PARASITIC SKIN INFECTIONS

CHI Formulary Indication Review

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Council of Health Insurance

INDICATION UPDATE

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ADDENDUM to the CHI Original Parasitic Skin Infections Clinical Guidance - Issued April 2020

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- IDF-FR-P-02-01-IndicationsReview&IDFUpdates
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Related WI:

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Abbreviations

AAFP	American Academy of Family Physicians
AAP	American Academy of Pediatrics
AIDS	Acquired Immunodeficiency Syndrome
ASTMH	American Society of Tropical Medicine and Hygiene
CHI	Council of Health Insurance
CL	Cutaneous Leishmaniasis
CLM	Cutaneous Larva Migrans
CPG	Clinical Practice Guideline
DEC	Diethylcarbamazine
EMA	European Medicines Agency
EPSD	Ectoparasitic Skin Diseases
FDA	U.S. Food and Drug Administration
GP	General Practitioner
GRADE	Grading of Recommendations Assessment, Development, and Evaluation
HIV	Human Immunodeficiency Virus
HPT	Health Protection Teams
IDF	Insurance Drug Formulary
IDSA	Infectious Diseases Society of America
IL	Intralesional
IM	Intramuscular
IV	Intravenous
ML	Mucocutaneous Leishmaniasis
OTC	Over the Counter
PE	Prescribing Edits
PPE	Personal Protective Equipment
SFDA	Saudi Food and Drug Authority
STI	Sexually Transmitted Infection
UKHSA	United Kingdom Health Security Agency
WHO	World Health Organization

Executive Summary

Parasitic skin infections refer to skin conditions caused by various parasites, which are organisms that live on or within a host organism and rely on the host for their survival. These parasites can affect the skin, leading to a range of symptoms and complications. There are different types of parasites that can cause skin infections, including:

- **Protozoa:** Single-celled organisms that can cause skin infections. Examples include Leishmania spp., which cause diseases such as leishmaniasis.
- **Helminths:** Worm-like parasites, such as larvae of certain types of worms, that can infest the skin and cause infections. Examples include hookworm larvae and certain types of filarial worms.
- **Arthropods:** Parasitic insects or arachnids that can infest the skin and cause various skin conditions. Examples include mites, ticks, and lice.

The symptoms of parasitic skin infections can vary widely depending on the type of parasite involved. Common symptoms include itching, redness, rash, swelling, and in some cases, the formation of lesions or sores[1].

The types of parasitic skin diseases that are of particular importance include:

- Scabies
- Pediculosis capitis (head lice)
- Loiasis
- Hookworm-related cutaneous larva migrans
- Cutaneous leishmaniasis[2]

Several risk factors may increase the likelihood of contracting parasitic skin infections. These factors can vary depending on the specific type of parasite involved, but some common risk factors include:

- **Geographic location:** The prevalence of certain parasitic skin infections varies by geographic region. For example, diseases like leishmaniasis and certain types of parasitic worms may be more common in specific areas.
- **Travel to endemic regions:** Traveling to or residing in regions where parasitic skin infections are prevalent increases the risk. Individuals may come into contact with parasites that are not commonly found in their home region.
- **Poor hygiene:** Inadequate personal hygiene practices can contribute to the risk of parasitic skin infections. Poor sanitation, lack of access to clean water, and improper waste disposal can facilitate the transmission of parasites.

- **Close contact with infected individuals:** Parasitic skin infections can be transmitted through direct or indirect contact with infected individuals. Sharing personal items, such as towels or clothing, with someone who has a parasitic infection may increase the risk.
- **Occupational exposure:** Certain occupations, such as agriculture, forestry, or construction, may involve contact with environments where parasitic organisms are present. This can increase the risk of exposure to parasites that cause skin infections.
- **Immunocompromised conditions:** Individuals with weakened immune systems, such as those with HIV/AIDS or undergoing immunosuppressive therapy, may be more susceptible to parasitic skin infections.
- **Malnutrition:** Poor nutritional status can weaken the immune system, making individuals more vulnerable to parasitic infections.
- **Environmental factors:** Living in environments conducive to the survival and transmission of parasites, such as areas with high humidity or specific vectors (e.g., mosquitoes, ticks), can increase the risk of parasitic skin infections.
- **Animal exposure:** Contact with infected animals or their habitats can lead to parasitic skin infections. For example, certain parasites transmitted by animals, such as scabies mites or certain fungi, can cause skin problems in humans[3].

Parasitic skin infections can lead to various complications, especially if left untreated. The nature and severity of complications depend on the specific parasite involved and the individual's overall health. Some common complications associated with parasitic skin infections include:

- **Secondary bacterial infections:** Scratching the affected areas can break the skin, creating entry points for bacteria. Secondary bacterial infections may occur, leading to conditions such as cellulitis or impetigo.
- **Abscess formation:** In some cases, parasitic skin infections can progress to the formation of abscesses, which are localized collections of pus. This can result in pain, swelling, and the need for drainage.
- **Chronic infections:** If not properly treated, some parasitic skin infections can become chronic, persisting for an extended period.
- **Scarring:** The healing process of the skin after a parasitic infection, especially if there are open sores or ulcers, may lead to the formation of scars.
- **Spread to other body parts:** Certain parasites can spread from the initial site of infection to other areas of the body, leading to more extensive involvement and increased complications.

- **Systemic involvement:** In severe cases, certain parasitic infections may spread beyond the skin, affecting internal organs and systems. This can lead to systemic symptoms, such as fever, fatigue, and organ dysfunction[3].

Scabies, pediculosis capitis and pediculosis pubis are prevalent globally, whereas pediculosis corporis are limited to cold-climate regions and are nearly nonexistent in tropical areas. With the exception of epidemic scenarios, data on ectoparasitic skin diseases (EPSD) are typically not documented, leading to a lack of reliable information regarding the global occurrence of diseases, changes in incidence over time, and the spatial distribution in endemic regions. A 2006 published report found that approximately 300 million cases of scabies exist worldwide, with a considerably larger population constantly at risk. In resource-poor settings, the risk of head lice infestation is virtually ubiquitous, affecting several billion people globally. The distribution of EPSD is irregular, and the incidence and prevalence vary depending on the area and population under study. For instance, a study in a resource-poor urban community in Bangladesh revealed that nearly all children under 6 years of age developed scabies within a 12-month period. In a rural village in the United Republic of Tanzania, the overall prevalence was 6%, while in rural and urban Brazil, it ranged from 8 to 10%, and in rural India, it was 13%. The prevalence in Egyptian children was estimated to be 5%, contrasting with Australian Aboriginal communities where it approached 50% in the same age group. In a displacement camp in Sierra Leone, 86% of 5–9-year-old children were found to be infested with S. scabiei[2].

Data extracted from a systematic review showed that skin infections and infestations prevalence in Saudi Arabia have been reported with an overall pooled proportion of 18.5% derived from 12 studies with an overall sample size of 29,244 patients. Cutaneous leishmaniasis was the most common parasitic skin diseases, while warts were the most common viral infection followed by chickenpox. In addition, bacterial skin diseases represented 3.3% of the total prevalence of skin disease in Saudi Arabia[4].

Parasitic skin infections can impose a significant economic burden on individuals, communities, and healthcare systems. The economic impact is multifaceted and includes direct medical costs, indirect costs related to productivity loss, and the costs associated with prevention and control efforts. The most severe manifestation of leishmaniasis has been demonstrated to result in substantial financial loss for up to 75% of households impacted by the disease in Asia and Africa. A comprehensive global assessment suggests an annualized decline in productive economic contributions ranging from 6% to 30% within affected households[5].

Drug therapy is an integral component for the management of Parasitic Skin Infections. The goals of treating Parasitic Skin Infections depend on its underlying parasitic cause and the individual's specific needs and health condition. However,

common goals of Parasitic Skin Infections treatment include eradication of the parasite, relief of symptoms, prevent the development of complications, resolution of skin lesions, prevention of transmission, management of recurrence and improvement of quality of life[3].

Treatment for parasitic skin infections typically involves a combination of approaches, including non-pharmacological interventions and pharmacological interventions.

The drug therapy for parasitic skin infections depends on the specific type of parasite causing the infection. Here are some common treatment options for Parasitic Skin Infections:

➔ **Pharmacological Measures**:

- Scabicides/Pediculicides: Permethrin, Ivermectin, Lindane
- Antiprotozoal Agents: Antimonials (e.g., sodium stibogluconate), Amphotericin B, Miltefosine
- Antiparasitic Medications: Diethylcarbamazine (DEC), Albendazole

➔ **Non-Pharmacological Measures:**

- Mechanical Removal
- Topical Treatments: Topical corticosteroids, lotions, shampoos
- Manual Removal
- Wound Care
- Preventive Measures: Personal hygiene practices, isolation measures[6].

CHI issued Parasitic Skin Infections clinical guidance after thorough review of renowned international and national clinical guidelines in April 2020. Updating clinical practice guidelines (CPGs) is a crucial process for maintaining the validity of recommendations.

This report functions as an addendum to the prior CHI Parasitic Skin Infections clinical guidance and seeks to offer guidance for the effective management of Parasitic Skin Infections. It provides an **update on the Parasitic Skin Infections Guidelines** for CHI Formulary with the ultimate objective of updating the IDF (CHI Drug Formulary) while addressing **the most updated best available clinical and economic evidence related to drug therapies.**

Main triggers for the update are summarized, being the issuance of **updated versions** of previously reviewed guidelines namely Guidelines for the Treatment of Scabies by Centers for Disease Control and Prevention of America – **October 2, 2019**; Guidelines for the Treatment of Head Lice by Centers for Disease Control and Prevention of America – **October 15, 2019**; Guidelines for the Treatment of Loiasis by

Centers for Disease Control and Prevention of America – **November 24, 2020** and Guidelines for the Treatment of Zoonotic Hookworm Cutaneous Larva Migrans (CLM) By the Center of Disease Control and Prevention of America – **May 26, 2020.**

Moreover, **new guidelines are added to the report** such as:

1. Centers for Disease Control and Prevention (CDC) Morbidity and Mortality Weekly Report (MMWR) Sexually Transmitted Infections Treatment Guidelines (2021)
2. American Academy of Family Physicians (AAFP) Treatment Update on Lice and Scabies (2019)
3. United Kingdom Health Security Agency (UKHSA) Guidance on the Management of Scabies Cases and Outbreaks in Long-Term Care Facilities and Other Closed Settings (2023)
4. European Academy of Dermatology and Venereology Guideline for the Management of Scabies (2017)
5. Japanese Dermatological Association Guideline for the Diagnosis and Treatment of Scabies in Japan (Third Edition) (2017)
6. Australian Society for HIV, Viral Hepatitis and Sexual Health Medicine (ASHM) Australian STI Management Guidelines: Ectoparasites (2021)
7. American Academy of Pediatrics (AAP) Guidance for the Management of Head Lice (2022)
8. Guidelines for the Treatment of Leishmaniasis by the Center of Disease Control and Prevention (CDC) of America (October 5, 2023)
9. Diagnosis and Treatment of Leishmaniasis: Clinical Practice Guidelines by the Infectious Diseases Society of America (IDSA) and the American Society of Tropical Medicine and Hygiene (ASTMH) (2016)

After carefully examining clinical guidelines and reviewing the SFDA drug list, it is important to note that there has been **withdrawal** of the following drugs:

- Diethylcarbamazine
- Sulfur

Moreover, there has been **no newly FDA/EMA approved drug** for the treatment of Parasitic Skin Infections. Additionally, there have been **updates** regarding previously mentioned drugs in terms of drug information and prescribing edits since April 2020.

Table 1. Prescribing Edits Modifications for Parasitic Skin Infections Medications

Drugs	PE modifications

Benzoyl benzoate	Add ST: Generally considered a second-line treatment for scabies, with other medications like permethrin and ivermectin being more commonly recommended as first-line options
Crotamiton	Add ST: Typically considered a second-line treatment for scabies, with other medications like permethrin and ivermectin being more commonly recommended as first-line options
Fluconazole	Add ST: Fluconazole is not typically considered a first-line treatment for cutaneous leishmaniasis
Ivermectin	Add AGE: Avoid use in children < 6 months of age due to risk for ivermectin toxicity potentially increased
Lindane	Addition of MD: routine use is no longer recommended due to potential neurotoxicity; when needed, lindane should be prescribed and monitor by a specialist (e.g., dermatologist or infectious diseases physicians)

All recommendations are well supported by reference guidelines, Grade of Recommendation (GoR), Level of Evidence (LoE) and Strength of Agreement (SoA) in all tables reflecting specific drug classes' role in the Parasitic Skin Infections therapeutic management. Table 2 summarizes the major changes based on the different Parasitic Skin Infections guidelines used to issue this report:

Table 2. General Recommendations for the Management of Parasitic Skin Infections

Management of Parasitic Skin Infections		
General Recommendations	**Level of Evidence/Grade of Recommendation**	**Reference**
Classic scabies treatment **Scabicides, products to kill scabies mites, are prescription-only, with no FDA-approved over-the-counter options. Available treatments include:** ○ Permethrin (5% cream): FDA-approved for scabies treatment in individuals aged 2 months and older. Safe and effective, it's the **preferred choice**, requiring two or more applications a week apart.	Not graded[7] Not graded[8]	CDC[7] STI Treatment Guidelines[8]

○ Crotamiton (10% lotion and cream): FDA-approved for adult scabies treatment, but not for children. Reports of frequent treatment failure exist. ○ Sulphur (5%-10%) ointment: Safe for topical use in children, even infants under 2 months, but its odor and cosmetic qualities may deter use. ○ Lindane (1% lotion): An organochloride FDA-approved for scabies but not recommended as first-line due to potential neurotoxicity. Restricted use for specific cases, excluding certain populations like pregnant women, infants, and those with skin issues. ○ Benzyl benzoate, available in 25% concentration (with or without tea tree oil), is an alternative to permethrin for scabies treatment. It may cause immediate skin irritation, and lower concentrations (10% or 12.5%) are recommended for children. ○ Additionally, a keratolytic cream can be used to reduce skin crusting and enhance the absorption of topical permethrin or benzyl benzoate.		
Topical treatment of scabies. Phenothrin is recommended as the first-line drug, and it should be applied at least twice with a 1-week interval between applications.	A[9]	Japanese Guidelines[9]
Ivermectin is considered for **classic scabies treatment**, especially when topical medications are ineffective or not tolerated. Although the FDA hasn't specifically approved it for scabies, evidence supports its efficacy. The recommended regimen is two doses (200µg/kg/dose) about a week apart. Caution is advised for children under 15 kg and pregnant women due to uncertain safety.	Not graded[7]	CDC[7]
Permethrin is considered safe in pregnancy and lactation, and it is licensed for use in children from 2 months of age.	Level of evidence III; grade B recommendation[10]	European Guidelines[10]

	Not graded[11]	Australian STI Guidelines[11]
Benzyl benzoate and sulfur are also deemed safe in pregnancy.	Level of evidence III; grade B recommendation[10]	European Guidelines[10]
Malathion was not studied in pregnant women, and while animal studies suggest no risk, these studies may not reliably predict human responses. Inappropriate use of agricultural-grade malathion for treating human infestations can lead to acute toxicity.	Level of evidence IV; grade C recommendation[10]	European Guidelines[10]
The use of Lindane is prohibited.	D[9]	Japanese Guidelines[9]
Crusted scabies treatment A combination of oral and topical agents is recommended. Ivermectin and Permethrin Cream 5% are key components. In crusted scabies, topical permethrin should be applied every 2-3 days over 1-2 weeks. Benzyl Benzoate 25%, an alternative topical agent, may cause skin irritation, and lower concentrations are suggested for children. Additionally, the use of a keratolytic cream can reduce skin crusting and enhance the absorption of topical agents.	Not graded[7] Not graded[8] Level of evidence IV; grade C recommendation[10]	CDC[7] STI Treatment Guidelines[8] European Guidelines[10]
Combination treatment for **crusted scabies** is recommended with a topical scabicide, either 5% topical permethrin cream (full-body application to be repeated daily for 7 days, then 2 times/week until cure) or 25% topical benzyl benzoate, and oral ivermectin 200 ug/kg body weight on days 1, 2, 8, 9, and 15. Additional ivermectin treatment on days 22 and 29 might be required for severe cases. Lindane should be avoided due to the risk of neurotoxicity with heavy applications on damaged skin.	Not graded[8]	STI Treatment Guidelines[8]
Oral ivermectin should be reserved for patients with scabies who do not improve with permethrin 5% cream.	Grade C[12]	AAFP[12]

