

UKMi

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HEAD LICE

Questions & Answers
for Healthcare
Professionals

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Introduction

This bulletin is laid out in a 'question and answer' format under three main headings: Disease background, diagnosis and treatment. The information provided in the bulletin is intended for use by healthcare professionals in Wales. Further information on head lice and treatment options prepared specifically for members of the public is available on the NHS Choices website.

Information in this bulletin is issued on the understanding that it is the best available from the resources at our disposal at the date of compilation. Manufacturers may alter the formulation of a product from time to time. Further information on any given product may be obtained from your Medicines Information Centre or the manufacturer.

Management summary

1. Wet combing (for 2 weeks) **or** dimeticone
2. Dimeticone (if not already used)
3. Other non-traditional (physical) insecticide **or** malathion

In pregnancy/breastfeeding mothers:

Try wet combing or dimeticone 4% before proceeding to aqueous malathion, if necessary.

In young children (infants aged 6 months to 2 years):

Try wet combing or dimeticone 4% before proceeding to aqueous malathion, if necessary.

In people with asthma or eczema:

Try wet combing or dimeticone 4% before proceeding to aqueous malathion, if necessary.

Refer people with scalp inflammation to their GP.

Disease background

1. How are head lice transmitted?

There is no evidence that lice can spread in any way other than via head to head contact.¹ Being unable to fly or jump, they crawl from one host to another.^{1,2} Human lice are not found on pets and therefore cannot be transmitted by them.¹ After a few hours away from a host, lice tend to become dehydrated and unable to feed.^{1,2} They will normally die within 24 hours of leaving a host (many within 12 hours).³

Sharing combs, hats or pillows is very unlikely to transmit head lice. However, lice that have been caught in brushes or combs could be returned to the head if brushing/combing is continued.⁴ These lice are unlikely to be viable if there is some time between combings.

2. Who is likely to become infested?

Infestation could be present in anyone who has had close head to head contact with a person carrying live head lice. Head lice are particularly common in children of primary school age,^{1,5} and are more common in girls than boys.¹

3. How many lice does a person with head lice carry?

A high proportion of children with lice may be infested for several months despite parents' attempts to treat by various means.⁶ Usually, around a dozen lice can be found on each affected head.¹ However, up to 5% of people presenting to their doctor with head lice may be carrying over 100 lice.⁷ Untreated infestation can last for long periods⁴ and could lead to skin infection (from scratching) and rashes behind the ears and at the back of the neck (due to hypersensitivity to louse faeces).⁴

4. What is the life cycle of the head louse?

Head lice can live for as long as four weeks.⁵ Female lice lay most of their eggs at the beginning of their adult life and after a few days the number of eggs slowly reduces.³ Each louse lays between 1 and 6 eggs each day, attaching them to hairs with a glue-like substance at a point close to the scalp.^{1,5} The eggs hatch in 7-10 days and the nymphs that hatch out become adult within 10 days.⁴ Adult lice are about the size of sesame seeds.^{1,4}

Diagnosis

5. What are the symptoms of head lice?

Many cases of head lice are symptomless, but some people experience scalp irritation.² When a person is infested for the first time, the level of sensitisation to louse saliva is generally low for several weeks.⁵ Following sensitisation, itching develops.⁵ Secondary infection might occur if bites are scratched or become infected by the bacteria on lice or in the faeces of the lice.⁸

6. How is infestation with head lice diagnosed?

Head lice can be diagnosed if a living louse is found on the head.⁵ Adult lice are visible and are black, brown or grey-white crawling insects, which will cling to hair.⁴ Lice should not be confused with dandruff, hair spray, scabs, dirt, eggs (nits), epidermal cells attached to hairs or other insects.⁹ No treatment should be carried out unless a live louse is found.⁹

7. How can head lice be detected?

Use a fine-toothed (0.2-0.3mm apart¹⁰) detection comb to detect lice.^{1,11} This is twice as fast¹ and over three times more effective than visual inspection alone.¹² Wetting the hair is not essential, but might be useful for very thick hair and to prevent the build up of static electricity, which can help transmission of lice by ejecting them from the surface of combs as they are pulled out from the hairs.¹³ If wet detection combing is being carried out, the hair should be shampooed as normal and conditioner applied to facilitate the combing.⁴

Comb the whole head of hair first with a normal comb to remove any knots or tangles, and then comb through thoroughly with a detection comb at least twice. Start each stroke near the crown and draw the comb down firmly. Check the comb for lice after each stroke.¹

