

Is wet combing effective in children with pediculosis capitis infestation?

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A 6-year-old boy presents to the paediatric emergency department complaining of pruritus affecting his scalp. On examination you notice several nits attached to his hair as well as a few adult head lice. You are considering treatment with pediculocides, but his mother is rather reluctant to use “chemicals”. You consult the *BNF for children*, which apart from listing three classes of pediculocides – carbaryl, malathion and pyrethroids (permethrin and phenothrin) – outlines the option of using wet combing as an alternative. You wonder whether there is good evidence to support the sole use of this intervention in head lice infestation.

Structured clinical question

In a child with pediculosis capitis infestation [patient], is wet combing alone [intervention] effective in eradicating the parasites [outcome]?

Search strategy and outcome

Cochrane Library using the search terms “head lice” and “pediculosis capitis”: one relevant Cochrane review.¹ However, the article dates back to 2001.

PubMed (1950–to date/no limits set) using the search terms “head lice and combing”: 33 articles of which only five articles were relevant,^{2–6} which are summarised in table 1. PubMed search using the terms “pediculosis capitis and combing”: 11 articles, all already identified. MeSH database search using the heading “lice infestations” produced no further relevant results.

EMBASE database (1974–to date) using the same set of search terms as employed in the PubMed search: 24 results – no additional relevant articles identified.

TRIP database using the same set of search terms as in the PubMed search: 22 results – no further relevant article identified.

Search of multiple trials registers using the same search terms including ISRCTN, NHS, NIH and MRC: eight results – four unrelated to pediculosis, three trials investigating new pediculocides, one investigating “suffocation-based” treatment – thus none relevant. The Cochrane Central Register of Controlled Trials using the same search terms: total of 10 references – all previously identified.

Search date: 17/02/07.

Commentary

Pediculosis capitis, an ectoparasitic infestation, remains a common problem in the paediatric population, although exact figures for the United Kingdom are currently unknown since most health authorities have abandoned routine screening in schools. However, previous reports have shown that there has been a significant increase in prevalence over the last decade.⁷ One regional study in England reported a prevalence of 2.0% and a worrying annual incidence of 37.4% in primary school children,⁸ while a more recent study from Wales established a

prevalence of 8.3%.⁹ Studies from other European countries reported prevalences of between 0.8%¹⁰ and 8.9%¹¹ in the last few years.

Pediculocides, which are essentially neuroactive insecticides, are the most commonly used treatment for head lice worldwide. Malathion is an organophosphate, permethrin and phenothrin belong to the class of pyrethroids and carbaryl is a carbamate.

Several authors have reported increasing levels of resistance of *Pediculus humanus capitis* to a variety of pediculocides in recent years.^{6–9, 12} A number of enzymatic alterations, including changes in acetylcholine esterase, esterases and glutathione-S-transferase, which affect the effectiveness of malathion and carbaryl have been identified. Regarding resistance to permethrin, a *kdr* type mechanism affecting sodium channels of the parasite has previously been reported. These changes in the parasite populations have been associated with an increase in the number of treatment failures. Ultimately, knowledge of the local resistance pattern may become vital to improve success rates.

In view of the emerging resistance to topical treatment, several research groups have explored oral forms of treatment, including ivermectin,¹³ thiabendazole¹⁴ and levamisole,¹⁵ and have reported encouraging results. Even more exciting are recent studies investigating non-toxic so-called “suffocation-based” topical treatments. One study investigating dimeticone (now licensed in the UK as Hedrin 4% lotion) – a substance also used orally as treatment for infant colic – reported a 70% cure rate,¹⁶ while another study reported an impressive 96% cure rate without observing any adverse effects.¹⁷ However, these substances may require further evaluation and one has to consider that the effectiveness may be lower outside supervised study conditions.

Parents are often concerned about the prospect of using insecticides as treatment for head lice infestation in their children. Wet combing therefore appears to be an attractive alternative. Some authors have raised concerns about the labour intensity of this approach, which may result in poor compliance. However, a study by Roberts *et al* found that compliance in a wet combing group was not significantly different from compliance in a group which used malathion,² while Vander Stichele *et al* reported that wet combing was a more popular choice than treatment with insecticides when both options were offered to parents.⁵

A number of different louse and nit combs as well as kits, including the Bug Buster Kit (UK) and LiceMeister kit (US), are currently commercially available. In comparison to regular and detection combs, the combs used for treatment are finer toothed. It is generally recommended that treatment sessions are carried out every 3 days for 14 days (thus five sessions in total). Any shampoo or conditioner can be used for the purpose of wet combing, since this merely acts as a lubricant.

