

The treatment and prevention of head lice infestation

INTRODUCTION

The incidence of head lice infestation (pediculosis) has steadily increased in the United States over the last few decades. Although considered highly undesirable by members of the public, from a medical perspective it is not considered a health hazard or a sign of poor hygiene. However it is problematic due to its contribution to the unnecessary loss of school and work days, as well as to the anxiety and embarrassment felt by the affected individual. Unfortunately, because most head lice cases are not diagnosed or treated by a healthcare provider, there is a potential for misuse and overuse of OTC pediculicide treatments, with an attendant increase in resistance to those agents. It is important that nurse practitioners and physician assistants understand the etiology of head lice, the concerns and issues parents face in responding to infestations of head lice and the advantages and disadvantages of available OTC and prescription treatments.

EPIDEMIOLOGY

Head lice affect an estimated 10 million to 12 million Americans each year.¹ Infestation is more com-

TABLE 1
Life stages of head lice

Stage	Appearance	Location	Length of stage	Survival off host
Nits	Oval shaped, yellow or white. Maturing nits may have "eye spot"	Attach to the hair, close to the scalp—usually located within 6 mm of the scalp	Hatch in five to 12 days	Can survive for 10 days off host
Nymphs	Appearance is the same as an adult but the size of a pinhead	Usually located close to the scalp due to need to feed on host	Reach adulthood in nine to 12 days	Must feed on blood within 24 hours of hatching to survive
Adult louse	Size of a sesame seed	Move quickly by crawling; cannot hop or fly	Can live for up to 30 days	Can live off host for two days

mon in children 3 to 12 years of age, with outbreaks generally occurring in elementary schools and day care centers.^{1,2} African-Americans in the United States have low infestation rates, possibly due to the oval structure of their hair shafts that makes it difficult for the lice to grasp.² Females are at greater risk than males, and socioeconomic status is not

considered a risk factor.

ETIOLOGY

Adult head lice are typically 3 mm to 4 mm long and grayish-white in color. The female is larger in size and lays seven to 10 eggs a day during its life span of approximately 30 days. The eggs, or nits, attach to the hair shaft close to the

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Program Goal: To improve the clinician's ability to provide consultation for the safe and proper eradication of head lice.

Learning Objectives

Upon completion of this program, the clinician should be able to:

1. Describe the signs and symptoms indicative of head lice.

2. Describe populations most at risk for head lice and how head lice spread.
3. List OTC and Rx treatments for head lice.
4. Discuss concerns associated with some head lice treatments, including resistance and adverse effects and/or toxicity.
5. Make appropriate recommendations to consumers regarding head lice eradication.

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PATIENT SCENARIO 1

Sara Blanca is an 11-year-old female who is in the clinic with her mother. Her mother explains that Sara has been complaining of an itchy scalp for the last two weeks. The scratching has been interfering with her schoolwork, and she feels embarrassed because she thinks her classmates are whispering and staring at her. She shampoos her hair regularly, and her parents thought maybe there was something in the shampoo that was irritating her skin. They have tried a couple of other shampoos, but it hasn't made a difference. Her mother wants to know if the pharmacist has any suggestions. She tells her daughter to go look at barrettes, and then whispers to the pharmacist that she's worried that her daughter might have gotten lice from her best friend because she heard that the reason the friend is out of school is because she has head lice. Their school has a no-nits policy, and it really has the mother worried. Sara is an "A" student, and the mother wants her to go to college. But if Sara misses as much school as her friend has, she doesn't know what will happen to her grades. (She had thought about taking her daughter to see a doctor, but her employer will not allow her to take a day off until a week from today.) With that in mind, she came into the pharmacy to look for an OTC product. The pharmacist offers to show Ms. Blanca the OTC products, but suggests that she may want to have the retail clinician see her daughter. Following that recommendation, Ms. Blanca and her daughter enter the retail clinician's office.