8. What do head lice and their eggs look like?

Head lice are up to 3mm long and wingless.^{4,14} Their colour varies, but they are often grey-white, brown or black.⁴ Lice tend to blend with hair colour, but can be a mixture of light and dark.³ They have six legs, each with a claw, which is used to grip the hair.⁴ The eggs of head lice are oval-shaped. They are translucent when newly laid, and white after hatching, at which stage they are known as nits.¹ Eggs containing dead, unhatched nymphs take on a dark brown colour as the contents dehydrate.³

9. Should I avoid the term infestation when speaking to patients?

Although it would be scientifically more correct to refer to 'infestation' rather than 'infection' with head lice, many members of the public will be less alarmed to hear the term 'infection'. Using the term 'infection' places head lice in the same context as colds and influenza and should help to eliminate any feelings of guilt. After all, there is no shame attached to catching a cold.

Treatment

10. Who should be treated?

Anyone found to have living lice should be treated.¹¹ Encouragement to use a detection comb, and to treat if live lice are found, should be given to anyone who has had close contact in the last month with someone with head lice.

Please refer to pages 17-20 for information on treating young children, people with asthma/sensitive skin, pregnant women and women who are breastfeeding

11. Which head lice treatments are available in the UK?

Mechanical methods

Wetting the hair and combing it with a fine-toothed head louse comb is effective if undertaken appropriately. Detailed instructions on wet combing are provided in **question 14**. The hair should be shampooed and combed first with a wide toothed comb. It might be easier to wet the hair and coat it with conditioner before combing.¹⁵ Vegetable oils can be used as alternatives to conditioner.¹⁶ To be effective, wet combing the hair must be undertaken twice weekly for a fortnight and will need to be continued for longer if live lice are present.¹¹ Finding no lice at three consecutive sessions indicates that the treatment has been successful.⁴

Physical insecticides

Various insecticides that act by physical means are now available in the UK.^{4,16} All the physically acting products listed in the table below are available over-the-counter, i.e. to buy without a prescription in community pharmacies, and some can also be prescribed (see table). All have shown efficacy in clinical trials.^{4,17-22} Under the 'Choose Pharmacy' scheme (previously known as the Common Ailments Service) in Wales, dimeticone 4% is the first-line treatment in patients of Afro-Caribbean origin and the second-line treatment (after wet combing) in all other patients.²³

Physical insecticides include:

Product Name	Active Ingredients	Medical Device (Y/N)	Prescribable (Y/N)
Hedrin® 4% lotion	Dimeticone 4%	N	Y
Hedrin Once® liquid gel	Dimeticone 4%	Y	N
NYDA®	Dimeticone 92%	Y	Y
Full Marks Solution®	Isopropyl myristate/ cyclomethicone	Y	Y
Hedrin Treat & Go®	Octane-1,2-diol	Y	N

Resistance has not been documented, and is unlikely to be a problem with products such as dimeticone and isopropyl myristate/cyclomethicone that have a physical mechanism of action.²⁴

Traditional insecticides

Malathion is available over-the-counter and on prescription as an aqueous solution. Malathion is the recommended traditional insecticide treatment in Wales, as there is evidence of resistance to the pyrethroids.²⁵ The British National Formulary (BNF) notes that resistance to malathion has also been reported.¹⁶

In general, shampoo insecticide preparations are diluted too much and have an insufficient contact time to kill eggs so are not recommended for the treatment of head lice. A treatment contact time of 8-12 hours/overnight is recommended.¹⁶ Currently there is no suitable preparation of permethrin available in the UK for head lice as the only available preparation is a shampoo.¹⁶

Herbal/occlusive agents

Among the substances that have been used to eradicate head lice are occlusive agents like petroleum jelly and mayonnaise²⁶ and herbal products, such as tea tree oil, eucalyptus oil and neem oil.^{26,27} There is evidence to support the use of eucalyptus oil,²⁸ but for most of these products, data on toxicity and efficacy from randomised clinical trials is lacking.⁴

12. How effective are the head lice treatments available in the UK?

Mechanical methods

Few studies have been carried out in this area, but there is limited clinical evidence to support 'bug busting' (wet combing using a special, fine-toothed comb with the patient's usual shampoo and conditioner):

Study	Treatments	Participants	Treatment details	Results
Roberts RJ et al, 2000. ³⁰ Randomised, controlled trial.	Malathion lotion (alcoholic Suleo M® - [discontinued in UK] or aqueous Derbac-M®) versus wet combing (Bug Buster Kit®)	74 children completed study; 2 excluded from analysis and 50% complied fully with treatment.	Two applications of treatment, 7 days apart or wet combing every 3-4 days for 2 weeks in an area showing intermediate resistance to malathion	Cure rates (no live head lice 7 days after end of treatment): 78% (malathion) versus 38% (wet combing) (p=0.0006).
Hill N et al, 2005. ^{31*} Single blind, randomised, comparative study.	Bug busting versus over-the-counter aqueous malathion or permethrin	133 young people, aged 2-15; 56 used bug busting and 70 used insecticide treatment	Single doses of insecticides used. Bug busting conducted as per manufacturer's instructions.	Intention-to-treat cure rate: 52% (bug busting) versus 13% (insecticides); relative risk 4.1, NNT= 2.26, 95% CI, 2.1-7.8.

