Lice and scabies: in the scheme of the ‘big’ diseases, they may not loom very large. But for parents—or anyone diagnosed with these parasites—they are a social and emotional nightmare, with their stigma of uncleanliness. Yet they are not uncommon: lice infestation, or pediculosis, has been estimated to occur in hundreds of millions of cases around the world each year.¹

These people are likely to visit a pharmacy looking for help in getting rid of these parasites. Pharmacists play an important role in counselling clients on the proper use of pediculicides, and reassuring them about the resolution of the problem.

LICE

BIOLOGY OF LICE

Lice are tiny blood-feeding parasitic insects. There are three species of lice that can affect humans: head lice (pediculus humanus capitis), body lice (pediculus humanus corporis) and pubic lice (phthirus pubis or “crabs”).

Head lice

Head lice are tiny crawling insects that live close to the scalp and take regular blood meals from their human host. They are one to four millimetres in length, or roughly the size of a sesame seed, and their colour ranges from nearly colourless (when they hatch) to reddish brown (after feeding).¹ ³ Their legs are equipped with claws that are able to firmly grip the hair.

The head louse goes through several stages in its life cycle, from egg (“nit”), first nymph, second nymph, third nymph, to adult. It takes seven to 10 days of incubation at scalp temperature and humidity for eggs to hatch. The first nymph then emerges and concentrates on feeding and growing. After approximately three days the first nymph molts its skin and the slightly larger second nymph emerges. This process is repeated for the third nymph stage, with the final moult giving rise to the sexually mature adult louse (total time to maturity is approximately 10 days).³ An adult head louse can live up to 30 days on its host and the female may lay six to 10 eggs per day. The majority of eggs are found cemented to the hair behind the ears and at the nape of the neck, as the temperature and humidity in these locations are optimal for survival.² Away from the host the louse will usually not survive more than 48 hours.³ A nit may survive up to 10 days,¹ although it is unable to hatch at an ambient temperature less than that near the scalp.⁵

Body lice

Body lice have a similar physical appearance to head lice, but their habitat is different. The body louse lives on and attaches its eggs to clothing fibres, especially along inner seams. It feeds less frequently, often emerging at night, and is generally considered to be more robust than the head louse.⁶ Eggs usually hatch in eight to 10 days but may take up to 30 days, and mature to adult lice in eight to 15 days. The body louse may survive up to 10 days away from the host.⁷

Pubic lice

Pubic lice (“crabs”) are usually found in the pubic and perianal regions, but occasionally may appear in coarse hair on other parts of the body such as eyelashes, eyebrows, beards, or other hairy areas.⁸ ⁹ They look different from head lice, appearing as small
yellow–brown to grey dots between 0.8 and 1.2 mm. Pubic lice have six legs, two being very large and resembling the pincer claws of a crab. Eggs are cemented to hair and hatch in eight to 10 days, with the louse maturing into the adult form within 14 to 22 days. Pubic lice are unable to survive more than 24 hours away from the host.1

PATHOPHYSIOLOGY AND DIAGNOSIS

Head lice

People of any ethnicity, gender or socioeconomic category can suffer from head louse infestation. Infestation is more common in children (aged three to 11) than adults, and is seen more frequently in females than males. These differences appear to be largely due to differing levels of contact during play, with girls engaging in “close play” involving more head-to-head contact. In North America, Caucasians are infested more often than people of African descent.5,10,11 Close contacts of infested people, such as family members, also have a greater rate of infestation.12 There is some debate surrounding the presence of seasonal variations in the rate of lice infestations. The belief that the prevalence increases in fall and winter may be due to an increased awareness at this time and therefore a larger number of cases are diagnosed.4

Transmission of head lice occurs mainly by head-to-head contact between individuals. Lice may also be transferred by sharing inanimate objects (fomites) such as combs, hats or headphones,13 but this is less likely.5,10,14 Pets are not vectors in the transmission of head lice.