Discussion

After examining Sara, the clinician makes the following notes:

11-year-old female in NAD

Skin: p/w/d; no rashes or suspicious lesions

Hair: Brown, thick; no obvious thinning or loss. + evidence of head lice – both nits and adult lice

Lymph nodes: no lymphadenopathy

EENT: Normal

Lungs: clear bilaterally; no crackles, wheezes or rubs

Treatment is indicated. The clinician should explain both the OTC and prescription options. Given the school's policy, if Sara does have head lice, malathion likely is the best choice. The clinician should make sure the mother understands the directions.

The clinician also should explain the benefits of environmental interventions at home, including washing and drying clothes and linens in hot temperatures, sealing her child's personal items in plastic bags for at least two weeks if they can't be washed, soaking combs and brushes in hot water for five to 10 minutes and vacuuming the floors and furniture thoroughly. Mom should be educated on precautions that her daughter can take to prevent another infestation. Recommend that all household members be checked for lice and treated if necessary. The clinician should advise the mother to notify the school so that her daughter's classmates also can be screened for lice.

scalp. Nits are 1 mm in diameter, oval-shaped and yellow or white in color. The nits hatch within five to 10 days, releasing nymphs that reach adulthood in nine to 12 days. Once hatched, the nymphs need to feed on the host within 24 hours in order to survive. They have well-developed legs for gripping hair and mouth parts for sucking blood. They feed on blood from the scalp multiple times a day. The adult lice ultimately mate, and the females lay

more eggs. The life cycle of the head lice can repeat itself every three weeks if the infestation is left untreated. Nits can survive for at least 10 days off the host, while adult lice can live for only two days off the scalp. Table 1 shows the life stages of head lice.

TRANSMISSION OF HEAD LICE

Lice are wingless parasites that crawl, and do not jump or fly, from one host to another. They do not use

pets or other animals as vectors.³ The most common mode of transmission is direct head-to-head contact with an infested individual. Infestation also can occur through contact with inanimate objects (e.g., combs, brushes, hats, clothing and linens) harboring nits or lice, but the incidence is low. Inanimate objects that have nits are relatively unlikely to produce adult lice because the nymphs die if they are unable to feed after hatching. Off the scalp, lice quickly die due to starvation and dehydration.³

CLINICAL PRESENTATION

Head lice infestations are initially asymptomatic.³ Upon feeding, the lice inject a small amount of saliva into the scalp. An allergic reaction to the saliva is what causes the itching, which is the most common symptom. The scalp, ears and neck are typically affected. The development of itching may be delayed with a first case of head lice because it can take several weeks for the host to become sensitive to the louse saliva.² Infestation causes little morbidity and usually is not associated with serious disease. Scratching can lead to secondary bacterial skin infection but is very rare.

DIAGNOSIS

Misdiagnosis of head lice infestation is frequent.³ Adult lice are often hard to detect because they are mobile.^{1,2} Nits and empty casings are easier to visualize during physical inspection of the scalp because they remain attached to the hair shaft and are lighter in color. In order to minimize misdiagnosis, it is important to differentiate lice or nits from such hair debris as dandruff, hairspray residue or dirt.

The use of a fine-toothed nit comb in addition to visual inspection may increase the efficiency and effectiveness of detecting lice and nits.³ Inspection should focus on the crown of the scalp, over the ears and the lower neck. Hair should first be

combed or brushed to remove any tangles. The nit comb then is inserted near the crown of the scalp and firmly drawn down the entire length of the hair. After each stroke, the nit comb should be inspected for lice.

Once the entire head is systematically combed, it is recommended that the process be repeated. The presence of nits does not always indicate an active infestation because it is possible for nits to remain on the scalp for months even after successful treatment.³ However, nits within 6 mm of the scalp are likely to have been laid within an active life cycle. Adult lice can move quickly, making identification difficult. Nonetheless it is preferred that a diagnosis be based on the detection of moving lice.