* This study has been criticised, partly because the sample size was small and may not have been representative.³² Also, patients using insecticide were examined at day 5 since, contrary to current recommendations, only single doses of insecticide were used. Those using bug busting were examined at day 15.^{31,33} Ovicidal activity was not evaluated.³³

Anecdotal evidence suggests that electric combs are ineffective and the efficacy of the vacuum lice-comb³⁴ has not been established.³⁵

Physical insecticides

Dimeticone: Dimeticone 4% is a physical treatment that acts by coating the louse and disrupting its ability to excrete surplus water.³⁶ Results of efficacy studies with dimeticone 4% lotion and liquid gel and dimeticone 92% are tabulated below:

Study	Treatments	Participants	Treatment details	Results
Burgess IF et al, 2007. ¹⁸ Single-blind, randomised, controlled trial	Dimeticone 4% lotion versus malathion 0.5% liquid	58 children 15 adults	Two applications of dimeticone, applied for 8 hours or overnight, or malathion liquid, applied for 12 hours or overnight, in both cases with 7 days between treatments.	Intention-to-treat analysis: Cure/infestation rates** for dimeticone versus malathion: 69.8% versus 33.3% (95% CI, 14.7%-58.2%, p<0.01)
Burgess IF et al, 2005. ⁶ Single-blind, randomised controlled equivalence trial.	Dimeticone 4% lotion versus phenothrin 0.5% liquid (no longer available)	214 young people (4-18 years) 39 adults	Two applications of dimeticone (8 hours or overnight) or phenothrin (12 hours or overnight) with 7 days between treatments.	Intention-to-treat analysis: Cure rates for dimeticone versus phenothrin: 70% versus 75% (difference= -5%; 95% CI, -16%-6%)*
Heukelbach J et al, 2008. ¹⁹ Single-blind, randomised, controlled trial.	Dimeticone 92% versus permethrin 1% (permethrin shampoo not recommended – see question 11)	145 children aged 5-15 years•	Two applications of dimeticone or permethrin with 7 days between applications.	Cure (absence of live lice) rates: Day 2: 94.5% (dimeticone) versus 66.7% (permethrin) (p<0.0001) Day 7: 64.4% (dimeticone) versus 59.7% (permethrin) (p=0.5) Day 9: 97.2% (dimeticone) versus 67.6% (permethrin) (p<0.0001)
Burgess IF, Burgess N, 2011. ¹⁷ Single-arm study	Dimeticone 4% liquid gel	41 participants (age range: 2- 44; median 10 years)	Two applications of dimeticone with 7 days between applications.	No live lice found on any participants at the four post-treatment assessments (days 1,6,11,14) No nymphal lice found on days 1 or 6 prior to second treatment.

**Cure: No evidence of lice after the second treatment at days 9 and 14. Reinfestation: No adult lice/stage 3 nymphs after first treatment, plus no more than two adult lice/stage 3 nymphs and no younger nymphs on days 9 or 14. All other outcomes: treatment failure.

***Rate of resistance to phenothrin in this study was comparable to malathion.

- Children were moved from a neighbourhood with a high prevalence of head lice to a holiday resort for the 9 days of the study.

The ovicidal (egg killing) activity of Hedrin® lotion (dimeticone 4%) is limited³⁷ and treatment should be repeated after seven days.³⁶ However research has indicated that dimeticone of a concentration $\geq 92\%$ has greater ovicidal efficacy.²⁴

Isopropyl myristate/cyclomethicone:

