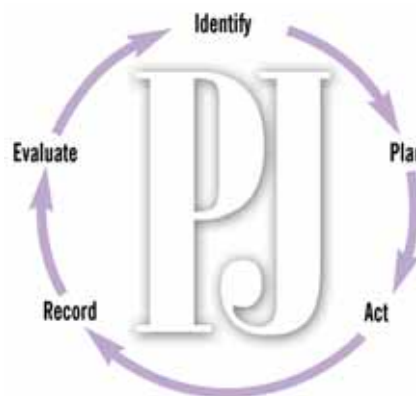


Head lice treatments and advice

The prevalence of head lice is said to have increased since the early 1990s and resistance to insecticides has made treatment more challenging. With children returning to school after the summer holiday, pharmacists are soon likely to be asked for advice from parents about head lice infestation. **Christine Clark** looks at the current treatments that can be recommended



Identify knowledge gaps

1. What are the three treatment options for head lice infestation?
2. Which formulations are not recommended for treating head lice?
3. What type of comb is recommended?

Before reading on, think about how this article may help you to do your job better. The Royal Pharmaceutical Society's areas of competence for pharmacists are listed in "Plan and record", (available at: www.rpsgb.org/education). This article relates to "common disease states" (see appendix 4 of "Plan and record").

Head lice can affect people of any age but children between the ages of four and 11 years are the most frequently infested. Surveys in UK schools have found between 4 and 22 per cent of children are affected. Girls are more commonly affected than boys (this may be because girls often huddle together when playing) and children living in urban areas are more frequently infested than those living in rural areas.

Although a common reaction to head lice is revulsion, it is worth remembering that a head lice infestation is a minor irritation — it rarely causes physical problems and head lice are not known to be vectors for infectious diseases. Children who are found to have head lice do not need to be kept away from school — by the time the infestation is diagnosed it will have been present for several weeks. If left untreated, however, the numbers of lice increase and can cause severe itching and scratching, which can then lead to a secondary bacterial infection, such as impetigo.

The severity of infestation can vary but, in typical cases, about 10 lice can be found on a head. In addition, allergy to louse faeces can result in a rash on the back of the neck and behind the ears.

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Life cycle

The louse is an external parasite of warm-blooded animals (ie, birds or mammals), spending its entire life cycle on them. Head lice (*Pediculus humanus capitis*) live on human scalps. They cling to hairs close to the head, typically behind the ears or on the nape of the neck. They are rarely found in other hairy areas, such as eyebrows or eyelashes.

Mature lice are about 3mm long and can be beige, brown or blackish, often blending in with the surrounding hair. Fertilised females can lay between five and 10 eggs each day. These oval, yellowish-white eggs are glued singly to hair shafts. After about seven days, the egg hatches, leaving an empty egg case or "nit" stuck to the hair.

Young lice (nymphs) are white and smaller than adults. Over the next six to 10 days, nymphs moult three times and grow into mature lice (see Figure on p186).

Head lice feed four to five times a day, piercing the skin and sucking blood from the host's scalp.

Transmission

Head to head contact is thought to be the most common mode of transmission because

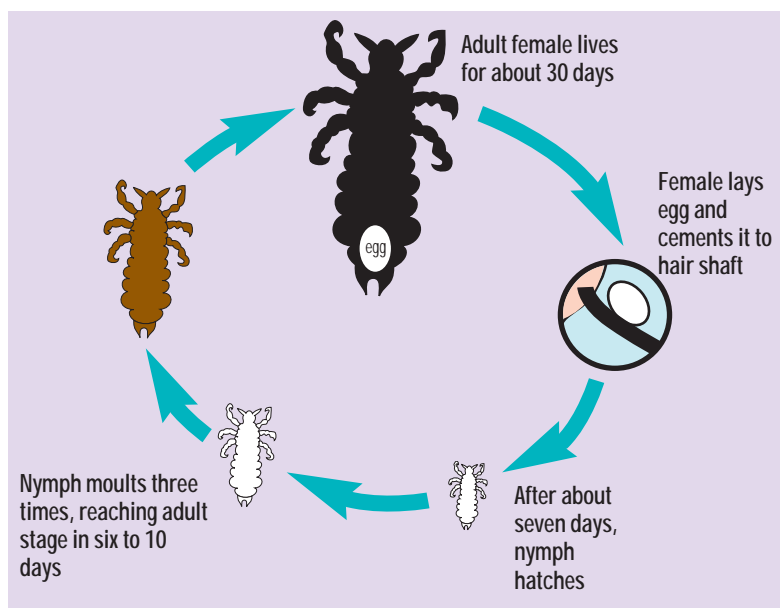


Figure: Head louse life cycle

head lice cannot fly, jump or swim. Moreover, they cannot survive away from the host for more than 12 hours and are unlikely to be passed from person to person through shared combs, brushes, towels, clothing or bedding.