○ Ivermectin and permethrin are more effective in the treatment of scabies than lindane. ○ Permethrin is more effective in the treatment of scabies than ivermectin. The use of the treatment may be considered, but there is insufficient evidence	A[9] C1[9]	Japanese Guidelines[9]
There is little clear scientific evidence on the efficacy of sulfur, but it may be used.	C1[9]	Japanese Guidelines[9]
Management of contacts (scabies) ○ Contacts who are off duty during treatment should finish the initial 24-hour treatment dose before returning to work. ○ It is advisable to maintain a low index of suspicion when identifying potential contacts of a crusted scabies case due to the heightened risk of transmission. ○ Staff members should remain vigilant for signs and symptoms of scabies over an 8-week period.	Not graded[13]	UKHSA[13]
Outbreak management in closed settings ○ For effective disruption of the transmission cycle, it is crucial to administer simultaneous treatment to all cases and contacts. Concurrent individual case management is essential for all cases and contacts involved in the outbreak. ○ In cases where staff requires treatment due to occupational exposure, employers are advised to consider funding the treatment to promote uptake and enable a swift return to normal working conditions. Social care settings can explore alternative funding options with local authority public health or social care commissioning teams.	Not graded[13]	UKHSA[13]
Mass population treatment is strongly recommended for the control of scabies in endemic areas, such as remote communities and	Level of evidence Ib; grade A recommendation[10]	European Guidelines[10]

for managing epidemics in closed communities like nursing homes or jails. ○ All individuals should receive treatment regardless of symptoms. ○ Oral ivermectin is a more convenient option for large-scale treatment compared to traditional topical scabicides. ○ A single dose of oral ivermectin at 200 micrograms/kg of body weight is effective.		
Scabies prevention Bedding and clothing should undergo decontamination, achieved through either machine washing and drying using the heat cycle or dry cleaning. Alternatively, these items should be kept away from direct body contact for more than 72 hours. Fumigation of living spaces is not required. Individuals with scabies are recommended to maintain closely trimmed fingernails to minimize injury resulting from excessive scratching.	Not graded[8]	STI Treatment Guidelines[8]
Crusted scabies prevention Standard infection control principles and the use of appropriate personal protective equipment (PPE) are deemed sufficient to prevent transmission. Isolating individuals with crusted scabies is not recommended, but close contact with those not undergoing concurrent treatment or unable to wear appropriate PPE should be limited.	Not graded[13]	UKHSA[13]
Partner management Patients are advised to avoid close contact until they and their sexual partners have completed treatment or for 7 days after treatment initiation, whichever is later.	Level of evidence IV; grade C recommendation[10] Not graded[11]	European Guidelines[10] Australian STI Guidelines[11]
Scabies and steroid therapy ○ Oral and topical steroid therapies may exacerbate scabies and prolong the time until the scabies are cured.	Not graded[9]	Japanese Guidelines[9]

○ Therefore, it is preferable to refrain from steroid therapy when treating scabies. However, when a patient has a disease that requires steroid therapy, the attending physician should be consulted regarding continuing with steroid therapy.		
Head lice infection The medical provider should initiate treatment only if there is a diagnosis of active head lice infestation. The ideal treatment of head lice should be safe, free of toxic chemicals, readily available, simple to apply, effective, and inexpensive.	Not graded[14]	AAP[14]
Head lice treatment For effective treatment of head lice, it's important to consider the ovicidal effect of pediculicides. Weakly ovicidal or non-ovicidal treatments may require routine retreatment, while strongly ovicidal ones may only need retreatment if live lice are still present after several days. Retreatment should be timed to occur after all eggs have hatched but before new eggs are produced. Additional non-pharmacologic measures, such as washing and drying personal items in hot cycles or vacuuming furniture, can enhance treatment effectiveness. Generally, these measures are not mandatory but can be combined with pharmacologic treatment for a comprehensive approach. Items in contact with an infested person's hair, like hats and towels, should not be shared to prevent reinfestation.	Not graded[15]	CDC[15]
Over-the-counter head lice medications include products with active ingredients such as pyrethrins combined with piperonyl butoxide and permethrin lotion 1%. ○ Pyrethrins are naturally occurring pyrethroid extracts, effective against live lice but not unhatched eggs.	Not graded[15] Not graded[14]	CDC[15] AAP[14]

○ Permethrin lotion 1% is a synthetic pyrethroid approved for use in children aged 2 months and older. **Prescription medications for head lice** include benzyl alcohol lotion 5%, ivermectin lotion 0.5%, malathion lotion 0.5%, and spinosad 0.9% topical suspension. ○ Benzyl alcohol is aromatic and requires a second treatment, while ivermectin is not ovicidal. ○ Malathion is pediculicidal and partially ovicidal, requiring a second treatment if live lice persist. ○ Spinosad kills live lice and unhatched eggs, usually not needing retreatment. Lindane shampoo 1% is a **second-line treatment** due to potential toxicity and restrictions on use. Always follow label instructions, and if live lice persist after treatment, consult a healthcare provider. **Lindane is not recommended.**		
Benzyl Alcohol (5%) No longer available due to discontinuation by the manufacturer in 2009, Benzyl alcohol lotion was FDA-approved for head lice (ages 6 months and older).	Not graded[14]	AAP[14]
Permethrin 1% lotion or shampoo (Nix) is first-line treatment for pediculosis. Alternative treatments should not be used unless permethrin fails after two treatments. It is the preferred treatment for head lice in individuals aged 2 months and older, including pregnant women	Grade C[12] Not graded[14]	AAFP[12] AAP[14]
Pyrethrin, derived from the chrysanthemum flower, is often combined with piperonyl butoxide to boost its effectiveness in products like shampoo or mousse for individuals aged 24 months and older.	Not graded[14]	AAP[14]
Non-ovicidal therapies for pediculosis should be applied twice, seven to 10 days apart, to fully	Grade C[12]	AAFP[12]

eradicate lice. Three treatments with permethrin or pyrethrins might be most effective.		
If permethrin fails after two treatments, recommend dimethicone solution as a second-line agent.	Not graded[12]	AAFP[12]
Head lice treatment: *Ivermectin* ○ The FDA has approved Ivermectin 0.5% lotion for individuals aged 6 months and older, and it became available over-the-counter in late 2020, requiring a single application to dry hair. ○ Oral ivermectin (Stromectol) is FDA-approved for adult head lice treatment, with pediatric use allowed for other infections. It is considered if topical treatments are unsuccessful, with recommended oral doses of 200 µg/kg given 7-10 days apart. ○ Safety concerns exist for infants under 15 kg, and limited data are available on adverse effects. There are reports of potential ivermectin-resistant head lice cases outside the U.S. ○ While pregnancy safety is indicated, permethrin remains the first-line treatment during pregnancy.	Not graded[14]	AAP[14]
Abametapir (0.74% Lotion) FDA-approved in 2020 for head lice (prescription-only, ages 6 months and older), Abametapir inhibits crucial proteins for lice survival. Not commercially available yet, it requires application to dry hair and rinsing after 10 minutes.	Not graded[14]	AAP[14]
Manual removal of live lice and nits, although not extensively studied in peer-reviewed literature, is considered notably safe compared to pesticide toxicity. Medical providers can include manual removal as a treatment option, providing an opportunity for caregivers and children to spend quality time together while effectively eliminating infestations and debris.	Not graded[14]	AAP[14]

Head lice prevention: o Avoid head-to-head contact during various activities. o Refrain from sharing clothing items, combs, brushes, or towels. o Disinfect combs and brushes in hot water. o Avoid lying on surfaces recently in contact with an infested person. o Launder clothing and linens using hot water and high heat drying. o Vacuum floors and furniture, especially where the infested person was. o Educate and encourage children to avoid activities that may spread head lice. o Fumigant sprays or fogs are unnecessary and can be toxic.	Not graded[14] Not graded[16]	AAP[14] CDC[16]
Loiasis treatment The treatment of loiasis is complex and requires consultation with experienced experts. o Surgical excision of migrating adult worms can alleviate localized symptoms but is not curative. o The drug of choice is diethylcarbamazine (DEC), providing cure with one or two courses for most patients. Quantitative blood smears are necessary before treatment. o Prophylactic DEC can prevent infection in long-term travelers. o Albendazole may be effective for DEC-refractory cases or to reduce microfilarial load before DEC treatment. Close monitoring is essential. o Treatment may briefly increase symptoms, and the risk of fatal encephalopathy exists with DEC, not entirely eliminated by corticosteroid treatment.	Not graded[17]	CDC[17]
Loiasis treatment for pregnant woman Albendazole, categorized as Pregnancy Category	Not graded[17]	CDC[17]

C, has limited data on use during pregnancy. WHO permits its use during the 2nd and 3rd trimesters when benefits outweigh risks, but decisions for pregnant women should consider the disease's progression.		
Zoonotic Hookworm Cutaneous larva Migrans treatment o Several treatment approaches have been suggested, such as cryotherapy and the use of topical anthelminthic therapy. However, these methods rely on locating the larvae for effectiveness, which is often challenging. o While applying topical anthelminthic over extensive skin areas has proven effective in certain instances, it may not always be feasible. o Curative treatments involve the use of albendazole or ivermectin. o In severe or recurring cases, particularly those involving folliculitis, additional doses may be required for successful treatment.	Not graded[18]	CDC[18]
Cutaneous Leishmaniasis Treatment In all CL cases, routine wound care, individualized documentation of lesion evolution, and patient education regarding manifestations and detection of local therapeutic failure/relapse and ML should be integral components of management	Strong recommendation, low quality of evidence[19]	IDSA/ASTMH[19]
Cutaneous Leishmaniasis Treatment Initial systemic therapy may be used in individuals with CL in whom it is not practical to use local therapy or, possibly, if more rapid healing of large, cosmetically, or functionally concerning lesions is preferred	Weak recommendation, very low quality of evidence[19]	IDSA/ASTMH[19]
Cutaneous Leishmaniasis Treatment *Parenteral systemic therapy* o **Conventional amphotericin B deoxycholate and lipid formulations, with**	Not graded[20]	CDC[20]

liposomal amphotericin B offering tolerance benefits. o Liposomal amphotericin B is typically administered at 3 mg/kg daily through IV infusion for 6 to 10 or more doses. o Pentamidine isethionate is rarely used in the U.S. due to potential toxicity and variable effectiveness. o Pentavalent antimonial (SbV) therapy involves a standard daily dose of 20 mg/kg, administered IV or IM. The duration varies based on the type of leishmaniasis, with traditional therapy lasting 20 days for cutaneous leishmaniasis (potentially 10 days in some cases).		
Cutaneous Leishmaniasis Treatment *Oral systemic therapy* o Miltefosine, an oral medication, received FDA approval in 2014 for treating cutaneous leishmaniasis in adults and adolescents who are not pregnant or breastfeeding. o Miltefosine's effectiveness can vary across geographic regions. Its off-label use includes treatment for other Leishmania species in the New World or any species in the Old World. It is not approved for use in children under 12.	Not graded[20]	CDC[20]
Cutaneous Leishmaniasis Treatment *Azoles therapy* o Ketoconazole, itraconazole, and fluconazole, administered orally, have shown varied outcomes in different contexts for treating leishmaniasis. o Ketoconazole, given at a daily regimen of 600 mg for 28 days, demonstrated modest effectiveness against L. mexicana and L. (V.) panamensis infections in small studies in Guatemala and Panama. o In contrast, itraconazole, prescribed at a daily regimen of 200 mg twice daily for 28 days,	Not graded[20]	CDC[20]

proved ineffective against L. (V.) panamensis infection in a clinical trial in Colombia. ○ Fluconazole, with an adult regimen of 200 mg daily for 6 weeks, showed mixed results in treating L. major infection in various Old World countries. Preliminary data from Iran suggested that a higher daily dose (400 vs. 200 mg) might be more effective against L. major infection.		
Cutaneous Leishmaniasis Treatment *Local therapy* ○ Localized treatment options that could be beneficial in certain scenarios include cryotherapy (using liquid nitrogen), thermotherapy (employing localized current field radiofrequency heat), intralesional administration of pentavalent antimonial (SbV), and the topical application of specific formulations of paromomycin.	Not graded[20]	CDC[20]
Cutaneous Leishmaniasis Prevention and control: There are currently no available vaccines or drugs to prevent leishmaniasis infection. Travelers can best protect themselves by minimizing nocturnal outdoor activities, wearing protective clothing, and applying insect repellent to exposed skin to prevent sand fly bites.	Not graded[20]	CDC[20]
Individuals with cutaneous leishmaniasis (CL) should be monitored for 6–12 months after treatment for clinical evidence of therapeutic failure, which is initially seen at the border of a healed lesion.	Strong recommendation, low quality of evidence[19]	IDSA/ASTMH[19]
Additional therapy is recommended when there is the development of new skin lesions or worsening of existing lesions. It is also recommended if there is incomplete healing by 3 months after completing the treatment course.	Strong recommendation, low quality of evidence[19]	IDSA/ASTMH[19]
Therapeutic failure should be assessed by physical appearance. A relatively little improvement or worsening while on therapy	Strong recommendation,	IDSA/ASTMH[19]

suggests an inadequate response, and an alternate treatment approach should be planned	low quality of evidence[19]	

At the end of the report, a **key recommendation synthesis section** is added highlighting the latest updates in **parasitic skin infections clinical and therapeutic management.**

Section 1.0 Summary of Reviewed Clinical Guidelines & Evidence

This section is divided into two parts; the first includes recommendations from **updated versions of guidelines** mentioned in the previous CHI Parasitic Skin Infections report, and the second includes **newly added guidelines** that have helped generate this report.

1.1 Revised Guidelines

The following segment contains the updated versions of the guidelines mentioned in the April 2020 CHI Parasitic Skin Infections Report and the corresponding recommendations:

Table 3. Guidelines Requiring Revision

Guidelines Requiring Revision		
Old Versions		**Updated versions**
1.1	Guidelines for the Treatment of Scabies by Centers for Disease Control and Prevention (**CDC**) of America - November 2, **2010**	Guidelines for the Treatment of Scabies by Centers for Disease Control and Prevention (**CDC**) of America – October 2, **2019**
1.2	Guidelines for the Treatment of Head Lice by Centers for Disease Control and Prevention (**CDC**) of America - November 2, **2010**	Guidelines for the Treatment of Head Lice by Centers for Disease Control and Prevention (**CDC**) of America – October 15, **2019**
1.3	Cutaneous Leishmaniasis Management Guide Ministry of Health, **Public Health Deputyship, Saudi Arabia** January **2019**	N/A*
1.4	Guidelines for the Treatment of Loiasis by Centers for Disease	Guidelines for the Treatment of Loiasis by Centers for Disease Control and

	Control and Prevention (**CDC**) of America – May 28, **2020**	Prevention (**CDC**) of America – November 24, **2020**
1.5	Guidelines for the Treatment of Zoonotic Hookworm Cutaneous Larva Migrans (CLM) By the Center of Disease Control and Prevention (**CDC**) of America - April 12, **2019**	Guidelines for the Treatment of Zoonotic Hookworm Cutaneous Larva Migrans (CLM) By the Center of Disease Control and Prevention (**CDC**) of America – May 26, **2020**

**: not available (no new updates for those guidelines)*

1.1.1 Guidelines for the Treatment of Scabies by Centers for Disease Control and Prevention of America – October 2, 2019

The CDC has issued the below recommendations for the treatment of scabies[7]:

Missing recommendations

- Apply scabicide lotion or cream to the entire body, covering areas from the neck down to the feet and toes.
- For infants and young children, extend the application to the entire head and neck as scabies can affect the face, scalp, and neck, in addition to the rest of the body.
- In the case of **infants**, only **permethrin** or **sulfur ointment** is suitable. Ensure the lotion or cream is applied to a clean body and left on for the recommended duration before washing it off.
- After treatment, clean clothing should be worn.
- Examine and treat both sexual and close personal contacts who have had direct prolonged skin-to-skin contact with an infested person within the preceding month. It is essential to treat all individuals simultaneously to prevent reinfestation.
- As the symptoms of scabies result from a hypersensitivity reaction to mites and their feces (scybala), itching may persist for several weeks after treatment, even if all mites and eggs are eradicated. If itching continues beyond 2 to 4 weeks post-treatment or if new burrows or rash lesions appear, retreatment may be necessary.
- Infected skin sores should be treated with an appropriate antibiotic prescribed by a doctor.

For the treatment of classic scabies, one major drug was omitted:

- **Ivermectin** is an oral antiparasitic agent that has received approval for the treatment of worm infestations. While evidence suggests that oral ivermectin may be a safe and effective treatment for scabies, it's important to note that the U.S. Food and Drug Administration (FDA) has not approved it for this specific use.
- Oral ivermectin is typically considered for patients who have not responded to treatment or cannot tolerate FDA-approved topical medications for scabies.
- For the treatment of classic scabies, it is recommended to take two doses of oral ivermectin (200 µg/kg/dose), each approximately one week apart. It is important to mention that the safety of ivermectin has not been established in children weighing less than 15 kg and in pregnant women.
- It's noteworthy that while the guidelines for ivermectin suggest taking it on an empty stomach, experts in the field of scabies recommend taking it with a meal to enhance its bioavailability.

For crusted scabies, both oral and topical agents should be used:

- **Ivermectin** (refer to previous CHI report)
- **Permethrin cream 5%:** Permethrin is an FDA-approved treatment for scabies in individuals who are at least 2 months of age. It belongs to the synthetic pyrethroid class, resembling naturally occurring pyrethrins extracted from the chrysanthemum flower. When used as directed, permethrin is considered safe and effective. It acts by killing both scabies mites and their eggs, making it the preferred drug for scabies treatment. For crusted scabies, topical permethrin should be applied every 2-3 days over 1-2 weeks.
- **Benzyl benzoate 25%** (with or without tea tree oil): serves as an alternative topical agent to permethrin. However, it may cause immediate skin irritation. Lower concentrations, such as 10% or 12.5%, may be more suitable for use in children.
- **Keratolytic cream:** A topical keratolytic cream can be employed to reduce skin crusting and enhance the absorption of topical permethrin or benzyl benzoate in scabies treatment.

1.1.2 Guidelines for the Treatment of Head Lice by Centers for Disease Control and Prevention of America – October 15, 2019

The CDC has issued the below recommendations for the treatment of head lice[15]:

Missing recommendations:

Supplemental Measures for Head Lice Prevention:

Head lice have a limited survival time when they fall off a person and are unable to feed. Extensive housecleaning is not required, but these steps can help prevent re-infestation by lice that have recently fallen off the hair or may be present on clothing or furniture.

- **Clothing and Bedding:**
  - Machine wash and dry clothing, bed linens, and other items worn or used by the infested person during the 2 days before treatment. Use the hot water (130°F, ≈ 55°C) laundry cycle and high heat drying cycle. Alternatively, clothing and items that cannot be washed can be dry-cleaned or sealed in a plastic bag and stored for 2 weeks.
- **Combs and Brushes:**
  - Soak combs and brushes in hot water (at least 130°F, ≈ 55°C) for 5–10 minutes to ensure they are free from any lice or nits.
- **Vacuuming:**
  - Vacuum the floor and furniture, paying attention to areas where the infested person sat or lay. While the risk of getting infested by a louse that has fallen onto rugs, carpets, or furniture is minimal, thorough vacuuming can help minimize any potential risk.
- **Understanding Lice Lifespan:**
  - Recognize that head lice survive less than 1–2 days if they fall off a person and cannot feed. Nits (lice eggs) cannot hatch and typically die within a week if they are not exposed to the same temperature found close to the human scalp.
- **Avoid Fumigant Sprays:**
  - Do not use fumigant sprays, as they can be toxic if inhaled or absorbed through the skin. Stick to safe and effective preventive measures without resorting to potentially harmful chemicals.