Study	Treatments	Participants	Treatment details	Results
Burgess IF et al, 2008. ²⁰ Two randomised controlled studies analysed together.	Isopropyl myristate/ cyclomethicone solution (Full Marks Solution®) versus permethrin 1% shampoo●●	168 people; 141 children, 27 adults	Treatment was applied to dry hair, combed through and washed out after 10 minutes.	Intention-to-treat cure/ reinfestation●●● rates: 82.0% for isopropyl myristate /cyclomethicone and 19.3% for permethrin (p<0.001).
Kaul N et al, 2007. ²¹ Two phase II trials: One study without a comparator; one single-blind, randomised study.	Isopropyl myristate 50% (Resultz®) alone and versus pyrethrin 0.33% and piperonyl butoxide 4% (not available in the UK).	Study 1: 30 people (21 children, 9 adults)	Treatment was applied and left for 10 minutes. Further treatment applied at days 7 and 14, as necessary.	After initial treatment, 13 participants required further treatment at either day 7 or 14. One participant tested positive for lice at days 7,14 and 21
		Study 2: 60 people received either isopropyl myristate 50% or combined pyrethrin 0.33% and piperonyl butoxide 4%	Isopropyl myristate-treated participants: up to three applications (as necessary) on days 0, 7 and 14. Comparator group: two applications on days 0 and 7, as recommended on the product label	Cure (lice-free) rates at 14 days: 40% (isopropyl myristate) versus 17% (pyrethrin/ piperonyl butoxide) (p≤0.05).

**Selected as a comparator because, like Full Marks Solution®, it has a treatment time of 10 minutes, however it is a shampoo. According to BNF, shampoos are diluted too much in use to be effective.¹⁶

***Cure: no lice at day 9 or 14

Reinfestation: any of the following:

- No adult/stage 3 nymphs present at day 2 or 6
- No stage 1 or 2 nymphs present at day 9 or 14
- No stage 1 or 2 nymphs present at day 6 if stage 3 nymphs are present at day 9
- No more than 2 stage 3 nymphs present at day 9 or 14
- No more than 2 adult lice at either day 9 or 14

Y Resultz® is not available in UK, but contains the same concentration of isopropyl myristate as Full Marks solution®

Octane-1,2-diol:

Study	Treatments	Participants	Treatment details	Results
Burgess IF et al, 2012 ²² Single-blind, randomised trial.	Octane-1,2-diol lotion (5%) (20% alcohol) versus malathion 0.5% liquid	520 people in three geographically separate centres	Contact times: Octane-1,2-diol lotion: 2-2.5 hours or 8 hours/overnight; Malathion 0.5% liquid: overnight All treatment repeated after one week	Cure or reinfestation after cure (on days 9 and 14): Octane-1,2,-diol 2-2.5 hours: 70.9% 8 hours/ overnight: 87.9% Malathion: 47.4%

Unlike the product under investigation in the clinical study by Burgess *et al* (2012), the formulations of the product Hedrin Treat & Go[®] currently on the market that have octane-1,2-diol as an active ingredient are alcohol-free, having only PEG-6 caprylic/capric glycerides and water as excipients.³⁸ The publication cited above²² also reported on a further study that compared the efficacy of octane-1,2-diol lotion (applied for 2-2.5 hours) with that of 1,2-octanediol alcohol-free mousse (applied for 2-2.5 hours or 8 hours/overnight). When applied for 8 hours/overnight, the cure rate for the mousse was 77.5%, compared with 60.0% for the lotion when applied for 2-2.5 hours (RR=1.29, 95% CI, 0.95-1.75). When both mousse and lotion were applied for 2-2.5 hours, the mousse was found to be less effective than the lotion (RR=0.69, 95% CI, 0.44-1.08).²²

Traditional insecticides

In the UK, there is documented evidence of resistance to pyrethroids, (permethrin) and to malathion.^{39,40} Resistance patterns vary across the UK so the most effective traditional insecticide for a particular individual may also depend on where they live.

Resistance has rendered pyrethroids less effective in some parts of Wales.²⁵ Therefore, in Wales, malathion liquid is the recommended treatment if a traditional insecticide is required. Use of pyrethroids has not been ruled out, but no suitable pyrethroid preparations are available in the UK at present.

Traditional insecticide shampoos: Shampoos are not recommended because diluting the insecticide with water decreases its efficacy, contact time is short and little active ingredient penetrates the lice.¹ The formulation of a preparation for the treatment of head lice is important. Products which are diluted too much in use and/or have insufficient contact time are not recommended.¹⁶

Other herbal / occlusive agents:

Study	Treatments	Participants	Treatment details	Results
Grieve KA et al, 2007. ²⁸ Randomised, double-blind studyYY.	1.Eucalyptus oil 11.0% (MOOV) 2.Piperonyl butoxide 16.5mg/g and pyrethrins 1.65mg/g (mousse) 3.Malathion 1.0% (foam)	40 assessed participants treated with eucalyptus oil, 36 with piperonyl butoxide/ pyrethrins and 37 with malathion.	Patients received 2 applications, 7 days apart, of the piperonyl butoxide/ pyrethrin preparation or the malathion preparation, or 3 applications of the eucalyptus preparation at day 0, 7, 14.	Cure (absence of live lice) ratesYYY: 82.5% (eucalyptus oil), 36.1% (piperonyl butoxide/ pyrethrin), 29.7% (malathion) (p<0.0001, eucalyptus oil vs. others)

YY This study has been criticised on the grounds that it had methodological shortcomings that could have led to bias.⁴

YYYCure rate was determined 7 days after the last application of each treatment.