TREATMENT

The goal of treatment is to kill the adult and nymph lice and remove nits from the hair of the infested individual. Because head lice do not carry disease, safety of treatment for head lice is considered important. However, parents also want a quick response. Part of this is no doubt because of the fact that most people have a strong distaste for head lice. However, some schools also have no-nit policies, which restrict students from attending school if any nits are present. This can result in lost days of school for the students and, for many parents, lost days of work as well. It should be noted that such policies are not recommended.^{2,8} However, they do exist in many communities.

One option for treatment is to use a nit comb on a daily basis for several weeks. However, this can require several hours of time every night for several weeks. For many families this is not practical. Also, certain hair characteristics can limit the effectiveness of this approach. This approach may still be useful as an adjuvant or it may be necessary in the event that the patient is under age 2, but in practice, it is rarely effective as a single therapy.

TABLE 2
OTC products

Ingredient	Brand name	Target	Comments
Permethrin	Nix® Creme Rinse	pediculicidal	Safe and effective when used as directed. Kills live lice, but not unhatched eggs. Treatment failures can be common due to resistance. Not approved for use in children less than 2 years old.
Pyrethrins	A-200® Pronto® R&C® Rid® Triple X®	pediculicidal	Safe and effective when used as directed. Can only kill live lice, not unhatched eggs (nits). Treatment failures can be common due to resistance to pyrethrins. Pyrethrins generally should not be used by persons who are allergic to chrysanthemums or ragweed.

NONPHARMALOGICAL TREATMENT

As noted, the manual removal of lice using the wet combing method is an option, especially for children under age 2, who are unable to use topical pediculicides.³ The procedure, which is similar to that used for diagnosis, is done on wet hair. Regular combs are not effective because the teeth are spaced too far apart to trap the nits and/or lice. The amount of time required for one session can be 15 to 30 minutes or longer depending on the length and thickness of the hair. The process should be repeated once every three to four days for several weeks. If live lice are found during a session, combing needs to be continued for an additional two weeks. Wet combing as monotherapy has a relatively low cure rate. It has not been proven to be as effective as pediculicides,

and it does not quicken resolution of the infestation when used in combination with pediculicides.

NONPRESCRIPTION TOPICAL PRODUCTS

The over-the-counter pediculicides available in the United States are the topical pyrethroids, which include synergized pyrethrins and permethrins (Table 2). Pyrethrins are derived from natural extracts of chrysanthemums. They have the ability to block nerve impulse transmission, which paralyzes and kills the lice. Pyrethrin products come in concentrations of 0.17 percent to 0.33 percent in combination with 2 percent to 4 percent piperonyl butoxide. The addition of piperonyl butoxide enhances the insecticidal effect by inhibiting the metabolism of pyrethrin and increasing its concentration in the louse. Pyrethrins are

neurotoxic to lice, but toxicity in mammals is low due to minimal percutaneous absorption.⁵ The most common adverse reactions that occur include skin irritation, erythema, itching and swelling. Rare cases of allergic reactions (e.g., wheezing, dyspnea) have been reported in patients sensitive to ragweed, and the use of pyrethrin products should be avoided in those allergic to chrysanthemums. Pyrethrins are pregnancy risk category C, and a healthcare provider should be consulted before treating an infested individual who is pregnant or lactating.⁶ These products are not to be used in children under the age of 2 unless directed by a healthcare provider.

Pyrethrins come in several dosage formulations, including shampoo, gel, foam and solution. Before applying the medication, hair needs to be shampooed, rinsed and then towel-dried. Conditioners and cream rinses are not to be used prior to application because they interfere with the ability of the medication to adhere to the hair shaft. The amount of pediculicide applied should be enough to saturate the scalp and needs to remain on the area for 10 minutes before it is rinsed off with water. Contact with eyes and mucous membranes should be avoided. Following the rinse, nit combing will help remove dead lice and nits from the hair. Pyrethrins only kill live lice and not unhatched nits, thus a large percentage of nits remain viable after the first application.²⁴ A second treatment is needed seven to 10 days later to kill any newly hatched nymphs before they can mature and lay more eggs.

