CURRENT TREATMENT OPTIONS FOR HEAD LICE

By

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To the faculty of Washington State University:

The members of the Committee appointed to examine the project of Diane M. Nelson find it satisfactory and recommend that it be accepted.

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To Lila, my mother in law, who spent more hours taking care of my family than I did, especially during the tough semesters.

My family that pushed me through the times that I thought of giving up, Kristin, Mark, Rob & Anita, thanks. My friends who were always ready to help, driving the kids, lifting my sprits, toasting a completed milestone, reminding me that I could do it, Darcy, Tracey, Terri, I couldn't have done it without you!

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Abstract

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Head lice cause much distress and worry in families with school-aged children. There are many available treatment options. Many of these options are costly and may not be effective. This report will review both traditional and non-traditional options available in the treatment of head lice. Education that can help with prevention of the spread of head lice is essential. The practitioner must be empathetic and supportive with patients that present or call for assistance in treating this annoying problem. While validating parental concerns, it is equally important to reassure that head lice, while annoying, are not a cause of any major health problems.
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CURRENT TREATMENT OPTIONS FOR HEAD LICE

Diane Marie Nelson
Family Nurse Practitioner Graduate Student

May, 1999
Abstract

Head lice cause much distress and worry in families with school-aged children. There are many available treatment options. Many of these options are costly and may not be effective. This report will review both traditional and non-traditional options available in the treatment of head lice. Education that can help with prevention of the spread of head lice is essential. The practitioner must be empathetic and supportive with patients that present or call for assistance in treating this annoying problem. While validating parental concerns, it is equally important to reassure that head lice, while annoying, are not a cause of any major health problems.
Introduction

Head lice are a world-wide problem. Sale of lice treatment products (table 1) amounted to $157 million in 1998. The Center for Disease Control in Atlanta estimates that up to 12 million Americans each year are infested with head lice ("Pharmacies play key role," 1998). Only three of the 200 known species of sucking lice infest humans.

These sucking lice are at the center of the problem for human infestation. They include the head louse, the body louse and the crab or pubic louse. Sucking lice are ectoparasites which feed on the blood of their host (Ellis, 1997). Crab lice (phthirus pubis) dwell primarily on pubic hair. Body lice (pediculus corporis) prefer fibers on the inner surface of clothing and move to the body to feed (Carson, 1997). Although body lice are seen in higher frequency in individuals with poor hygiene, head lice (pediculus capitus) are not related to uncleanliness and can be seen at all socioeconomic levels (Adams, 1996).

Health care providers' initial responsibilities include diagnosing and managing individual cases. Practitioners also have a larger public health responsibility to the community. Educating the public is essential to reduce transmission and reinfestation of head lice (Brainerd, 1998).

Scattered reports that head lice may be building a resistance to over-the-counter treatment can not be confirmed by current research. The company that manufactures Nix, the top-selling lice treatment, acknowledges reports of resistance (American Druggist, 1996).

History/Incidence

Head lice have been around since the time of the ancient Greeks (Brown, 1996). Extensive paleopathological studies have concluded that the morphological evolution of lice
(and their eggs) has occurred gradually, following the gradual biological evolution of the human hosts (Capasso & DiTota, 1998). The Romans were the first to develop nit combs, with pieces of broken lice found on wooden combs dating back to 68 AD (Sokoloff, 1994).

Lice infestation is a problem in almost all levels of society and ethnic groups, with the notable exception of low prevalence in the black population (Schachner, 1997). The lower incidence among black families is attributed to the shape of their hair shafts (Sokoloff, 1994). In North America, Caucasians are more frequently affected than other ethnic groups. Children between the ages of 5 and 12, and girls more than boys, have the highest infestation rates (Pollack, 1998).

In 1941, before pharmacological treatment was available, studies from the United Kingdom claim infestation rates of up to 33% in school-aged children. Following the advent of insecticidal treatment, prevalence fell to an overall rate of 2.4% (Vermaak, 1996). Distressed parents may believe the incidence of infestation appears to be rising, however, published research does not support this. Possible explanations for the alleged increase include: the diligence by school personnel in examining larger numbers of school children, or a relaxation in formality which allows for more frequent body contact by children (Chunge, Scott, Underwood, & Zavarella, 1991).