It is thought that tea tree is effective against head lice, but clinical trials proving the efficacy of tea tree oil against head lice have not been performed. Many products for sale containing tea tree are shampoos. Once added to wet hair, they are too dilute, and therefore ineffective against head lice.¹⁶

There is no published evidence to support the use of occlusive agents such as petroleum jelly or mayonnaise.

13. How safe are the head lice treatments available in the UK?

Mechanical methods

Other than discomfort, wet combing with conditioner is unlikely to cause any harm that has not been observed during the normal use of conditioner.

Physically acting treatments

Dimeticone

Results of studies with dimeticone 4% have been consistent with regard to the nature and frequency of reported adverse effects.

Treatment-related effects in a study that compared dimethicone 4% with phenothrin included mild eye irritation (n=2 in dimeticone group) and itching/irritation of the scalp or neck (n=3 for dimeticone group n=11 for phenothrin group).⁶ An itchy, flaky scalp and irritation around the eyes are listed as undesirable effects on the SPC for Hedrin® lotion (dimeticone 4%).³⁶

Two treatment-related cases of eye irritation were reported in the dimeticone group of a study comparing dimeticone 92% with permethrin 1% in 145 children. No treatment-related adverse events were reported in the permethrin group.¹⁹

Neither the lotion nor the gel formulations of dimethicone 4% (Hedrin®) have been tested in people with asthma,⁴¹ though no additional safety issues have been identified for these products in people with asthma.⁴¹ Once dimethicone has been applied, the hair should be kept away from naked flames, cigarettes and other sources of ignition as the product is combustible.^{4,42} Similarly, NYDA® has flammable ingredients.⁴³

Isopropyl myristate/cyclomethicone

In two studies in which isopropyl myristate/cyclomethicone solution was compared with permethrin 1% solution, four adverse effects were considered to be possibly or probably related to treatment. These all occurred in the isopropyl myristate/cyclomethicone solution group and were rash, nausea, dry skin and eye pain (solution dripped into eye).²⁰

Adverse effects were described as mild, similar in both groups and consistent with those seen with other pediculicides in a study in which isopropyl myristate 50% was compared with a combined pyrethrin 0.33% and piperonyl butoxide 4% product.²¹

Octane-1,2-diol

In studies comparing octane-1,2-diol alcohol-free mousse with malathion 0.5% and with octane-1,2-diol lotion, treatment-related adverse events were primarily transient and involved some form of skin irritation.²² Adverse events were more common with 1,2-octanediol lotion (at either 2-2.5 hours [12.0%, $p=0.001$] or 8 hours/overnight [14.9%, $p<0.0005$] than with malathion 0.5% (2.3%). These reactions also occurred more frequently with 1,2-octanediol lotion than with the mousse ($p<0.045$).²² According to the patient information leaflet for the lotion, spray and mousse formulations of octane-1,2-diol (Hedrin Treat & Go®), these products are formulated with non-volatile ingredients; they contain no known asthma triggers and are skin friendly.³⁸

Traditional insecticides

Topically applied malathion is not readily absorbed and it is metabolised and excreted quickly in humans.⁴⁴ A review of safety data on topical malathion (i.e. Derbac-M®) concluded that there is no evidence of serious systemic adverse reactions associated with its use,⁴⁵ but the prescribing information states that skin irritation can occur.⁴⁶

Aqueous insecticidal preparations, such as malathion liquid (Derbac-M®) are less likely than alcoholic preparations to cause skin irritation and are therefore recommended for people with eczema or sensitive skin. Preparations with an aqueous base are also thought to be more suitable for people with asthma (**see question 23**).

One pyrethroid preparation (permethrin [Lyclear® Crème Rinse]) is available in the UK at present, and, being a shampoo with a short contact time, this is not recommended for the treatment of head lice.¹⁶

Menegaux et al⁴⁷ observed a potential association between insecticidal shampoo exposure and childhood leukaemia. The study looked at a relatively small group of children with leukaemia who showed a slightly higher rate of prior exposure to pesticides than the control group. This may show a theoretical risk following exposure to pesticides but the study did not take into account numerous other factors that may have contributed to the risk.