By following these practical steps, it is possible to prevent reinfestation without the need for excessive time or financial investment in housecleaning activities.

When treating head lice, it's crucial to adhere to specific guidelines to ensure safe and effective use of medications:

- **Dosage Instructions:**

- Do not use extra amounts of any lice medication unless specifically instructed to do so by physician or pharmacist. Lice medications are insecticides and can be hazardous if misused or overused.

- **Avoid Contact with Eyes:**
  - Keep all lice medications away from the eyes. In case of contact with the eyes, flush them immediately. It's important to prevent any direct contact with the eyes.
- **Limit Treatment Frequency:**
  - Refrain from treating an infested person more than 2–3 times with the same medication if it appears ineffective. This could be due to improper use or potential resistance to the medicine.
- **Avoid Simultaneous Use of Different Medications:**
  - Do not use different head lice drugs simultaneously unless explicitly directed to do so by physician and pharmacist. Mixing medications without guidance can be unsafe.
- **Rinsing Procedures:**
  - Follow the American Academy of Pediatrics (AAP) recommendation to rinse all topical pediculicides from the hair over a sink, not in the shower or bath. This helps limit skin exposure. Additionally, use warm water instead of hot water to minimize absorption.

By adhering to these guidelines, individuals can effectively treat head lice while minimizing the risk of adverse effects and ensuring the proper use of medications. Always seek professional advice if there are concerns or uncertainties during the treatment process.

In a subsection in this guideline, the CDC[16] issued the following for prevention and control of head lice:

Head lice are primarily transmitted through direct head-to-head (hair-to-hair) contact, with less frequent spread occurring through shared clothing or belongings onto which lice have crawled or nits attached to shed hairs may have fallen. The risk of infestation by a louse falling onto carpets or furniture is minimal, as head lice survive less than 1–2 days when off a person and unable to feed; nits typically die within a week if not maintained at scalp-like temperatures.

To prevent and control the spread of head lice, consider the following measures:

- Avoid head-to-head contact during play and activities at home, school, and elsewhere (sports, playground, slumber parties, camp).

- Refrain from sharing clothing items such as hats, scarves, coats, sports uniforms, hair ribbons, or barrettes.
- Avoid sharing combs, brushes, or towels. Disinfect combs and brushes used by an infested person by soaking them in hot water (at least 130°F) for 5–10 minutes.
- Avoid lying on surfaces like beds, couches, pillows, carpets, or stuffed animals recently in contact with an infested person.
- Launder clothing, bed linens, and items worn or used by an infested person in the 2 days before treatment using the hot water (130°F) laundry cycle and high heat drying cycle. Non-washable items can be dry-cleaned or sealed in a plastic bag and stored for 2 weeks.
- Vacuum floors and furniture, especially where the infested person sat or lay. However, extensive housecleaning is unnecessary to prevent reinfestation by lice or nits that may have fallen off the head or onto furniture or clothing.
- Avoid using fumigant sprays or fogs, as they are not required for head lice control and can be toxic if inhaled or absorbed through the skin.

To manage a head lice outbreak in a community, school, or camp, educate children to avoid activities that might facilitate the spread of head lice.

Over-the-counter medications include pyrethrins combined with piperonyl butoxide, permethrin lotion 1%. Prescription medications include benzyl alcohol lotion 5%, ivermectin lotion 0.5%, malathion lotion 0.5%, spinosad topical suspension 0.9%, and lindane shampoo 1%. The latter is used for second-line treatment only.

1.1.4 Guidelines for the Treatment of Loiasis by Centers for Disease Control and Prevention of America – November 24, 2020

Loiasis is an infection caused by the parasitic worm *Loa loa*. While many people remain asymptomatic after contracting the infection, symptoms do not usually show up for many months after the infection. The parasite is passed from deerflies to humans in certain rain forests of West and Central Africa, and the infection does not spread person-to-person.

The CDC has issued recommendations below[17]:

Missing recommendations:

- Albendazole does not seem to have a tendency to induce encephalopathy, although there is a scarcity of published data on this matter.

- The drug of choice for the treatment of loiasis is diethylcarbamazine, and most patients will achieve cure with one or two courses.
- The treatment of loiasis with antiparasitic agents may lead to a transient exacerbation of symptoms, such as Calabar swelling or pruritus. Some authors propose that these symptoms could be mitigated by concurrently administering antihistamines or corticosteroids during the initial seven days of treatment. It is important to note the potential occurrence of fatal encephalopathy with diethylcarbamazine (DEC) treatment, and this risk does not appear to be mitigated by corticosteroid therapy.
- *Loa loa* do not contain *Wolbachia* so doxycycline is not an effective treatment.

Table 4. Treatment Options for Loiasis

Treatment	Indication	Adult Dose	Pediatric Dose
Diethylcarbamazine (DEC)	Symptomatic loiasis with MF/mL <8,000	8–10 mg/kg/day orally in 3 divided doses daily for 21 days	8–10 mg/kg/day orally in 3 divided doses daily for 21 days
Albendazole	Symptomatic loiasis, with MF/mL <8,000 and failed 2 rounds DEC OR Symptomatic loiasis, with MF/ml ≥8,000 to reduce level to <8,000 prior to treatment with DEC	200 mg orally twice daily for 21 days	200 mg orally twice daily for 21 days
Apheresis* followed by DEC	Symptomatic loiasis, with MF/mL ≥8,000	N/A	N/A

MF = microfilariae of *L. loa*
* Apheresis should be performed at an institution with experience in using this therapeutic modality for loiasis. Oral albendazole is available for human use in the United States.

Important information regarding the risk of fatal encephalopathy during loiasis treatment:

- Based on available data, the risk of fatal encephalopathy in patients undergoing diethylcarbamazine (DEC) treatment with microfilarial loads less than 8,000 microfilariae per mL is nearly negligible. For those individuals with microfilarial loads equal to or exceeding 8,000 microfilariae per mL,

specialized centers may consider apheresis to reduce the load below the 8,000 threshold before initiating treatment. Some authors propose a more conservative threshold of 2,500 microfilariae per mL for commencing loiasis treatment, although this lower threshold must be carefully weighed against the associated risks of apheresis. Limited data suggest that treating patients with albendazole, 200mg twice daily for 21 days, may bring the microfilarial load to acceptable levels. However, re-evaluation of levels after albendazole treatment is necessary before proceeding with DEC treatment.

- **A note on treating patients with O. volvulus co-infection**: DEC is not recommended for individuals with onchocerciasis due to the potential risk of blindness or severe exacerbation of skin disease. Refer to the onchocerciasis web pages for appropriate treatment recommendations.
- **A note on medication acquisition:** Diethylcarbamazine (DEC), having been globally utilized for over 50 years, is no longer approved by the U.S. Food and Drug Administration (FDA) and is unavailable for sale in the United States due to the rarity of this infection in the country. Physicians can obtain the medication from the CDC after confirming positive laboratory results.

Albendazole:

- Albendazole falls under pregnancy category C.
- Limited data exist on the use of albendazole in pregnant women, but the available evidence indicates no discernible difference in congenital abnormalities between children of women accidentally treated with albendazole during mass prevention campaigns and those who were not.
- In instances where the World Health Organization (WHO) has deemed that the benefits of treatment outweigh the risks, albendazole is permitted during the 2nd and 3rd trimesters of pregnancy. However, the decision to administer treatment to pregnant women with known infections should consider the balance between the risk of treatment and the potential progression of the disease in the absence of intervention.
- As per pregnancy Category C classification, this signifies that adverse effects on the fetus have been observed in animal studies (teratogenic or embryocidal), and either controlled studies in women are unavailable or there are no available studies in both women and animals. Administration of drugs should only occur if the potential benefits justify the potential risks to the fetus.
- The excretion of albendazole in human milk is not known. Therefore, caution is advised when using albendazole in breastfeeding women.

- The safety of albendazole in children under 6 years old is uncertain, although studies in children as young as one year old suggest its safety.
- According to WHO guidelines for mass prevention campaigns, albendazole can be utilized in children as young as 1 year old, and many children under 6 have received albendazole in these campaigns, albeit at a reduced dose.

1.1.5 Guidelines for the Treatment of Zoonotic Hookworm Cutaneous Larva Migrans (CLM) By the Center of Disease Control and Prevention of America – May 26, 2020

The CDC has issued recommendations below[18]:

- Oral albendazole is available for human use in the United States.
- Oral ivermectin is available for human use in the United States.

Table 5. Treatment Options for Zoonotic Hookworm Cutaneous Larva Migrans

Drug	Adult Dose	Pediatric Dose
Albendazole	400 mg per day by mouth for 3 to 7 days	Children aged > 2 years: 400 mg per day by mouth for 3 days This drug is contraindicated in children younger than 2 years age.
Ivermectin	200 mcg/kg by mouth as a single dose	Children over 15 kg weight: 200 mcg/kg by mouth as a single dose

1.2 Additional Guidelines

This part includes the added guidelines to the previous CHI Parasitic Skin Infections report, along with their recommendations.

Table 6. List of Additional Guidelines

Additional Guidelines

Centers for Disease Control and Prevention (**CDC**) Morbidity and Mortality Weekly Report (MMWR) Sexually Transmitted Infections Treatment Guidelines **(2021)**
American Academy of Family Physicians (**AAFP**) Treatment Update on Lice and Scabies **(2019)**
United Kingdom Health Security Agency (**UKHSA**) Guidance on the Management of Scabies Cases and Outbreaks in Long-Term Care Facilities and Other Closed Settings **(2023)**
European Academy of Dermatology and Venereology Guideline for the Management of Scabies **(2017)**
Japanese Dermatological Association Guideline for the Diagnosis and Treatment of Scabies in Japan (Third Edition) **(2017)**
Australian Society for HIV, Viral Hepatitis and Sexual Health Medicine (**ASHM**) Australian STI Management Guidelines: Ectoparasites **(2021)**
American Academy of Pediatrics (**AAP**) Guidance for the Management of Head Lice **(2022)**
Guidelines for the Treatment of Leishmaniasis by the Center of Disease Control and Prevention (**CDC**) of America **(October 5, 2023)**
Diagnosis and Treatment of Leishmaniasis: Clinical Practice Guidelines by the Infectious Diseases Society of America (**IDSA**) and the American Society of Tropical Medicine and Hygiene (**ASTMH**) **(2016)**

1.2.1 Centers for Disease Control and Prevention (CDC) Morbidity and Mortality Weekly Report (MMWR) Sexually Transmitted Infections Treatment Guidelines (2021)

While the MMWR report issued by the CDC covers all types of sexually transmitted infections, this section will only focus on those caused by parasitic organisms and requiring, mainly scabies. The main recommendations below are summarized below[8]:

- Topical permethrin and oral/topical ivermectin are equally effective in curing scabies, with treatment choice based on patient preferences, drug interactions, and cost considerations.
- Permethrin is safe with a single application, while ivermectin, though effective, requires a second dose after 14 days.
- Lindane is an alternative but is toxic and should only be used if other therapies are intolerable or ineffective, with precautions for specific populations. Lindane is not recommended for pregnant and breastfeeding women, children aged < 10 years and persons with extensive dermatitis.

- Bedding and clothing should undergo decontamination, achieved through either machine washing and drying using the heat cycle or dry cleaning. Alternatively, these items should be kept away from direct body contact for more than 72 hours. Fumigation of living spaces is not required. Individuals with scabies are recommended to maintain closely trimmed fingernails to minimize injury resulting from excessive scratching.
- Crusted scabies, more severe and easily transmitted, may require combination therapy with permethrin or benzyl benzoate and oral ivermectin, with caution against lindane due to potential neurotoxicity risks. The treatment of crusted scabies lacks clear guidelines, but combination therapy is often recommended, especially for severe cases.
- Combination treatment is recommended with a topical scabicide, either 5% topical permethrin cream (full-body application to be repeated daily for 7 days, then 2 times/week until cure) or 25% topical benzyl benzoate, and oral ivermectin 200 ug/kg body weight on days 1, 2, 8, 9, and 15. Additional ivermectin treatment on days 22 and 29 might be required for severe cases. Lindane should be avoided due to the risk of neurotoxicity with heavy applications on damaged skin.
- Permethrin is the recommended treatment for infants and young children, given the undetermined safety of ivermectin for those weighing less than 15 kg.
- Lindane should not be used in infants and children under 10 years old.
- While ivermectin is considered to pose a low risk to pregnant women and is likely compatible with breastfeeding, limited data on its use in pregnant and lactating women suggest that permethrin is the preferred treatment.
- Persons who have had sexual, close personal, or household contact with the patient within the month preceding scabies infestation should be examined. Those identified as being infested should be provided with treatment.

Table 7. Recommended Regimens for the Treatment of Scabies

Recommended Regimens for Scabies
Permethrin 5% cream applied to all areas of the body from the neck down and washed off after 8–14 hours or

Ivermectin 200 ug/kg body weight orally, repeated in 14 days* or Ivermectin 1% lotion applied to all areas of the body from the neck down and washed off after 8–14 hours; repeat treatment in 1 week if symptoms persist
* Oral ivermectin has limited ovicidal activity; a second dose is required for eradication.
Alternative Regimen
Lindane 1% 1 oz of lotion or 30 g of cream applied in a thin layer to all areas of the body from the neck down and thoroughly washed off after 8 hours*
* Infants and children aged < 10 years should not be treated with lindane

1.2.2 American Academy of Family Physicians (AAFP) Treatment Update on Lice and Scabies (2019)

The AAFP has issued an updated guideline on the management of lice and scabies, and the main recommendations are summarized in table 9[12]:

Table 8. Grading the Certainty of Evidence and Strength of Recommendations (AAFP)

Grade	Level of Evidence
A	Consistent, good-quality patient-oriented evidence
B	Inconsistent or limited-quality patient-oriented evidence
C	Consensus, disease-oriented evidence, usual practice, expert opinion, or case series.

Table 9. AAFP Key Recommendations for Treatment of Head Lice and Scabies

KEY RECOMMENDATIONS FOR PRACTICE		
Clinical recommendation	**Evidence rating**	**Comment**

A “no-nit” policy is not recommended for schools and day cares because nits alone do not indicate an active infestation. Children should not be kept out of school during treatment, even with active infestation, because the likelihood of transmission is low, and this can result in significant absences.	C	U.S. and Canadian consensus guidelines based on basic knowledge of the lice life cycle
Permethrin 1% lotion or shampoo is first-line treatment for pediculosis. Alternative treatments should not be used unless permethrin fails after two treatments.	C	U.S. consensus guidelines balancing effective-ness and toxicity
Non-ovicidal therapies for pediculosis should be applied twice, seven to 10 days apart, to fully eradicate lice. Some authors postulate that three treatments with permethrin or pyrethrins might be most effective.	C	U.S. and Canadian consensus guidelines based on basic knowledge of the lice life cycle Inappropriate retreatment may result in resistance and lack of treatment effectiveness
Scabies should be considered in patients with a pruritic, papular rash in the typical distribution and pruritus in close contacts. The classic bur- rows in webs and creases may not be present.	C	U.S. and European consensus guidelines based on epidemiologic data and case studies
Oral ivermectin should be reserved for patients with scabies who do not improve with permethrin 5% cream.	C	Guidelines using consensus agreement in area of little clinical research

Pharmacological treatment of head lice:

- The pharmacological treatment of head lice infestation revolves around three main mechanisms: inducing neurotoxicity leading to lice paralysis (insecticidal treatments), suffocating the lice by forming a "coating," or dissolving the wax covering on the exoskeleton.
- Insecticidal agents with neurotoxic effects on lice include permethrin 1% lotion or shampoo, pyrethrins 0.3%/piperonyl butoxide 4% shampoo, malathion 0.5% lotion, spinosad 0.9% suspension, ivermectin 0.5% lotion, and oral ivermectin.

- Permethrin 1% is recommended as the initial treatment for head lice.
- Non-insecticidal agents relying on suffocation or exoskeleton dissolution include benzyl alcohol 5% lotion, dimethicone solution, and isopropyl myristate solution. If permethrin fails after two treatments, the Canadian Paediatric Society recommends dimethicone solution and isopropyl myristate solution as second-line agents.
- Effectively formulating a treatment regimen involves recognizing the efficacy of available treatments in destroying viable eggs, determining the need for retreatment. Ovicidal agents such as malathion, spinosad, and topical ivermectin eliminate both live lice and eggs in one treatment. Non-ovicidal agents (permethrin, pyrethrins, benzyl alcohol, dimethicone, oral ivermectin, and isopropyl myristate) typically require a repeat application for complete eradication. The timing for non-ovicidal treatments is based on the louse life cycle. An initial application followed by a second application seven to 10 days later (nine days being optimal) should be sufficient for most cases. Some authors suggest an effective retreatment schedule for permethrin or pyrethrins might involve three doses on days 0, 7, and 13 to 15.
- Resistance to permethrin and pyrethrins/piperonyl butoxide can be significant, although the geographic distribution of resistant lice is not well-known. Pseudoresistance may result from poor adherence, incorrect product use (underdosing or not following directions), and reinfection. If two appropriately administered courses of permethrin prove ineffective, an alternative agent should be considered.
- Lindane is no longer recommended due to its neurotoxicity in humans.

