

Head lice infestations: A clinical update



Canadian
Paediatric
Society

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Head lice (*Pediculus capitis*) infestations remain a pesky communicable problem, particularly in school-age children in Canada and elsewhere (1). A small, population-based study (2) of primary school children in the United Kingdom published in 2003 noted a prevalence of head lice of 2% and an annual incidence of 37%.

Unlike body lice, head lice are not a health hazard, a sign of uncleanliness or a vector for disease.

This update to the 1996 statement (3) highlights changes in the head lice treatment products available in Canada, reports treatment failures, and reviews recent studies that provide evidence and rationale for management recommendations.

THE AGENT

Head lice are wingless, 2 mm to 4 mm long (adult louse), six legged, blood-sucking insects that live on the scalp of humans but not on pets such as dogs or cats (4). Infested children usually carry fewer than 20 mature head lice (more commonly less than 10), each of which, if untreated, live for three to four weeks (5-7). Head lice stay close to the scalp for food, warmth, shelter and moisture (6,7). The head louse feeds every 3 h to 6 h by sucking blood and simultaneously injecting saliva. After mating, the adult female louse can produce five to six eggs per day for 30 days (8), each in a shell (a nit) that is 'glued' to the hair shaft near the scalp (5,6). The eggs hatch nine to 10 days later into nymphs that molt several times over the next nine to 15 days to become adult head lice (5). The hatched empty eggshells (nits) remain on the hair but are not a source of reinfestation. Nymphs and adult head lice can survive for up to three days away from the human host (8). While eggs can survive away from the host for up to three days, they do not hatch at temperatures lower than that near the scalp (7).

THE INFESTATION

An infestation with lice is called pediculosis. In a normal healthy child, an infestation usually involves less than 10 live lice (7). Infestations may be asymptomatic. Itching may occur if the individual becomes sensitized to antigenic components of louse saliva that is injected as the louse feeds (7). On the first infestation, sensitization may take four to six weeks (7,9). Some individuals can remain asymptomatic

and never itch (7). In neglected cases with heavy infestations, secondary infection of the excoriated scalp may occur. Unlike body lice, head lice are not vectors for other disease agents (7,9).

Transmission of head lice

Head lice are thought to be spread mainly through direct head to head (hair to hair) contact (9,10). Lice do not hop or fly but can crawl at a rapid rate (23 cm/min under natural conditions) (8). There continues to be controversy about the role fomites play in transmission (8). Two studies from Australia suggest that in the home, pillowcases present only a small risk (10), and in the classroom, the floor carpets pose no risk (11). Pets are not vectors for human head lice (4).

DIAGNOSIS

The definitive diagnosis of head lice infestation requires the detection of a living louse (6,9) (Figure 1). A live louse indicates active infestation. The presence of nits only indicates a past infestation that may or may not be currently active.

Because head lice can move quickly, their detection requires expertise and experience. An Israeli study (12) with experienced parasitologists noted that combing with a

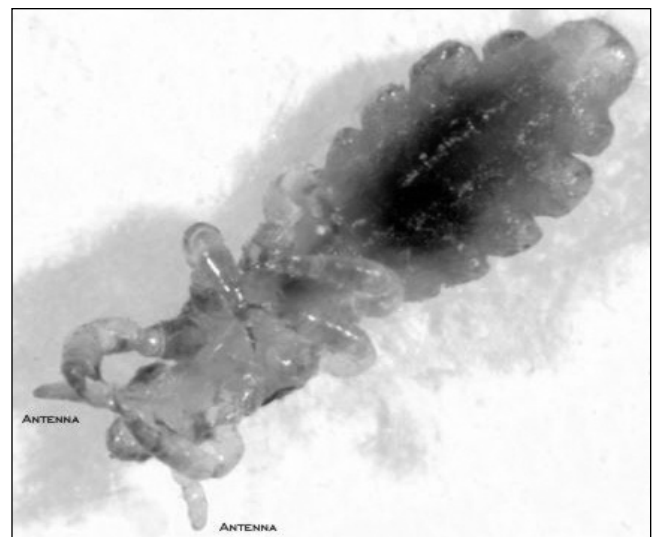


Figure 1 An adult louse measures 2 mm to 4 mm. Reprinted with permission from <www.headlice.org>

fine-toothed louse comb was four times more effective and twice as fast as direct visual examination for the detection of live head lice, and hence, for the diagnosis of head louse infestations. In the study, direct visual examinations alone without combing underestimated active infestations.