A Cochrane review by Dodd published in 2001 has assessed the different interventions for treating head lice.¹ The author came to the conclusion that physical control methods such as combing are inappropriate as primary treatment against head louse infection. However, this judgement was solely based on the only article related to this form of treatment published at the time.²

A wide variation of cure rates with wet combing has been reported by the five studies listed below. Roberts *et al* have reported a disappointing cure rate of 38%.² However, in this study an early version of the Bug Buster Kit was used and the low level of compliance (only 50%) is likely to have contributed to treatment failures. The later studies have shown more promising results with cure rates of between 47% and 75%. In the study by Hill *et al*, which reported that wet combing was far

Table 1 Treatment for pediculosis capitis infestation

| Citation | Study group | Study type (level of evidence) | Outcome | Key results | Comments |
|--|---|--|--|--|---|
| Roberts <i>et al</i> (2000) ² | 74 children (aged 3–14 years) randomised to wet combing (Bug Buster Kit) every 3–4 days for 2 weeks or treatment with 0.5% malathion lotion (2 applications 7 days apart) without use of a nit comb. Treatment carried out by parents at home. | Randomised controlled trial (level 1b) | Presence of live lice 7 days post treatment | Cure rate was 38% for wet combing and 78% for malathion. Cure 2.8 times more likely with malathion (95% CI 1.0 to 5.2, $p=0.0006$). | Area where study was conducted known to have intermediate resistance to malathion. Only 50% of patients fully compliant (no significant difference between treatment groups). Majority of individuals in wet combing group used treatment for ≥ 14 days (81%). No side effects observed. |
| Bingham <i>et al</i> (2000) ³ | 15 college students randomised to wet combing (Bug Buster Kit) every 3 days for 2 weeks or single treatment with insecticide (permethrin*). First treatment was carried out by researcher, subsequent treatment by parents. | Randomised controlled trial (pilot) (level 1b) | Presence of live lice on day 14 after starting treatment | Cure rate was 75% for wet combing and 43% for insecticide (no statistical significance reached). | 40% of lice collected showed resistance to malathion and carbaryl. Drop out rate high (40%). |
| Plastow <i>et al</i> (2001) ⁴ | 30 children (aged 4–16 years) randomised to wet combing (Bug Buster Kit) every 3 days for 2 weeks or treatment with phenothrin lotion (2 applications 7 days apart) without use of a nit comb. Treatment was carried out by nurse. | Randomised controlled trial (level 1b) | Presence of live lice on day 14 after starting treatment | Cure rate was 53% for wet combing and 13% for phenothrin ($p=0.05$). Number needed to treat 2.5 (95% CI 1.5 to 16.7) for wet combing. All children were cured after prolonged treatment with wet combing (maximum duration 24 days). | Children in lotion arm more heavily infested than in wet combing arm. Local resistance pattern unknown. All patients completed the study and had full treatment as per protocol. No side effects reported |
| Vander Stichele <i>et al</i> (2002) ⁵ | 38 school children treated with wet combing (sessions every 4–5 days for 2 weeks) and 25 treated with insecticide alone. 1% permethrine applied for 10 min, 0.5% malathion for 12 h or pyrethrin for 30 min. Parents chose initial treatment. If no cure on day 7, same insecticide applied again. If no cure at day 14 another substance was used. | Cohort study/poor quality (level 4) | Presence of live lice and/or nits on day 14 after starting treatment. Inconsistent definition of cure (varied between schools) | Cure rate was 47% for wet combing and 64% for insecticides (combined figure). No statistical comparison made. | Further children included in the report had combined treatments, alternative treatments or no treatment. Local resistance pattern unknown. |
| Hill <i>et al</i> (2005) ⁶ | 126 children (aged 2–15 years) randomised to wet combing (Bug Buster Kit) four sessions with 3 days between sessions or single dose treatment with 0.5% malathion lotion or treatment with 0.5% permethrin. Treatment carried out by parents at home. | Randomised controlled trial with high risk of bias (level 1b–) | Presence of live lice 2–4 days post treatment | Cure rate was 57% for wet combing and 13% for insecticides. "Relative risk" 4.4 (95% CI 2.3 to 8.5) with wet combing when compared with both pediculocides combined. | Only 22% of participants had pediculosis for the first time (88% repeated infestation). Allocation concealment was inadequate. Lice from participants tested by molecular methods, confirmed high proportion of resistance against pyrethroids. Study used newer version of the Bug Buster Kit. |