Permethrin is a synthetic pyrethroid that is available as a 1 percent cream rinse. It is similar to the pyrethrins in mechanism of action, causing lice paralysis and death. Toxicity in humans from the use of permethrin is low, with some of the more common side effects being skin irritation, edema, erythema and itch-

ing. In contrast to pyrethrins, permethrin does not cause allergic reactions in people with allergies to plants.⁵ Permethrin is pregnancy category B, but women who are pregnant or lactating should still consult their healthcare provider prior to use.⁷ It should not be used in children under age 2 unless directed by a healthcare provider.

When parents know or fear their child has head lice, they typically want to get the infestation treated and eliminated as quickly as possible. As noted previously, permethrin- and pyrethrin-containing products are available in OTC formulations and, as such, often are among the first ones chosen.

Directions for the safe and effective use of permethrin are similar to those of the pyrethrin products. Adjunctive nit combing is recommended to remove the dead lice and nits. Permethrin eliminates only live lice and not unhatched nits. Unlike the pyrethrins, permethrin is designed to leave a residue on the hair shaft that enables it to maintain its effect for up to 10 days.⁷ This residual effect targets nymphs that emerge from nits that remained after the first application. The manufacturer recommends repeating treatment seven to 10 days later only if live lice are detected. Others recommend routine retreatment after seven to 10 days due to increasing reports of permethrin resistance.

When parents know or fear their child has head lice, they typically want to get the infestation treated and eliminated as quickly as possible. As noted previously, permethrin- and pyrethrin-containing products are available in OTC formulations and, as such, often are among the first selected. Originally, these products were highly effective. However, in recent years, increasing levels of resistance to these agents have been reported. The development of resistance is most likely related to a number of factors. First, because these products are available without a prescription, there is concern that they may be used more often than is necessary. As noted previously, it can be difficult to see adult head lice, as they move quickly and may dart away as the hair is being examined. Nits, which do not move, are very tiny and can be confused with particles of dandruff or other matter.

Another factor in the development of resistance is likely related to the fact that neither permethrin nor pyrethrin kills nits. Multiple applications are necessary to kill the nymphs as they hatch and, if not done properly or not applied at the correct time, it is possible for the lice to be exposed to a sublethal dose. Genetic traits that facilitate resistance then are passed on to the offspring.¹⁴ The primary mechanism behind pyrethroid resistance involves genetic mutations at the pyrethroid target site.

The prevalence of pyrethroid-resistant lice varies by geographic location, but recent studies⁸ have shown cure rates as low as 45 percent, compared with rates of more than 90 percent in the 1980s. Nit combing is an important adjunctive treatment when using pyrethroids but, as noted previously, this can be time consuming and, probably as a result, not have a successful outcome.

PRESCRIPTION PRODUCTS

Two prescription products are

TABLE 3

Prescription products

Ingredient	Brand name	Target	Comments
Malathion	Ovide®	pediculicidal, ovicidal	Safe and effective when used as directed. Intended for use on children 6 years old and older.
Lindane	None available		Not recommended as a first-line therapy. Its use should be restricted to patients who have failed treatment with or cannot tolerate other medications that pose less risk. Medication guide required.

Some patients may be familiar with malathion due to its use in agricultural products. These patients should be advised that, while malathion is used in some agricultural products, those products contain a much higher concentration of malathion than is found in the medicinal product.

available for the treatment of head lice (Table 3).

Malathion

Malathion is an organophosphate insecticide that is available as a lotion in a 0.5 percent concentration. It acts via irreversible cholinesterase inhibition, which causes excessive stimulation of the nervous system and leads to rapid paralysis and death of the louse.

