

Pediculosis Corporis: An Ancient Itch

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Received: November 11, 2006.

Accepted: January 10, 2007.

SUMMARY Lice are obligatory parasites surviving on blood meals obtained from the host, with their mouthparts modified to enable piercing and sucking. The infestation with body lice, also known as pediculosis corporis, is a common worldwide problem that affects people of all races. Body lice are preferentially seen in cold climates, under conditions of poor sanitation and crowding. Pediculosis corporis is not only a disease in itself, but it can also be a source of bacterial infections. The hallmark of pediculosis corporis is pruritus and pyoderma of clothing covered areas. A more general reaction of fever, headaches, a diffuse rash, fatigue, and myalgias may appear a few weeks or months after the beginning of the parasitism. Treatment is comprised of improved hygiene and laundering of all the infested clothing, bedding and linens in hot water. Medical treatment involving pediculicides is required in large-scale infestations.

KEY WORDS: body lice, pediculus, insects, pyoderma

INTRODUCTION

Lice are small, six-legged, wingless, blood sucking insects that are ecto-parasites of mammals (1,2). Lice belong to the phylum Arthropoda, class Insecta, order Phthiraptera, suborder Anoplura, family Pediculidae or family Pthiridae (3,4). They are highly host specific. Two species are recognized as human parasites: *Pthirus pubis* (pubic louse) and *Pediculus humanus*. The latter has two noteworthy varieties: *Pediculus humanus capitis* (head louse) and *Pediculus humanus corporis* (body louse) (3,4). The body louse is the largest (Fig. 1). Pubic lice are the smallest, with prominent claws, and a body width greater than length, conferring them with a crablike appearance (Fig. 2) (1-9). Lice are obligatory parasites, surviving on blood from the host, with their mouthparts adapted for piercing and sucking. Body lice cause dermatitis, pruritus and overall general discomfort. They also serve as vectors of systemic disease (6-10).

EPIDEMIOLOGY

Body lice infestation, also known as pediculosis corporis, is common, worldwide, and affects people of all races (5-10). Body lice are seen preferentially in cold climates and under circumstances of crowding and poor sanitation (9,11,12). Body lice are most often found in homeless, vagrant, indigent populations (10), in jails, in mental institutions (13), and among military personnel in times of war (14). The infestation spreads rapidly *via* contact with skin, clothing, or bed linens of an infected person (5-10). Infestation is unlikely to persist on anyone who frequently showers and has access to freshly laundered clothing and bed linens (4-10). Unlike head lice, body lice are uncommon among affluent members of society (4).

The body louse can be a vector for serious bacterial infections, including relapsing fever caused by *Borrelia recurrentis*; trench fever, bacillary angiomatosis, endocarditis, chronic bacteremia, and



Figure 1. *Pediculus humanus var. corporis*. Photograph by Dr. JL Castner, Department of Entomology and Nematology, University of Florida.

chronic lymphadenopathy caused by *Bartonella quintana*; and epidemic typhus caused by *Rickettsia (R.) prowazekii* (15-25). Although epidemic typhus is no longer prevalent, it still exists in places where cold climate, persistent poverty, and social norms prevent frequent bathing and changing of clothes. Epidemics may arise in times of war, civil turmoil, natural disasters, in refugee camps, and in prisons, where people are crowded together under unsanitary conditions (15-25).

LIFE CYCLE AND ANATOMY

As obligate human parasites, adult body lice cannot survive off their host for more than 10 days (1,8,9,26). The body louse cycle has 3 stages: the egg (also known as the nit), the nymph, and the adult (1,8,9,26).

Nit: Nits are body louse eggs (1,8,9,26). Since the body louse is extremely susceptible to cold, the eggs are usually attached to the inner clothing, closer to the skin (1,4-10,26,27). They can be seen in the seams of clothing, particularly under the armpits, and around the waistline, groin, and collar areas (1,4-10,15,26,27). Louse eggs are held in place by an adhesive produced by the female's accessory gland (1). They are about 0.8 mm long, oval and usually yellow to white (8,9). They are firmly attached to the clothing fibers and may remain viable for up to 1 month (1,4,8,9). If held at a constant temperature (when clothes are not changed), the eggs will hatch 6 to 9 days after being deposited. The incubation time is directly dependent on the temperature, which varies with the proximity of the eggs to the body. Eggs only hatch within a temperature range of 23 °C to 38 °C (1,15). In the body louse's life cycle, eggs are the most resistant stage to variable environmental temperatures (1,15).