**Etiology/Epidemiology**

Lice belong to the order Phthiraptera, and are the only truly parasitic group amongst the exopterygote insects. Most lice will spend their entire life cycle on a single host (person infested with lice), with transmission largely occurring opportunistically when hosts are in close contact with each other.
Head lice, for reasons largely unknown, are exquisitely adapted to living on the scalp and neck of their human host (Pollack, 1998). To date there are more than 3000 known species of lice, their remarkable host specificity remains a mystery (Smith, Page & Young, 1997).

Lice are obligatory blood-sucking ectoparasites that depend on their hosts for both food and warmth. The adult head louse is a six-legged wingless insect (figure 1) that is about 2-4 mm in length (Carson, 1997, Greene, 1997). Head lice feed from blood on the scalp up to five times a day. Reports of how long lice can live off the body without feeding vary from 24 hours to about 3 days (Sokoloff, 1994). Female lice lay 6-10 eggs or “nits” in a one-month lifespan. These nits hatch within 10-12 days. They mature in less than two weeks to adult lice (Braninerd, 1998). Nits may survive away from the human host for up to 10 days (Burkhart, C. G. et al, 1998).

The adult head louse appears gray in color, although it may appear reddish-brown after a blood meal. Carson (1997) describes the louse-feeding pattern; “The ‘mouth’ of these sucking insects is a long appendage with serrated ‘teeth’ for piercing the skin down to the level of the dermis.”

Head lice are spread by direct contact. Lice can crawl quickly, but cannot hop or jump. Inanimate objects such as combs, brushes, and pillows may have a role in transmission. Few studies have looked at the modes of transmission of head lice. A Canadian study concluded that no unhatched eggs hatched after manual removal from the human head, nor did lice attach to hairbrushes. Results support the importance of head-to-head transmission while discouraging environmental significance (Chunge, Scott, Underwood & Zavarella, 1991). The researchers did not include specific study of transmission via shared hats, scarves or hair ornaments, raising questions that warrant further investigation.
Clinical Presentation/Differential Diagnosis

Pruritus (intense itching) is the most common initial sign of infestation. Breaks in the skin caused by the louse and resultant scratching can cause secondary bacterial skin infection, especially in the absence of good hygiene (Dill & Kirby, 1995). While head lice are not known to transmit disease, providers do need to be aware of the possibility of secondary skin infection from severe itching and scratching.

It is important to ensure that lice are present before considering treatment. When confirming or ruling out a lice infestation, practitioners must be aware of “pseudo-nits”. Bits of hair spray, dead skin scales, or loose debris may be seen on hair shafts. These move with pressure from the fingers, nits do not. Live nits (that have not hatched) glow when exposed to a black light (or UV light), dead nits and empty nits do not (Greene, 1997). This may be a simple, cost-effective way to confirm a diagnosis in the office setting.

Another type of “pseudo-nit” is hair casts. Hair casts are formed by the retention of keratinized internal root sheaths and may be associated with keratinizing disorders of the scalp, but may occur without any scalp abnormalities. While hair casts are an unusual disorder, it is important to be aware of this condition because of its close resemblance to nits from a head lice infestation. On microscopic examination, nits are bottle shaped and are asymmetrically oriented around the hair shaft (Lam, Crutchfield & Lewis, 1997). Proper identification of “pseudo-nits” will prevent unnecessary treatment and subjecting the patient to the social stigma that unfortunately remains associated with lice infestation.

Traditional Treatment

There are currently two compounds (table 2), pyrethroids, available for over-the-counter use in the United States. Pyrethrins are natural insecticides extracted from chrysanthemums.
When combined with a synergist, piperonyl butoxide, pyrethrins have an enhanced lethal effect on the insect (Carson, 1997). Pyrethrins, under the brand names, Rid, Pronto, A-200 and others, have reported cure rates of less than 90% (Vander Strichele, Dezeure, & Bogaert, 1996).