Symptoms of an infestation are usually mild, or may not be present at all, especially in light infestations (one to five lice).12,14 If symptoms are present, the main complaint is pruritus around the back and sides of the scalp. As lice feed, they simultaneously inject saliva10 that can cause a hypersensitivity reaction, leading to the formation of itchy papules.3 This immune response, however, may take weeks to develop.2 Other symptoms include a “tickling feeling” of something moving in the hair, or irritability.11 In some cases nits can develop from scratching, and a secondary bacterial infection can result.10

Identification of a live louse is the gold standard of diagnosis.2,5,10,15 This may be difficult as lice are able to crawl up to 30 centimetres per minute, moving rapidly away from any perceived peril such as light or agitation of the hair.5,13 The use of a nit comb has been shown to be four times more effective and twice as fast in detecting live lice versus direct visual examination.16 The comb should be inserted near the crown until it touches the scalp and then drawn down, examining the comb for live lice after each stroke.10,16 The entire head should be combed at least twice.16

Nits appear as brown/yellow translucent oval eggs approximately one millimetre long before hatching and are visible to the naked eye.11 They are usually found attached to the hair at the nape of the neck and behind the ears, less than one centimetre from the scalp. Those found more than one centimetre from the scalp indicate an old infestation (since this means the hair has had time to grow away from the scalp).5,11,12 After hatching the empty shells are more visible and appear opaque white.11

Body lice

Transmission of body lice occurs through sharing of clothing and linens. Poor hygiene plays a major role in its epidemiology, with infestation unlikely in individuals who wash and change their clothes regularly.7,17 Spread is rapid under crowded, unsanitary conditions where there is regular contact between people and infested belongings. A diagnosis can be made by examining seams of clothing for eggs and crawling lice.7

Symptoms such as hypersensitivity can develop from the bites, resulting in pruritus and excoriations, which may be prone to secondary infections. In addition, body lice can act as vectors in the transmission of diseases such as typhus, relapsing fever and trench fever.1,7

Pubic lice

Pubic lice are transmitted mainly by sexual or close body contact,8,9 and occasionally by sharing of linens or clothes. Contrary to popular belief, it is unlikely that infestation can be transmitted through sharing toilet seats, since the pubic louse cannot survive for a long time away from its host, and is not morphologically equipped to grasp smooth surfaces.8

A diagnosis can be made by examining pubic hair for nits or adult lice.8,9 Finding crawling lice may be difficult as they are able to move quickly away from light, but the presence of nits confirms infestation.8 Rust-coloured flecks from lice feces may be found on the skin, and blue macules may be present on the skin at feeding sites.9

The main symptom is pruritus in the pubic or perianal area.1,8 All patients with pubic lice should have a thorough investigation for other sexually transmitted diseases, and close contacts notified in order to seek treatment.9

PHARMACOLOGICAL TREATMENT

Pharmacological treatment is not recommended for body lice.7 Treatment for body
Lice includes nonpharmacological measures outlined in the section below.

Pharmacological treatment options for head and pubic lice include application of topical nonprescription pediculicides. The three main pediculicides used in Canada include permethrin (a synthetic pyrethroid), pyrethrins with piperonyl butoxide and lindane. Two additional synthetic pyrethroids, bioallethrin and allethrin, are also available. Pediculicides exert their activity on the central nervous system of the louse, resulting in its paralysis and eventual death. These products differ with respect to their pediculicidal activity (ability to kill lice), ovicidal activity (ability to kill viable eggs), residual activity (retention of the pediculicide on the hair and scalp after washing) and safety profiles.

Proper application of pediculicides is essential to ensure optimal treatment. Table 1 summarizes appropriate application of the most commonly used pediculicides.

**Lindane** is a gamma benzene hexachloride. It exhibits the least pediculicidal efficacy compared to permethrin and pyrethrins/piperonyl butoxide, with poor ovicidal activity and no residual activity. The use of lindane is also limited by its less than favourable safety profile. Lindane is only an alternative treatment for patients who cannot tolerate or have failed first-line treatment with safer medications for the treatment of lice.26 The product is approximately 10 per cent systemically absorbed and accumulates with repeated exposures, which can potentially lead to neurotoxicity. Adverse effects range from mild local irritation to neurotoxicity such as dizziness, nausea, vomiting, hallucinations and seizures. Lindane is not recommended for children less than six years old; for elderly, pregnant or lactating patients; or for those with a seizure disorder. It must also be used with caution in patients with extremely excoriated skin who may exhibit enhanced absorption, putting them at a greater potential risk for neurotoxicity. Patients weighing less than 50 kg are also at an increased risk of neurotoxicity. Lindane is contraindicated in premature infants and individuals with known uncontrolled seizures. It has been withdrawn from the market in several countries, and is available only by prescription in the United States.12 Lindane is available without a prescription in Canada.

