

# Testing of "vacuum-combing" a new method in the treatment and detection of *Pediculus capitis*.

## Original report

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## Testing “vacuum combing”...

### Summary.

Vacuum combing is a new method for treatment and detection of head lice. The method makes use of a new developed modified vacuum cleaner mouthpiece and a standard vacuum cleaner. A specially constructed fine-toothed comb is fitted into the opening of the mouthpiece and a filter cup is mounted into the connector to the vacuum cleaner tube. When the mouthpiece is used a section of the hair is sucked into the opening, the comb is guided to the hair root and inserted into the hair. The first five cm's of the hair is then combed carefully, without filtering the hair: The lice will be loosened by the combing, caught by the air stream and finally collected in the filter cup. The method has not previously been described or tested, and we present the first study on the efficacy of the device.

**Material and method:** Participants in the study were recruited through the local press and from screening of a public school. Two operators, trained in the use of the equipment, performed the treatment. The infested persons underwent a scheduled treatment plan according to the user manual: Five treatment sessions over a two week period and at each session the participants were combed until no further adult lice or large nymphs were detected. After each session the lice were sorted into stadium and counted. A person was considered cured if no lice were detected at a treatment session provided no adult lice had been detected at the last three sessions. Furthermore the participants had agreed to contact us within eight weeks after the study if lice infestation reappeared. Testing

**Results:** A total of 105 persons were screened, 27 lice infested persons were detected and 23 agreed to participate in the study. They had a total of 1467 lice (167 adult lice) and an average of 22.7 lice (1-118). All participants except one were female, average age 12.3 years (3-43), length of hair average 32.2 cm (3-60). Twenty persons (87,0%) were lice free after the scheduled five treatments. One was noncompliant, but was cured after extra five treatments; two had very heavy hair and needed one respective five extra treatments to be cured. The ability to detect lice was estimated from the effect of one single combing “round” of 5-15 minutes duration. On the primary treatment day all hatched lice were removed with one single combing “round” in 10 participants, while 11 needed two combings. There were no significant side effects to the treatment.

**Conclusion:** “vacuum-combing” is found to be efficacious into the hands of trained operators in the treatment of head lice and it is a very effective method for detection of lice.

### Introduction

Head lice are widespread and cause great inconvenience and discomfort in a vast number of families. The children and their parents are often ashamed and a lot of effort and cost is spent on treatment of the infestation. Insecticides have long been the cores in the official treatment recommendations in several countries including Denmark where malation (Prioderm<sup>®</sup>) and pyrethrin (Nix<sup>®</sup>) are marketed. However, there are an increasing number of reports indicating development of resistance to these agents and this may be one of the explanations of the emerging experience of unsuccessful treatments. Satisfactory documentation of the different treatment modalities in head lice is surprisingly sparse and in a recent Cochrane review only four out of 71 identified studies met the applied inclusion criteria. In only one of these studies fine toothed combing was examined and this was done in a comparative fashion with wet combing vs. malathion lotion. The conclusion of that study was that combing was significantly less effective than the insecticide in the treatment of head lice and therefore suggests that wet combing, as first line treatment is inappropriate. There are no other satisfactory reports on the treatment effect of combing in the literature so the evidence regarding combing is not conclusive.

However there is good evidence for and it is also stressed in the Cochrane review, that combing is a significantly better control method than different types of inspection.

A new method for detection and treatment of head lice is “vacuum-combing”. This method makes use of a new principle of combined suction, which keeps the hair stretched in a modified vacuum-cleaner mouthpiece, and combing with a modified fine toothed lice comb mounted into the mouthpiece. That the hair is held stretched without filtering allows it to be easily combed, the lice will be removed by the combination of combing and suction and they are caught in a filter cup mounted into the mouthpiece.

The aim of the present study was to clarify the efficacy of vacuum combing for detection and treatment of head lice. The study was non comparative and follows the recommendations listed in the Cochrane review cited above.