Nymph: The egg hatches into an immature louse called a nymph or larva (1,8,9,15). The nymph looks similar to an adult body louse, but is smaller (1,8,9,15). The larva matures into an adult within about 9 days after hatching. Freshly hatched larvae die unless a blood meal is obtained within approximately 24 h (8). The growing larva molts three times after hatching before becoming a mature louse (1,15).

Adult: The adult body louse is 2 to 4 mm long, has a dorso-ventrally flattened body, 6 legs, and is tan to grayish-white in color (1,4-9,15,26,27). The color of the louse cuticle may reflect the skin color of the host (15). The 3 pairs of legs are about equivalent in length and possess delicate hooks at the distal ends that are adapted for feeding and permit the louse to grasp and hold firmly onto hair or clothing (1,6-9,15,26,27). The head is short, constricted, and has 2 segmented antennae (1,8,9). The thorax is compact, and the 7 segment abdomen is long and membranous with lateral plates (Figs. 3 and 4) (1,15). Females lay 6 eggs each day for up to 1 month. The adult female may deposit 150 to 300 eggs during its reproductive life (1,8,9,15).

PHYSIOLOGY

The body louse lives in seams of clothing rather than on the skin. It is found on the skin only transiently when feeding. Since body lice are highly susceptible to cold, they are most often found in the areas of clothing that are in constant con-

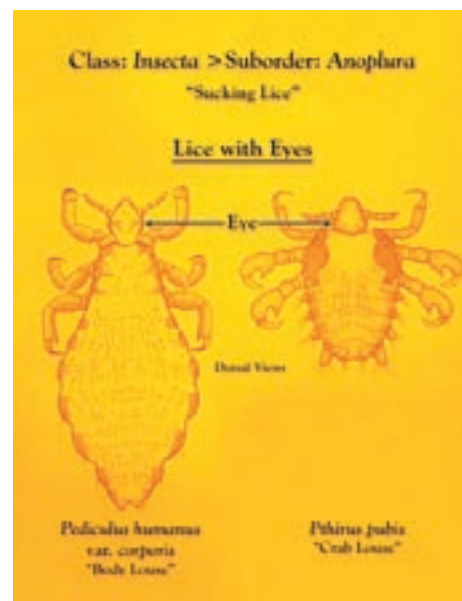


Figure 2. Body louse and crab louse. Courtesy of the CDC.

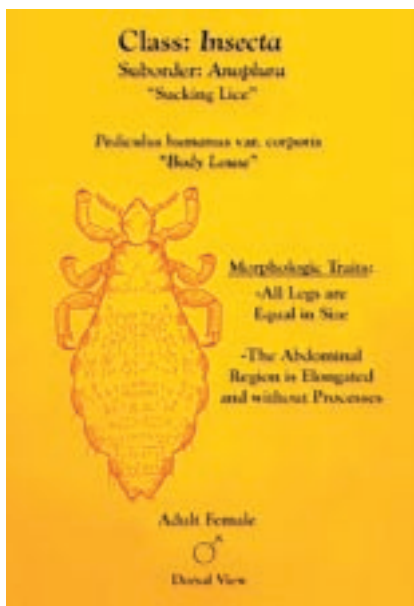


Figure 3. Body louse, female. Courtesy of the CDC.

tact with the body, such as underwear, armpits, belt line, and near the neck and shoulders (1,4-10,15,27).

Body lice feed approximately 5 times a day by piercing the skin with their jaws, injecting irritating saliva, and sucking blood (1-10). Body lice must take small frequent meals since their proboscis has a small diameter that prevents the uptake of large amounts of blood (10). They rapidly digest the blood meal. The gut of the body louse is susceptible to rupture, and the louse may turn red as the gut contents diffuse into the hemo-lymph (1). This phenomenon is most frequently observed when lice are infected by *R. prowazekii*, because the intracellular replication of these bacteria disrupt the gut (15). "Red lice" have been known as a sign of lice that transmit epidemic typhus (15,18,19,24,25).