Some patients may be familiar with malathion due to its use in agricultural products. These patients should be advised that, while malathion is used in some agricultural products, those products contain a much higher concentration of malathion than is found in the medicinal product. Additionally, the malathion in the prescription product for head lice is pharmaceutical grade and does not contain impurities that may occur in the agricultural products. According to the prescribing information for prescription malathion, adverse effects in humans of the topical application are limited to minor skin irritation.

The prescription malathion-based formulation available in the United

States has pediculicidal and ovicidal activity. The ovicidal effect is thought to be a result of nervous system effects that prevent the nymph from hatching out of the nit.¹⁰ Two other components in the lotion, isopropyl alcohol (78 percent) and terpineol (12 percent), also contribute to its ability to kill both lice and nits effectively.⁹ This triple combination of active agents is a likely reason for the low incidence of malathion resistance.

Growing concerns over the in-

crease in pediculicide resistance brought about the reintroduction of malathion into the U.S. market.⁸ It previously had been withdrawn from the U.S. market due to the greater appeal and rising use of OTC pediculicides, but it did remain on the European market.⁵ Evidence has shown that malathion is the fastest and most effective head lice treatment in comparison with other currently available pediculicides on the market.^{5,8,9}

PRACTICE POINTS

- In order to prevent the development of resistant lice and unnecessary exposure to chemical pediculicides, active lice infestation should be confirmed prior to using any medications.
- The available nonprescription pediculicides include permethrin 1 percent and synergized pyrethrins.
- Prescription malathion is effective for lice suspected to be resistant to the pyrethroids.
- The same medication should not be used repeatedly if it does not seem to be working.
- Adjunctive nit combing, environmental treatments and other measures of prevention are critical in the management of head lice.

Approximately 80 percent of patients are cured with a single application. The hair and scalp should be examined seven to nine days after the initial treatment. If live lice are observed, application of malathion should be repeated. There have been no reports of resistance to malathion in the United States, and studies have found cure rates ranging from 98 percent to 100 percent.^{8,9,15,16}

The safety profile of malathion is favorable, and no serious toxic effects have been reported. Minor adverse reactions that have occurred include skin irritation and conjunctivitis. As noted, the formulation has a high alcohol content. As a result, the risk of flammability is a concern. The product labeling includes a warning to avoid smoking, open flames and the use of electrical heat sources (hair dryers, curling irons) when using the medication.⁹ Patients should be advised to follow this, and all package directions. However, a recent review article found no reports of injury from fire.⁸ Malathion should only be used on individuals 6 years old and above. It is pregnancy category B, and a healthcare provider should be consulted prior to use in pregnant or lactating women. As with many topical medications, there is a risk of injury if malathion is swallowed. Severe respiratory depression may occur with accidental ingestion. Thus, as with any medication, care should be taken to keep malathion out of the hands of young children.

The medication is applied to dry hair and rubbed into the scalp until it is thoroughly saturated. The hair should be left uncovered and allowed to dry naturally for eight to 12 hours before it is shampooed and rinsed off. Nit combing should follow the treatment. The first application usually is successful, but retreatment in seven to nine days may be required if live lice are detected. Recently a number of studies have looked at the efficacy of malathion using a shorter period of

application. These studies showed good efficacy.^{15,16} However, patients should be advised to apply malathion according to the package directions unless directed otherwise by their healthcare provider.

Lindane

For many years, lindane was considered the treatment of choice for head lice. Due to poor efficacy, widespread resistance and reports of neurotoxicity, it now is a second-line agent for those who cannot tolerate or have failed treatment with the other available pediculicides.¹¹ Lindane is an organochloride formulated as a 1 percent shampoo. It paralyzes

It is required by law to provide patients with a medication guide each time lindane shampoo is dispensed. It is important to counsel on the appropriate use of lindane because toxicity commonly occurs due to improper use, overuse or accidental ingestion.