## Method and material

Performance of the study was based on a detailed protocol which specified the methods used:

"*Vacuum-combing*" was performed with a newly developed device the "Licesnatcher<sup>R</sup>" (manufactured by Snatchers Company A/S, [www.licesnatcher.com](http://www.licesnatcher.com)), and was applied in accordance with the user manual: In each combing session the hair was divided in 3-6 separate bundles kept apart with hair bands. Each bundle of hair was then combed carefully for up till 5 min's (fig 1-4) depending on the nature of the hair (long/short, thick/thin, curly/straight). In short hair hairbands were not necessary. When lice were found in the first "round", combing was continued immediately with another "round" and so on until no more lice were detected. Sessions of *vacuum combing* in this fashion were repeated five times with an interval of three to four days during two weeks. If adult lice were detected at any time after the initial treatment day, combing was restarted from day one. Comparison of combing "round one" vs. "round two" permitted an estimation of the effectiveness of a single detection combing with the Licesnatcher<sup>R</sup>.

Standard vacuum cleaners were used; they had 1000-1400 W engines and standard tube and connector dimensions (3.0 and 3.5 cm). Sufficient air flow checked by the sound generated by the hair fluttering in the mouthpiece.

The participants were recruited in two ways:

1. The public was informed of the new treatment modality through articles in the local newspaper. Persons with lice were encouraged to contact us for participation in the study. Eleven families were invited - 32 persons in total -18 had lice and entered the study
2. We performed a screening examination in a public school. Pupils from the lower four classes were offered detection combing with the Licesnatcher. Seventy-three kids were examined, nine had lice and five agreed to participate in the study.

The treatment was performed by two operators trained to use the equipment and treatment was given both in the homes of the participants and at our office. The time schedule allowed approximately 30 min treatment for each person. After combing of the individual the filter cups used were inspected and the lice were sorted in adult lice and the three nymphet instars. Total treatment time was registered. The main results were the number of lice free persons at the fifth session. An individual was considered cured from the lice infestation if no lice were revealed at the last treatment session, provided no adult lice had been detected during the last three sessions. Furthermore the participants had agreed to contact us within eight weeks after the study if lice infestation reappeared. The participants were encouraged to use detection combing as check method.

## Ethics.

The study was in accordance with the Helsinki II Declaration. All participants agreed to participate and the parents to children gave written consent.

## Results.

Twenty-three persons participated in the study; they had a total of 1467 lice (167 adult lice) and an average of 22.7 lice (1-118). All participants except one were female, average age 12.3 years (3-43), length of hair average 32.2 cm (3-60). The results of the vacuum combing are given in table 1 and it is seen that 20 persons were free of lice at the fifth treatment day. Three still had lice after the scheduled treatment; Two, a mother and her daughter, had a very large and thick hair and the time schedule was not sufficient to assure that all lice were caught; adult lice were found at some of the following sessions. The mother was cured after one extra treatment. In the daughter the last adult lice was detected at the 6'th treatment and she was free of lice at the 10'th treatment. Apart from these two the time schedule was sufficient to empty the hair in all individuals. The equipment permits inspection of the filter without removing it and hence only a few minutes were needed to treat a hair bundle after the initial round. The last treatment failure was because of non-compliance, an eight-year did not show up in a nine days period, but she was free of lice after totally 10

treatments. None of the participants reported of reinfestation with lice during the following eight weeks.

The effect of one single combing “round” of 5-15 min’s duration was evaluated on the primary treatment day where all hatched lice were removed with a single combing “round” in 10 participants, while 11 needed two combings. Two of the three that were not cured after five treatments probably had adult lice or large nymphs, which were not caught because of the large and heavy hair.

There were no adverse effects to the “*vacuum-combing*” treatment. We asked specifically after eczema, small wounds and scratching in the scalp, but none were reported. The main problem was discomfort especially in small kids, but empathy and patience made it possible to complete the treatment in all included individuals.

## **Discussion.**

This test on the new combing method, *vacuum-combing*, performed with the Licesnatcher<sup>R</sup> shows that the method has a high efficacy in the treatment of head lice. After two weeks with five standardized treatments 87% of the participants were cured and with a maximum of five extra treatment days 100% were free of lice.