**Pyrethrin** is an insecticide extracted from chrysanthemum genus flowers. It is combined with piperonyl butoxide, which acts synergistically by decreasing the metabolism of pyrethrin in arthropods. Pyrethrin/piperonyl butoxide products demonstrate less pediculicidal efficacy than permethrin, but have better efficacy than lindane. There is no residual effect and there appears to be minimal ovicidal activity. Systemic absorption is minimal after topical application. Any of the product that is absorbed is rapidly metabolized. Pyrethrin/piperonyl butoxide preparations have an FDA Pregnancy Risk Factor C (meaning risk cannot be ruled out, but human studies are lacking and animal studies are either positive for fetal risk or are lacking, and that the potential benefits may justify the potential risk), and have been used safely in children as young as one year old. Adverse effects may include contact dermatitis (due to the petroleum distillates required for solvent purposes in the formulation) and anaphylactoid reactions, particularly in ragweed-sensitive patients. It is contraindicated in patients with allergies to ragweed and chrysanthemum.

**Permethrin** is a synthetic pyrethroid derived from the structure of the ester pyrethrum, a natural insecticide extracted from the chrysanthemum. It is considered a first-line therapy for treatment of lice due to its efficacy and favourable safety profile. Permethrin exhibits the highest pediculicidal and ovicidal efficacy compared to pyrethrins and lindane. Toxicity is considered very low. The minimal amount of permethrin that is systemically absorbed is rapidly cleaved into inactive metabolites by skin esterases, and ultimately excreted in the urine. Adverse effects are generally mild, such as transient itching and redness, but may uncommonly include burning, stinging, rash and numbness.

<table>
<thead>
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<th>TABLE 1 Proper application of commonly used pediculicides18-24</th>
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<td><strong>Active ingredient</strong></td>
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**Notes:** Additional information on pediculicides includes:
- **Lindane 1% Shampoo:** Shake product well • Application of product on hair and scalp after washing) and thoroughly towel dry. Rinse or 2-in-1 shampoo (containing conditioner) prior to application may limit residual activity of the product. Hair must be thoroughly towel dried, as application to wet hair may dilute the product.
- **Pyrethrin/piperonyl butoxide:** Shake product well • Application of product on wet hair dilutes product and limits efficacy.
- **Pyrethrin/piperonyl butoxide:** Shake product well • Application of product on wet hair dilutes product and limits efficacy.
- **Lindane 1% Shampoo:** Shake product well • Application of product on wet hair dilutes product and limits efficacy.
is considered safe to use in pregnancy (FDA Pregnancy Risk Factor B) and in children, with caution advised in children less than two months of age. The product is contraindicated in individuals with allergies to ragweed and chrysanthemum, as there may be cross-sensitivity.18

Residual activity of permethrin persists for approximately two weeks.30 While residual activity is thought to supplement ovicidal activity and temporarily prevent re-infestation,30 there is controversy as to whether this is helpful or harmful. Theoretically, the sublethal concentration of drug remaining on the hair may contribute to resistance.25,30 Insects are highly adaptable, and repeated exposure to non-killing concentrations of a pediculicide may assist in the emergence of a population immune to the product.30

Resistance has been reported to all commonly used pediculicides, both in the laboratory and in clinical practice.30 Permethrin resistance data has been most frequently researched and published. It has been reported in various countries including Israel, France, United States and Czechoslovakia, raising questions about the usefulness of permethrin in the future.31 Furthermore, concern has been raised about the potential for resistance extending to the other classes of pediculicides since they all share underlying chemical similarities.12 In fact, cross-resistance has been shown with bioallethrin and other synthetic pyrethrins.32

Resistance to pyrethroids has been shown by at least two mechanisms.31,12 One mechanism is metabolic resistance, which involves changes in the mono-oxygenase enzyme used in the metabolism of permethrin. A second mechanism is "altered site of action resistance."33 This refers to genetic changes causing nerve insensitivity to pyrethroid poisoning. A factor that may contribute to resistance is the inappropriate use of pediculicides by using inadequate quantities, thus exposing lice to sublethal concentrations of drug.30 This could produce an effect similar to residual activity as outlined above.