Permethrin, a synthetic pyrethroid, brand name Nix, appears to have the highest efficacy, with cure rates consistently above 90% (Vander Strichele, et al, 1995). Both pyrethrin and permethrin are absorbed through the chitinous exoskeleton of arthropods, but are poorly absorbed through the skin of mammals (Carson, 1997). Because of its safety and efficacy, permethrin (Nix) is generally considered the treatment of choice for head lice (Eichenfield, 1998).

Lindane (gamma benzene hexachloride) is a prescription treatment for head lice that has been used since the second world war (Vander, 1995). Lindane is absorbed through the insect’s exoskeleton. The insecticidal properties are based on its lethal effect on the insect’s nervous system (Sokoloff, 1995).

Because of toxicity, the FDA-approved labeling for Lindane indicates that it should be used only as a second-line treatment for head lice in people who have failed other therapies (Struble, 1998). Vander Strichele, Dezeure, & Bogaert (1995) found that lindane had a cure rate of less than 90%. Adverse side effects include neurotoxicity and bone marrow suppression. Lindane shampoo has a long half-life—18 hours in infants and children (Carson, 1997). Lindane is contraindicated in premature infants, in women who are either pregnant or nursing, and for patients with seizure disorders (Eichenfield, 1998).

Malathion, an organophosphate pesticide, while still being used effectively, is no longer available in the United States. Malathion is an irreversible cholinesterase inhibitor; it may have been the fastest killing and most ovicidal pediculicide marketed (Drugs for head lice, 1997).
Problems with a bad odor, an alcohol vehicle, and long application time may have led to its withdrawal from the United States marketplace (Schachner, 1997).

The National Pediculosis Association maintains a popular website on the Internet. The mission of the National Pediculosis Association (NPA) is to protect children from the misuse and abuse of potentially harmful lice pesticidal treatments (Altschuler, D. Z. 1998). The NPA states “Seizures, behavioral changes, attention deficit disorders, cancer, skin diseases, and even death have been reported to the National Pediculosis Association's registry by people who have used chemical treatments to get rid of head lice” (National Pediculosis, 1998). Because less than 2% of pyrethroids are absorbed, and are rapidly metabolized to inactive metabolites, and excreted in the urine, toxicity is unlikely (Burkhart, C.G., et al, 1998).

**Alternative Treatment**

Many parents claim success with such items as Vaseline, (or other petroleum based products) olive oil and mayonnaise. The Harvard School of Public Health conducted a preliminary test to measure the effect of olive oil. Six active lice were submerged in olive oil. Lice removed after an hour recovered, but those submerged for two hours succumbed. The researchers stress that the study was of preliminary nature and should not be construed as solid evidence on which to base treatment recommendations (Pollack, 1998).

The NPA has the following statement regarding the use of mayonnaise:

The use of mayonnaise or margarine appears to give people a sense of hopefulness, since the majority who use it will already have had failure with readily available pediculicides from the local drug stores. If there is success with such alternatives, we suspect that it may have to do with motivation and the "parent power" behind the effort - rather than a particular pediculicidal or ovicidal property.

Schachner (1997) states that viscous petrolatum (of which Vaseline is one) clogs both the respiratory spiracles of the louse blocking efficient exchange of air. Diligent shampooing for at
least the next 7 to 10 days is necessary to remove the residue. Burkhart, Burkhart, Pchalek & Arbogast (1998) found that lice were unable to continue movement of appendages and died within 15 minutes of immersion in petrolatum. Petrolatum has no effect on egg viability, therefore, therapy should be repeated weekly for four weeks to smother newly hatched lice.

The Burkhart study (1998) also concluded that pomades, medicated ointments for hair commonly used by African Americans, yielded results that were similar to petrolatum products. Pomades were the choice over petrolatum, because they are more readily washed out of hair.

Ivermectin, an anti-parasitic drug now available in the United States for oral use to treat strongyloidiasis and onchocerciasis (river blindness) (Drugs for head lice, 1997). Ivermectin in a single oral dose of 200 mcg/kg repeated in 10 days has been shown to be effective in eradicating head lice (Burkhart, Burkhart & Burkhart, 1998). In a letter to the President of the NPA, Merck & Co., makers of Stomectol (Ivermectin) state; “We do not have an FDA approved indication for the treatment of scabies or head lice. However . . . health care professionals have studied this product for use in this area” (Skoien, M, 1998). While no topical formulation is commercially available for human use for the treatment of head lice (Schachner, 1997), recommendations in reviews of drugs for head lice include; “. . . head lice resistant to all other treatments, a single oral dose of Ivermectin, repeated once after 10 days, may be worth trying” (Drugs for head lice, 1997).