Pollack et al (13) found that expertise is key to diagnosis. They documented that health care providers and lay personnel frequently overdiagnosed and misdiagnosed pediculosis (13). Many failed to distinguish active from extinct infestations, particularly if they were relying only on nit detection. School nurses were particularly adept at spotting nits but appeared to lack the expertise, equipment, time and inclination to distinguish active from inactive infestations. Microscopy of a louse and a nit on a hair can be helpful, but, expertise is still needed. A viable nit is more likely to be found close to the scalp (less than 0.6 cm) on the hair (14). On microscopy, a viable nit can be seen as intact and containing a well-hydrated mass or a discernibly developing embryo (13). Without the ability to distinguish potentially viable from nonviable nits, conclusions on the potential for active infestation by nit detection alone are not reliable (13).

Finding nits close to the scalp is, at best, only a modest predictor of possible active infestation. While a study in Georgia (14) found that having five or more nits within 0.6 cm of the scalp was a risk factor for becoming infested with active lice, this occurred in fewer than 32% of such children (14). For children with fewer than five nits close to the scalp, only 7% became actively infested. Hence, having nits close to the scalp does not necessarily indicate that a live lice infestation is or will occur.

TREATMENT

There is some scientific evidence for three basic treatment options for proven head lice infestation: topical insecticides, oral agents and wet combing.

Topical insecticides

Table 1 presents a list of the topical insecticides (pyrethrins, permethrin 1% and lindane) currently available and approved for the treatment of head lice infestations in Canada, their active ingredients, methods of use and areas of concern. None of these approved products are 100% ovicidal; therefore, a second treatment is indicated. Malathion lotion (0.5%), crotamiton lotion (10%) and permethrin 5% are not available in Canada.

Two systematic reviews of head lice treatment with topical insecticides have been published (15,16). Vander Stichele et al (15) concluded that there is only sufficient evidence available on the efficacy of permethrin, and more data are required for the evaluation of the efficacy of malathion and carbaryl. Lindane and pyrethrins were considered to lack sufficient efficacy (15). The more recent Cochrane Review (16) noted that only three studies met the inclusion criteria (two placebo-controlled studies and one comparative clinical field study). On the basis of these three trials, the review concluded that the effectiveness was proven for permethrin, malathion and synergized pyrethrins (ie, pyrethrin with piperonyl butoxide) (16).

For all three topical insecticides, pyrethrin, permethrin and lindane, reapplication seven to 10 days later is recommended to minimize resistance (9). None of these agents are fully ovicidal.

Toxicity of topical insecticides: Both pyrethrins and permethrin have favourable safety profiles with minimal percutaneous absorption (5). In contrast, lindane, which is an organochloride similar to dichlorodiphenyltrichloroethane (DDT), can cause neurotoxicity and anemia in humans following percutaneous absorption (5,17). Topical lindane for head lice is not recommended for use in infants and young children (17), and special care should be taken to ensure that it is not misused.

To minimize body exposure to a topical insecticide following application to the scalp, care should be taken to rinse well using cool water over a sink, rather than rinsing in a shower or a bath.

Resistance to topical insecticides: Resistance has been reported with pyrethrins, permethrin and lindane in a number of countries (Table 1) (5,18). While some resistance to permethrin has been documented in the United States, resistance to other topical agents has not been proven (19). The resistance rates in Canada are unknown because formal studies have not been performed. A number of factors must be assessed before resistance is considered (9,13):

- misdiagnosis and overdiagnosis (diagnosis requires detection of live lice after treatment);
- poor compliance with instructions for proper application of the topical insecticide, lack of secondary application, or reapplication too soon after first application; and
- new infestation acquired after treatment.

Of particular note, itching occurring post-treatment with a topical insecticide does NOT mean that a reinfestation has occurred. Application of an approved topical insecticide to the scalp can cause rash, itching and mild burning (5). The diagnosis of a reinfestation requires the detection of live lice. If the post-treatment itching is bothersome, topical steroids and/or antihistamines may help provide relief (9).

Oral agents

Data to support the use of oral agents for the treatment of head lice are limited.