The main risk factors for infestation with head lice (pediculosis) are being of primary school age or having a young child in the family. Having unwashed hair or long hair is not a risk factor and neither is low social class.

Diagnosis

Itching of the scalp is a common presenting symptom of infestation but it is possible to have head lice without itching. The onset of itching can be anything from one week to three months after infestation. It is caused by a delayed hypersensitivity reaction to louse saliva. Puncture marks can sometimes be found on the scalp and black louse faeces seen on collars and pillows.

The presence of eggs stuck to hairs close to the scalp should raise the suspicion of infestation but these can sometimes be confused with dandruff, hair muffs (hair follicle secretions that are wrapped around the hair shaft) or hairspray, and a firm diagnosis can only be made when live, moving lice are found. If infestation is suspected, detection combing should be performed. This is a more reliable way to check for the presence of lice than simple visual inspection.

Detection combing is best done on wet hair and involves systematically combing the hair from the scalp to the ends, by sections, using a fine-toothed detection comb with a tooth spacing of less than 0.3mm. Head lice have strong claws and cannot be dislodged from the hair shaft by normal brushing or combing.

After each stroke, the detection comb should be inspected and wiped on a white cloth or tissue. As well as lice, combing can also remove moulted louse skins and dislodge nits. Removal of skins and nits alone does not prove that there is an active louse infestation.

Detection combing can be painful in children with frizzy hair so it may be better for a wider-toothed comb and plenty of conditioner to be used.

If live lice are found, it is essential to trace adult and child contacts. Members of the same household (and ideally all other close contacts) with live lice should be treated at the same time.

Treatment

There are three treatment options: insecticides, dimeticone and wet-combing. Benzyl benzoate is licensed for the treatment of head lice but is less effective than other agents. To prevent resistance and avoid unnecessary exposure, treatment with an agent should only be started if live lice are found.

Insecticides The insecticides currently licensed for the treatment of head lice are phenothrin, permethrin, malathion and carbaryl. All except carbaryl can be supplied without a prescription.

The organophosphate malathion binds to and inhibits acetylcholinesterase, causing paralysis and death of the louse. The pyrethroids (phenothrin and permethrin) bind to sodium channels of peripheral nerves resulting in repetitive firing of louse synapses and, therefore, paralysis and death.

In order to use any of the insecticide products effectively, application must be thorough (from hair root to tip). The quantity usually required is 50–100ml per application (50ml can be sufficient for short hair). The contact time should be eight to 12 hours and this can be conveniently achieved by applying the product in the evening and leaving it on overnight.

According to the Clinical Knowledge Summaries, there is insufficient evidence to rank the insecticides by effectiveness because there are few comparative studies. The prevalence of resistance can also influence efficacy. Some formulations, however, can generally be recommended over others. It has often been assumed that alcohol-based formulations are more effective than aqueous formulations but there is no evidence to support this. Alcohol-based products can cause irritation of eczematous skin and the vapour can precipitate bouts of asthma. Moreover, they must be applied in well-ventilated areas away from naked flames, cigarettes and hairdryers. According to the Clinical Knowledge Summaries, in view of these considerations, aqueous products should be the first choice. In addition, the British National Formulary states shampoos, cream rinses and mousses are not recommended because the contact time is likely to be too short for an effective insecticidal action. There is also concern that shampoos may become too dilute during use to be effective. As permethrin is only available as a cream rinse to treat head lice, it is not recommended.

All the recommended insecticides kill adult lice but do not reliably kill ova. To kill any newly hatched nymphs, a second applica-

In the absence of information, resistance can be assumed to be most likely against pyrethroids, intermediate against malathion and least likely against carbaryl

tion of the chosen insecticide, after seven days, should be recommended.

It is important to check that a treatment has been effective by detection combing four days afterwards. If no lice or nymphs are found, detection combing should be repeated eight to 10 days after treatment. The detection of live adult lice on either of these occasions indicates treatment failure or reinfestation. The detection of nymphs suggests that viable eggs have survived treatment. Common reasons include:

- Use of too little insecticide
- Insufficient contact time
- Not performing second application after seven days
- Failure to trace and treat close contacts
- Using conditioner before applying insecticide (treatments must be applied to dry hair)

In cases of further detection after a course of treatment, pharmacists should, therefore, ask how the treatment was carried out. It is clear that, to minimise treatment failure, pharmacists should take time to make sure people understand the treatment procedure.

In the case of suspected resistance, a different insecticide or an alternative treatment (see below) can be recommended. A particular insecticide should not be used more than once a week for three consecutive weeks. In general, if two applications with phenothrin fails, a non-pyrethroid parasitocidal product should be used for the next course and vice versa.