Louse feces, seen on the skin as small, rust-colored flecks, are dry and powdery, with a water content of only 2% (1). Feces contain a large amount of ammonium, which attracts other lice. The sensory glands in the antennae of lice identify the ammonium. *R. prowazekii* can remain viable in feces for up to 3 months, and louse excrement can serve as a source of epidemic typhus (18,19).

Lice populations vary in size, dynamics, and sex ratio. Theoretically, a pair of mating lice can generate 200 lice during their 1 month life span (15). Evans and Smith (28) have calculated that a population of lice can increase by nearly 11% per day; however, this rate is rarely observed. This

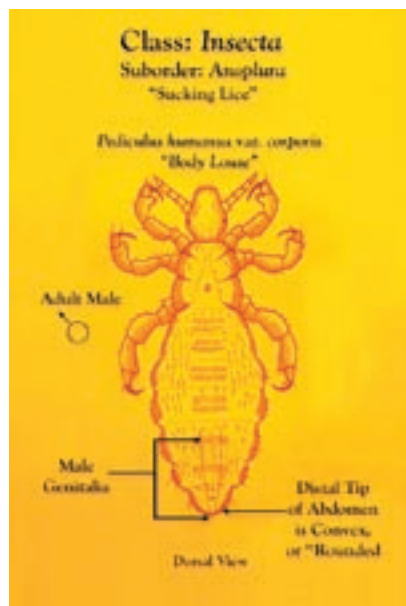


Figure 4. Body louse, male. Courtesy of the CDC.

theoretical estimate emphasizes how rapidly an outbreak of louse infestation could develop (15).

Body lice are susceptible to rapid dehydration; therefore, adequately humid conditions are vitally important to their survival. The optimal humidity for survival is in the range of 70% to 90%. Lice will not survive below 40%. On the other hand, conditions of extremely high humidity cause louse feces to become sticky and can fatally adhere lice to clothing. The only method of rehydration for the louse is to feed on blood (1,15).

Temperature also plays a significant role in the louse's physiology. Nesting in clothing in close contact with the skin allows lice to maintain the required temperature range of 29 °C to 32 °C. If a host becomes too hot due to fever or heavy exercise, infesting lice will leave the body. Body lice die at 50 °C, making this temperature critical when washing clothes, since water or soap alone do not kill lice (1,8,9,15). Temperatures below -17 °C are also lethal to lice within minutes, whereas lice can survive up to 19 h when immersed under water.

Lice can travel at speeds up to 23 cm/min, which explains the relative ease of their transmission (1,8-10,15).

SYMPTOMS

Pruritus, especially at night, is the hallmark of pediculosis corporis. Both adult lice and nymphs feed on human blood, injecting their salivary secretions with biologically active proteins, which include an anticoagulant and an anesthetic, into

the human host, and depositing their fecal matter on the skin (1,5-10,15,29-35). As an individual becomes sensitized to these antigens over a period of 3 to 4 weeks, an allergic reaction is provoked. The primary lesion is an intensely pruritic small red macule or papule with a central hemorrhagic punctum located on the shoulders, trunk, back, axillae and groin areas. Additional findings include excoriations, urticaria, wheals, and eczematous plaques. Secondary impetiginization can also be seen (1,5-10,15,29-35). A more general reaction comprised of fever, headaches, a diffuse rash, fatigue, and myalgias, may appear a few weeks to months after the beginning of the parasitism. Patients can also develop lymphadenopathy and an allergy to the louse feces associated with fever (1,8,9,15).

Chronic infestation with body lice may lead to "Vagabond's skin" or "Morbus errorum", which is manifested as lichenified, scaling, brown bronze hyperpigmented plaques, most commonly found on the trunk (1,8,15). A long-term consequence of infestation with lice can be a syndrome characterized by apathy, lethargy, and fatigue (1,15).