Although trimethoprim-sulfamethoxazole has been used in a randomized trial (20) to treat head lice, both alone and in combination with topical permethrin, concerns have been raised about the diagnostic criteria used in the trial and the potential for promoting bacterial resistance and further reducing the value of this drug in other settings if this practice becomes wide spread (19). There are no published large trials. This is not an approved use of trimethoprim-sulfamethoxazole in Canada.

There are limited reports regarding the oral (and topical) use of ivermectin for the treatment of head lice (5), but no large trials. This drug is not available in Canada.

TABLE 1
Topical insecticides for treatment of head lice infestations

	Trade name	Active ingredient	Method of use in brief	Areas of concern
Pyrethrins				
- resistance documented in Czech Republic, Argentina, France, Israel and United Kingdom (5)	- R&C Shampoo/Conditioner [†]	- pyrethrin plus piperonyl butoxide - made from natural extracts from chrysanthemums - neurotoxic to lice but very low toxicity to humans	- apply to dry hair that does not have conditioner, gels, creams, etc, on it - soak with minimum of 25 mL - let sit 10 min - add small amount of water to form lather and work into hair - rinse well with cool water over a sink, rather than in a shower or bath, to minimize body exposure - repeat treatment 7 to 10 days later	- true allergic reactions are rare - possible allergic reactions if allergic to ragweed - may cause itching or mild burning sensation of scalp*
Permethrin				
- resistance documented in Czech Republic, Argentina, France, Israel, United Kingdom and United States (5,18)	- Kwellada-P - Creme Rinse [†] - Nix Creme Rinse [‡]	- 1% permethrin (synthetic pyrethroid) - neurotoxic to lice, very low human toxicity	- after washing hair with conditioner-free shampoo, rinse, towel dry - apply enough permethrin creme to saturate hair and scalp - leave on for 10 min - rinse well with cool water over a sink, rather than in a shower or bath, to minimize body exposure - towel dry - repeat in 7 days*	- does not cause allergic reactions - may cause itching or mild burning sensation of scalp*
Lindane				
- resistance documented in England, Netherlands and Panama (5,19)	- Hexit Shampoo [§] - PMS-Lindane Shampoo [¶]	- 1% lindane (gamma benzene hexachloride) - an organochloride with properties similar to DDT - very neurotoxic to lice but also to humans	- apply to dry hair that does not have conditioner, gels, creams, etc, on it - apply this shampoo over a sink, not in the shower or bath, to minimize body exposure - apply minimum amount to thoroughly wet hair and scalp - rub shampoo into hair and scalp, allow to remain in place for 4 min, use just enough water to form a good lather - rinse thoroughly with cool water and dry with a clean towel	- possible neurotoxicity, including seizures - possible anemia - contraindicated if there is a history of seizures - occasional irritation of scalp* - not recommended for infants

*Itching and burning sensation of the scalp, which occurs following treatment, does not necessarily indicate reinfestation and need for retreatment. If bothersome, topical steroids and antihistamines may be helpful (9); [†]GlaxoSmithKline Consumer Healthcare, Canada; [‡]Insight Pharmaceuticals, Canada; [§]Odan Laboratories Ltd, Canada; [¶]Pharmascience Inc, Canada (according to the Compendium of Pharmaceuticals and Specialties 2000. Ottawa: Canadian Pharmacists Association, 2000). DDT Dichlorodiphenyltrichloroethane

Wet combing

There is little evidence in support of wet combing as a primary treatment for head lice (21,22). In a randomized trial of 4037 school children in Wales (21), mechanical removal of lice through combing of wet hair with a fine-toothed comb every three to four days for two weeks was compared with two applications of topical 0.5% malathion lotion seven days apart (21). Wet combing resulted in a cure (no

detection of live lice after two weeks) in 38%, while the malathion treatment resulted in a cure in 78% (21). In another study, the addition of wet combing to the topical 1% permethrin treatment protocol did not improve the efficacy of permethrin treatment alone when assessed at days 2, 8, 9 and 15 (combing 72.7%, no combing 78.3%) (22). While vinegar has been suggested as a home remedy to aid wet combing, there are no studies showing benefit.

Alternative therapies

A number of household products, such as mayonnaise, petroleum jelly, olive oil, tub margarine and thick hair gel, have been suggested as treatment for head lice. Application of a thick coating of such agents to the hair and scalp left on overnight will theoretically occlude lice spiracles and decrease respiration (5). However, these products show little killing of lice and are less effective than topical insecticides (7). There are no published trials on the safety or efficacy of these home remedies.