Properly performed, “*vacuum-combing*” removed all hatched lice with a single 5-15 min’s treatment in 43% of the infested individuals and 91% after two treatments. When compared to other treatment modalities, including insecticides, this is a very high success rate and it implies that combing, when performed by trained operators is equally effective as chemical treatment. It should however be noticed that in the study by Roberts et al (2) the population was chosen representatively and the treatment was performed by the parents.

In all kinds of treatment in the health system, there is off course an important “human factor”, which is detrimental to the effect. It is essential to comply with the treatment plan when treating lice with any combing method and this goes for the operator as well as the infested individual. The intervals of 3-4 days between treatment sessions must be respected carefully, otherwise new eggs will be laid and accordingly the treatment must be restarted. This may be difficult to carry through in busy families and a learning period must also be encountered before one can use the method effectively. However, the same arguments must be raised to other treatment methods and concerning the insecticidal agents, resistance to the products has to be added to the list of inconveniences.

It is generally accepted that combing is the best way to detect lice infestation. It has been shown that dry combing identifies up to four times more infested individuals compared to different ways of inspection. Our results indicate that “*vacuum-combing*” is extremely effective for lice detection. No specific preparations or precautions are needed before the method can be applied, although it is easier if the hair is clean. The lice are collected in the filter cup, which has a translucent lid and this allows careful inspection without risk of spreading the lice. As shown in this study 5-15 minutes with “*vacuum-combing*” reveals a large proportion of the lice in an infested individual, actually all hatched lice were caught in 43 of the participants after one treatment “round” at the initial treatment session. Therefore a person can very quickly and reliably be diagnosed with this equipment and accordingly “*vacuum-combing*” is very suitable for lice detection in families, institutions etc.

The representative ness of our study group must be discussed: Five individuals were recruited from screening of a public school, whereas 18 had voluntarily responded to newspaper articles. These could be expected to be particularly motivated and this seemed to be the case, however they also seemed to have had particularly severe attacks of lice infestation, with numerous treatment failures. We suggest that this explains the dominance of girls in our population.

Another point of discussion concerns the fact that the operators in this study was trained and motivated, which means that the results cannot readily be extrapolated to the general population.

Our study could be criticized because the control method is vacuum-combing itself; however it is the clear conviction of the authors, that no other combing method is more effective for detecting lice. Furthermore the validity of the results is assured by the fact that none of the participants reported of recurrence of lice during an eight week period after the study.

## Conclusion.

"vacuum-combing" is found to have high efficacy in the treatment of head lice when used by trained operators. The cure rate seems to be of the same size as seen after treatment with insecticide containing products. However, the issue of effectiveness clearly will need further research focused on RCT's where the operators are the families (parents) themselves.

Finally we found that "vacuum-combing" is a highly effective and practical method for detection of lice infestation and for collecting lice e.g. for scientific purposes.

**Table 1**

Session No	1	2	3	4	5	6	7	8	9	10
Lice No Average (range)	22.7 (1-108)	21.6 (0-111)	13.0 (0-105)	4.5 (0-36)	1.6 (0-32)	0.3 (0-8)	0.4 (0-6)	0.1 (0-2)	0.1 (0-3)	0
Lice Total (Adult lice)	527 (167)	493 (14)	281 (1)	103 (5)	36 (0)	8 (1)	9 (0)	2 (0)	3 (0)	0
Lice total for the 20 cured (Adult lice)	386 (120)	421 (0)	181 (0)	28 (0)	0	-	-	-	-	-
Lice free persons No	0	3 13.1%	6 26.1%	10 43.5%	20 87.0%	21 91.3%	21 91.3%	22 95.6%	22 95.6%	23 100%

**Table I.** This table shows the 10 sessions with "vacuum-combing" performed over a four-week period in 23 individuals infested with totally 1457 lice (187 adult).

The average and total number of lice is shown for the all 23 individuals in line 2 and 3. The 20 persons cured after scheduled 5 sessions are summarized in line 3 and the bottom line shows the number of lice free persons (without recurrence) at each session.

## References

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