Although current research shows that permethrin resistance does exist, the actual incidence, and whether it is increasing, is not currently known.31 It is important to distinguish resistance from vigor tolerance and simple product failure. ‘Vigor tolerance’ is observed if suboptimal doses of a pediculicide eliminate only the weak and elderly lice, leaving the strongest and most healthy lice alive. If this selection pressure persists, some individuals may actually be found to exhibit characteristics of true resistance.2 Vigor tolerance differs from resistance, however, since all vigor-tolerant insects will be killed when exposed to an adequate dose of a pediculicide.2

In cases of true resistance, options are limited. Malathion 0.5% lotion, an organophosphate that irreversibly blocks acetylcholine esterase, is available in the United States (re-introduced in 1999). It is being used successfully to treat lice infestations and exhibits pediculicidal and ovicidal activity superior to permethrin.25 Malathion lotion was removed from the Canadian market by the manufacturer in 1991, as more effective compounds were available. The ovicidal activity of malathion preparations is very dependent on the vehicle used in the formulation. The less effective formulations did not contain terpineol as part of the vehicle, while the current product in the United States does contain terpineol, limonene and pine needle oil.18 Malathion has an objectionable odor due to the release of sulphydryl compounds through hydrolysis.30

A second potential option for resistant head lice may be ivermectin, an oral antiparasitic agent that interrupts GABA-induced neurotransmission of a variety of parasites, including scabies and head lice.33 It is available through the Special Access Programme in Canada. Ivermectin is given orally in a single dose of 200 µg/kg of body weight, and can be repeated seven to 10 days later, as it likely has no ovicidal activity.30 However, although it has been effective in a number of trials, it is not officially approved for the treatment of lice infestations.34

Combination therapy with permethrin and trimethoprim/sulfamethoxazole has been shown to be more effective than either agent alone for the treatment of head lice infestations.35 There is concern, however, that this approach may lead to the inappropriate use of this antibiotic which may reduce its usefulness in the future. The proposed mechanism of action of trimethoprim/sulfamethoxazole for lice infestation involves alteration of the louse’s symbiotic bacteria which are necessary for its survival.30 Therapeutic doses are given for 10 days.35

TREATMENT GUIDELINES
After the presence of a lice infestation has been confirmed, a topical pediculicide should be applied according to package instructions (see Table 1). In addition, all family members and close contacts should be checked for lice infestation and treated only if infested, avoiding unnecessary exposure to pediculicides.12,16,17 Clean clothing should be worn after the treatment and hair should not be re-washed for one to two days.30 Re-application in seven to 10 days is required for all products in order to kill any nymphs emerging from eggs that survived the first treatment.12,30

Hair should be checked for live lice 24 to 48 hours after treatment. Checking for live lice before 24 hours has elapsed may actually over-estimate the mortality rate, as lice are known to have the ability to "resurrect" from a state of seeming death.25,38 Insects are less dependent than mammals on continuous nervous control for circulatory and respiratory function; therefore, the exact point of death is not well defined. Irreversible nervous system damage may take several hours to occur.38 If live lice are detected, an alternative pediculicide should be used, followed by a repeat treatment seven to 10 days later.12 In cases where infants or children under two years of age are infested, pharmacological products are not recommended by the manufacturers, although permethrin has been used in infants as young as two months. Instead, crawling lice and nits can be removed manually.36