DIAGNOSIS

The diagnosis of louse infestation is suggested by a history and physical examination of the patient, seeking evidence of pruritus, specifically on the trunk (1,5-9,15,29-31,33,34). Maculae ceruleae, the hemosiderin-stained purpuric spots where lice have fed, also suggest a body lice infestation (30,33,34). The diagnosis is confirmed by finding lice and eggs in clothing. The inner belts of underwear, bands of trousers, or skirts, side seams and underarm seams are the best places to look (1,5-9,15,26,27,29,32). Lice and nits can be seen easily under a microscope. Live nits fluoresce white, and can be detected by Wood's light examination. Empty nits fluoresce gray (26). However, many patients might be infested with only a few insects, which can be difficult to locate (1,5-9,15,29,35). People with body lice should also be checked for head and pubic lice (1,5-9,15,26,29,35).

DIFFERENTIAL DIAGNOSIS

The differential diagnosis of pediculosis corporis includes atopic dermatitis, neurodermatitis, allergic contact dermatitis, irritant contact dermatitis, scabies, drug reaction, viral exanthema, impetigo, delusions of parasitosis, acne, folliculitis, transient acantholytic dermatosis (Grover's disease), and xerosis with subsequent excoriations (1,4-9,15,26,27,29-35).

TREATMENT

Since body lice live primarily in clothing, the simplest method for delousing is a complete change of clothing, with destruction or careful washing of infected garments. Therapy consists of improved hygiene and hot water laundering of all infested clothing, bedding and towels (1,4-10,15,26,29,32-36).

A uniform temperature of 65 °C, wet or dry, for 15 to 30 minutes kills all eggs and lice. Alternatively, eggs hatch and nymphs starve to death if clothing is stored for 2 weeks at 24 °C to 30 °C. Other effective measures include boiling and chemical dry cleaning of the infested clothes (1,4-10,15,26,29,32-36). Permethrin 5% cream or 1% lotion applied cream applied for 8 to 12 h can be used to eradicate any eggs and lice that happen to be on body hair.

For those who are unable to launder clothing, dusting the garments while inside out with permethrin 1% powder will eliminate the lice and remains effective for approximately 1 month (1,4-10,15,26,29,32-36).

Insecticides are necessary for large-scale decontamination. According to the protocol proposed by the World Health Organization, permethrin 1% dusting powder is the insecticide of choice. This powder should be applied in a dose of 30 to 50 grams *per* adult (15 to 25 grams *per* child) by a motor driven air compressor with multiple duster heads (15). The treated individuals should remain fully clothed so that the skin and clothing can be treated simultaneously. The method of treatment involves applying dust or powder for a few seconds by blower nozzle into the openings of the clothing of people standing or sitting (15). Treatment should be repeated every 6 weeks. Clothing may be rinsed in cold water; no soap should be used (15).

Recent studies suggest that oral ivermectin, a macrocyclic lactone, is a potential alternative therapy for pediculosis corporis (37,38). In one study conducted in a cohort of 33 homeless men from a shelter in Marseilles, France, three doses of oral ivermectin (12 mg each), administered at 7-day intervals over a 14-day period, reduced the prevalence of infested individuals from 84.9% to 18.5%. Ivermectin treats scabies, head lice, demodicosis, cutaneous larva migrans, cutaneous larva currens, myiasis, and filariasis. Therefore, it may represent a good empirical therapy for the treatment of populations with multiple simultaneous infestations (37,38).

When a louse-borne infectious disease exists, appropriate antibiotic treatment is necessary (16,19,22,24,25,39).

PREVENTION

The only management strategy for lice is complete eradication. In the long term, the control of lice has largely failed. In the short term, it has shown itself to be greatly beneficial, especially in the circumstances when louse-borne diseases are prevalent (1,8,9,15,29,34). In such cases, efforts to control louse infestations even with limited resources can prevent an outbreak. Adhering to standards of good personal hygiene, frequent changing of clothes and treating infected persons effectively will stop lice from spreading to others (1,8,9,15,29,35). However, since the body louse is a symptom of chronic poverty, its eradication will be achieved only when the general level of hygiene of the population rises significantly.

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