and kills lice by inhibiting the gamma-amino butyric acid (GABA) receptor, causing excessive stimulation of the nervous system. It has been associated with serious adverse events in humans, including neurotoxicity (e.g., seizures, dizziness and paresthesia) and even death. Common minor side effects are itching, burning and dry skin. Those who are at higher risk for neurotoxicity include infants, children, the elderly, those with skin disorders that may increase absorption of the medication

and individuals weighing less than 110 pounds (50 kg). The product should not be used on premature infants, patients with poorly controlled seizure disorders and those with known hypersensitivity to lindane. It should be used with caution in patients who are taking medications that can lower the seizure threshold. Lindane is pregnancy category C, and its use is not recommended during pregnancy. The medication also may be present in breast milk. Women who are breast-feeding and using lindane should pump and discard their milk for at least 24 hours after using the medication.

It is required by law to provide patients with a medication guide each time lindane shampoo is dispensed. It is important to counsel on the appropriate use of lindane because toxicity commonly occurs due to improper use, overuse or accidental ingestion. Confirmation that the patient is truly infested with live lice is needed before using lindane. Hair must be shampooed, without conditioner, and dried prior to application. However, the hair should not be washed one hour before using the shampoo. Use of oil-based hair products ought to be avoided because they may promote the absorption of lindane into the skin. Lindane can seep through regular latex gloves easily, thus heavy-duty gloves (e.g., nitrile, latex with neoprene and vinyl) should be worn when handling the medication. Without the addition of water, the shampoo is applied and massaged into dry hair in an amount sufficient to coat the hair and scalp. Once applied, it should only remain on the head for four minutes uncovered. Water is then added to the hair to create a lather, which should be immediately rinsed off, carefully avoiding any contact with the eyes or other body surfaces. After towel-drying the hair, nit combing should follow. The patient should be informed that lindane may worsen the itching, but it does

not mean that the medication did not work. Retreatment is not recommended because of potential toxicity.

Permethrin

Permethrin 5 percent is available as a prescription product for the treatment of scabies. The prescription strength does not have an indication for head lice and, with regard to the treatment of head lice, it has no advantages over the 1 percent OTC product. Moreover, in the event that head lice are permethrin-resistant, neither the 5 percent nor the 1 percent formulation will be effective.

Other Treatments

Decreasing efficacy of the pyrethroids has encouraged some to turn to alternative therapies for eradicating head lice. There is a lack of evidence to support the use of these agents, and they are not approved by the Food and Drug Administration for use as pediculicides.

Such oral agents as ivermectin and trimethoprim/sulfamethoxazole have exhibited pediculicidal activity.^{2,5,8} The lice are killed when they ingest a blood meal containing these drugs. Ivermectin should not be used in children weighing less than 15 kg because it can cross the blood brain barrier and potentially cause adverse effects on neurotransmission. There is potential for serious allergic reactions with trimethoprim/sulfamethoxazole, which makes it an undesirable option. Again, these products do not have an FDA-approved indication for head lice.

The efficacy of other therapies intended to suffocate lice, such as olive oil, petrolatum and mayonnaise, has not been proven. Lice can live for long periods of time without oxygen, so more than likely these products only slow down the movement of lice.⁵ Gasoline and kerosene have been used by uninformed individuals who fail to recognize that the flammability and toxicity of these products. The research for products that may be

effective against head lice is ongoing; however, it has not yet resulted in any additional FDA-approved products.¹³

ENVIRONMENTAL STEPS

Environmental interventions also should be considered. Clothing, linens and other personal items used by the infested individual two days prior to medical treatment should be machine-washed in hot water then dried in the hot air cycle.⁴ Lice and nits are killed after being exposed to temperatures greater than 130°F (50°C to 60°C) for at least five minutes. Objects that cannot be washed can be dry-cleaned or sealed in plastic bags for at least two weeks. Any nits that survived would have hatched during that time, and the nymphs would die without a blood meal. Combs and brushes can be soaked in hot water for five to 10 minutes. Carpets, floors and furniture should be vacuumed thoroughly and routinely. However, the risk of infestation by lice and nits that have fallen off the host is low. The use of insecticidal sprays on inanimate objects is unnecessary and not recommended due to potential toxicity to humans if inhaled or absorbed through the skin.