Other herbal/ occlusive agents

Although side effects to essential oils are rare, they have been reported and are particularly associated with high doses.

Tea tree oil can cause local skin irritation and inflammation⁴⁸ and prolonged use of essential oils can result in sensitisation.⁴⁹ Occlusive agents can be difficult to remove from the hair⁵ and might irritate the scalp.

14. How should wet combing be carried out?

First wash the hair with an ordinary shampoo. When the hair is still wet, massage in conditioner or vegetable oil, for instance a tablespoonful of olive oil. Comb the whole head of hair with a normal comb until it is tangle-free and then comb it with a fine-toothed (space between teeth < 0.3mm) detection comb. Start each stroke at the scalp, making sure the teeth of the comb slot into the hair at the roots with the bevel edge of the teeth lightly touching the scalp, and pull the comb firmly down through the hair. Check for lice after each stroke. Lice that are found should be rinsed off the comb or wiped onto a tissue. Continue combing until no lice are found (generally at least 10 to 30 minutes per session, but may be longer for long, thick hair). Rinse out the conditioner. Comb the rinsed hair again with the detection comb.⁴ Conduct the whole combing procedure four times over two weeks (i.e. every four days or so). Continue until no lice are found on three consecutive sessions.⁴

15. How should insecticide (physical and traditional) treatment be applied?

Physically acting treatments

Dimeticone (Hedrin®) lotion

The manufacturers advise that Hedrin® is applied to dry hair and spread evenly from roots to tips, ensuring that no part of the scalp is left uncovered.³⁶ Allow the hair to dry naturally,³⁶ keeping it away from open flames or other sources of ignition.³⁶ Hedrin® should be left on for eight hours or overnight and then washed out with normal shampoo, rinsing thoroughly with water.³⁶ One 50 mL bottle should be sufficient for short to shoulder length hair. Long, thick hair will require one 150 mL bottle. Treatment should be repeated after 7 days in all cases.^{4,36}

Isopropyl myristate/cyclomethicone (Full Marks Solution®)

The manufacturers recommend that Full Marks Solution® is applied to dry hair, massaged in, and left for 10 minutes. The hair can then be combed with the comb provided to remove the lice. To comb thoroughly, divide the hair into quarters and comb each quarter in small sections from the scalp to the hair tips, rinsing the comb out or wiping it with a tissue after each stroke. Once the area of hair is free of lice and eggs push the section aside and continue onto the next section. When the whole head of hair has been combed, wash the hair with a normal, non-conditioning shampoo. It may be necessary to wash the hair more than once to remove the solution.⁵⁰ Repeat the treatment after seven days. On average, each application requires 50 mL solution, but more might be needed for long/thick hair.⁵⁰

Octane-1,2-diol (Hedrin Treat & Go®)

Apply the lotion to dry hair, rubbing or combing it in until the hair is covered from root to tip. Leave the lotion in the hair for at least 8 hours before rinsing or shampooing it out. Any empty egg cases can be removed with the fingers or a fine toothed comb. Repeat this treatment after seven days.³⁸

Traditional insecticides

In all cases, a treatment course should be two applications of the product; the second application should be made 7 days after the first.¹⁶ A second application is made because not all traditional insecticides are 100% ovicidal and any product can fail if applied poorly.

Malathion 0.5% liquid (Derbac-M®)

Sufficient liquid should be applied to dry hair to ensure no part of the scalp is left uncovered, working into the hair spreading the liquid evenly from roots to tip.⁴ Once moistened, the hair should then be left to dry naturally in a warm, well-ventilated room.⁴⁶ One bottle (50 mL) of product might be sufficient for one head, but up to 200 mL might be required, depending on length and thickness of hair.⁴ The insecticide should be left on the hair for 12 hours or overnight. The hair can then be washed with a standard shampoo.⁴⁶

For advice on application of other available head lice treatments, please refer to their Patient Information Leaflets.

16. How quickly do physical and traditional insecticide treatments work?

Traditional insecticide treatment

One treatment might be sufficient to eradicate lice, but not eggs and any product can fail if applied poorly. Experts therefore advise routine use of a second application, after 7 days, for all insecticides.

People who have used head louse treatments are advised to check their hair with a detection comb 2-3 days after the second application.⁴ At this stage, the presence of live lice may indicate reinfestation or that eradication has been unsuccessful and a different treatment should be used.

