Hot Air May Be an Effective Nonchemical Treatment of Head Lice

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November 13, 2006 — Of 6 different methods used to eliminate head lice, a hot-air device was most effective, according to the results of a study reported in the November issue of Pediatrics.

"Each year millions of children are infested with head lice, a condition known as pediculosis, which is responsible for tens of millions of lost school days," write Brad M. Goates, MS, from the University of Utah in Salt Lake City, and colleagues. "Head lice have evolved resistance to many of the currently used pediculicides; therefore, an effective new treatment for head lice is needed. In this study, we examined the effectiveness of several methods that use hot air to kill head lice and their eggs."

The investigators tested 6 different treatment methods, each delivering hot air to the scalp in a different way, on 169 infested individuals. They evaluated how well these methods kill lice and their eggs in situ, and they performed follow-up inspections to determine whether the sixth, most successful, method could cure head louse infestations.

Although all 6 methods killed at least 88% of eggs, they showed more variable success in killing hatched lice. The most successful method, using a custom-built machine called the LouseBuster, resulted in nearly 100% mortality of eggs and 80% mortality of hatched lice, even when operated at a comfortable temperature (slightly cooler than a standard blow-dryer). Virtually all subjects were cured of head lice when examined 1 week after treatment with the LouseBuster, and no adverse effects were observed.

"Our findings demonstrate that one 30-minute application of hot air has the potential to eradicate head lice infestations," the authors write. "Hot air is an effective, safe treatment and one to which lice are unlikely to evolve resistance."

The authors suggest that the LouseBuster could be an institutionally based machine operated by healthcare providers, school administrators, or trained parents and other volunteers. Although effective use of the LouseBuster is not difficult, they note that it does require a little practice to perfect.
"The advantage of an institutionally based device, particularly for schools, is that it could be used to simultaneously treat all children with head lice, minimizing the problem of reinestation," the authors conclude. "In our experience, this would be particularly useful in the case of children with parents who cannot afford the time, expense, or discipline required to treat head lice effectively in their home."

The University of Utah, Primary Children's Medical Center Foundation, the Utah Centers of Excellence Program, and the National Pediculosis Association funded this study. The National Pediculosis Association also provided free LiceMeister combs.

Three of the authors have disclosed having US and international patents pending for methods of using heat to treat head lice.


**Learning Objectives for This Educational Activity**

Upon completion of this activity, participants will be able to:

- Describe 6 methods using hot air for killing head lice in children.
- Compare the efficacy of 6 methods of single treatment using hot air for killing head lice.

**Clinical Context**

There are 6 to 12 million cases of head lice in the United States yearly, with an estimated 12 to 24 million days of missed school in school-aged children. While general approaches, such as shampoo, louse combs, and home remedies are available, most are not entirely effective at killing lice eggs or hatched lice. Lindane and pyrethroid shampoos are the most commonly used methods currently. Hot air at 50ºC produced by a blow-dryer was shown to be effective at killing body lice, probably by desiccation, according to Kobayashi and colleagues in the 1995 issue of the _Japanese Journal of Sanitary Zoology_. But, according to the current authors, this method by Kobayashi and colleagues has not been tested for the treatment of head lice.

The current study examines the efficacy of 6 different hot-air application methods for killing lice eggs and hatched lice in 169 elementary school-aged children.

**Study Highlights**

- 169 children who presented with head lice to local elementary schools were enrolled.
- 94% were female and mean age was 10 years.
- Diagnosis was confirmed by combing out live lice from the head.
- Excluded were those who had used pediculicides or home remedies within 2 weeks and those younger than 6 years who may not tolerate the hot-air treatment.
- Treatments were conducted at home once for a 1-hour period.
- Primary outcome was dead and live lice count after treatment.
- Lice count was obtained prior to treatment by combing half the scalp with a LiceMeister comb, removing all lice encountered, placing them in a 33ºC portable incubator then counting dead and live lice under a microscope in the laboratory.
- The hot-air treatment was applied to the other side of the scalp (which was not combed out prior to treatment).
- The posttreatment lice count was done on the half of the scalp, which received the hot-air treatment.
- Kill rate was determined by before and after treatment counts.
- Dead lice and eggs were counted again 1 week after treatment of a subgroup of children.
- Infestations of children ranged from a few lice to hundreds of lice.
- The 6 hot-air methods were as follows:
  - Method 1, bonnet-style hair dryer. Airflow from 2 hair dryers were combined by attaching the hose from each machine to a single plastic bonnet that enclosed the hair with an elastic band around its perimeter.
  - Method 2, handheld blow-dryer: diffusion heating. The child's hair was divided into 10 sections, and the nozzle of the dryer was moved around the base of each section. Each section was heated for 3 minutes.
  - Method 3, handheld blow-dryer: directed heating. Hair was divided into 20 sections with each section treated for 60 seconds.
Method 4, wall-mounted dryer. A 15-cm aluminum hose was attached to the nozzle of the blow-dryer, and this delivered twice the volume of the previous 3 methods to hair sections.

Method 5, LouseBuster with sections. This device was custom-built to deliver air at a fixed temperature to 14 to 20 hair sections each heated for 60 seconds.

Method 6, LouseBuster with hand piece. This is the same device but with a hand piece to facilitate delivery of hot air to hair roots during slow combing so that each region received hot air for 30 seconds.

The temperature generated for each treatment was monitored at the hose and recorded on a computer and air volume produced was measured.

The minimum temperature used for all 6 methods was 55ºC.

Average time of exposure to hot air for the entire scalp was 30 minutes for all 6 methods.

None of the methods killed 100% of lice.

The least effective method was the bonnet-style hair dryer with an after-before kill rate of 7.3%, followed by the handheld diffuse method with an 8.9% kill rate, then the directed heating method with a 42.2% kill rate and the wall-mounted dryer with a kill rate of 47.5%.

The LouseBuster with sections had a kill rate of 67.8% vs the LouseBuster with hand piece with a rate of 72.3%.

All 6 methods had an effect on lice count, but the LouseBuster with hand-piece method was the most efficacious, with 98% mortality for eggs and 80% mortality for hatched lice 1 week after treatment.

The authors state that future studies will be needed to test the variation in the kill rate and high efficacy rate of the LouseBuster.

Discomfort was experienced by 24% of children in method 1, 50% in method 2, 33% in method 3, 27% in method 4, 17% in method 5, and 11% in method 6.

Pearls for Practice

- Six methods of delivering hot air as treatment of head lice are associated with different kill rates for lice and their eggs and different comfort level for children.
- The LouseBuster method with hand piece is the most efficacious at killing head lice and their eggs at 1 week after treatment.

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