A small study conducted in Wales in 2006 found 83 per cent of head lice carried a pyrethroid resistance gene but no evidence of resistance to organophosphates. However, in the absence of definitive information for a geographical area, resistance can be assumed to be most likely to pyrethroids, intermediate to malathion and least likely to carbaryl.

The policy of rotating insecticides on a district-wide basis is now considered outmoded but local policies are in operation in some areas.

Insecticides should not be used for prophylaxis.

Safety concerns Carbaryl has the same mechanism of action as malathion. It became a prescription-only medicine after reports of carcinogenicity on long-term exposure in rodents. The risk to humans is believed to be minimal but carbaryl is generally reserved for use against lice that have become resistant to other agents. It should not be used on broken skin, or where there is a secondary infection. Carbaryl can cause skin irritation.

The possibility of systemic toxicity from topical application of malathion has been raised but there is as yet no evidence that it is hazardous. Like carbaryl, malathion can cause skin irritation. It should not be used on broken or a secondarily infected skin.

Dimeticone Parental concerns about the use of insecticides have fuelled the search for

Panel 1: Wet-combing method

- Hair should be washed as usual, with ordinary shampoo. Immersion inhibits the movement of head lice.
- The shampoo should be rinsed out and plenty of conditioner applied. This lubricates the hair and facilitates combing.
- The hair should be combed through with a normal comb to get rid of tangles, which makes it easier subsequently to glide the detection comb through the hair.
- When the hair is untangled, the detection comb can be used, slotting the teeth of the comb into the hair at the roots, so that the comb touches the scalp (this traps adult lice and nymphs which live close to the scalp) and drawing the comb through to the tips of the hair.
- The detection comb should be checked for lice after each stroke. If any lice are seen, the comb should be cleaned (by wiping or rinsing) before the next stroke to prevent trapped head lice from reinfesting the scalp.
- Combing should be performed systematically, working around the head to minimise the risk of missing any head lice during the procedure.
- After all the hair has been thoroughly combed through, the conditioner can be rinsed out.
- While the hair is still wet, the ordinary comb should be used once more to get rid of tangles and then the detection comb used again to check for any lice which might have been missed the first time.
- Wet-combing should be continued for at least two weeks (repeat on days 5, 9, and 13 to remove nymphs hatching from eggs laid before wet combing was started) and until no lice have been seen for three consecutive sessions.

Panel 2: Further advice

- Hair grows by about 1cm per month, so the distance between the scalp and closest egg cases gives an indication of the length of infestation.
- Head lice are not transmitted by pets.
- Shaving the head is not an effective treatment option because lice can cling to as little as 1mm of hair.
- None of the treatments for head lice is 100 per cent effective after a single application: all depend on careful and correct use.
- Regardless of the treatment strategy adopted, more than one treatment session will be needed.
- Itching can persist after infestation has been cleared.
- For troublesome itching, a sedating antihistamine may be recommended.
- People with long, thick hair will need more lotion or solution than those with short or thin hair.
- Nits (egg cases) are not removed by head louse treatments. A nit comb can be used (see p188).
- There is no need to wash or fumigate clothing or bedding.
- If head lice are prevalent in a school or play group, weekly wet detection combing is advisable.

alternative approaches to treatment. The mode of action of dimeticone is not fully understood but it is thought that it covers lice and disrupts their ability to manage their water balance. Consequently, treated insects fail to excrete surplus water and die. Dimeticone lotion should be applied to dry hair (from roots to tips) and the scalp. It should be left on for eight hours and then rinsed off. Like insecticides, dimeticone is not ovicidal, so a second application after seven days is recommended. Detection combing should be repeated after treatment to check for treatment failure or reinfestation.

Dimeticone is extensively used in toiletries and cosmetics and has a good safety profile. There is little or no absorption of dimeticone through the skin. Adverse effects (irritation of the eyes and itching of the scalp) appear to be rare. Because of its physical action, dimeticone

is effective against lice that have become resistant to insecticides.

Wet-combing Wet-combing (also called “bug-busting”) can break the life cycle of head lice and eradicate infestation if it is done meticulously. The aim is to physically remove lice and nymphs. The recommended method is described in Panel 1 (p187). It is worth noting that it takes an experienced professional 30 minutes to wet-comb a whole head.

Combs Experts suggest that the effectiveness of lice combs depends of the spacing and shape of the teeth of the comb. The Department of Health does not specify what combs should be made of (ie, steel versus plastic), only that they are fine enough to catch lice. The Bug Buster kit that is available on prescription contains four plastic combs: a wide-toothed detangling comb, two detection combs and a nit comb. The detection combs have bevel-edged teeth and are designed to be easy to use at the correct angle, close to the scalp to trap both nymphs and adult lice.