Table 10. Pharmacologic Treatments for Head Lice

Treatment	Ovicidal?	Mechanism of action	Directions (per package inserts)	Effectiveness
Benzyl alcohol 5% lotion; prescription	No	Suffocation	Apply to dry hair, leave on for 10 minutes then rinse; repeat in seven days	75% to 76% of patients are lice free at 14 days
Dimethicone solution; OTC	No	Suffocation	Spray all over dry hair, and massage until wet; let it sit for 30 minutes, then comb into hair; leave on overnight; wash out, and use a lice comb; repeat in eight to 10 days	70% to 96% of patients are lice free at 14 days (study of dimethicone 100%)
Isopropyl myristate; OTC†	No	Exoskeleton dissolution	Apply to dry hair and scalp, leave on for 10 minutes then rinse with warm water; repeat in eight to 10 days	54% to 82% of patients are lice free at 14 to 21 days
Ivermectin 0.5% lotion; prescription	Not directly, but lice hatched from treated eggs die within 48 hours	Neurotoxic to lice	Apply to dry hair and scalp, leave on for 10 minutes then rinse; one application is sufficient	74% of patients are lice free at 15 days
Ivermectin, oral; prescription‡	Partial	Neurotoxic to lice	200 mcg per kg, two doses seven to 10 days apart	92% to 97% of patients are lice free at 14 to 15 days after two doses
Malathion 0.5% lotion;	Partial	Neurotoxic to lice	Apply to dry hair until hair and scalp are wet, allow to dry	80% of patients are lice free at 14 days

prescription			naturally, shampoo eight to 12 hours later, rinse and use a lice comb; repeat after seven to nine days only if live lice are still present	
Permethrin 1% shampoo; OTC	No	Neurotoxic to lice	Apply to damp hair, leave on for 10 minutes then rinse; repeat in seven days	50% to 97% of patients are lice free at 14 days
Pyrethrins 0.3%/ piperonyl butoxide 4% shampoo or mousse; OTC	No	Neurotoxic to lice	Apply to dry hair, leave on for 10 minutes then rinse; repeat in seven days	62% to 94% of patients are lice free (unclear time frame)
Spinosad 0.9% suspension; prescription	Yes	Neurotoxic to lice	Apply to dry hair, leave on for 10 minutes then rinse; repeat in seven days only if live lice are present	68% to 87% of patients are lice free at 14 days

FDA = U.S. Food and Drug Administration; OTC = over the counter.
†—FDA approved in May 2017 but not yet marketed in the United States.
‡—Off-label use.

Non-pharmacological approaches to head lice treatment

- Wet combing, a non-pharmacological method for treating head lice, involves washing with regular shampoo, dampening the hair with a commercially available leave-in conditioner, detangling with a wide-tooth comb, and systematically combing the hair from root to tip using a lice comb. Afterward, the conditioner is rinsed out, and the hair is combed with a lice comb again. Wet combing, while devoid of adverse effects, is time-consuming and is preferred by parents seeking to avoid chemical treatments. It should be performed every three days until no lice are detected on four to five consecutive occasions.
- Several substances, including vinegar, formic acid solution, nit-removal conditioners, water, regular conditioner, and almond oil, have been evaluated for removing nits by loosening them from the hair shaft. In vitro studies indicate water and regular conditioner are most effective in nit removal. The use of herbal and alternative products (e.g., tea tree oil, eucalyptus oil) in children is not recommended due to the lack of evaluation by the U.S. Food and Drug Administration, limited evidence of benefit, and uncertainty about safety.
- Head-to-head contact is the primary mode of lice transmission, while fomite transmission is rare. Items in direct contact with the head within the two days before treatment (e.g., pillowcases, hats, clothing) should be washed, and exposing them to a temperature of at least 130°F (54°C) in the washing machine or dryer effectively eliminates lice. Alternatively, sealing items in a plastic bag for two weeks proves effective. The use of sprays, carpet treatments, and other chemical environmental decontamination measures is not recommended.

Scabies

- Permethrin 5% cream is the primary treatment for scabies. Physicians should instruct patients on the correct application of permethrin cream, emphasizing its application to all areas of the body from the neck down. It should be left on the skin for eight to 14 hours or overnight, washed off, and reapplied after one week. Patients need to be aware that itching may persist for up to two weeks post-treatment, and persistent symptoms should prompt consideration of misdiagnosis, treatment failure, or treatment-related skin irritation. Sex partners from the past two months should also undergo treatment.
- Oral ivermectin (200 mcg per kg, two doses 14 days apart) is an alternative for scabies, recommended by the Centers for Disease Control and Prevention if topical permethrin treatment proves unsuccessful. However, its use is often limited to second-line therapy due to cost and availability constraints.

- Environmental control measures for scabies involve washing items like sheets and clothing at a temperature of at least 122°F (50°C) and drying them in a hot dryer. For items that cannot be machine-washed, isolating them in a sealed plastic bag for at least one week is sufficient.

1.2.3 United Kingdom Health Security Agency (UKHSA) Guidance on the Management of Scabies Cases and Outbreaks in Long-Term Care Facilities and Other Closed Settings (2023)

The UKHSA has issued recommendations below[13]:

Management of single cases of scabies:

- The recommended treatment involves applying either permethrin (5%) cream or malathion (0.5%) aqueous liquid if permethrin is not suitable.
- Individuals affected by scabies can return to work, school, or nursery after completing the first 24-hour treatment dose as prescribed by a clinician.
- They should avoid close physical contact with others until completing the first 24-hour treatment dose.
- Symptoms may persist for up to 6 weeks after treatment, and clinicians may consider prescribing antipruritic agents for persistent or distressing itch.
- In cases where scabies are acquired from a sexual partner, a referral for a sexually transmitted infection (STI) screen is advised.
- Staff and carers should wear appropriate personal protective equipment (PPE) when handling and providing personal care until the first 24-hour treatment dose is completed.
- Transfer of cases to other settings should be avoided until the first 24-hour treatment dose is completed.

Management of contacts:

- Defined as individuals with close physical contact with the case without appropriate personal protective equipment (PPE), treatment should be administered at the same time as the index case on two occasions 7 days apart, even if asymptomatic.
- Contacts who are off duty at the time of treatment should complete the first 24-hour treatment dose before returning to work.
- A low index of suspicion is recommended for identifying potential contacts of a case of crusted scabies due to the increased risk of transmission.

- Staff should be vigilant for signs and symptoms of scabies for an 8-week period, and if two or more cases are identified in the setting, management should proceed as per an outbreak scenario.
- If the case has been transferred within 8 weeks of symptom onset from another setting, staff should inform management at that setting to investigate for possible close contacts and consider implementing other control measures.

Laundry and environmental considerations

- All clothes, soft slippers, towels, and bed linen of the affected case should be washed at a minimum of 50°C (122°F) on the day of the first treatment application.
- If clothes cannot be washed at a high temperature, they can be sealed in plastic bags for 4 days at room temperature.
- Alternative methods include pressing clothes with a warm iron, dry cleaning, and putting items into a hot cycle in the dryer for 10 to 30 minutes.
- Appropriate PPE should be worn when handling these items, and there is no necessity to fumigate living areas, furniture, or treat pets.

Outbreak management in closed settings

Coordinating Mass Treatment:

- To disrupt the transmission cycle, all cases and contacts should undergo treatment simultaneously. If staff members are off duty during the treatment, they should complete the initial 24-hour treatment dose before returning to work. Individual case management should occur concurrently for all cases and contacts within the outbreak.
- Environmental measures are generally implemented to minimize the potential risk of fomite transmission and reinfection. While there is limited evidence for a single optimal approach to environmental management, an approach found feasible in the experience of contributing Health Protection Teams (HPTs) is described.
- In cases where staff requires treatment due to occupational exposure, it is recommended that employers consider funding the treatment to encourage uptake and facilitate a prompt return to normal working conditions. Social care settings can explore alternative funding options with local authority public health or social care commissioning teams.
- Ivermectin, an off-label single- or double-dose oral treatment for scabies, is recognized within closed settings, particularly when logistical challenges exist

for successful topical therapy delivery, or in the context of immunosuppression or crusted scabies. The decision to prescribe ivermectin in such contexts rests with local specialist dermatology and infectious diseases services.

Exclusion or Isolation of Cases in Closed Settings:

- For classical scabies, isolation of residents diagnosed with scabies is generally not warranted during an outbreak, assuming contacts are wearing appropriate PPE or undergoing treatment simultaneously.
- Close contact with individuals not undergoing concurrent treatment or unable to wear appropriate PPE should be minimized, especially for those finding treatment challenging, such as individuals with dementia or learning difficulties.

Crusted Scabies

- In the case of crusted scabies, which is highly transmissible, standard infection control principles and wearing appropriate PPE should suffice to prevent transmission. Isolation of individuals with crusted scabies is not recommended. Close contact with those not undergoing concurrent treatment or unable to wear appropriate PPE should be limited.
- Individuals with crusted scabies may require multiple treatment applications or oral ivermectin for complete resolution. The decision on when a patient is no longer infectious should be guided by the specialist clinician involved in care. Minimizing skin-to-skin contact is advisable until non-infectious.

Staff:

- Staff members diagnosed with scabies or identified as contacts should refrain from returning to work until after completing their first 24-hour treatment dose. They should coordinate treatment doses to align with the care home's treatment dates. Staff identified as cases with household or other contacts in the community should advise their contacts to coordinate treatment doses to prevent further transmission.
- The setting management team is responsible for determining the most appropriate route for staff to access treatment, such as through occupational health services, setting healthcare teams or GPs, or their personal GPs. Agency staff diagnosed with scabies should inform their other places of work, including home care recipients, for risk assessment and client identification in those settings.

Control Measures:

- **Personal Protective Equipment (PPE):** Adhering to standard infection control principles is generally effective in preventing transmission. For activities involving close personal care or handling where skin contact with patients' skin, infested linen, or clothing may occur, the use of single-patient, long-sleeve gowns or sleeve protectors is advisable to minimize transmission risk.
- **Environmental Management:**
    1. **Cleaning:** Cleaning aims to remove skin scales and dust from the environment. While the role of fomites in scabies transmission is unclear, normal cleaning routines are typically sufficient for classical scabies cases and outbreaks. For crusted scabies, more frequent vacuuming and deep clean post-treatment cycles are recommended due to increased skin shedding.
    2. **Laundry**: Compliance with guidelines for decontamination of laundry is essential. Residents' clothing worn before completing the first 24-hour treatment dose should be handled with appropriate PPE. Items can be collected in a dissolvable alginate bag for laundering. If unable to undergo a hot wash, items can be sealed in a plastic bag for at least 4 days. Linen and towels of cases should be treated as infected linen.
- **Family and Visitors:** Family members and regular visitors should be informed about the outbreak, educated on scabies symptoms, and advised to seek treatment if they meet case or contact criteria. Notices should be displayed, and visits should be risk-assessed, emphasizing avoiding skin-to-skin contact and wearing appropriate PPE.
- **Essential Visits and Transfers, Healthcare Workers, and Health Care Settings:** Healthcare workers with close or prolonged contact with residents should be informed of the outbreak and reminded to wear appropriate PPE. Transfers out of the setting should be coordinated after the first 24-hour treatment dose, considering completion, avoidance of close skin-to-skin contact, and staff's ability to use PPE during close contact.

Recurrent Infections and Outbreaks:

- It's crucial to recognize that symptoms such as itch or rash may persist for up to 6 weeks after completing treatment, and this persistence doesn't necessarily indicate treatment failure or re-infestation. Residents or staff members experiencing ongoing symptoms post-treatment should be evaluated by their GP to explore alternative causes of their symptoms and receive relief for itching.

- In the event of subsequent scabies outbreaks within 12 weeks of the initial outbreak, prompt notification to the Health Protection Team (HPT) and relevant infection prevention and control teams is imperative. This notification enables a thorough review to determine whether it's a new outbreak or a continuation of the original one. In either case, a meticulous examination of infection control procedures and treatment protocols is essential to identify potential shortcomings in interrupting the transmission chain or achieving de-infestation.

1.2.4 European Academy of Dermatology and Venereology Guideline for the Management of Scabies (2017)

Table 11. Grading the Certainty of Evidence and Strength of Recommendations of the European Guidelines

Level	Quality of evidence
Ia	Evidence obtained from meta-analysis of randomized controlled trial
Ib	Evidence obtained from at least one randomized controlled trial
IIa	Evidence obtained from at least one well-designed study without randomization
IIb	Evidence obtained from at least one other type of well-designed quasi-experimental study
III	Evidence obtained from well-designed non-experimental descriptive studies such as comparative studies, correlation studies and case–control studies
IV	Evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities
Grading	**Strength of recommendation**
A	Requires at least one randomized controlled trial as part of the body of literature of overall good quality and consistency addressing the specific recommendation
B	Requires availability of well-conducted clinical studies but no randomized clinical trials on the topic of recommendation
C	Requires evidence from expert committee reports or opinions and/or clinical experience of respected authorities. Indicates absence of directly applicable studies of good quality.

The European Guideline has issued the recommendations below[10]:

Recommended treatment regimens for scabies

- **Permethrin 5% cream** applied head to toe and washed off after 8–12 h. The treatment must be repeated after 7– 14 days {evidence Ib; grade A recommendation}.
- Oral **ivermectin** (taken with food) 200 micrograms/kg as two doses 1 week apart {level of evidence Ib; grade A recommendation}.
- **Benzyl benzoate lotion** 10–25% applied once daily at night on 2 consecutive days with re-application at 7 days {level of evidence IV; grade C recommendation}

Alternative treatments

- **Malathion** 0.5% aqueous lotion {level of evidence IV; grade C recommendation}.
- **Ivermectin** 1% lotion was reported to be as effective as permethrin cream 5% {level of evidence Ib; grade A recommendation}.
- **Sulphur** 6-33% as cream, ointment or lotion is the oldest antiscabetic in use. It is effective and requires application on three successive days {level of evidence Ib; grade A recommendation}.
- Synergized **pyrethrins** are available as a foam preparation in some countries and are as effective as permethrin cream 5% {level of evidence IIa; grade B recommendation}.
- Lindane is no longer recommended because of its potential to cause neurotoxicity.

Crusted scabies

- A topical scabicide (permethrin 5% cream or benzyl benzoate lotion 25%) repeated daily for 7 days then 2x weekly until cure

  AND

- Oral ivermectin 200 micrograms/kg on days 1, 2 and 8. For severe cases, based on persistent live mites on skin scrapings at follow-up visit, additional ivermectin treatment might be required on days 9 and 15 or on days 9, 15, 22 and 29 {level of evidence IV; grade C recommendation}.

Post-treatment itch

- Post-treatment itch should be treated with repeated application of emollients. Oral antihistamines and mild topical corticosteroids may also be useful.

Special situations

- Permethrin is safe in pregnancy {level of evidence III; grade B recommendation} and lactation and is licensed for use in children from age 2 months onwards.
- Benzyl benzoate and sulphur are considered safe in pregnancy {level of evidence III; grade B recommendation}.
- Ivermectin should not be used during pregnancy or in children weighing less than 15 kg.44
- Malathion was not studied in pregnant women. Animal studies suggest that there is no risk. However, animal reproductive studies are not always predictive of human responses. Inappropriate use of agricultural grade malathion for treating human infestations can induce acute toxicity {level of evidence IV; grade C recommendation}.

Mass population treatment {level of evidence Ib; grade A recommendation}

- Mass population treatment is recommended for the control of scabies in endemic areas, for example remote communities or mass population displacements, and in the management of epidemics in closed communities such as nursing homes or jails.
- All individuals should be treated irrespective of symptoms.
- Oral ivermectin is easier to administer than traditional topical scabicides, thus facilitating treatment of large populations.
- A single dose of oral ivermectin 200 micrograms/kg of bodyweight is effective.
- Ivermectin may not sterilize scabies eggs, and a second dose given after one week has been shown to increase the response.
- The administration of a second dose of ivermectin is recommended {level of evidence Ib; grade A recommendation} although the importance of this second dose for scabies control needs to be further evaluated.
- Drug resistance to scabicides including permethrin and ivermectin is an emerging concern, and the impact of mass treatment programmes on development of drug resistance requires future study.

Follow-up

- A follow-up visit 2 weeks after completion of treatment is recommended for a test of cure by microscopy examination {level of evidence IV; grade C recommendation}.

Partner management

- Patients should be advised to avoid close contact until they and their sexual partners have completed treatment {level of evidence IV; grade C recommendation}.
- Infestation in children due to sexual abuse is rare and is more usually associated with close non-sexual contact. Assessment and epidemiological treatment is recommended for sexual partners over the past 2 months {level of evidence IV; grade C recommendation}.

Prevention/health promotion

- The risk of scabies can be reduced by limiting the number of sexual partners and observing strict personal hygiene when living in crowded spaces (e.g. no sharing of underwear clothing, bedding and towels and avoidance of skin-to-skin contact).
- Transmission is not prevented by condom use.
- No additional preventive measures have been shown to be effective.

1.2.5 Japanese Dermatological Association Guideline for the Diagnosis and Treatment of Scabies in Japan (Third Edition) (2017)

The Japanese Dermatological Association published its third edition of clinical guidelines for the management of scabies in 2017. The main recommendations are summarized below[9]:

Table 12. Grading the Certainty of Evidence and Strength of Recommendations of the Japanese Clinical Guidelines

Classification of evidence level	
I	Systematic review/meta-analysis
II	One or more randomized controlled trials
III	Non-randomized controlled trial
IV	Analytical epidemiological study (cohort study, case–control trial)
V	Descriptive study (case report, case series)
VI	Opinions of specialist committee, specialist individual[†]
Classification of recommendation level[‡]	
A	Use of the treatment is strongly recommended (there is at least one level I or good quality level II evidence demonstrating efficacy)

B	Use of the treatment is recommended (there is at least one or more inferior quality level II, good quality level III or extremely good quality level IV evidence demonstrating efficacy)
C1	Use of the treatment may be considered, but there is insufficient evidence[§] (inferior quality level III–IV, a number of good quality level V or a committee-approved level VI)
C2	Use of the treatment cannot be recommended, as there is no evidence[§] (no evidence of efficacy or evidence of ineffectiveness)
D	Recommended to not use the treatment (there is good quality evidence demonstrating that the treatment is ineffective or harmful)

[†]Data based on basic experiments and theory guided by that data would correspond to this level.