Nit-picking

Mechanically removing lice and nits is the most effective, yet time-consuming method of managing head lice infestation. Researchers have studied nits microscopically and have found that nits firmly attach to the hair shaft by a cylindrical adherent material. Multiple agents have been investigated to determine their effect in facilitating the sliding of nit casts off the hair
shaft. The agents studied included; vinegar, WD-40, acetone, bleach, vodka, liquid nitrogen, as well as commercially available agents for the removal of nits. None of the substances tested had any visible effect (Burkhart, C.N. et al, 1998).

It is important to educate that pediculicides neither kill nits nor cause them to fall off. Specially designed egg-removal combs supplied with commercial products such as Nix and Rid can make the process faster and more effective. The NPA endorses (and sells via its website, www.headlice.org) a specially made Nit comb known as the Licemeister. Claims of effectiveness vary, but the comb may greatly cut down on nit-picking time. Effective November 1, 1998, Medicaid clients (with a prescription) in Washington State, can purchase these combs from pharmacists, DME providers and Home Health Agencies (Is the Licemeister comb reimburseable?, 1998).

Prevention

Regardless of varied treatment efficacy, researchers universally agree that education is the key to prevention. Multiple studies have been done to study the impact of parent and community awareness in breaking the cycle of reinfestation. Chouela, et al (1997) conducted an epidemiological survey in Argentinean school children. While researchers conducted a multi-focal study, the education of parents is of particular importance. Significant survey conclusions from the survey included 95.2% of parents stated that they had increased knowledge through intervention.

A similar study in Mexico explored the role schoolteachers have in the management and prevention of head louse infestation. In comparing three schools, the analysis showed a higher prevalence of infestation in schools in which teachers did not provide any information on the
prevention or control of pediculosis (Paredes, Estrada, Alarcon, Chavez, Romero & Hay, 1997).

In a United Kingdom study, researchers summarized that an infestation is more a nuisance to health professionals and parents than a significant health problem. The study evaluated the effectiveness of a comprehensive plan that included health education. In this particular study, the author describes an “elimination day”, organized annually with good resolution of infestations. Elimination day was the culmination of a year-long educational program of parents, staff and the public. One day was chosen to have children checked and treated (if needed) by their parents, for head lice infestation. The aims of elimination day included; increase knowledge about head lice amongst the general public, and transfer responsibility of hair care from school health nurses back to parents. Parents responded in a positive manner, and infestation rates decreased. Follow-up recommendations included continual flow of information to keep parents up to date regarding the general situation in the community and the latest recommended treatments (Vermaak, 1996).

Future

Further studies are needed to evaluate the effectiveness of current treatment strategies. The effectiveness of alternative methods needs to be documented conclusively. Further empirical data are needed to support claims of dangerous, toxic side effects of currently available pediculicides.

Research-based guidelines for parental education programs are needed. School nurses are encouraged to set up information nights for parents with concerns. The community needs to be educated that head lice are not socio-economically minded. Most public libraries have computers available for internet use. Many reputable web sites can help with information and
ideas to combat infestations. (table 3) Parents should be cautioned that many vendors promote and sell “effective alternative treatments” on the internet, however, they are not required to provide research based evidence to back their claims.

Support groups for parents frustrated by apparent treatment failures may be effective. Utilize the parents’ ideas and feedback to assist in future recommendations. As health care providers, acknowledge the difficulty these families are facing, while reassuring them that head lice are not health threatening. Head lice infestations are embarrassing and frustrating, as well as financially burdensome (table 4).

Health care providers need to be involved in research studies. The Harvard School of Public Medicine invites health care providers to supply samples of nits and lice for further study. Specimens will be studied, results of the study will be sent within a few days of receipt. Check the Harvard School of Public Medicine Website for more details.