Nit removal has a role in preventing re-infestation, as nits found within one centimetre from the scalp have the potential to be viable if not removed.37 There are differing opinions on the value of nit removal, since some studies have not shown any benefit to nit combing in addition to pharmacotherapy.29 However, failure to see benefit is often attributed to difficulties in technique or compliance.29 Theoretically, if done thoroughly, nit removal should play an essential role in managing a lice infestation since no pediculicide is completely ovicidal. Removal of nits more than one
centimetre from the scalp is not necessary, as they are unlikely to be alive; this is done usually for cosmetic reasons. Thus, the “no nit” policies in some schools may be excessive.37

A number of techniques may facilitate the removal of nits. A fine-toothed nit comb is used and is often included with pediculicide treatments. Metal nit combs may be less likely to bend or break and can often be purchased separately. Application of a de-tangler, conditioner or light oil can facilitate combing the hair. In addition, the cement that binds the nit to the hair shaft can be loosened by applying a damp towel to the scalp for 30 to 60 minutes,32 soaking the hair in equal parts of vinegar and water, or using a commercially available product containing 8% formic acid.12,36 Backcombing towards the scalp may dislodge nits more easily than standard combing.12

For treatment of pubic lice, nit removal is required. For nits and lice found on eyebrows and eyelashes, ophthalmic-grade petrolatum ointment can be applied twice daily for 10 days.8

Nonpharmacological treatment
In addition to the use of pediculicides and nit removal, other nonpharmacological steps may be taken to manage a lice infestation. This includes laundering all clothing and bedding used by the infested person in the previous two days, using hot water (70°C or 130°F) and drying using the hot cycle for at least 20 minutes.36 Items such as combs can be washed with soap and hot water, or soaked in rubbing alcohol for one hour.36 For other household items such as stuffed animals and comforters, there is some debate as to whether “bagging” and sealing for 10 days is necessary.12,39 Vacuuming floors and furniture can help to remove lice and fallen hairs with attached nits. Fumigant sprays are no longer recommended due to the potential toxicity from their use in confined areas.12,36,39

Pediculicides are not necessary to treat body lice; washing infested clothing and bedding in hot water is effective treatment. Alternately, items that cannot be laundered may be sealed in a plastic bag for at least 10 days.1 Bagging is necessary in the case of body lice due to their ability to survive away from their host for a prolonged period of time.

Treatment failure
Permethrin resistance may be a contributing factor as discussed above; however, in many cases treatment failure can be attributed to misdiagnosis, improper use of products, incomplete removal of nits, or re-infestation due to failure to treat close contacts. If a properly applied therapy does fail, switching to another pharmacological class, as outlined above, may be helpful.12,36

SCABIES
Scabies is a skin infestation caused by the mite Sarcoptes scabiei var hominis, an obligate human parasite.

BIOLOGY OF SCABIES
The female scabies mite is about 0.4 mm by 0.3 mm, translucent pearly white, flattened in appearance and barely visible to the naked eye. The male mite is half this size and rarely found since it dies shortly after mating.1,40 The mites burrow into the epidermis at a rate ranging from 0.5 to five millimetres per day using their jaws and claws, sucking tissue fluids for feeding. They deposit feces behind them and lay two to three eggs a day in the burrow.40,41 The eggs hatch in approximately 55 hours and the nymphs travel to the skin surface where, after three moltings, they mature into adult mites in 14 to 17 days. Female mites die after about five weeks at the end of the burrow.40

PATHOPHYSIOLOGY AND DIAGNOSIS
Scabies is a common condition, with an estimated prevalence of 300 million cases occurring worldwide.41,42 Any person at any age is at risk of getting scabies, especially those living or working in crowded conditions, as scabies is highly contagious.42

Transmission occurs mainly through skin-to-skin contact.40,41,43 The role of fomites in transmission is somewhat controversial. Even though scabies mites are essentially helpless off their human host, since they cannot jump or even walk and are blind,44 mites have been found to survive up to three days off the host.9 Most agree that transmission is possible through sharing items such as clothing or bedding.9,40,41,43 Cyclical epidemics can occur, especially in larger long-term care institutions with a low bed-to-healthcare worker ratio.9,41 Scabies mites from other animals are genetically different than the human scabies mite and, although they might cause some limited irritation, they will not become an infestation. Therefore, animals are not a reservoir for human scabies.40,43

