, obligate, blood-leeching ectoparasites of which only two species infest humans: *Pediculus humanus*, which is subdivided into head lice and body lice, and *Phthirus pubis*, or pubic lice. Lice are transmitted by close personal contact with an infected individual or by the sharing of fomites (e.g. clothing) used by an infested individual. Treatment includes the use of prescription and over the counter medications (head lice and pubic lice) and the cleaning or disposal of fomites (all types). Prevention and control measures include avoidance of sharing of grooming instruments (head lice), improving personal hygiene including regular changing and washing of clothing, avoidance of close personal contact with infected individuals, and regular screening of high-risk individuals.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Bartonella. This 1995 issue of The New England Journal of Medicine had two articles and an editorial about bartonella in homeless persons in Seattle and Paris.

Bartonella: A Complication of Lice

Bartonella is an aerobic, fastidious, gram-negative bacillus that causes a wide range of diseases, including bacillary angiomatosis and trench fever. *Bartonella quintana*, as opposed to the other species of Bartonella, is associated with exposure to body lice, homelessness, and low socioeconomic status. Several recent studies have demonstrated significant numbers of homeless individuals with positive serologic testing for *B. quintana* in this country and in others. One study done in downtown Paris examined homeless individuals with cutaneous parasitic infestations and found that increasing age of the individual and number of years of homelessness were both independently associated with a positive *B. quintana* serology. *B. quintana* causes bacillary angiomatosis, asymptomatic bacteremia, trench fever, and endocarditis. Each will be discussed briefly in this section.

The only known vector of *B. quintana* is the human body louse. It is unclear whether there are additional modes of transmission. There are several reported cases of *B. quintana* endocarditis in which the patient contacted cats or cat fleas but was not homeless and had no contact with lice.

Bacillary Angiomatosis

Prevalence and Distribution

Bacillary angiomatosis (BA) is usually a disease of immunocompromised individuals and is caused by both *B. henselae* and *B. quintana*. BA caused by *B. henselae* is associated with exposure to cats and their fleas and can cause disease of the liver and spleen and involve the lymph nodes. BA due to *B. quintana* is strongly associated with homelessness and the presence of lice and manifests itself more commonly as subcutaneous infection and bony invasion.

Symptoms and Diagnosis

The skin findings of bacillary angiomatosis (also known as epithelioid angiomatosis) are reddish or purple vascular papules or nodules that may be found anywhere on the skin or mucosa. These are often tender, bleed easily, and can range in size from very small lesions, much like cherry angiomas, to much larger pedunculated masses with a scaly collarette that measure several centimeters. Ulcerations may occur in the lesions. Peripheral satellite lesions may be present, as well as invasion and destruction of the underlying bone. The subcutaneous nodules are often tender and range in appearance from well-demarcated nodules to diffuse subcutaneous swellings that may be indurated.

Diagnosis is generally based on tissue histology or by culture.

Treatment and Complications

Several different antibiotics have been effective in treating bacillary angiomatosis. Treatments with macrolides, tetracyclines, or antituberculous agents have been used. A prolonged course of up to 2 months of treatment may be necessary. The skin lesions may not resolve with treatment.

Trench Fever

Trench fever was originally described in soldiers fighting in the trenches in World War I. This febrile illness causes significant morbidity, although it is rarely fatal. The causative agents are *B. henselae* and *B. quintana.*

Prevalence and Distribution

Trench fever has reemerged in the USA, primarily among homeless individuals (*B. quintana*) and among some individuals with tick bites (*B. henselae*).

Symptoms and Diagnosis

The clinical presentation of trench fever is quite variable and may include headache of sudden onset, paroxysmal and often very high fever, weight loss, malaise, severe musculoskeletal discomfort, and aseptic meningitis. Bacteremia may be chronic and accompanied by few clinical findings in homeless patients.

The diagnosis of trench fever is made by finding bacteremia, which can persist for weeks. *B. quintana* and *B. henselae* are slow growing organisms and can require 45 days of incubation.

Treatment and Complications

The most effective treatments are azithromycin (Zithromax™), with dosage of 500 mg per day, or erythromycin (Eryc™, E-mycin™) 2 gms per day. A course of 4 weeks may be necessary for treatment.

Bartonella Endocarditis

Four Bartonella species have been established as causing what had previously been classified as "culture negative" endocarditis. The most frequently isolated species is *B. quintana,* though other species including *B. henselae* have also been found to be causative agents of this serious infection of the heart valves.

Prevalence and Distribution

Homelessness, alcoholism, and contact with body lice are all independently and significantly associated with *B. quintana* endocarditis. These patients are also significantly less likely than other endocarditis patients to have underlying valvular disease. Other species of Bartonella have not shown similar associations.

Symptoms and Diagnosis

Diagnosis is confirmed by blood culture.

Treatment

No clear antibiotic regimen has been demonstrated to be the standard of care in the treatment of Bartonella endocarditis. A 4-6 week course of antibiotics is appropriate for the treatment of uncomplicated *B. quintana* bacteremia. Erythromycin (Eryc™, E-mycin™), azithromycin (Zithromax™), and doxycycline (Vibramycin™) are recommended. Treatment with doxycycline and gentamicin (Garamycin™) has been found to be effective in preventing relapses. Treatment of *B. quintana* endocarditis, in the absence of valve surgery, should continue for 4-6 months, with a bactericidal agent (for example an aminoglycoside or 3rd generation cephalosporin) added during the first 2-3 weeks of treatment.

Prevention and Control

No clear regimen that has been recommended to prevent Bartonellosis. Presumably the most important interventions would be those described in the section on body lice.

Summary

Bartonella causes a variety of illnesses, some of which occur more frequently in the homeless population. The primary vector appears to be the body louse. Several treatment regimens have been used for each of these illnesses, and there is very little at this point that can be reported as standard of care. ■

The authors of this chapter gratefully acknowledge the invaluable contribution of Barry Bock, RN, who authored this chapter in the original Manual.

Lice Medication List

Generic	Brand	Cost
lindane	Kwell	$
permethrin	Elimite, Nix	$$
pyrethrins with piperonyl butoxide	A-200, RID	$
hydroxyzine	Atarax	$
ivermectin	Stromectol	$

Bartonella Medication List

Generic	Brand	Cost
erythromycin	E-Mycin, Eryc	$
azithromycin	Zithromax	$$
doxycycline	Vibramycin	$
gentamicin	Garamycin	$$

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