[‡]There may be levels of recommendation in this text that do not always match the criteria in the above table. This is because there are sections where the grade of recommendation level was decided based on the consensus of the Executive Committee, which was based on considerations that there is a lack of evidence on this condition internationally, given that overseas evidence cannot always be applied without change to the situation in Japan, and further considering the practical applications of treatment (after demonstrating the evidence level).

[§]Evidence refers to findings based on clinical studies and/or epidemiological studies

- There is little clear scientific evidence on the efficacy of sulfur, but it may be used. The use of the treatment may be considered, but there is insufficient evidence (C1).
- The efficacy of crotamiton monotherapy is not highly evaluated, but it is effective depending on the patient. The use of the treatment may be considered, but there is insufficient evidence (C1).
- The treatment method differs depending on the referenced article, and while it is difficult to determine the efficacy and safety of this treatment clearly, it is effective to a degree, so it may be used. The use of the treatment may be considered, but there is insufficient evidence (C1).
- Lindane was designated in Annex A of the Stockholm Convention relating to persistent organic pollutants, so its use is now prohibited. (D, recommended not to use the treatment).
- **Permethrin** is superior for treating scabies in terms of both efficacy and safety, and it can be used in infants aged 2 months and older, as well as in pregnant and lactating women. The use of the treatment may be considered, but there is insufficient evidence (C1).

- Based on clinical data and the data on permethrin, **phenothrin** is superior in terms of efficacy and safety. The use of the treatment is strongly recommended (A).
- There are no results that demonstrate the efficacy of malathion. The use of the treatment cannot be recommended, as there is no evidence (C2).
- **Ivermectin** is effective for treating scabies. The use of the treatment is strongly recommended (A).
- Ivermectin is more effective in the treatment of scabies than lindane (A).
- Permethrin is more effective in the treatment of scabies than lindane. The use of the treatment may be considered, but there is insufficient evidence (C1).
- Permethrin is more effective in the treatment of scabies than ivermectin. The use of the treatment may be considered, but there is insufficient evidence (C1).

Actual treatment method

- With common scabies, the usage method for topical agents is application of the medication over the entire body below the neck, including areas free of eruption. Ensure all areas are coated, including behind the ears, between the fingers, the external genitalia, and the buttocks.
- With children and elderly patients, ensure the entire body is coated, including the face and the head, even with cases of common scabies.
- With crusted scabies, the entire body is to be coated, including the face and the head.
- With sulfur, crotamiton and benzyl benzoate, the topical agents are to be washed off in a bath or shower 24 h after application. The same process applies to phenothrin 12 h or more after application. Consider wearing gloves and socks as needed to prevent the medication entering the mouth.
- Treatment is completed once S. scabiei is no longer detected, or no new formation of eruptions characteristic of scabies, such as the scabies burrows, occurs. However, be aware of itching sensation, eruptions, reinfestation and relapse after scabies treatment.

Common scabies management

- **Topical treatment**. Phenothrin (recommendation level A) is recommended as the first-line drug, and it should be applied at least twice with a 1-week interval between applications.
- The topical medication is washed off in the bath or shower at least 12 h after application.

- There is limited experience with phenothrin use, so it should be administrated while checking efficacy and safety.
- Second-line drugs are crotamiton (C1), sulfur (C1) and benzyl benzoate (C1).
- **Oral treatment.** Ivermectin (A) is administrated on an empty stomach at a dose of 200 microgram/kg. The patient is requested to come back after 1 week, and if S. scabiei are detected with a microscope or dermoscope, or if new formation of the characteristic scabies eruption (e.g. scabies burrows) is seen, then ivermectin is re-administrated. Liver function tests should be conducted as necessary for patients with liver dysfunction or elderly patients.
- Normally, the scabies are cured in approximately 1 month with two doses. When insufficient response is seen with topical treatment or oral treatment, consider changing the treatment method after checking treatment compliance with the patient.
- Patients on steroids or those taking immunosuppressants, patients with malignant tumors and diabetes, those on dialysis and elderly patients may have a reduced immune status, which may prolong the treatment period. For such cases, combined treatment with topical and oral medication should be considered.

Crusted scabies

- The basic treatment is: (i) removal of the hyperkeratotic layer; and (ii) topical, oral, or a combination of topical and oral treatment.
- When combining phenothrin lotion and ivermectin, careful consideration should be given to drug interactions, efficacy and safety.
- As a measure to prevent the spread of infection, the patient needs to be isolated in a private room for 1–2 weeks after obtaining consent for this procedure.

Treatment of itching sensation

- Oral antihistamines are administrated to control the itching sensation.
- However, first-generation antihistamines have anticholinergic action, so they cannot be used in patients with benign prostatic hypertrophy, glaucoma, epilepsy, or other related disorders. In elderly patients and children, consideration must also be given to the adverse reaction of somnolence, reduced work efficiency and the risk of falls.
- Thus, classical antihistamines should be administrated with adequate care. Therefore, it is preferable to use non-sedating second-generation antihistamines.

Treatment for patients with diseases that require steroid therapy

- Oral and topical steroid therapies may exacerbate scabies and prolong the time until the scabies are cured.
- Therefore, it is preferable to refrain from steroid therapy when treating scabies. However, when a patient has a disease that requires steroid therapy, the attending physician should be consulted regarding continuing with steroid therapy.
- When steroid therapy is essential, the dose should be kept to the minimum required dose. If continuing with topical steroid, the patient's condition should be carefully monitored.

Treatment of children

- Regarding children aged 2 months and older, or with a bodyweight of less than 15 kg, the safety of phenothrin has not been established (no usage experience), but phenothrin (C1) can be used.
- However, when using the drug, the patient and guardian (family) should be fully informed that there is no usage experience in children as it is a new drug. Otherwise, sulfur (C1) or crotamiton (C1) may be used.
- Regarding children younger than 2 months of age, there is no evidence on therapeutic agents.
- Phenothrin is highly safe, but this drug should only be used after the patient's guardian (family) has been fully informed and consent obtained.

Treatment of pregnant woman

- **Phenothrin** (C1) has low toxicity, and the plasma concentration after application is low, so it can be administrated.
- However, it is a new drug, and there is no usage experience; thus, the patient and their family should be fully informed before use.
- Ultimately, the drug should only be used when it has been determined that the medical benefits outweigh the risks.
- Otherwise, sulfur (C1) or crotamiton (C1) may also be used.
- **Ivermectin must not be used**.
- Many drugs, including drugs to treat scabies, are excreted in breast milk, so it is recommended to stop breast-feeding when using these drugs.

1.2.6 Australian Society for HIV, Viral Hepatitis and Sexual Health Medicine (ASHM) Australian STI Management Guidelines: Ectoparasites (2021)

The Australian STI Management Guidelines has issued recommendations below[11]:

Principal Treatment Option

Scabies:

- Apply 5% permethrin cream topically on dry skin from the neck down, especially on hands and genitalia, and under nails with a nailbrush. Leave on for a minimum of 8 hours, usually overnight. Reapply to hands if washed.
    - Consider extending to 24 hours in case of treatment failure. Repeat after 1 week for improved success.
- Alternatively, apply 25% benzyl benzoate emulsion topically on dry skin, emphasizing hands and genitalia, and under nails with a nailbrush. Leave on for 24 hours, reapplying to hands if washed. Repeat treatment after 7 days.

Crusted Scabies:

- Seek specialist advice for treatment due to the high mite population in this severe condition.

Treatment Advice:

- For scabies, avoid close body contact, complete treatment for the patient and recent partner(s), apply cream at night (including finger webs), isolate and launder clothes, towels, and bed linen, limit applications to prevent irritation, and use antipruritic treatments if needed.

Other Immediate Management:

- Advise abstaining from sexual contact for 7 days after treatment initiation or until completion and symptom resolution, whichever is later.
- Conduct contact tracing.

Special Considerations:

It is advisable to consult a specialist before addressing any intricate or persistent conditions.

Table 13. Recommended Treatment of Scabies in Specific Situations

Situation	Recommendation
Complicated or Disseminated Infection	For less severe crusted scabies, consider: • Ivermectin 200mcg/kg orally on days 1, with a second dose between days 8-14.

	• Seek specialist advice for an additional dose in moderate-severe cases. • In cases of severe secondary bacterial infection (impetigo), administer antibiotics targeting S. aureus and/or S. pyogenes before initiating antiscabetic treatment.
Persistent Infection	Ivermectin 200 mcg/kg orally on days 1 and 8-14, not before 4 weeks post-failure of both topical permethrin and benzyl benzoate.
Pregnancy	Permethrin is considered safe during pregnancy and breastfeeding.
Regional and Remote	No distinct variations; however, in regional and remote areas, entire small communities may be affected by scabies, necessitating a community-wide treatment approach. Seek local advice.
Eyelash Infestation	Use ophthalmic-grade petrolatum ointment twice daily for 10 days (requires a prescription, and a compounding pharmacist may be needed).

1.2.7 American Academy of Pediatrics (AAP) Guidance for the Management of Head Lice (2022)

This clinical report published by the AAP is intended to serve as guidance for the clinician for the management of head lice. The main recommendations are summarized below[14]:

- The medical provider should initiate treatment only if there is a diagnosis of active head lice infestation. The ideal treatment of head lice should be safe, free of toxic chemicals, readily available, simple to apply, effective, and inexpensive.
- Topical treatments approved by the FDA for head lice are considered safe for use during pregnancy and lactation. These formulations have minimal systemic absorption, posing low risk to the fetus or breastfeeding child.
- The FDA-approved pediculicides include Permethrin and Pyrethrins, which act as neurotoxins causing spastic paralysis in lice.
- **Pyrethrins** are extracted from chrysanthemum flowers, while pyrethroids like **Permethrin** are synthetic but demonstrate consistent and stable activity. Permethrin (1% Lotion) is widely used in the U.S., and despite a discernible smell, additional ventilation is unnecessary during use.

- Although caution is advised due to reported symptoms with exposure, true allergic reactions are rare.
- **Permethrin** is the preferred treatment for head lice in individuals aged 2 months and older, including pregnant women. To enhance its effectiveness, avoid using conditioners or silicone-based additives found in many shampoos on the day of application, as they can hinder permethrin adherence. After washing the hair with a nonconditioning shampoo and towel drying, permethrin is applied to damp hair, left on for 10 minutes, and then rinsed off. Hair should not be shampooed for 24 to 48 hours after application to allow the residue to kill emerging nymphs. A repeat application is recommended between day 9 and 10 if live lice are observed. An alternative treatment schedule on days 0, 7, and 13 to 15 is proposed based on the lice life cycle.
- **Pyrethrin**, derived from the chrysanthemum flower, is often combined with **piperonyl butoxide** to boost its effectiveness in products like shampoo or mousse for individuals aged 24 months and older. Applied to dry hair, the product is left on for 10 minutes before rinsing. Unlike permethrin, there is no residual activity after rinsing. As 20% to 30% of nits may survive treatment, a second application is necessary after 9 to 10 days to eliminate newly hatched nymphs. Retreatment is advised if live lice are still present, following a similar schedule to permethrin (1%).
- **Resistance to Permethrin and Pyrethrins**: Studies conducted over the last four decades indicate a decline in the clinical effectiveness of these compounds, dropping from nearly 100% when initially introduced in the 1980s to as low as 25%. The prevalence of clinical resistance varies significantly between communities and countries. While genetic alterations and ex vivo studies in head lice have been identified as potential indicators of resistance, they may not reliably predict actual clinical outcomes.

Other treatments

Ivermectin (0.5% Lotion; Oral Formulation)

- Ivermectin, widely used as an anthelmintic agent, disrupts lice muscle cells, leading to paralysis and death. FDA-approved in lotion form for individuals 6 months and older, it was later approved for over-the-counter use in late 2020. The lotion, applied to dry hair, requires a single application.
- Oral ivermectin is FDA-approved for adult head lice treatment, with pediatric use allowed for other infections. Prescription-only, it's considered if topical treatments fail. Oral doses of 200 µg/kg, given 7-10 days apart, have shown effectiveness. Safety concerns for infants under 15 kg exist, with limited data

on adverse effects. Potential ivermectin-resistant head lice cases outside the U.S. are reported.

- Pregnancy safety is indicated, but permethrin remains the first-line treatment during pregnancy.
- Ivermectin for veterinary use is available online but not recommended for human use due to differing formulations.

Malathion (0.5% Lotion)

- Malathion, an organophosphate used since 1999 for head lice (prescription-only for ages 6 and older), requires a single application, but reapplication is advised if live lice persist. It has high efficacy and ovicidal activity but has a strong odor.
- Caution is needed due to its flammability (78% isopropyl alcohol).
- Safety for children under 6 is undetermined, and ingestion can cause respiratory depression. Resistance is documented globally, but not reported in the U.S.

Spinosad (0.9% Suspension)

- Spinosad, with broad insect activity, is FDA-approved for head lice (prescription-only, ages 6 months and older). Applied to dry hair, it requires rinsing after 10 minutes, with a second treatment if live lice persist. It outperforms permethrin with success rates of 84% to 87%.
- Caution is needed for children under 6 months due to benzyl alcohol.

Abametapir (0.74% Lotion)

- FDA-approved in 2020 for head lice (prescription-only, ages 6 months and older), Abametapir inhibits crucial proteins for lice survival.
- Not commercially available yet, it requires application to dry hair and rinsing after 10 minutes.
- Success rates of 81% have been reported. Avoidance of certain drugs for two weeks post-application is advised.

Benzyl Alcohol (5%)

- No longer available due to discontinuation by the manufacturer in 2009, Benzyl alcohol lotion was FDA-approved for head lice (ages 6 months and older).
- Although effective, its availability ceased with no indication of a return.

Lindane (1%)

- Although FDA-approved for head lice, Lindane is not recommended by AAP, CDC, or the Medical Letter due to neurotoxicity concerns.

Persistent cases of head lice

- When confronted with persistent head lice following the use of a pharmaceutical pediculicide, healthcare professionals should explore various possibilities, such as misdiagnosis, lack of adherence, inadequate treatment, reinfestation, or resistance.
- Given the familiarity and convenience of OTC permethrin or pyrethrin-based formulations, these are recommended as first-line treatments.
- If treatment failure occurs and is not due to misuse of OTC products, a full course of a different class of medication is suggested.
- Age-appropriate alternatives include topical ivermectin lotion, spinosad suspension, and malathion lotion. In cases of resistance to topical agents, oral ivermectin may be considered for children over 15 kg.
- If pediculicides are not feasible, manual removal via wet combing or an occlusive method can be employed, emphasizing careful technique over a minimum of 3 weeks (1 louse life cycle).

Manual Removal

- While there is limited peer-reviewed literature on the efficacy of manually removing live lice and nits, the inherent safety of this method compared to pesticide toxicity is notable.
- Medical providers can consider manual removal as part of their treatment options. This process allows caregivers and children to spend quality time together while safely eliminating infestations and residual debris.
- Manual nit removal has additional benefits, including reducing social stigma in school settings and addressing aesthetic concerns.
- Since no pediculicide is 100% ovicidal, it is reasonable to manually remove nits, especially within 1 cm of the scalp, after using any product. Nit removal can be challenging, and fine-toothed "nit combs".
- Terminator can facilitate the process.
- Combing on wet hair is recommended, as studies suggest that lice removed by combing and brushing are often damaged and less likely to survive.

- Electronic louse combs claim to remove lice and nits, but their efficacy is not well-documented. Caution is advised with electronic combs, particularly for individuals with seizure disorders or pacemakers.
- Other devices using ultrasonographic actuation or localized ionized gas are under preclinical investigation.
- Some products claim to loosen the "glue" attaching nits to hair shafts, making nit-picking easier. Vinegar or vinegar-based products, applied for three minutes before combing, are among these options.

Prevention

Preventing all head lice infestations is unlikely, given frequent head-to-head contact among children and adolescents.

- It's advisable to teach them not to share personal items like combs, brushes, hats, and pillows.
- However, avoiding protective headgear due to fear of head lice is not recommended.
- Prompt treatment of infested individuals in shared environments is crucial to minimize further spread.
- Regular surveillance by caregivers, perhaps monthly, helps detect and treat early infestations, preventing spread to others.

Control Measures in Congregate Settings

- Congregate settings like group homes, shelters, and long-term care facilities pose a risk for head lice transmission. In outbreaks, priorities include reducing affected individuals and educating unaffected ones to avoid activities leading to transmission.
- First-line treatment with 1% permethrin is recommended post-diagnosis, covering a broad group, including young and pregnant individuals.
- Close contacts, especially family members and those sharing beds, should be examined, and treated if necessary.
- Follow-up within the next 3 weeks is advisable to detect any surviving lice from nits unaffected by the initial treatment.
- Items which have been in contact with persons undergoing treatment within the 2 days preceding the treatment should be cleaned.

1.2.8 Guidelines for the Treatment of Leishmaniasis by the Center of Disease Control and Prevention of America (October 5, 2023)

The CDC has issued recommendations below[20]:

- Decisions regarding the treatment of **cutaneous leishmaniasis** should be personalized, considering factors such as the Leishmania species, geographic origin of infection, natural history, risk for mucosal dissemination, drug susceptibilities, and clinical characteristics of skin lesions.
- Treatment objectives include reducing mucosal risk, accelerating lesion healing, preventing relapse, minimizing morbidity from large lesions, and decreasing infection reservoirs in specific regions.
- Therapeutic response is often marked by reduced lesion induration, with healing continuing post-treatment. Clinical reactivation (relapse) typically manifests initially at the lesion margin.