Symptoms of a scabies infestation include generalized itching, predominantly at night. This is a result of sensitization to the mites, eggs, or feces. In the first infestation, this sensitization takes weeks to develop, but re-infestation provokes a response in one to three days.40,41 Other findings include consistent cutaneous eruptions commonly found between the folds of the skin in areas such as finger webs; at the wrists, elbows or axillae; as well as male genitalia and women’s breasts.41,43 In infants and children, scabies may also occur on the scalp, palms of the hands and soles of the feet.41 The characteristic lesion is the burrow that appears as a threadlike papule up to a centimetre in length with a small vesicle containing a black dot at the end.40 However, these lesions are not necessary for diagnosis as they may not always be visible to the naked eye.41

Diagnosis of scabies must be made by a physician, as presentation can mimic many other skin conditions. Prompt diagnosis is essential in order to limit the spread of the infestation. Common misdiagnoses include insect bites, hives, eczema, folliculitis, dermatitis, impetigo, rosacea, psoriasis, lymphoma and drug reactions.40,43 Definitive diagnosis is made through microscopic identification of the mite, eggs, or feces using a skin scraping.40,41,43

Complications of scabies infestations are not uncommon. Impetigo may arise when scratching compromises the skin barrier and staphylococci or streptococci bacteria are able to proliferate. Appropriate topical and systemic antibacterial agents need to be used promptly. Impetiginous lesions may complicate things further by misleading the diagnosis of the underlying scabies.40 Post-scarbic pruritus may last weeks due to the hypersensitivity reaction, and is usually controlled with oral antihistamines and topical corticosteroids. Short courses of oral corticosteroids may be necessary in severe cases.40 In cases of trusted
scabies, keratolytic agents are often a helpful adjunctive treatment to remove crusts.45

Crusted scabies is an extremely contagious form of scabies and can be responsible for large institutional outbreaks.40 Classic scabies usually involves 10 to 15 mites per person, whereas the rarer but more contagious and severe crusted scabies may involve millions of mites.9,40,46 Crusted scabies occurs in immunocompromised patients such as those with HIV infection or receiving glucocorticoid therapy,9,41 as well as institutionalized people9 and pregnant women.1 Clinical presentation involves extreme scaling of the hands and feet, but may be generalized. Unlike classic scabies, crusted scabies is not pruritic.39,40,46

Clinical diagnosis may be delayed since the differential diagnosis includes psoriasis, seborrheic dermatitis and eczema. Crusted scabies may not be recognized in some cases until contacts develop classic scabies.40

Nodular scabies is recognized by the presence of persistent, pruritic nodules after the successful treatment of scabies. They are brownish red and are up to two centimetres in diameter. The nodules are believed to be due to local allergic hypersensitivity to the scabies mites or their feces, and can be treated with local or intralesional corticosteroids.40

PHARMACOLOGICAL THERAPY

Pharmacological treatment options for scabies include topical scabicides as well as oral ivermectin. The best treatment is difficult to identify due to insufficient data comparing the efficacy of the available treatments, and lack of a review comparing their toxic effects.40

Table 2 summarizes application procedures for the most commonly used scabicidal treatments. The proper application of these products is essential for optimal treatment.

Lindane is used as a 1% lotion for scabies treatment. After a diagnosis has been confirmed, the last application.52 In addition, it is applied nightly for three days.9 Vacuuming removes the mite from rugs and furniture.41,43

Ivermectin is an oral treatment as outlined above. Its pharmacology differs from topical agents; thus it offers an alternate mechanism of action against the scabies mite. Adverse effects of ivermectin include headaches and pruritus.48 The dose most commonly used for scabies treatment is 200 μg/kg as a single dose, which is repeated in 10 to 14 days in order to kill mites that hatched since the initial dose.9,33,40,49 For more severe cases such as crusted scabies, three doses at intervals of seven to 14 days are likely needed to be curative,48 in addition to using a topical scabicide.50

