

An incurable itch

Head lice

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Abstract

Question Head lice infestations continue to be seen frequently in many communities. Some of these children require multiple treatments before eradication. What are the current treatment recommendations for head lice?

Answer Head lice (*Pediculus humanus capitis*) infestations are common, particularly among school-aged children. In order to minimize louse resistance, insecticide usage, and social stigmatization, diagnosis and treatment should be limited to those with live lice on the scalp. Options for management are predominantly topical therapies or physical removal. Large studies comparing the efficacy of these treatments are lacking. Treatment should be repeated in approximately 7 days if topical insecticides are used or every 2 to 3 days for 2 weeks if wet combing is used. Lice resistance patterns vary widely geographically, and resistance is now the most common cause of treatment failure.

Pediculosis (infestation with head lice, *Pediculus humanus capitis*) is the most common parasitic infection in children.¹ The highest prevalence is in children between 3 and 11 years old and in girls, with no relevant seasonal variation nor relation to level of hygiene.²

The diagnosis of pediculosis requires the presence of live lice on the scalp, not only the presence of nits (hatched empty eggshells).³ Detection by combing was found to be 3.8 times more effective than visual inspection for live lice.⁴ The human head louse (*Pediculus humanus capitis*) is a parasite with 6 legs that cannot fly or jump; thus, lice are transmitted by head-to-head contact. As obligate human blood feeders, lice do not survive away from a human host for more than 3 days.¹ The role and extent of fomite transmission (eg, hats, hair accessories, bedding) remains controversial.²

An adult louse deposits eggs close to the scalp and the eggs hatch within 6 to 9 days. Within 9 to 15 days these nymphs mature to adults and begin laying eggs.² The life span of a louse is generally 3 to 4 weeks and it can lay 50 to 150 eggs in this time frame.⁵

The characteristic itch that is classic of head lice infestations is caused by irritation from saliva injected by the feeding louse. This might take 2 to 6 weeks to develop with the first infestation, and subsequent infestations might take hours for symptoms to start.⁶

Treatment

Treatment of head lice includes physical methods, topical pediculicides, and oral agents. Choice of treatment is determined by age, louse resistance patterns particular to the local area, and potential toxicity.⁶

Physical methods. Wet combing, otherwise known as “bug busting,”³ is a commonly used method for eradication of head lice infestation. It involves using combs with teeth less than 0.3 mm apart⁷ with the hair wet with water, conditioner, or oils (eg, petroleum jelly, olive oil, mayonnaise).^{6,7} The perceived benefit of the wet hair is that it slows the lice down in order to comb them out,⁸ and lubricants theoretically occlude the louse’s respiratory system.⁸ However, these methods do not kill lice and appropriate disposal of the removed lice is essential to prevent spread or reinfection. Wet combing is time-consuming, as each episode of combing is continued until all lice are removed, which might take up to 30 minutes.¹ This needs to be undertaken approximately every 2 to 3 days for at least 2 weeks.^{1,5}

Topical pediculicides. Topical pediculicides require 2 applications 7 to 10 days apart,^{6,8} as no pediculicide is completely ovicidal and in order to reduce the development of resistance.⁹ The topical treatments that are available in Canada are pyrethrins (extracted from chrysanthemums), pyrethroids (synthetic derivatives of pyrethrins), and lindane, all of which have a neurotoxic mode of action.^{8,9}

Pyrethrins and pyrethroids (eg, 1% permethrin) are the most common over-the-counter pediculicides.⁶ These agents quickly immobilize and kill lice. Permethrin also has residual effects because it adheres

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to the hair shaft as long as conditioner or silicone-based shampoos are not used.⁶