Systemic Therapy (Parenteral):

- Conventional amphotericin B deoxycholate and lipid formulations are utilized, with liposomal amphotericin B showing tolerance benefits. However, the data supporting their use for treatment of cutaneous (and mucosal) leishmaniasis are from case reports/series rather than from controlled clinical trials; standard dosage regimens have not been established. When liposomal amphotericin B has been used for treatment of cutaneous leishmaniasis, patients typically have received 3 mg per kg daily, by IV infusion, for a total of 6 to 10 or more doses.
- Pentamidine isethionate is rarely used in the U.S. due to potential toxicity and variable effectiveness.
- Pentavalent antimonial (SbV) therapy involves a standard daily dose of 20 mg/kg, administered IV or IM, with varying durations based on the type of leishmaniasis. The traditional duration of therapy is 20 days for cutaneous leishmaniasis (10 days may suffice in some settings) and 28 days for mucosal (and visceral) leishmaniasis. For some patients, adjustment of the daily dose or the duration of therapy may be indicated. No standard IL treatment regimen has been established, various regimens have been used depending in part on the size and characteristics of the lesions.

Systemic Therapy (Oral):

- In 2014, the FDA granted approval to the oral medication **miltefosine** for treating cutaneous leishmaniasis in adults and adolescents who are not pregnant or breastfeeding. Its approved use is specific to infections caused by three New World species within the Viannia subgenus: Leishmania (V.)

braziliensis, L. (V.) panamensis, and L. (V.) guyanensis. The effectiveness of miltefosine therapy varies across geographic regions, and its use for other Leishmania species in the New World or any species in the Old World, as well as for children under 12, would be considered off-label. Refer to the previous section for additional insights and considerations on miltefosine.

The "azoles"—**ketoconazole**, **itraconazole**, and **fluconazole**—administered orally have yielded diverse outcomes in different contexts. For instance:

- Ketoconazole (adult regimen: 600 mg daily for 28 days) demonstrated modest effectiveness against L. mexicana and L. (V.) panamensis infections in small studies in Guatemala and Panama, respectively. Conversely, itraconazole (adult regimen: 200 mg twice daily for 28 days) proved ineffective against L. (V.) panamensis infection in a clinical trial in Colombia.
- Fluconazole (adult regimen: 200 mg daily for 6 weeks) usage for treating L. major infection in various Old-World countries showed mixed results. Preliminary data from Iran suggested that a higher daily dose (400 vs. 200 mg) might be more effective against L. major infection. In northeastern Brazil, adults infected with L. (V.) braziliensis exhibited a low response rate to fluconazole treatment (6.5–8.0 mg per kg per day for 28 days).

Local Therapy:

- Certain instances of cutaneous leishmaniasis may be suitable for local therapy, contingent on factors such as the risk of mucosal dissemination/disease and the specific attributes of the skin lesions, including their number, location, and size. Localized treatment approaches that could be beneficial in certain scenarios comprise cryotherapy (utilizing liquid nitrogen), thermotherapy (employing localized current field radiofrequency heat), intralesional (IL) administration of SbV, and the topical application of specific formulations of paromomycin.

Prevention and control:

- There are currently no available vaccines or drugs to prevent leishmaniasis infection. Travelers can best protect themselves by minimizing nocturnal outdoor activities, wearing protective clothing, and applying insect repellent to exposed skin to prevent sand fly bites.
- Prevention and control measures need to be adapted to the local context and are often challenging to sustain. Effective control measures against sand fly vectors or animal reservoir hosts may be applicable in certain settings.
- In regions where leishmaniasis is present in humans, the parasite transmission cycle is often maintained by animal reservoir hosts (e.g., rodents or dogs) along with sand flies. Control strategies are under evaluation,

especially in areas where dogs serve as the primary reservoir hosts, as seen in L. infantum/L. chagasi-endemic regions.

- In areas where infected humans are essential for the transmission cycle (anthroponotic transmission), such as the Indian Subcontinent, early detection and effective treatment of infected individuals can be a crucial control measure. Intra- and peridomiciliary transmission in these areas makes the use of residual-action insecticides in houses and bed nets treated with long-lasting insecticides potentially protective.

1.2.9 Diagnosis and Treatment of Leishmaniasis: Clinical Practice Guidelines by the Infectious Diseases Society of America (IDSA) and the American Society of Tropical Medicine and Hygiene (ASTMH) (2016)

The IDSA/ASTMH[19] have opted for the GRADE (Grading of Recommendations, Assessment, Development, and Evaluation) system:

Table 14. Grading the Certainty of Evidence and Strength of Recommendations of IDSA/ASTMH Using the GRADE Approach

Strength of Recommendation	
Strong	Benefits clearly outweigh risks and burden or vice versa. Usually stated as: **"we recommend"**
Conditional	Benefits probably outweigh risks and burden, or vice versa, but there is appreciable uncertainty.
Weak	Benefits closely balanced with risks and burden. Usually stated as: **"we suggest"**
Evidence level (quality of evidence)	
High	One or more well-designed and well-executed randomized controlled trials (RCTs) that yield consistent and directly applicable results. This level also means that further research is very unlikely to change our confidence in the estimate of effect.
Medium	RCTs with important limitations (i.e., biased assessment of the treatment effect, large loss to follow-up, lack of blinding, unexplained heterogeneity), indirect evidence originating from similar (but not identical) populations of interest, and RCTs with a very small number of participants or observed events. In addition, evidence from well-designed controlled trials without randomization, from well-designed cohort or case-control analytic studies, and from multiple time series with or without intervention

	is in this category. This level also means that further research will probably have an important impact on our confidence in the estimate of effect and may change the estimate.
Low	Observational studies would typically be rated as low quality because of the risk for bias. This level also means that further research is very likely to have an important impact on our confidence in the estimate of effect and will probably change the estimate.
Very low	Evidence is conflicting, of poor quality, or lacking, and hence the balance of benefits and harms cannot be determined. Any estimate of effect is very uncertain as evidence is either unavailable or does not permit a conclusion.

The IDSA/ASTMH has issued recommendations below[19]:

- After a thorough diagnostic evaluation, during which neither leishmaniasis nor any alternative diagnosis is confirmed, empirical treatment may be considered based on an individualized risk-benefit assessment (weak, very low). It is essential to discuss this option with the patient and periodically reevaluate it, considering the clinical evolution.
- Immunocompetent individuals with clinically simple skin lesions caused by Leishmania species not associated with increased risk for mucocutaneous leishmaniasis (ML) and that are healing spontaneously may be observed without treatment if the patient agrees (strong, moderate).
- For individuals with cutaneous leishmaniasis (CL) when the Leishmania species is unknown and the infection was not acquired in an increased ML-risk region, treatment of clinically simple or healing skin lesions is not required in immunocompetent patients who agree with this approach (strong, low)
- Systemic treatment is suggested for individuals with healing/recently healed CL lesions caused by increased ML-risk species or when the species is unknown, but the infection was acquired in an increased ML-risk region. Risks and benefits of treatment should be discussed with the patient (weak, low). Note: In some cases, watchful waiting, with vigilance for signs and symptoms of ML, may be a reasonable approach.
- Any decision to observe a CL patient without treatment should be periodically reevaluated. The decision not to treat should be reconsidered if healing does not progress as anticipated (strong, very low).

- In all CL cases, routine wound care, individualized documentation of lesion evolution, and patient education regarding manifestations and detection of local therapeutic failure/relapse and ML should be integral components of management (strong, low)
- Potential consequences of inadequate treatment include a poor cosmetic outcome due to scarring or superinfection, the persistence of chronic wound(s), and, with some Leishmania species, destructive and disfiguring mucocutaneous leishmaniasis (ML). In immunocompromised individuals, cutaneous, mucosal, and visceral dissemination may occur (fact, no grade).
- Individuals with cutaneous leishmaniasis (CL) should be actively monitored by clinical appearance, including periodic nasal and oropharyngeal examinations up to 1 year, or at least 2 years if at increased risk for ML. They should be educated about the signs and symptoms of relapse and ML and instructed to seek medical attention anytime these appear (strong, low).
- Symptoms such as chronic nasal stuffiness, epistaxis, or hoarseness, or findings such as septal perforation that occur anytime in a person with a prior or current diagnosis of CL or a scar consistent with prior CL should prompt evaluation for ML, including fiber-optic examination of the affected area if relevant (strong, moderate).
- Systemic treatment is recommended for individuals with complex cutaneous leishmaniasis (CL) (strong, moderate).
- Initial systemic therapy may be used in individuals with CL in whom it is not practical to use local therapy or, possibly, if more rapid healing of large, cosmetically, or functionally concerning lesions is preferred (weak, very low).
- Less common cutaneous syndromes, such as leishmaniasis recidivans (caused by L. tropica and occasionally other species), diffuse cutaneous leishmaniasis (caused by L. mexicana, L. amazonensis, and L. aethiopica), and disseminated cutaneous leishmaniasis (caused by L. [V.] braziliensis), usually require systemic therapy (strong, low).
- The available parenteral options for systemic therapy in North America include **conventional amphotericin B deoxycholate**, **lipid formulations of amphotericin B**, **pentavalent antimonial (SbV) compounds**, and **pentamidine** (listed in alphabetical order). Oral options include **miltefosine** and **"azole" antifungal compounds**, such as ketoconazole (if potential benefits outweigh risks for hepatotoxicity and QT prolongation) and fluconazole (fact, no grade).
- To maximize effectiveness and minimize toxicity, the choice of agent, dose, and duration of therapy should be individualized (strong, moderate). No ideal or universally applicable therapy for cutaneous leishmaniasis (CL) has been

identified. Some therapies/regimens appear highly effective only against certain Leishmania species/strains in specific geographic regions. Both the parasite species and host factors (e.g., comorbid conditions and immunologic status) should be considered.

- Factors to consider when selecting CL treatment for an individual patient include the risk for mucosal leishmaniasis (ML), the Leishmania strain/species, and published response rates for antileishmanial agents in the relevant geographic region. Other considerations include the potential for adverse events, age extremes, childbearing competence and pregnancy, obesity, hepatic, pancreatic, renal, and cardiac comorbid conditions, preference for and convenience of various routes of administration, the rapidity with which one wishes to control the infection, the impact of lesions on daily activities and patient self-confidence, the patient/provider comfort level with logistics (e.g., Investigational New Drug protocols), and other practical issues (e.g., drug availability, various types of cost, insurance reimbursement) (strong, low).
- Response to treatment is assessed by clinical criteria; repeat parasitologic testing is not recommended if the skin lesion appears to be healing (strong, low). The healing process may continue after the treatment course is completed, especially for large ulcerative lesions.
- Individuals with cutaneous leishmaniasis (CL) should be monitored for 6–12 months after treatment for clinical evidence of therapeutic failure, which is initially seen at the border of a healed lesion (strong, low). The first sign of healing is typically flattening of the skin lesion. By 4–6 weeks after treatment, the lesion size should have decreased by >50%, ulcerative lesions should be reepithelializing, and no new lesions should be appearing. Ulcerative lesions are generally fully reepithelialized and clinically healed by approximately 3 months after treatment.
- Additional therapy is recommended when there is the development of new skin lesions or worsening of existing lesions. It is also recommended if there is incomplete healing by 3 months after completing the treatment course (strong, low).
- Therapeutic failure should be assessed by physical appearance. A relatively little improvement or worsening while on therapy suggests an inadequate response, and an alternate treatment approach should be planned (strong, low). A paradoxical increase in the local inflammatory response may be seen in the first 2–3 weeks of treatment, making it difficult to differentiate from therapeutic failure.

- Consultation with a leishmaniasis expert about other treatment options is recommended for managing individuals with lesions associated with therapeutic failure (strong, very low).

Section 2.0 Drug Therapy in Parasitic Skin Infections

This section comprises four subsections: the first contains the newly recommended drugs, the second covers drug modifications, the third outlines the drugs to delist due to withdrawal from the market among others and the fourth tackles other drugs approved by FDA/EMA but not yet approved by SFDA.

2.1 Additions

No new drugs have been approved by the SFDA for the treatment of Parasitic Skin Infections since April 2020.

2.2 Modifications

The following modifications and adjustments have been implemented since the 2020 report:

Table 15. PE Modifications for Parasitic Skin Infections Medications

Drugs	PE modifications
Benzoyl benzoate	Add ST: Generally considered a second-line treatment for scabies, with other medications like permethrin and ivermectin being more commonly recommended as first-line options
Crotamiton	Add ST: Typically considered a second-line treatment for scabies, with other medications like permethrin and ivermectin being more commonly recommended as first-line options
Fluconazole	Add ST: Fluconazole is not typically considered a first-line treatment for cutaneous leishmaniasis
Ivermectin	Add AGE: Avoid use in children < 6 months of age due to risk for ivermectin toxicity potentially increased
Lindane	Addition of MD: routine use is no longer recommended due to potential neurotoxicity; when needed, lindane should be prescribed and monitor by a specialist (e.g., dermatologist or infectious diseases physicians)

2.3 Delisting

The medications below are not SFDA registered[21], therefore, it is recommended to delist the following drug from CHI formulary:

- Diethylcarbamazine
- Sulfur

2.4 Other Drugs

The drugs detailed in this section were newly approved for Parasitic Skin Infections by the FDA/EMA however **not yet registered by the SFDA.**

XEGLYZE® (Abametapir 0.74% Lotion)

XEGLYZE® was approved by the FDA on July 24, 2020. It is a pediculicide indicated for the topical treatment of head lice infestation in patients 6 months of age and older. It should be used in the context of an overall lice management program:

- Wash (with hot water) or dry-clean all recently worn clothing, hats, used bedding and towels
- Wash personal care items such as combs, brushes and hair clips in hot water
- Use a fine-tooth comb or special nit comb to remove dead lice and nits.

It is for topical use only and should be used as such:

- Shake well before use.
- Apply XEGLYZE to dry hair in an amount sufficient (up to the full content of one bottle) to thoroughly coat the hair and scalp. Avoid contact with eyes.
- Massage XEGLYZE into the scalp and throughout the hair; leave on the hair and scalp for 10 minutes and then rinse off with warm water.
- Massage XEGLYZE into the scalp and throughout the hair; leave on the hair and scalp for 10 minutes and then rinse off with warm water.

Warnings for Use: not recommended in pediatric patients under 6 months of age because of the potential for increased systemic absorption that could lead to serious adverse reactions and death in neonates and low birth-weight infants[22].

IMPAVIDO® (Miltefosine)

IMPAVIDO® was approved by the FDA on March 19, 2014. It is an antileishmanial drug indicated in adults and adolescents ≥12 years of age weighing ≥30 kg (66 lbs) for treatment of:

- Visceral leishmaniasis due to Leishmania donovani.

- Cutaneous leishmaniasis due to Leishmania braziliensis, Leishmania guyanensis, and Leishmania panamensis.
- Mucosal leishmaniasis due to Leishmania braziliensis.

It is administered as such:

- For patients 30 to 44 kg: one 50 mg capsule twice daily for 28 consecutive days.
- For patients 45 kg or greater: one 50 mg capsule three times daily for 28 consecutive days.

Impavido poses a risk of causing harm to the fetus, as demonstrated by fetal death and teratogenic effects in animal studies at doses lower than those recommended for humans. Therefore, it is strongly advised not to administer it to pregnant women. Before prescribing Impavido to females capable of reproduction, it is recommended to conduct a serum or urine pregnancy test. Additionally, women of reproductive potential are advised to use effective contraception during the treatment with Impavido and for a period of 5 months after completing the therapy[23].

Section 3.0 Key Recommendations Synthesis

Classic scabies treatment

- Scabicides, products to kill scabies mites, are prescription-only, with no FDA-approved over-the-counter options. Available treatments include:
- Permethrin (5% cream): FDA-approved for scabies treatment in individuals aged 2 months and older. Safe and effective, it's the preferred choice, requiring two or more applications a week apart.
- Crotamiton (10% lotion and cream): FDA-approved for adult scabies treatment, but not for children. Reports of frequent treatment failure exist.
- Sulphur (5%-10%) ointment: Safe for topical use in children, even infants under 2 months, but its odor and cosmetic qualities may deter use.
- Lindane (1% lotion): An organochloride FDA-approved for scabies but not recommended as first-line due to potential neurotoxicity. Restricted use for specific cases, excluding certain populations like pregnant women, infants, and those with skin issues.
- Benzyl benzoate, available in 25% concentration (with or without tea tree oil), is an alternative to permethrin for scabies treatment. It may cause immediate skin irritation, and lower concentrations (10% or 12.5%) are recommended for children.
- Additionally, a keratolytic cream can be used to reduce skin crusting and enhance the absorption of topical permethrin or benzyl benzoate[7, 8].

Topical treatment of scabies: Phenothrin is recommended as the first-line drug, and it should be applied at least twice with a 1-week interval between applications[9].

- Ivermectin is considered for classic scabies treatment, especially when topical medications are ineffective or not tolerated. Although the FDA hasn't specifically approved it for scabies, evidence supports its efficacy. The recommended regimen is two doses (200µg/kg/dose) about a week apart. Caution is advised for children under 15 kg and pregnant women due to uncertain safety[7].
- Permethrin is considered safe in pregnancy and lactation, and it is licensed for use in children from 2 months of age[10, 11].
- Benzyl benzoate and sulfur are also deemed safe in pregnancy[10].
- Malathion was not studied in pregnant women, and while animal studies suggest no risk, these studies may not reliably predict human responses.

Inappropriate use of agricultural-grade malathion for treating human infestations can lead to acute toxicity[10].

- The use of Lindane is prohibited[9].