Other treatments are also available for the treatment of scabies, but are used less commonly. Precipitated sulfur in petrolatum in concentrations of 5-10% is an expensive treatment and has been used successfully for mass treatments during outbreaks of scabies in institutional settings.51 For infants less than two months old, concentrations of 6% or less are preferred. The ointment can be applied nightly for three nights and washed off 24 hours after the last treatment,52 with a repeat treatment course in one week.27,50,51 The use of sulfur is limited by its offensive odour, messiness and staining.51 Crotamiton 10% cream is another scabicide product, but its efficacy is controversial.40,51 It is applied nightly for two nights and washed off 24 hours after the last application.52

TREATMENT GUIDELINES

After a diagnosis has been confirmed, the infested person and all close physical contacts should be treated with a topical scabicide. It is important to treat contacts even if symptoms are not present, since symptoms may take weeks to develop and during that time they are still contagious.9,40,41 A single application of a scabicide will cure a scabies infestation in most cases. However, a second application may be used after seven to 10 days if there is no clinical improvement or if new lesions appear.52

Patients need to be informed that itching may persist for one to two weeks after treatment, and this is not an indication to repeat treatment.41 An evaluation is recommended one month after treatment with a scabicide, to assess efficacy. Four weeks is an adequate time for lesions to heal and for any eggs to reach maturity as adult mites.40 As outlined above, adjunctive treatments such as topical corticosteroids and antibiotics may be required in some cases.

**Nonpharmacological treatment**

In addition to pharmacological treatment, other measures should be taken to manage a scabies infestation. Fingernails and toenails should be trimmed to remove mites present under the nails due to scratching. Clothing, bedding and bath towels should be washed in hot water, and items that cannot be washed should be isolated from use for at least three days.9 Vacuuming removes the mite from rugs and furniture.41,43

### Table 2: Proper application of commonly used scabicides9,20-24

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<th>Active ingredient</th>
<th>Dosage form</th>
<th>Proper application</th>
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<tbody>
<tr>
<td>Permethrin 5%</td>
<td>Lotion, cream</td>
<td>• Shake product well • Apply to clean, cool, dry skin • Massage lotion or cream into skin from neck to soles of feet, paying special attention to areas between fingers and toes, under fingernails, wrists, armpits, buttocks, external genitalia (lotion will disappear; it is not necessary to apply a thick, visible layer of lotion) • Remove after 12 to 14 hours by taking a shower or bath</td>
<td>• Need to reapply to hands if they are washed with soap and water within eight hours of application</td>
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<tr>
<td>Lindane 1%</td>
<td>Lotion</td>
<td>• Take a warm bath or shower, then dry and cool skin well • Shake product well • Massage lotion into skin from neck to soles of feet, paying special attention to areas between fingers and toes, under fingernails, wrists, armpits, buttocks, external genitalia • Leave on for eight hours • Remove by washing thoroughly</td>
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Scabies cases in institutional settings require special precautions aimed at control of dissemination. These include isolation of the patient, use of gloves and gowns by staff and visitors, treatment of clothing and linens as outlined, and prophylactic treatment of contacts (i.e., entire institution and visitors).41

Treatment failure
Treatment failures can be attributed to a number of factors including misdiagnosis, inadequate or improper use of topical treatments, and re-infection due to failure to treat household or close contacts.9,40

THE PHARMACIST’S ROLE
Pharmacists are often the first point of contact when people first realize, or suspect, that they or someone in their family has a case of lice or scabies. Pharmacists can help to ease the social stigma attached to these conditions by reassuring clients that common infestations such as head lice and scabies are not diseases of uncleanliness. It is important for pharmacists to be able to recognize signs and symptoms of infestations, and know when to refer patients to their physician for further diagnosis, especially for potential scabies infestations. Pharmacists have a key role in helping patients avoid treatment failure by providing information about the appropriate use of pediculicides and scabicides, as well as the non-pharmacological measures that should be taken to manage the infestation.

REFERENCES

QUESTIONS

1. Head lice are most often transmitted by:
   a) head-to-head contact
   b) pets
   c) sharing personal items
   d) a and c

2. If removed from its host, a head louse may survive up to:
   a) 12 hours
   b) 24 hours
   c) 48 hours
   d) four days

3. A nit found 2 cm from the scalp would hatch in approximately:
   a) seven days
   b) 10 days
   c) 12 days
   d) never

4. A garment infested with body louse is discarded. The lice may survive up to:
   a) 24 hours
   b) two days
   c) five days
   d) 10 days

5. T. C. has been told that his eyelashes are infested with lice. These are most likely:
   a) head lice
   b) body lice
   c) pubic lice
   d) a and c

Case A
J.P., a six-year-old Caucasian boy, comes home with a note from school indicating that a child in his class has head lice.