When released, pyrethrin and pyrethroid treatments were 88% to 99% successful in eradicating infestations; however, after their widespread use, studies in the past 10 years demonstrated efficacy of only 10% to 75%.⁵ The marked reduction in effectiveness reflects the development of resistance in *Pediculus humanus capitis*, which is documented worldwide and which has grown rapidly with susceptibility patterns varying substantially even between schools.¹⁰ A study of a known recessive resistance allele in the human head louse population throughout Canada revealed the resistant allele had a frequency of 97%.¹¹ In vivo resistance patterns in Canada have not been studied.⁹

Treatment failure, the presence of live lice after 2 pediculicide applications, is now considered more likely a result of resistance than a lack of compliance with treatment. More important, the ongoing presence of nits or itch is not a sign of treatment failure.³ The misdiagnosis and overtreatment of head lice has promoted resistance to available treatments and exposed children to insecticides unnecessarily.³

The common side effect of topical treatments is local irritation with scalp burning and itching. Those allergic to ragweed, chrysanthemums, or related plants should avoid pyrethrins, as they might develop dyspnea and wheeze.⁶ Use of synthetic pyrethroids (eg, permethrin) does not result in this adverse reaction profile.

Lindane is an insecticide that is recommended by the Canadian Paediatric Society as a second-line treatment in the management of head lice. The side effects of neurotoxicity and anemia due to absorption through human skin are rare but serious.^{9,12} There are several reports of deaths and neurologic side effects as a result of lindane toxicity,^{13,14} even if used as directed.¹⁴ Lindane is not recommended for children younger than 10 years old, those weighing less than 50 kg, or those with seizures or HIV.^{9,13} Fifty-seven countries have banned lindane for all uses and many other countries have severely restricted uses for lindane.

There is limited evidence to support the efficacy of topical pediculicides over non-insecticide-based treatments such as wet combing. Wet combing was half as successful as a topical pediculicide (malathion lotion) in a study of 74 school students in the United Kingdom (cure rate of 38% and 78%, respectively; $P = .006$).¹⁵ However, when children who had received treatment with a topical pediculicide in the previous 4 weeks were excluded there was no significant difference in the effectiveness of the 2 treatments ($n = 42$, $P = .16$).¹⁵ The generalizability of the results of all studies comparing treatments are limited by the resistance patterns in the populations of interest. As parents are often concerned about the use of insecticides on their children,

wet combing remains a commonly used, less-expensive method and a viable option in infants when pediculicides are contraindicated.

Oral anthelmintics and antibiotics. With increasing resistance to topical therapies, there has been increased interest in oral anthelmintic treatments. Ivermectin (400 µg/kg as a single dose and repeated in 7 days) is an anthelmintic agent resulting in 95% of patients being lice-free on day 15, as compared with 85% of those receiving 0.5% malathion topically ($n = 812$, absolute difference 10.2 percentage points; 95% CI 4.6 to 15.7). This study did not exclude patients who had previously tried topical pediculicides, which potentially enhanced the perceived treatment effect with ivermectin.¹⁶

Although ivermectin is a potent neurotoxin for the louse, it can also cross the blood-brain barrier and cause potential neurotoxicity in children whose body weight is less than 15 kg, as well as in pregnant and breastfeeding women.⁶ In Canada, ivermectin is available off label through the medication special access scheme.⁹

Trimethoprim-sulfamethoxazole is a treatment that has been hypothesized to treat head lice infestations either as a sole agent or in combination with topical pediculicides. However, current evidence for efficacy is inconclusive, with the limited studies to date having contrasting results or methodologic flaws.^{9,17} Treatment of head lice infestations with trimethoprim-sulfamethoxazole remains controversial.^{9,17}

Conclusion

Pediculosis remains a common problem for children, particularly those of school age. There is extensive and variable resistance to topical pediculicides in the *Pediculus humanus capitis* population worldwide. Over-the-counter topical pediculicides are still common treatments; however, they are less effective now than when first introduced. Treatment should be repeated in approximately 7 days if using topical insecticides or oral therapies, or every 2 to 3 days for 2 weeks if using wet combing, in order to eliminate the lice that have hatched since the previous treatment. 🌿

Competing interests

None declared

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