If treatment failure is due to poor application technique, and it is clear that this is the case, a further treatment of the same insecticide can be given, with advice on correct application.

If no lice or nymphs were detected during the first detection combing 2-3 days after the second treatment application, then carry out a second detection combing session 9-10 days after the second application of treatment. Treatment is deemed to be successful if no lice have been found at both sessions.⁴

Physical insecticide treatment

Because the ovicidal activity of dimeticone 4% lotion (Hedrin[®]) is limited,³⁷ routine use of a second application after seven days is recommended. Detection combs can then be used, at days 2 or 3 and 9 or 10 after the second application, as after insecticide treatment (see above); to check that the treatment has been successful.⁴ The product information for Hedrin[®]³⁶ recommends that a pharmacist is consulted if live lice are detected following the second application. There is nothing in the product information to indicate that further treatment with Hedrin[®] would be harmful. Alternatively, a different treatment could be used at this stage.

As with dimeticone 4% lotion (Hedrin[®])³⁶, a repeat treatment is recommended after seven days with other available physical insecticides.⁴

According to the product literature for isopropyl myristate/cyclomethicone (Full Marks Solution[®]), if the lice are still present 14 days after the first application, a further treatment can be carried out.⁵⁰

17. Is there any need to treat clothing or bedding with which head lice have come into contact?

Lice that fall off the head are unlikely to survive for more than 24 hours therefore there is no need to fumigate. Clothing and bedding washed on a high temperature (50 degrees C or more) will kill any live lice.¹¹ However there is no evidence to show that lice are transmitted any way other than via head to head contact.¹ **(Also see question 1).**

When a treatment has been used overnight, it could be desirable to wash the bedding as some of the treatment may have rubbed off onto the pillow or bedding and dead lice might have fallen out of the hair.

18. Do children with head lice or nits need to be excluded from school?

No, but children with live head lice should be treated with wet combing or a physical or traditional insecticide as soon as a louse is found.

19. Why does treatment sometimes fail?

Reasons for treatment failure include:

- Incorrect comb being used for wet combing
- Failure to repeat treatment after seven days
- Incorrect treatment application or combing technique
- Inadequate treatment – too little treatment being applied (**see question 15**); treatment being left on for too short a period, too few wet combing sessions or combing sessions too short
- Louse eggs surviving treatment
- Resistance to traditional insecticide⁴

Treatment may appear to fail if there is reinfestation or the diagnosis is wrong and the individual does not have head lice.³

20. What should I do if treatment fails?

Consider the possible reasons for treatment failure (**see question 19**) and switch to another treatment (see management summary) if appropriate.

21. What measures can be taken to reduce the risk of infestation or re-infestation?

- As far as possible, treat all contacts with an infestation simultaneously.
- Use regular grooming (wet combing) to ensure that head lice can be detected and treated promptly.

22. What is the recommended treatment for a young child (0-2 years)?

- Try wet combing or dimeticone 4% before proceeding to aqueous malathion, if necessary.

Wet combing can be effective in young children, whose hair is often neither thick nor long.

The manufacturers' information for dimeticone 4% (Hedrin[®]) and aqueous malathion (Derbac-M[®]) states that they are suitable for infants aged six months and over.^{36,46} A review produced by the NHS advises that dimeticone 4% lotion can be used in infants from the age of one month.⁴ However, infants under the age of six months should be treated with dimeticone 4% or malathion under medical supervision only.^{36,46} Expert advice is to use dimeticone 4% in children under 6 months as it is associated with fewer contraindications for this age group.⁵¹ Due to a lack of safety data, NYDA[®] (dimeticone 92%) is not suitable for infants below the age of two years.⁴

Because there is a lack of available safety data on isopropyl myristate/cyclomethicone (Full Marks Solution[®]), this product cannot be recommended in children under the age of two years.⁴

According to the manufacturers of octane-1,2-diol (Hedrin Treat & Go[®]), children under six months of age can be treated with this product but only under medical supervision.³⁸

23. What are the recommended treatments in people with asthma/sensitive skin?

- Try wet combing, or dimeticone 4% before proceeding to aqueous malathion, if necessary.

Alcoholic preparations can cause wheezing in people with asthma and skin irritation in people with sensitive skin or scalp conditions.