Other products such as gasoline or kerosene are flammable and toxic, and are not recommended.

While a number of 'natural' agents, such as tea tree oil and aromatherapy, have been used for the treatment of head lice, efficacy and toxicity data are not available for these agents (6,7). One small study in Israel (23) noted that a natural product, which contained coconut oil, anise oil and ylang ylang oil, applied to hair three times at five-day intervals, was as successful as the control pediculicide.

Animal lice products are not recommended for human use.

SCHOOL AND DAYCARE HEAD LICE AND NIT POLICIES

As noted above, head lice infestations are common among young schoolchildren (1); head lice infestations, while irksome, are not a vector for spread of serious disease (9); nit misdiagnoses are common (13); the detection of nits close to the scalp is not associated with a high probability of live lice being present (over 75% are not) (14); and infestations may be asymptomatic for weeks (9). Therefore, school exclusion due to the detection of the presence of 'nits' does not have sound medical rationale.

For similar reasons, even the detection of active head lice should not lead to the exclusion of the affected child from school. Treatment should be recommended and close head-to-head contact should be discouraged pending treatment.

The American Academy of Pediatrics also discourages 'no nit' school policies (9).

Families of children in the classroom where a case of active head lice has been detected should be alerted that an active infestation has been noted, and informed about the diagnosis, misdiagnosis and management of head lice, and the lack of risk for serious disease.

Although data on the prevalence of head lice in daycare centre attendees are not available, head lice exclusion policies are not warranted for schools or daycare centres because there is no sound medical justification.

ROLE OF ENVIRONMENTAL DECONTAMINATION

Data on whether disinfection of personal, school or household items decreases the likelihood of reinfestation are lacking (10,11). As noted, head lice do not live long away from the scalp and nits are unlikely to hatch at room temperature (7,8). Hence, excessive cleaning is not warranted. At most, the cleaning of items in prolonged or intimate contact with the head (eg, hats, pillowcases, brushes and combs) may be

warranted. Washing the item in hot water (66°C), drying it in a hot dryer for 15 min or storing it in an occlusive plastic bag for two weeks can kill lice and nits (7,10).

ROLE OF HEALTH CARE PROVIDERS

Health care providers need to be well-informed about head lice diagnosis and management to help dispel the myths about head lice and the stigma of infestations. Given the prevalence of infestations, the notoriety and high anxiety levels that a diagnosis of head lice in schoolchildren can generate in parents and/or teachers, health care providers need to ensure that head lice myths are dispelled and that accurate information is provided. Parents and teachers need to be informed that head lice infestations are common, may be asymptomatic, are not a sign of uncleanliness, and are not a vector for serious medical diseases. As well, information on optimizing diagnosis and minimizing misdiagnosis, and appropriate management strategies if a case is diagnosed, need to be provided.

SUMMARY

- Head lice infestations are common in schoolchildren but are not associated with serious disease and are not a sign of uncleanliness.
- Head lice infestations can be asymptomatic for weeks.
- Misdiagnosis of head lice infestations is common. The diagnosis requires detection of live head lice. Detection of nits alone does not indicate active infestation.
- Treatment with an approved, properly applied topical head lice insecticide (two applications seven days apart) is recommended when a case of active infestation is detected. Contacts of cases where head-to-head touching may have occurred merit examination to detect active infestation and, if present, treatment.
- Scalp itchiness can occur following application of a topical insecticide and does not indicate that resistance to treatment or a reinfestation has occurred. Diagnosis of an active reinfestation requires detection of live lice.
- Topical insecticides, especially lindane, can be toxic, particularly if misused. Care should be taken to avoid unnecessary exposure and, when indicated, to minimize skin contact beyond the scalp.
- 'No nit' school exclusion policies lack a rational medical basis and are not recommended.
- Excessive household or school cleaning is not warranted following the detection of a case of head lice because neither head lice nor nits survive for an extended period away from the scalp.
- While resistance to topical agents has been noted in other countries, this does not appear to be as large a problem in North America.

A parent handout titled "Head lice" is available on our Web site. Visit www.caringforkids.cps.ca for a printable version.

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Principal author: Dr Noni MacDonald, *University of Oxford, Oxford, United Kingdom*

The recommendations in this statement do not indicate an exclusive course of treatment or procedure to be followed. Variations, taking into account individual circumstances, may be appropriate.