*Information on which insecticide was used in this study kindly provided by the author (personal communication).

more effective than insecticides (57% vs 13%), the results may have been distorted by the fact that only 22% of the participants had acquired head lice for the first time and the majority of participants had undergone treatment with pediculocides prior to entering the study, which may have given rise to resistance.⁶ Nevertheless, a very similar observation was made by Plastow *et al* (cure rate 53% vs 13%), again suggesting that wet combing may be superior to treatment with insecticides in certain regions in view of the high failure rate with the latter.⁴ However, when considering the evidence one has to take into account that the study by Plastow *et al* was very small and did not include sample size calculations, while the study by Hill *et al* was previously criticised as seriously flawed.¹⁸ The main weakness in the latter study was inadequate allocation concealment, as the participating general practitioners were

given the randomisation list. Thus, the investigators knew who was having which treatment before recruiting the patient into the study. This may have introduced considerable selection bias and ultimately altered the results. Schulz *et al* have previously shown that RCTs with inadequate or unclear allocation concealment yielded larger estimates of treatment effects (41% and 30%, respectively on average) than trials in which authors reported adequate concealment.¹⁹

Plastow *et al* reported another interesting observation, which was not part of the original study. The authors found that all patients were cured of the infestation when wet combing was employed for longer than the recommended 14 days. In one case treatment had to be continued for 24 days. However, it has to be taken into account that in this study the treatment was administered by a nurse specifically trained for this task. Thus

in a real life situation, where wet combing is performed by parents who have not received prior training or supervision, this might not be as successful.

In conclusion, there is some evidence that wet combing is an effective treatment for pediculosis capitis when used correctly and consistently. However, as outlined above, the currently existing evidence has considerable limitations. A sufficiently large, well conducted randomised controlled trial with adequate randomisation process and appropriate allocation concealment would therefore be desirable.

However, wet combing it is not associated with any potential side effects and is generally preferred by parents over treatment with insecticides. In view of the rising level of resistance of *Pediculus humanus capitis* this method may represent a viable alternative, particularly as treatment failure does ultimately not carry the risk of having detrimental effects to the child's health.

CLINICAL BOTTOM LINE

- There is limited evidence that suggests that wet combing is an effective treatment for pediculosis capitis, although cure rates are variable. (Grade B)
- Parents prefer this treatment option over that of pediculocides. (Grade D)
- Treatment for a longer duration than the generally recommended 2 weeks may improve success rates. (Grade D)

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Leukocytosis as a predictor for progression to haemolytic uraemic syndrome in *Escherichia coli* O157:H7 infection

Report by

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You are the specialist registrar in paediatrics doing the ward rounds. There has been a recent outbreak of *Escherichia coli* (*E coli*) O157:H7 gastroenteritis in the community. A 5-year old girl was admitted 3 days ago with bloody diarrhoea, abdominal cramps and vomiting. Her stool has grown *E coli* O157:H7. She is now stable and her parents are keen to take her home but are understandably anxious and ask you about possible complications. You are aware of the risk for progression to haemolytic uraemic syndrome (HUS). However, you are not sure if all such patients should be closely monitored. You note that the patient now has a normal platelet count and renal function and wonder if there are any simple parameters to predict the risk of HUS, which may take up to 2 weeks to develop.

You talk to the consultant in public health medicine, who kindly directs to you to the national guidelines by the Health Protection Agency (HPA) on the management of *E coli* O157:H7 infections.¹ Unfortunately, the guidelines do not answer your question. Your consultant has come across anecdotal evidence that leukocytosis may be a predictor for HUS in such children.

You decide to do a literature search and critically appraise the evidence.

Structured clinical question

In a child with *Escherichia coli* O157:H7 infection [patient], does a high white blood cell count [risk factor] predict progression to haemolytic uraemic syndrome [outcome]?

Search strategy

Secondary sources

Cochrane library, Best Evidence, Clinical Evidence

No relevant articles were found

Primary sources

MEDLINE (1966 to date) and OLDMEDLINE (1950–1965) searched by the PubMed interface on 29/10/2006.

Search terms

“Hemolytic uremic syndrome” AND “*Escherichia coli* O157” with limits (English, Human, All child: 0–18 years) revealed 267 results.

Addition of the key words (leukocytosis OR “white cell count”) to the above yielded only seven results. This was felt to be an inappropriately low number, possibly due to variations in the terms used by authors (“elevated WBC”, “high leukocytes”, “increased white cell count”, etc).