The signs of hypersensitivity reactions listed on the dimeticone 4% lotion (Hedrin[®]) SPC include breathing difficulties.³⁶ However, dimeticone 4% lotion (Hedrin[®]) does not contain alcohol³⁶ and, according to the manufacturers, there are no safety issues associated with use in people with asthma/respiratory problems or eczema.⁴¹ Dimeticone 4% gel (Hedrin Once[®]) preparations are formulated with non-volatile ingredients,⁴² and are also considered by the manufacturers to be suitable for patients with asthma or eczema.⁴¹ The manufacturers recommend that use of Hedrin[®] and Hedrin Once[®] products in people with eczema or sensitive skin is preceded by a patch test.⁴¹

According to the manufacturers, dimeticone 92% (NYDA[®]) is suitable for patients with asthma or eczema.⁵²

The lotion, spray and mousse formulations of octane-1,2-diol (Hedrin Treat & Go[®]) are formulated with non-volatile ingredients and there are no known safety issues associated with their use in people with eczema/sensitive skin or asthma. As with dimeticone 4% lotion (Hedrin[®]), the manufacturers recommend that use in people with sensitive skin or eczema is preceded by a patch test.⁴¹

Isopropyl myristate/cyclomethicone (Full Marks Solution[®]) is suitable for people with asthma, but not those with sensitive skin because of the lack of study data in this patient group.⁴

If a traditional insecticide is to be used, people with asthma and conditions such as eczema should use an aqueous preparation (Derbac-M[®] liquid).⁴

24. How should head lice be treated during pregnancy?

- Try wet combing, or dimeticone 4% before proceeding to aqueous malathion, if necessary

Human data on the safety of head lice treatment during pregnancy are limited.⁵³ The UK Teratology Information Service recommends the use of wet combing or dimeticone 4% lotion, which is licensed for use during pregnancy and lactation.⁵³

Dimeticone

There are no published data on the use of dimeticone in human pregnancy, but it has a good safety profile in the general population and would not be expected to cause problems.⁵³ Hedrin® lotion (dimeticone 4%) is licensed for use during pregnancy⁴ but the manufacturers of NYDA®, which contains a higher concentration of dimeticone (dimeticone 92%) advise against the use of this product in pregnancy due to a lack of experience in pregnant women.⁵²

Malathion

The Summary of Product Characteristics for the malathion containing product, Derbac-M® liquid states that there are no known effects in pregnancy, but advises caution.⁴⁶ There has been a report of an amyoplasia congenita-like condition in a newborn baby whose mother used malathion 0.5% hair lotion during weeks 11 and 12 of pregnancy. The baby died not long after delivery due to respiratory insufficiency.^{53,54} Though a causal relationship could not be excluded, the aetiology of amyoplasia is not yet fully understood.⁵³ In another case, a healthy infant was born following the use of topical malathion and other agents for the treatment of recurrent crusted scabies.^{53,55}

Other products

Insufficient safety data is available on isopropyl myristate/cyclomethicone (Full Marks Solution®) to recommend this product during pregnancy.⁴ According to the manufacturers, octane-1,2-diol (Hedrin Treat & Go®) is unlikely to produce any ill effects if used during pregnancy.³⁸

25. How should head lice be treated in breastfeeding mothers?

- Try wet combing, or dimeticone 4% before proceeding to aqueous malathion, if necessary

Wet combing and dimeticone 4% are the most suitable options for breastfeeding mothers.^{4,56} If a traditional insecticide is thought to be necessary due to treatment failure, aqueous malathion is recommended.⁵⁷

Wet combing

This option might be preferred by some women during breastfeeding because no chemicals other than the conditioner used are involved.

Dimeticone

There are no data on the safety of dimeticone 4% (Hedrin®) during lactation. However, since according to the manufacturers, very little or no Hedrin® is absorbed through the skin³⁶ and oral dimeticone is used for colic in infants,⁵⁶ it is unlikely to pose a significant risk to the infant. Hedrin® lotion is licensed for use during lactation⁴ but the manufacturers of NYDA®, which contains a higher concentration of dimeticone (dimeticone 92%), advise against the use of this product in breastfeeding due to a lack of experience in breastfeeding mothers.⁵²

Malathion

If a traditional insecticide is required as an alternative in treatment failure, aqueous malathion 0.5% can be used.⁵⁶ Approximately 4% of a dose of malathion is absorbed through the skin, and it is broken down rapidly.⁵⁶ The instructions on the bottle should be followed correctly and the preparation should not be used excessively. The manufacturers of Derbac-M® (an aqueous preparation) state that there are no known effects of malathion in lactation, but recommend using the product with caution during lactation.⁴⁶

Other products

Insufficient safety data is available on isopropyl myristate/cyclomethicone (Full Marks Solution®) to recommend this product during breastfeeding.^{4,56} According to the manufacturers, octane-1,2-diol (Hedrin Treat & Go®) is unlikely to produce any ill effects during breastfeeding.³⁸

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