Crusted scabies treatment

- A combination of oral and topical agents is recommended. Ivermectin and Permethrin Cream 5% are key components. In crusted scabies, topical permethrin should be applied every 2-3 days over 1-2 weeks. Benzyl Benzoate 25%, an alternative topical agent, may cause skin irritation, and lower concentrations are suggested for children. Additionally, the use of a keratolytic cream can reduce skin crusting and enhance the absorption of topical agents[7, 8].
- Combination treatment for crusted scabies is recommended with a topical scabicide, either 5% topical permethrin cream (full-body application to be repeated daily for 7 days then 2 times/week until cure) or 25% topical benzyl benzoate, and oral ivermectin 200 ug/kg body weight on days 1, 2, 8, 9, and 15. Additional ivermectin treatment on days 22 and 29 might be required for severe cases. Lindane should be avoided due to the risk of neurotoxicity with heavy applications on damaged skin[8].
- Oral ivermectin should be reserved for patients with scabies who do not improve with permethrin 5% cream[12].
- Ivermectin and permethrin are more effective in the treatment of scabies than lindane[9].
- Permethrin is more effective in the treatment of scabies than ivermectin. The use of the treatment may be considered, but there is insufficient evidence[9].
- There is little clear scientific evidence on the efficacy of sulfur, but it may be used[9].

Management of contacts (scabies)

- Contacts who are off duty during treatment should finish the initial 24-hour treatment dose before returning to work.
- It is advisable to maintain a low index of suspicion when identifying potential contacts of a crusted scabies case due to the heightened risk of transmission.
- Staff members should remain vigilant for signs and symptoms of scabies over an 8-week period[13].

Outbreak management in closed settings

- For effective disruption of the transmission cycle, it is crucial to administer simultaneous treatment to all cases and contacts. Concurrent individual case management is essential for all cases and contacts involved in the outbreak.
- In cases where staff requires treatment due to occupational exposure, employers are advised to consider funding the treatment to promote uptake and enable a swift return to normal working conditions. Social care settings can explore alternative funding options with local authority public health or social care commissioning teams[13].

Mass population treatment is strongly recommended for the control of scabies in endemic areas, such as remote communities and for managing epidemics in closed communities like nursing homes or jails.

- All individuals should receive treatment regardless of symptoms.
- Oral ivermectin is a more convenient option for large-scale treatment compared to traditional topical scabicides.
- A single dose of oral ivermectin at 200 micrograms/kg of body weight is effective[10].

Scabies prevention

- Bedding and clothing should undergo decontamination, achieved through either machine washing and drying using the heat cycle or dry cleaning. Alternatively, these items should be kept away from direct body contact for more than 72 hours. Fumigation of living spaces is not required. Individuals with scabies are recommended to maintain closely trimmed fingernails to minimize injury resulting from excessive scratching[8].

Crusted scabies prevention

- Standard infection control principles and the use of appropriate personal protective equipment (PPE) are deemed sufficient to prevent transmission. Isolating individuals with crusted scabies is not recommended, but close contact with those not undergoing concurrent treatment or unable to wear appropriate PPE should be limited[13].

Partner management

- Patients are advised to avoid close contact until they and their sexual partners have completed treatment or for 7 days after treatment initiation, whichever is later[10].

Scabies and steroid therapy

- Oral and topical steroid therapies may exacerbate scabies and prolong the time until the scabies are cured.
- Therefore, it is preferable to refrain from steroid therapy when treating scabies. However, when a patient has a disease that requires steroid therapy, the attending physician should be consulted regarding continuing with steroid therapy[9].

Head lice infection

- The medical provider should initiate treatment only if there is a diagnosis of active head lice infestation. The ideal treatment of head lice should be safe, free of toxic chemicals, readily available, simple to apply, effective, and inexpensive[14].

Head lice treatment

- For effective treatment of head lice, it's important to consider the ovicidal effect of pediculicides. Weakly ovicidal or non-ovicidal treatments may require routine retreatment, while strongly ovicidal ones may only need retreatment if live lice are still present after several days.
- Retreatment should be timed to occur after all eggs have hatched but before new eggs are produced. Additional non-pharmacologic measures, such as washing and drying personal items in hot cycles or vacuuming furniture, can enhance treatment effectiveness.
- Generally, these measures are not mandatory but can be combined with pharmacologic treatment for a comprehensive approach. Items in contact with an infested person's hair, like hats and towels, should not be shared to prevent reinfestation[15].

Over-the-counter head lice medications include products with active ingredients such as pyrethrins combined with piperonyl butoxide and permethrin lotion 1%.

- Pyrethrins are naturally occurring pyrethroid extracts, effective against live lice but not unhatched eggs.
- Permethrin lotion 1% is a synthetic pyrethroid approved for use in children aged 2 months and older [14, 15].

Prescription medications for head lice include benzyl alcohol lotion 5%, ivermectin lotion 0.5%, malathion lotion 0.5%, and spinosad 0.9% topical suspension.

- Benzyl alcohol is aromatic and requires a second treatment, while ivermectin is not ovicidal.

- Malathion is pediculicidal and partially ovicidal, requiring a second treatment if live lice persist.
- Spinosad kills live lice and unhatched eggs, usually not needing retreatment.
- Lindane shampoo 1% is a second-line treatment due to potential toxicity and restrictions on use. Always follow label instructions, and if live lice persist after treatment, consult a healthcare provider. Lindane is not recommended[14, 15].

Benzyl Alcohol (5%)

- No longer available due to discontinuation by the manufacturer in 2009, Benzyl alcohol lotion was FDA-approved for head lice (ages 6 months and older)[14].
- **Permethrin 1% lotion or shampoo** is a first-line treatment for pediculosis. Alternative treatments should not be used unless permethrin fails after two treatments. It is the preferred treatment for head lice in individuals aged 2 months and older, including pregnant women[14, 15].
- **Pyrethrin,** derived from the chrysanthemum flower, is often combined with piperonyl butoxide to boost its effectiveness in products like shampoo or mousse for individuals aged 24 months and older[14].
- Nonovicidal therapies for pediculosis should be applied twice, seven to 10 days apart, to fully eradicate lice. Some authors postulate that three treatments with permethrin or pyrethrins might be most effective[12].

Head lice treatment: *Ivermectin*

- The FDA has approved Ivermectin 0.5% lotion for individuals aged 6 months and older, and it became available over the counter in late 2020, requiring a single application to dry hair.
- Oral ivermectin is FDA-approved for adult head lice treatment, with pediatric use allowed for other infections. It is considered if topical treatments are unsuccessful, with recommended oral doses of 200 µg/kg given 7-10 days apart.
- Safety concerns exist for infants under 15 kg, and limited data are available on adverse effects. There are reports of potential ivermectin-resistant head lice cases outside the U.S.
- While pregnancy safety is indicated, permethrin remains the first-line treatment during pregnancy[14].

Abametapir (0.74% Lotion)

- FDA-approved in 2020 for head lice (prescription-only, ages 6 months and older), Abametapir inhibits crucial proteins for lice survival. Not commercially available yet, it requires application to dry hair and rinsing after 10 minutes[14].

Manual removal of live lice and nits, although not extensively studied in peer-reviewed literature, is considered notably safe compared to pesticide toxicity. Medical providers can include manual removal as a treatment option, providing an opportunity for caregivers and children to spend quality time together while effectively eliminating infestations and debris[14].

Head lice prevention:

- Avoid head-to-head contact during various activities.
- Refrain from sharing clothing items, combs, brushes, or towels.
- Disinfect combs and brushes in hot water.
- Avoid lying on surfaces recently in contact with an infested person.
- Launder clothing and linens using hot water and high heat drying.
- Vacuum floors and furniture, especially where the infested person was.
- Educate and encourage children to avoid activities that may spread head lice.
- Fumigant sprays or fogs are unnecessary and can be toxic[14,16].

Loiasis treatment

The treatment of loiasis is complex and requires consultation with experienced experts.

- Surgical excision of migrating adult worms can alleviate localized symptoms but is not curative.
- The drug of choice is diethylcarbamazine (DEC), providing cure with one or two courses for most patients. Quantitative blood smears are necessary before treatment.
- Prophylactic DEC can prevent infection in long-term travelers.
- Albendazole may be effective for DEC-refractory cases or to reduce microfilarial load before DEC treatment. Close monitoring is essential.
- Treatment may briefly increase symptoms, and the risk of fatal encephalopathy exists with DEC, not entirely eliminated by corticosteroid treatment[17].

Loiasis treatment for pregnant woman

- Albendazole, categorized as Pregnancy Category C, has limited data on use during pregnancy. WHO permits its use during the 2nd and 3rd trimesters when benefits outweigh risks, but decisions for pregnant women should consider the disease's progression[17].

Zoonotic Hookworm Cutaneous larva Migrans treatment

- Several treatment approaches have been suggested, such as cryotherapy and the use of topical anthelminthic therapy. However, these methods rely on locating the larvae for effectiveness, which is often challenging.
- While applying topical anthelminthic over extensive skin areas has proven effective in certain instances, it may not always be feasible.
- Curative treatments involve the use of albendazole or ivermectin.
- In severe or recurring cases, particularly those involving folliculitis, additional doses may be required for successful treatment[18].

Cutaneous Leishmaniasis Treatment

- In all CL cases, routine wound care, individualized documentation of lesion evolution, and patient education regarding manifestations and detection of local therapeutic failure/relapse and ML should be integral components of management.
- Initial systemic therapy may be used in individuals with CL in whom it is not practical to use local therapy or, possibly, if more rapid healing of large, cosmetically, or functionally concerning lesions is preferred[19].

Cutaneous Leishmaniasis Treatment: **Parenteral systemic therapy**

- Conventional amphotericin B deoxycholate and lipid formulations, with liposomal amphotericin B offering tolerance benefits.
- Liposomal amphotericin B is typically administered at 3 mg/kg daily through IV infusion for 6 to 10 or more doses.
- Pentamidine isethionate is rarely used in the U.S. due to potential toxicity and variable effectiveness.
- Pentavalent antimonial (SbV) therapy involves a standard daily dose of 20 mg/kg, administered IV or IM. The duration varies based on the type of leishmaniasis, with traditional therapy lasting 20 days for cutaneous leishmaniasis (potentially 10 days in some cases)[20].

Cutaneous Leishmaniasis Treatment: **Oral systemic therapy**

- Miltefosine, an oral medication, received FDA approval in 2014 for treating cutaneous leishmaniasis in adults and adolescents who are not pregnant or breastfeeding.
- Miltefosine's effectiveness can vary across geographic regions. Its off-label use includes treatment for other Leishmania species in the New World or any species in the Old World. It is also not approved for use in children under 12[20].

Cutaneous Leishmaniasis Treatment: **Azoles therapy**

- Ketoconazole, itraconazole, and fluconazole, administered orally, have shown varied outcomes in different contexts for treating leishmaniasis.
- Ketoconazole, given at a daily regimen of 600 mg for 28 days, demonstrated modest effectiveness against L. mexicana and L. (V.) panamensis infections in small studies in Guatemala and Panama.
- In contrast, itraconazole, prescribed at a daily regimen of 200 mg twice daily for 28 days, proved ineffective against L. (V.) panamensis infection in a clinical trial in Colombia.
- Fluconazole, with an adult regimen of 200 mg daily for 6 weeks, showed mixed results in treating L. major infection in various Old-World countries. Preliminary data from Iran suggested that a higher daily dose (400 vs. 200 mg) might be more effective against L. major infection.

Cutaneous Leishmaniasis Treatment: **Local therapy**

- Localized treatment options that could be beneficial in certain scenarios include cryotherapy (using liquid nitrogen), thermotherapy (employing localized current field radiofrequency heat), intralesional administration of pentavalent antimonial (SbV), and the topical application of specific formulations of paromomycin[20].

Cutaneous Leishmaniasis Prevention and control:

- There are currently no available vaccines or drugs to prevent leishmaniasis infection. Travelers can best protect themselves by minimizing nocturnal outdoor activities, wearing protective clothing, and applying insect repellent to exposed skin to prevent sand fly bites[20].
- Individuals with cutaneous leishmaniasis (CL) should be monitored for 6–12 months after treatment for clinical evidence of therapeutic failure, which is initially seen at the border of a healed lesion[19].
- Additional therapy is recommended when there is the development of new skin lesions or worsening of existing lesions. It is also recommended if there is incomplete healing by 3 months after completing the treatment course[19].

- Therapeutic failure should be assessed by physical appearance. A relatively little improvement or worsening while on therapy suggests an inadequate response, and an alternate treatment approach should be planned[19].

Section 4.0 Conclusion

This report serves as **an annex to the previous CHI Parasitic Skin Infections report** and aims to provide recommendations to aid in the management of Parasitic Skin Infections. It is important to note that these recommendations should be utilized to support clinical decision-making and not replace it in the management of individual patients with Parasitic Skin Infections. Health professionals are expected to consider this guidance alongside the specific needs, preferences, and values of their patients when exercising their judgment.

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Section 6.0 Appendices

Appendix A. Prescribing Edits Definition

Some covered drugs may have additional requirements, rules, or limits on coverage. These requirements and limits may include:

Prescribing Edits Tools	Description
AGE (Age):	Coverage may depend on patient age
CU (Concurrent Use):	Coverage may depend upon concurrent use of another drug
G (Gender):	Coverage may depend on patient gender
MD (Physician Specialty):	Coverage may depend on prescribing physician's specialty or board certification
PA (Prior Authorization):	Requires specific physician request process
QL (Quantity Limits):	Coverage may be limited to specific quantities per prescription and/or time period
ST (Step Therapy):	Coverage may depend on previous use of another drug
EU (Emergency Use only):	This drug status on Formulary is only for emergency use
PE (Protocol Edit):	Use of drug is dependent on protocol combination, doses and sequence of therapy

Appendix B. Parasitic Skin Infections Scope

Section	Rationale/Updates
Section 1.1 Guidelines for the Treatment of Scabies by Centers for Disease Control and Prevention of America – October 2, 2019[7]	**Missing recommendations** ○ Apply scabicide lotion or cream to the entire body, covering areas from the neck down to the feet and toes. ○ For infants and young children, extend the application to their entire head and neck as scabies can affect their face, scalp, and neck, in addition to the rest of the body. ○ In the case of infants, only permethrin or sulfur ointment is suitable. Ensure the lotion or cream is applied to a clean body and left on for the recommended duration before washing it off. ○ After treatment, wear clean clothing. ○ Examine and treat both sexual and close personal contacts who have had direct prolonged skin-to-skin contact with an infested person within the preceding month. It is essential to treat all individuals simultaneously to prevent reinfestation. ○ As the symptoms of scabies result from a hypersensitivity reaction to mites and their feces (scybala), itching may persist for several weeks after treatment, even if all mites and eggs are eradicated. If itching continues beyond 2 to 4 weeks post-treatment or if new burrows or rash lesions appear, retreatment may be necessary. ○ Infected skin sores should be treated with an appropriate antibiotic prescribed by a doctor. For the treatment of classic scabies, one major drug was omitted: ○ **Ivermectin** is an oral antiparasitic agent that has received approval for the treatment of worm infestations. While evidence suggests that oral ivermectin may be a safe and effective treatment for scabies, it's important to note that the U.S. Food and Drug Administration (FDA) has not approved it for this specific use. ○ Oral ivermectin is typically considered for patients who have not responded to treatment or cannot tolerate FDA-approved topical medications for scabies.

	○ For the treatment of classic scabies, it is recommended to take two doses of oral ivermectin (200µg/kg/dose), each approximately one week apart. It is important to mention that the safety of ivermectin has not been established in children weighing less than 15 kg and in pregnant women. ○ It's noteworthy that while the guidelines for ivermectin suggest taking it on an empty stomach, experts in the field of scabies recommend taking it with a meal to enhance its bioavailability. For crusted scabies, both oral and topical agents should be used: ○ **Ivermectin** (refer to IQVIA report) ○ **Permethrin Cream 5%:** Permethrin is an FDA-approved treatment for scabies in individuals who are at least 2 months of age. It belongs to the synthetic pyrethroid class, resembling naturally occurring pyrethrins extracted from the chrysanthemum flower. When used as directed, permethrin is considered safe and effective. It acts by killing both scabies mites and their eggs, making it the preferred drug for scabies treatment. For crusted scabies, topical permethrin should be applied every 2-3 days over 1-2 weeks. ○ **Benzyl Benzoate 25%** (with or without tea tree oil): serves as an alternative topical agent to permethrin. However, it may cause immediate skin irritation. Lower concentrations, such as 10% or 12.5%, may be more suitable for use in children. ○ **Keratolytic Cream:** A topical keratolytic cream can be employed to reduce skin crusting and enhance the absorption of topical permethrin or benzyl benzoate in scabies treatment.
Section 1.2 Guidelines for the Treatment of Head Lice by Centers for Disease Control and Prevention of America –	**Missing recommendations:** **Supplemental Measures for Head Lice Prevention:** Head lice have a limited survival time when they fall off a person and are unable to feed. Extensive housecleaning is not required, but these steps can help prevent re-infestation by lice that have recently fallen off the hair or may be present on clothing or furniture. ○ **Clothing and Bedding:** • Machine wash and dry clothing, bed linens, and other items worn or used by the infested person during the 2 days before treatment. Use the hot water (130°F) laundry

October 15, 2019[15]	cycle and high heat drying cycle. Alternatively, clothing and items that cannot be washed can be dry-cleaned or sealed in a plastic bag and stored for 2 weeks. ○ **Combs and Brushes:** • Soak combs and brushes in hot water (at least 130°F) for 5–10 minutes to ensure they are free from any lice or nits. ○ **Vacuuming:** • Vacuum the floor and furniture, paying attention to areas where the infested person sat or lay. While the risk of getting infested by a louse that has fallen onto rugs, carpets, or furniture is minimal, thorough vacuuming can help minimize any potential risk. ○ **Understanding Lice Lifespan:** • Recognize that head lice survive less than 1–2 days if they fall off a person and cannot feed. Nits (lice eggs) cannot hatch and typically die within a week if they are not exposed to the same temperature found close to the human scalp. ○ **Avoid Fumigant Sprays:** • Do not use fumigant sprays, as they can be toxic if inhaled or absorbed through the skin. Stick to safe and effective preventive measures without resorting to potentially harmful chemicals. By following these practical steps, it is possible to prevent reinfestation without the need for excessive time or financial investment in housecleaning activities. When treating head lice, it's crucial to adhere to specific guidelines to ensure safe and effective use of medications: ○ **Dosage Instructions:** • Do not use extra amounts of any lice medication unless specifically instructed to do so by physician or pharmacist. Lice medications are insecticides and can be hazardous if misused or overused. ○ **Avoid Contact with Eyes:** • Keep all lice medications away from the eyes. In case of contact with the eyes, flush them immediately. It's important to prevent any direct contact with the eyes.

