

Report of laboratory tests of the Robi Comb™ against human lice.

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Abstract

Objective: To determine the effectiveness of Robi Comb™ in the detection and elimination of human head lice.

Materials and Methods: Human clothing lice, *Pediculus humanus*, were obtained from the culture colony maintained by the Medical Entomology Centre. Three groups of lice at various stages of development were used. The lice were placed on a lock of secured hair and the Robi Comb™ was turned on and drawn through the hair. The lice were collected and signs of activity were observed. Similar tests were done with the Robi Comb™ turned off.

Results: The lice were easier to remove from the hair with the charged comb compared to the uncharged comb which allowed the lice to grip to the hair shaft. No nymphs survived treatment with the charged comb and only 2/31 (6.6%) adults survived after 24 hours. Nearly all the lice survived when treated with the uncharged comb.

Conclusion: The Robi Comb™ is an important innovation for the detection and elimination of human head lice at all stages of their development. It proved effective for both these purposes. The action of the comb on the lice damages their cuticle causing immobilisation and/or death.

INTRODUCTION

This report describes tests of a novel comb designed for the eradication of head lice. The Robi Comb™ works by delivering an electrical charge to the teeth via a capacitor. The teeth are alternately anodic and cathodic. Power is delivered from a single 1.5 volt AA battery. The patient is protected from shock by resin droplets applied to alternate teeth thus preventing a circuit from being set up with the scalp.

As the comb is drawn through the hair the buzzing sound, indicating that the comb is switched on, stops each time it comes into contact with a louse as a current is emitted. The louse is brushed off the teeth and the buzzing resumes to indicate that combing can continue.

Materials and Methods

The Robi Comb™ was supplied by Oris Beauty Products Limited.

Human clothing lice, *Pediculus humanus*, were obtained from the culture colony maintained by the Medical Entomology Centre at the University of Cambridge.

Pediculus humanus is the species which includes both the head louse, *P.h. capitus*, and the body louse, *P.h.humanus*.

Three groups of lice were used: first instar nymphs that had newly emerged from their eggs but had not yet fed, first instar nymphs that had fed at least once and were more than 24 hours old and adult lice that had fed not less than five hours previously.

For each test a lock of human hair approximately

150mm long was fixed to a block with adhesive tape so that about 100mm of hair remained hanging free. The hair was first combed with a normal grooming comb to remove tangles. Lice were placed individually onto the hairs and allowed to settle for half a minute.

The Robi Comb™ was switched on and the teeth drawn through the hair. The buzzer sounded and as the comb was brought into contact with the louse the buzzing ceased, indicating a discharge of current. The comb was drawn through the remainder of the hair and the louse removed from the teeth by shaking or brushing off into a plastic Petri dish containing a square of corduroy cloth.

A control group of lice was treated in the same way except that the power switch of the comb was turned 'off' so no current flowed through the teeth. This group of lice was combed out and collected on a corduroy pad in the same way as the test insects.

Lice were observed up to one hour and after 24 hours to assess mortality.

Results

When lice were combed from the hair using the Robi Comb™ switched 'on' they were removed easily because the electric shock received from the charged teeth caused them to lose their grasp on the hairs. When the comb was used with the current switched 'off' the lice were able to grasp at hairs continually which slowed the passage of the comb through the hairs and in some cases caused some tangling of the hair shafts.

Lice Immobilised

The effect of the electric shock delivered by the comb on the survival of lice is shown in Table 1.

	Total no of head lice in age group	No alive after		
		1 hr	24 hrs	
Test	Adults	31	22	2
	Fed nymphs	45	0	0
	Unfed nymphs	37	0	0
Control	Adults	27	27	24
	Fed nymphs	35	34	32
	Unfed nymphs	29	29	23

All insects were immobilised on contact with the charged teeth and in some cases a discharged flash could be seen at the point of contact.

Microscopic examination of the adult lice after removal revealed some obvious damage such as shrivelled antennae. Some lice began to move again after about ten minutes and this progressed during the period up to one hour after treatment. Some lice appeared to recover completely whereas others were obviously damaged and unable to move one or more limbs.

In the case of newly emerged, unfed nymphs no sign of recovery was observed and only slight movements were seen in the previously fed nymphs up to one hour after removal.

Mortality Rate

After 24 hours all nymph lice had become wholly dehydrated. The majority of adults were dead and obviously very dehydrated, presumably having lost water through those areas of cuticle damaged by contact with the charged teeth of the comb.

In contrast, mortality among lice in the control group was low and appeared to be related to physical damage resulting from combing alone. The damage to nymphs in this test was principally as a result of them becoming trapped between the teeth of the comb. Damage to adults was found to result in a rupture of the gut subsequent to torsion whilst being pulled through the hair.

Microscopic examination of adult and nymphal lice immediately after contact with the charged teeth of the comb revealed patches where droplets of fluid were escaping through lice cuticles at the points of contact with the comb. However, within ten minutes this fluid had evaporated without further obvious loss of liquid. Consequently, from the mortality it is clear that water

Key points

- Robi Comb™ is effective for the detection and elimination of human head lice
- Lice coming into contact with the charged teeth of the comb cause a flow of current that stops the comb 'buzzing'
- This method of detecting lice is an important advance since they are difficult to detect by other means
- The comb is charged teeth immobilise lice allowing them to be easily removed from the hair
- The electric shock causes immediate death or dehydration resulting in death

loss continued over the next few hours. It can only be assumed, therefore, that the two lice that were not killed failed to come into complete contact with the teeth and that an insufficient amount of the cuticle was damaged to dehydrate them. Nevertheless they were removed from the hair easily and in actual use of the comb for detection or treatment this would have meant their subsequent death.

Conclusions

The Robi Comb™ is an important innovation for the detection and elimination of head lice.

Lice coming into contact with the charged teeth cause a flow of current that stops the buzzer sounding. This is an important advance in the detection of lice since by other means they are often very difficult if not impossible to find.

During the discharge of current the cuticle of the lice is damaged causing a loss of body fluid.

This shock immobilises the lice and causes them to loosen their grasp on hairs, which permits them to be removed more easily.

Some lice are killed outright, especially if the shock is delivered to the head of the insects.

Although some insects appear to recover they die later from dehydration due to loss of body fluids.

The comb is capable of killing lice of all ages. Even if lice are not removed from the scalp by the comb they will either die later from the effects or be caught on a subsequent application.

Any lice that are not killed but are removed physically are eliminated from the infection.

It can be concluded that routine, correct use of the Robi Comb™ is an effective method for the detection of head lice infestations and will eliminate an infestation without the need for chemical insecticides.

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