PREVENTION

Management of head lice should include proper education and counseling on the prevention of future infestations. Close contacts (e.g., household members, bedmates and classmates) of the infested individual should be checked and treated if there is evidence of an active infestation. Some even recommend prophylactic treatment for all close contacts without screening, but many are opposed to exposing individuals to pediculicides without having a definitive diagnosis of head lice.⁸ Other preventive measures include environmental cleaning, not sharing personal items (e.g., hats, combs and brushes) and avoiding direct head-to-head contact. Parents should be encouraged to frequently check their

children for head lice, especially if they are symptomatic.

CONCLUSION

Practitioners can assist patients by educating and counseling them on how to examine the head and scalp to determine if lice are present. Practitioners also should counsel patients on proper use of products. In particular, if patients select an OTC product, they should be advised that if lice are still present after two to three applica-

Management of head lice should include proper education and counseling on the prevention of future infestations. Close contacts of the infested individual should be checked and treated if there is evidence of an active infestation.

tions, the lice likely are resistant and a prescription product should be considered. Patients who are concerned about resistance may want to begin with malathion as a first choice.

Wet combing is a nonpharmacologic alternative for patients who cannot, or prefer not to, use topical pediculicides, but the process is tedious and not highly effective. Environmental treatment is helpful in preventing potential transmission of head lice to close contacts and reinfestation of the patient. Once the head lice infestation is resolved, instructions should be given on the proper precautions one can take to prevent future infestations. Patients should be encouraged to consult a healthcare provider, if possible, for an accurate diagnosis and close supervision of medication use.

Learning Assessment

Successful completion of “The treatment and prevention of head lice infestation” is approved for two contact hours of credit.

To obtain credit, answer the following questions and complete the evaluation online at www.retailclinician.com.

- Nits can survive off of the host for at least:**
 - Two days
 - Seven days
 - 10 days
 - 14 days
- The most common way that lice are transmitted is:**
 - By direct head-to-head contact
 - By jumping from one host to another
 - By having a pet that is infested
 - By sharing clothing
- The allergic reaction that occurs during an active head lice infestation is caused by:**
 - Allergens on the surface of the nits
 - The movement of the adult lice
 - Toxins secreted from the legs of the lice
 - Saliva injected by the lice as they feed
- A nonpharmacologic alternative for treating head lice in patients who cannot use topical pediculicides is:**
 - Brushing hair three times a day
 - Washing and shampooing the hair daily
 - Wet combing daily for several weeks
 - Covering the hair with baking soda
- Treating the patient’s environment includes:**
 - Laundering clothes and linens used by the patient in warm water
 - Sealing items that cannot be washed in plastic bags for two weeks
 - Soaking combs and brushes in ice cold water for 10 minutes
 - Spraying a chemical insecticide on the carpets and furniture
- Pyrethrins should be avoided if the patient has an allergy to:**
 - Sunflowers
 - Roses
 - Daisies
 - Chrysanthemums
- Which of the following agents possesses both pediculicidal and ovicidal effects?**
 - Lindane
 - Malathion
 - Permethrin
 - Pyrethrin
- Lindane is associated with which serious adverse event?**
 - Anaphylaxis
 - Cardiac toxicity
 - Seizure
 - Thrombocytopenia
- Directions for the use of lindane include:**
 - Applying to wet hair
 - Avoiding oil-based products prior to the application of the medication
 - Keeping the medication on the head for at least 10 minutes
 - Using regular latex gloves when handling the medication
- For which of the following products has resistance NOT been reported in the United States?**
 - Lindane
 - Malathion
 - Permethrin
 - Pyrethrin

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