6. Initially, J.P.’s parents must:
   a) treat everyone in the family
   b) take J.P. to see his physician
   c) check J.P.’s hair for visual evidence of nit or lice
   d) a and c

7. J.P.’s family lives in an affluent neighbourhood. Relative to people in lower-income housing, how likely is it that J.P.’s family may become infested with head lice?
   a) very unlikely
   b) slightly less likely
   c) equally likely
   d) more likely

J.P.’s parents decide to do a quick inspection of his hair to try to find nits, but find nothing. Two weeks later, J.P. complains of itchiness behind his ears and back of his head. Upon more careful inspection, J.P.’s parents find that he is indeed infested with head lice.

8. J.P.’s lice infestation can be confirmed by:
   a) finding dead lice
   b) finding a live louse
   c) finding nits less than 1 cm from his scalp
   d) b or c

9. For effective treatment and management of J.P.’s lice infestation, his parents should:
   a) treat every infested member of their family
   b) check their dog and treat him if necessary
   c) discard all stuffed toys or unwashable items
   d) none of the above

10. If treating J.P. with pyrethrin, it is important to:
    a) make sure hair is wet when shampoo is applied to ensure a good lather
    b) leave on for at least 30 minutes
    c) remove nits after treatment
    d) automatically repeat the application in five days

J.P.’s first treatment seems to have failed since a few live lice have been found a week after therapy. His parents made sure to thoroughly wet his hair before applying the lice treatment shampoo, carefully removed all the nits they could find, and appropriately treated their household.

11. The most likely cause of J.P.’s treatment failure is:
    a) failure to remove nits
    b) improper use of treatment product
    c) resistance to the treatment
    d) new infestation

12. Which of the following statements is/are true about body lice?
    a) They are common in all socioeconomic situations.
    b) They are a possible vector for disease.
    c) They are effectively treated with pediculicides.
    d) all of the above

13. Pubic lice are commonly transmitted though:
    a) sexual contact
    b) public toilet seats
    c) trying on lingerie
    d) all of the above

14. The most common physical symptom of pubic lice infestation in women is:
    a) vaginal discharge
    b) itching in the pubic or perianal area
    c) a or b
    d) none of the above

15. Itching associated with a scabies infestation may be apparent within:
    a) one day in all cases
    b) one day in first cases
    c) one day in repeat cases
    d) three weeks in all cases

16. Diagnosis of scabies infestation requires:
    a) demonstration of visible burrows on the skin
    b) microscopic demonstration of a scabies mite, feces or egg by a physician
    c) obvious physical symptoms such as itching at night
    d) a and b

17. Transmission of scabies may occur through:
    a) skin-to-skin contact
    b) sharing bedding or clothing
    c) a and b
    d) none of the above

Case B
C.S. is a 56-year-old married female who has been diagnosed with a classic case of scabies. She is experiencing pruritus, especially at night. She decides to try permethrin 5% dermal cream.

18. Which of the following counselling points would you discuss with her?
    a) apply the cream liberally only to affected areas
    b) leave cream on for 12 to 14 hours
    c) take a hot bath before she applies the product
    d) none of the above

19. C.S.’s husband should:
    a) automatically treat himself with a permethrin product
    b) treat himself with a permethrin product if he develops symptoms
    c) treat himself, preferably with a non-permethrin product, if he develops symptoms
    d) not worry about treating himself, as scabies is not contagious

20. C.S. is still experiencing itching two weeks after her treatment and is frustrated that her initial treatment seems to have failed. She should:
    a) repeat her treatment with permethrin 5% cream
    b) repeat her treatment with an alternate product such as lindane
    c) confirm her diagnosis before re-treating
    d) not worry about re-treating as itching often persists for four weeks following treatment
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