Ivermectin may be the newest trend in the battle to control head lice. Further studies to gain FDA approval would be prudent.

Head lice, unfortunately, remain a secretive affliction that is rarely discussed openly, which may hamper practitioners ability to obtain samples for researchers. Helping to dispel myths about head lice may well be the most effective way to continue research efforts.
REFERENCES


Yes - head lice can be resistant to treatment! (1997, September). *Child Health Alert, 15,* 1.
### Table 1 – Cost comparison of head lice treatments

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Pharmacy A</th>
<th>Pharmacy B</th>
<th>Pharmacy C</th>
<th>Pharmacy D</th>
<th>Pharmacy E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nix 2oz</td>
<td>$10.89</td>
<td>$10.99</td>
<td>$09.97</td>
<td>$09.88</td>
<td>$11.99</td>
</tr>
<tr>
<td>Nix 4 oz</td>
<td>$17.99</td>
<td>$17.99</td>
<td>$15.99</td>
<td>$15.47</td>
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<td>Rid 2 oz</td>
<td>$07.59</td>
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<td>Rid 4 oz</td>
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<td>$09.49</td>
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<td>Pronto 2oz</td>
<td>$06.99</td>
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<td>A200 4oz</td>
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<td>$13.49</td>
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<td>Lindane 4oz #</td>
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<td>n/a</td>
<td>$09.90</td>
<td>$15.13</td>
<td>$12.98</td>
</tr>
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n/a = not available  
# = prescription required

price comparison 12/98
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<tr>
<th>Trade Name(s)</th>
<th>Active Ingredient(s)</th>
<th>Formulation</th>
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</thead>
<tbody>
<tr>
<td>Nix, Elimite</td>
<td>Permethrin</td>
<td>Cream rinse</td>
</tr>
<tr>
<td>Rid, A200, R&amp;C, Pronto, various store brands</td>
<td>Pyrethrins plus piperonyl butoxide</td>
<td>Shampoo</td>
</tr>
<tr>
<td>Lindane, Kwell</td>
<td>Gamma benzene hexachloride</td>
<td>Shampoo, lotion</td>
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### Table 3 - Head lice Web sites

<table>
<thead>
<tr>
<th>Website Name</th>
<th>Web address</th>
<th>Available information</th>
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</thead>
<tbody>
<tr>
<td>National Pediculosis Association</td>
<td><a href="http://www.headlice.org">www.headlice.org</a></td>
<td>National clearing house on head lice and scabies issues – with information available in Spanish</td>
</tr>
<tr>
<td>Harvard School of Public Health</td>
<td><a href="http://www.hsph.harvard.edu/headlice.html#resistant">www.hsph.harvard.edu/headlice.html#resistant</a></td>
<td>Head lice: Information and Frequently Asked Questions</td>
</tr>
<tr>
<td>University of Maine - Cooperative Extension</td>
<td>pmo.umext.maine.edu/factsht/headlice.htm</td>
<td>Head lice fact sheet</td>
</tr>
<tr>
<td>University of Iowa College of Medicine - Dept of Dermatology</td>
<td>tray.dermatology.uiowa.edu/PedicCapit-01.htm</td>
<td>a microscopic view of the nits</td>
</tr>
</tbody>
</table>
Table 4 – **Additional cost considerations for a head lice infestation**

<table>
<thead>
<tr>
<th>Cost Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottle of head lice treatment product</td>
</tr>
<tr>
<td>25-30 loads of extra laundry</td>
</tr>
<tr>
<td>Dry cleaning for clothes that can’t be laundered</td>
</tr>
<tr>
<td>Extra louse combs</td>
</tr>
<tr>
<td>Time off from work (min. ½ day)</td>
</tr>
<tr>
<td>Unproductive time spent at work worrying about lice</td>
</tr>
<tr>
<td>Child’s haircut (not necessary, but practical)</td>
</tr>
<tr>
<td>Parent’s haircut (not necessary, but empathetic itching may require)</td>
</tr>
<tr>
<td>Evening hours used nit picking, vacuuming and doing laundry</td>
</tr>
</tbody>
</table>

Adapted from Siegler, 1996
FIGURE 1 – Pediculus Capitus (Adult Head Louse)