Metal combs are not suitable for wet-combing. They have round teeth, which are finely spaced. This means that lice are pushed to the base of the teeth (where they are difficult to see) and can get combed back into the hair. However, metal combs can be useful for removing nits, which can be unsightly.

Electric combs are available for detecting and removing lice from dry hair. These combs make a continuous buzzing sound, which stops when a louse is trapped between their teeth. The manufacturers claim that trapped lice are killed by a small electric charge. However, there is only anecdotal evidence of the success or failure of electric combs. In addition, the manufacturers warn against use of these combs by people with epilepsy or a pacemaker.

Treatment choice All treatments require more than one treatment session and treatment choice will depend on personal preference and treatment history. For example, some parents do not want to expose their children to insecticides. Others, particularly those with large families, may find wet-combing too time consuming. Recent trials report cure rates of 70–80 per cent, 70 per cent and 50–60 per cent, for insecticides, dimeticone and wet-combing, respectively. If a person wishes to use an insecticide and has not already used one, malathion or phenothrin are generally recommended first-line.

However, some groups require special consideration:

Pregnant women Pregnant women with head lice should be advised to use dimeticone or to wet-comb. In the past, malathion products were recommended on the basis that malathion is poorly absorbed and rapidly eliminated but the availability of dimeticone makes this approach redundant.

People with asthma or eczema Dimeticone or wet-combing should be the preferred meth-



Community Hygiene Concern

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Action: practice points

Reading is only one way to undertake CPD and the Society will expect to see various approaches in a pharmacist's CPD portfolio.

1. Find out if there is a local policy for preferred treatments so that you are in a position to reinforce advice given by other members of the health care team. Information should be available from primary care organisation pharmaceutical advisers.
2. Make sure your staff are able to offer a choice of treatments (ie, insecticide, dimeticone and wet-combing) and to explain the pros and cons of each.
3. Write down five questions you would ask to ensure that a treatment has been used correctly.

Evaluate

For your work to be presented as CPD, you need to evaluate your reading and any other activities. Answer the following questions:

What have you learnt?
How has it added value to your practice? (Have you applied this learning or had any feedback?) What will you do now and how will this be achieved?

ods of treatment for people with eczema or asthma. Insecticides are more often associated with skin irritation than is dimeticone. Alcohol-based products should be avoided.

Infants Infants under six months of age may be referred to their GPs because none of the available agents should be used in children in this age group without medical supervision.

Future and alternative treatments A new product, containing isopropyl myristate and cyclomethicone (Full Marks Solution), claims to be effective when used in two 10-minute applications. However, there are no published trial data to support this.

One study has described the successful use of a “dry-on, suffocation-based pediculicide” (DSP).¹ The DSP lotion is applied to hair and then blown dry with a hair drier, to form an adherent film. This “shrink-wrapped” film layer completely covers the louse, plugging its breathing holes and causing death by suffocation. This approach might be an avenue for future product development.

Numerous herbal treatments, including tea tree oil, quassia and delphinine, are marketed for removing lice but there is little evidence to support their use. One small study of a product containing coconut, aniseed, and ylang ylang oils (Chich-Chack), similar to Lyclear SprayAway, suggests that a natural remedy may be as effective as insecticides.² However, there were methodological weaknesses in the study.

Another approach that has been tried is the use of dry, warm (but not hot) air to dry out both adult lice and eggs.³

There is no evidence for the effectiveness of herbal products as head lice repellents.

Conclusion

Effective treatment of pediculosis requires an understanding of the mechanisms of action of the treatments available and of the life-cycle of the head louse. Community pharmacists are in an important position to reinforce any local policies and to educate people about effective treatment. Panel 2 (p187) lists further advice pharmacists can give.

References

1. Pearlman DL. A simple treatment for head lice: dry-on, suffocation-based pediculicide. *Pediatrics* 2004;114:e275–9.
2. Mumcuoglu KY, Miller J, Zamir C, Zentner G, Helbin V, Ingber A. The in vivo pediculicidal efficacy of a natural remedy. *Israel Medical Association Journal* 2002;4(10):790–
3. Goates BM, Atkin JS, Wilding KG, Birch KG, Cottam MR, Bush SE, Clayton DH. An effective nonchemical treatment for head lice: a lot of hot air. *Pediatrics* 2006;118 1962–70.

Resources

- Clinical knowledge summary of head lice. Available at www.cks.library.nhs.uk (accessed on 9 July 2007).
- The Community Hygiene Concern website (www.chc.org) contains useful information for parents.
- A Department of Health leaflet on the prevention and treatment of head lice is available (e-mail dh@prolog.uk.com).