	○ **Limit Treatment Frequency:** • Refrain from treating an infested person more than 2–3 times with the same medication if it appears ineffective. This could be due to improper use or potential resistance to the medicine. Consult healthcare provider for advice if needed, and they may suggest an alternative medication. ○ **Avoid Simultaneous Use of Different Medications:** • Do not use different head lice drugs simultaneously unless explicitly directed to do so by physician and pharmacist. Mixing medications without guidance can be unsafe. ○ **Rinsing Procedures:** • Follow the American Academy of Pediatrics (AAP) recommendation to rinse all topical pediculicides from the hair over a sink, not in the shower or bath. This helps limit skin exposure. Additionally, use warm water instead of hot water to minimize absorption. By adhering to these guidelines, individuals can effectively treat head lice while minimizing the risk of adverse effects and ensuring the proper use of medications. Always seek professional advice if there are concerns or uncertainties during the treatment process. In a subsection in this guideline, the CDC[16] issued the following for prevention and control of head lice: Head lice are primarily transmitted through direct head-to-head (hair-to-hair) contact, with less frequent spread occurring through shared clothing or belongings onto which lice have crawled or nits attached to shed hairs may have fallen. The risk of infestation by a louse falling onto carpets or furniture is minimal, as head lice survive less than 1–2 days when off a person and unable to feed; nits typically die within a week if not maintained at scalp-like temperatures. To prevent and control the spread of head lice, consider the following measures: ○ Avoid head-to-head contact during play and activities at home, school, and elsewhere (sports, playground, slumber parties, camp). ○ Refrain from sharing clothing items such as hats, scarves, coats, sports uniforms, hair ribbons, or barrettes. ○ Avoid sharing combs, brushes, or towels. Disinfect combs and brushes used by an infested

<table>
<tr><td></td><td>person by soaking them in hot water (at least 130°F) for 5–10 minutes.
o Avoid lying on surfaces like beds, couches, pillows, carpets, or stuffed animals recently in contact with an infested person.
o Launder clothing, bed linens, and items worn or used by an infested person in the 2 days before treatment using the hot water (130°F) laundry cycle and high heat drying cycle. Non-washable items can be dry-cleaned or sealed in a plastic bag and stored for 2 weeks.
o Vacuum floors and furniture, especially where the infested person sat or lay. However, extensive housecleaning is unnecessary to prevent reinfestation by lice or nits that may have fallen off the head or onto furniture or clothing.
o Avoid using fumigant sprays or fogs, as they are not required for head lice control and can be toxic if inhaled or absorbed through the skin.
To manage a head lice outbreak in a community, school, or camp, educate children to avoid activities that might facilitate the spread of head lice.</td></tr>
<tr><td>Section 1.4
Guidelines for the Treatment of Loiasis by Centers for Disease Control and Prevention of America – November 24, 2020[17]</td><td>Missing recommendations:
o Albendazole does not seem to have a tendency to induce encephalopathy, although there is a scarcity of published data on this matter.
o The treatment of loiasis with antiparasitic agents may lead to a transient exacerbation of symptoms, such as Calabar swelling or pruritus. Some authors propose that these symptoms could be mitigated by concurrently administering antihistamines or corticosteroids during the initial seven days of treatment. It is important to note the potential occurrence of fatal encephalopathy with diethylcarbamazine (DEC) treatment, and this risk does not appear to be mitigated by corticosteroid therapy.
o Loa loa do not contain Wolbachia so doxycycline is not an effective treatment.
<table>
<tr><th>Treatment</th><th>Indication</th><th>Adult Dose</th><th>Pediatric Dose</th></tr>
<tr><td>Diethylcarbamazine (DEC)</td><td>Symptomatic loiasis with MF/mL <8,000</td><td>8–10 mg/kg/day orally in 3 divided doses daily for 21 days</td><td>8–10 mg/kg/day orally in 3 divided doses daily for 21 days</td></tr>
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Albendazole	Symptomatic loiasis, with MF/mL <8,000 and failed 2 rounds DEC OR Symptomatic loiasis, with MF/ml ≥8,000 to reduce level to <8,000 prior to treatment with DEC	200 mg orally twice daily for 21 days	200 mg orally twice daily for 21 days
Apheresis* followed by DEC	Symptomatic loiasis, with MF/mL ≥8,000	N/A	N/A

MF = microfilariae of *L. loa*

* Apheresis should be performed at an institution with experience in using this therapeutic modality for loiasis. Oral albendazole is available for human use in the United States.

Important information regarding the risk of fatal encephalopathy during loiasis treatment:

- Based on available data, the risk of fatal encephalopathy in patients undergoing diethylcarbamazine (DEC) treatment with microfilarial loads less than 8,000 microfilariae per mL is nearly negligible. For those individuals with microfilarial loads equal to or exceeding 8,000 microfilariae per mL, specialized centers may consider apheresis to reduce the load below the 8,000 threshold before initiating treatment. Some authors propose a more conservative threshold of 2,500 microfilariae per mL for commencing loiasis treatment, although this lower threshold must be carefully weighed against the associated risks of apheresis. Limited data suggest that treating patients with albendazole, 200mg twice daily for 21 days, may bring the microfilarial load to acceptable levels. However, re-evaluation of levels after albendazole treatment is necessary before proceeding with DEC treatment.
- **A note on treating patients with O. volvulus co-infection**: DEC is not recommended for individuals with onchocerciasis due to the potential risk of blindness or severe exacerbation of skin disease. Refer to the onchocerciasis web pages for appropriate

	treatment recommendations. o **A note on medication acquisition:** Diethylcarbamazine (DEC), having been globally utilized for over 50 years, is no longer approved by the U.S. Food and Drug Administration (FDA) and is unavailable for sale in the United States due to the rarity of this infection in the country. Physicians can obtain the medication from the CDC after confirming positive laboratory results. **Albendazole:** o Albendazole falls under pregnancy category C. o Limited data exist on the use of albendazole in pregnant women, but the available evidence indicates no discernible difference in congenital abnormalities between children of women accidentally treated with albendazole during mass prevention campaigns and those who were not. o In instances where the World Health Organization (WHO) has deemed that the benefits of treatment outweigh the risks, albendazole is permitted during the 2nd and 3rd trimesters of pregnancy. However, the decision to administer treatment to pregnant women with known infections should consider the balance between the risk of treatment and the potential progression of the disease in the absence of intervention. o As per Pregnancy Category C classification, this signifies that adverse effects on the fetus have been observed in animal studies (teratogenic or embryocidal), and either controlled studies in women are unavailable or there are no available studies in both women and animals. Administration of drugs should only occur if the potential benefits justify the potential risks to the fetus. o The excretion of albendazole in human milk is not known. Therefore, caution is advised when using albendazole in breastfeeding women. o The safety of albendazole in children under 6 years old is uncertain, although studies in children as young as one year old suggest its safety. o According to WHO guidelines for mass prevention campaigns, albendazole can be utilized in children as young as 1 year old, and many children under 6 have received albendazole in these campaigns, albeit at a reduced dose.

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<tr>
<td>Section 1.5
Guidelines for the Treatment of Zoonotic Hookworm Cutaneous Larva Migrans (CLM) By the Center of Disease Control and Prevention of America – May 26, 2020[18]</td>
<td>

Oral albendazole is available for human use in the United States.
Oral ivermectin is available for human use in the United States.

<table>
<tr><th>Drug</th><th>Adult Dose</th><th>Pediatric Dose</th></tr>
<tr><td>Albendazole</td><td>400 mg per day by mouth for 3 to 7 days</td><td>Children aged > 2 years: 400 mg per day by mouth for 3 days
This drug is contraindicated in children younger than 2 years age.</td></tr>
<tr><td>Ivermectin</td><td>200 mcg/kg by mouth as a single dose</td><td>Children over 15 kg weight: 200 mcg/kg by mouth as a single dose</td></tr>
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<tr>
<td>Addition of a new section:
Sexually Transmitted Infections Treatment Guidelines (2021)[8]</td>
<td>

Topical permethrin and oral/topical ivermectin are equally effective in curing scabies, with treatment choice based on patient preferences, drug interactions, and cost considerations.
Permethrin is safe with a single application, while ivermectin, though effective, requires a second dose after 14 days.
Lindane is an alternative but is toxic and should only be used if other therapies are intolerable or ineffective, with precautions for specific populations. Lindane is not recommended for pregnant and breastfeeding women, children aged < 10 years and persons with extensive dermatitis.
Bedding and clothing should undergo decontamination, achieved through either machine washing and drying using the heat cycle or dry cleaning. Alternatively, these items should be kept away from direct body contact for more than 72 hours. Fumigation of living spaces is not required. Individuals with scabies are recommended to maintain closely trimmed fingernails to minimize injury resulting from excessive scratching.
Crusted scabies, more severe and easily transmitted, may require combination therapy with permethrin or benzyl benzoate and oral ivermectin, with caution against lindane due

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to potential neurotoxicity risks. The treatment of crusted scabies lacks clear guidelines, but combination therapy is often recommended, especially for severe cases.

- Combination treatment is recommended with a topical scabicide, either 5% topical permethrin cream (full-body application to be repeated daily for 7 days then 2 times/week until cure) or 25% topical benzyl benzoate, and oral ivermectin 200 ug/kg body weight on days 1, 2, 8, 9, and 15. Additional ivermectin treatment on days 22 and 29 might be required for severe cases. Lindane should be avoided due to the risk of neurotoxicity with heavy applications on damaged skin.
- Permethrin is the recommended treatment for infants and young children, given the undetermined safety of ivermectin for those weighing less than 15 kg.
- Lindane should not be used in infants and children under 10 years old.
- While ivermectin is considered to pose a low risk to pregnant women and is likely compatible with breastfeeding, limited data on its use in pregnant and lactating women suggest that permethrin is the preferred treatment.
- Persons who have had sexual, close personal, or household contact with the patient within the month preceding scabies infestation should be examined. Those identified as being infested should be provided treatment.

Recommended Regimens for Scabies
Permethrin 5% cream applied to all areas of the body from the neck down and washed off after 8–14 hours or Ivermectin 200 ug/kg body weight orally, repeated in 14 days* or Ivermectin 1% lotion applied to all areas of the body from the neck down and washed off after 8–14 hours; repeat treatment in 1 week if symptoms persist
* Oral ivermectin has limited ovicidal activity; a second dose is required for eradication.
Alternative Regimen

<table>
<tr><td></td><td>Lindane 1% 1 oz of lotion or 30 g of cream applied in a thin layer to all areas of the body from the neck down and thoroughly washed off after 8 hours*
* Infants and children aged < 10 years should not be treated with lindane</td></tr>
<tr><td>Addition of a new section:
AAFP Lice and Scabies: Treatment Update (2019)[12]</td><td>
<table>
<tr><th colspan="3">KEY RECOMMENDATIONS FOR PRACTICE</th></tr>
<tr><th>Clinical recommendation</th><th>Evidence rating</th><th>Comment</th></tr>
<tr><td>A “no-nit” policy is not recommended for schools and day cares because nits alone do not indicate an active infestation. Children should not be kept out of school during treatment, even with active infestation, because the likelihood of transmissionis low, and this can result in significant absences.</td><td>C</td><td>U.S. and Canadian consensus guidelines based on basic knowledge of the lice life cycle</td></tr>
<tr><td>Permethrin 1% lotion or shampoo (Nix) is first-linetreatment for pediculosis. Alternative treatments should not be used unless permethrin fails after two treatments.</td><td>C</td><td>U.S. consensus guidelines balancing effective-ness and toxicity</td></tr>
<tr><td>Nonovicidal therapies for pediculosis should be applied twice, seven to 10 days apart, to fully eradicate lice. Some authors postulate that threetreatments with permethrin or pyrethrins might be most effective.</td><td>C</td><td>U.S. and Canadian consensus guidelines basedon basic knowledge of the lice life cycle
Inappropriate retreatment may result in resis-tance and lack of treatment effectiveness</td></tr>
<tr><td>Scabies should be considered in patients with apruritic, papular rash in the typical distribution and pruritus in close contacts.</td><td>C</td><td>U.S. and European consensus guidelines based on epidemiologic data and</td></tr>
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The classic bur- rows in webs and creases may not be present.		case studies
Oral ivermectin (Stromectol) should be reserved for patients with scabies who do not improve with permethrin 5% cream (Elimite).	C	Guidelines using consensus agreement in area of little clinical research

Pharmacological treatment of head lice:

- The pharmacological treatment of head lice infestation revolves around three main mechanisms: inducing neurotoxicity leading to lice paralysis (insecticidal treatments), suffocating the lice by forming a "coating," or dissolving the wax covering on the exoskeleton.
- Insecticidal agents with neurotoxic effects on lice include permethrin 1% lotion or shampoo, pyrethrins 0.3%/piperonyl butoxide 4% shampoo, malathion 0.5% lotion, spinosad 0.9% suspension, ivermectin 0.5% lotion (Sklice), and oral ivermectin.
- Permethrin 1% is recommended as the initial treatment for head lice.
- Non-insecticidal agents relying on suffocation or exoskeleton dissolution include benzyl alcohol 5% lotion, dimethicone solution, and isopropyl myristate solution. If permethrin fails after two treatments, the Canadian Paediatric Society recommends dimethicone solution and isopropyl myristate solution as second-line agents.
- Effectively formulating a treatment regimen involves recognizing the efficacy of available treatments in destroying viable eggs, determining the need for retreatment. Ovicidal agents such as malathion, spinosad, and topical ivermectin eliminate both live lice and eggs in one treatment. Non-ovicidal agents (permethrin, pyrethrins, benzyl alcohol, dimethicone, oral ivermectin, and isopropyl myristate) typically require a repeat application for complete eradication. The timing for non-ovicidal treatments is based on the louse life cycle. An initial application followed by a second application seven to 10 days later (nine days being optimal) should be sufficient for most cases. Some authors suggest an effective retreatment schedule for permethrin or pyrethrins might involve three doses

on days 0, 7, and 13 to 15.

- Resistance to permethrin and pyrethrins/piperonyl butoxide can be significant, although the geographic distribution of resistant lice is not well-known. Pseudoresistance may result from poor adherence, incorrect product use (underdosing or not following directions), and reinfection. If two appropriately administered courses of permethrin prove ineffective, an alternative agent should be considered.
- Although lindane is available in the United States, it is no longer recommended due to its neurotoxicity in humans.

Treatment	Ovicidal?	Mechanism of action	Directions (per package inserts)	Effectiveness
Benzyl alcohol 5% lotion (Ulesfia); prescription	No	Suffocation	Apply to dry hair, leave on for 10 min- utes then rinse; repeat in seven days	75% to 76% of patients are lice free at 14 days[11]
Dimethicone solu- tion (Nix Ultra, Lice MD); OTC	No	Suffocation	Spray all over dry hair, and massage until wet; let it sit for 30 minutes, then comb into hair; leave on overnight; wash out, and use a lice comb; repeat in eight to 10 days	70% to 96% of patients are lice free at 14 days (study of dimethicone 100%)[12,13]
Isopropyl myristate (Resultz); OTC†	No	Exoskeleton dissolution	Apply to dry hair and scalp, leave on for 10 minutes then rinse with	54% to 82% of patients are lice free at 14 to

				warm water; repeat in eight to 10 days	21 days[12]
	Ivermectin 0.5% lotion (Sklice); prescription	Not directly, but lice hatched from treated eggs die within 48 hours	Neurotoxic to lice[4]	Apply to dry hair and scalp, leave on for 10 minutes then rinse; one application is sufficient	74% of patients are lice free at 15 days[14]
	Ivermectin, oral (Stromectol); prescription‡	Partial	Neurotoxic to lice	200 mcg per kg, two doses seven to 10 days apart[8]	92% to 97% of patients are lice free at 14 to 15 days after two doses[15]
	Malathion 0.5% lotion (Ovide); prescription	Partial	Neurotoxic to lice	Apply to dry hair until hair and scalp are wet, allow to dry naturally, shampoo eight to 12 hours later, rinse and use a lice comb; repeat after seven to nine	80% of patients are lice free at 14 days[16]

			days only if live lice are still present	
Permethrin 1% shampoo (Nix); OTC	No	Neurotoxic to lice	Apply to damp hair, leave on for 10 min- utes then rinse; repeat in seven days	50% to 97% of patients are lice free at 14 days[1,8,17]
Pyrethrins 0.3%/ piperonyl butoxide 4% shampoo or mousse (Rid); OTC	No	Neurotoxic to lice	Apply to dry hair, leave on for 10 min- utes then rinse; repeat in seven days	62% to 94% of patients are lice free (unclear time frame)[1]
Spinosad 0.9% sus- pension (Natroba); prescription	Yes	Neurotoxic to lice	Apply to dry hair, leave on for 10 min- utes then rinse; repeat in seven days only if live lice are present	68% to 87% of patients are lice free at 14 days[16]
FDA = U.S. Food and Drug Administration; OTC = over the counter. *—Estimated retail price based on information obtained at http://www.goodrx.com (accessed October 22, 2018) and Walgreens. Generic price listed first; brand name price listed in parentheses. †—FDA approved in May 2017 but not yet marketed in the United States.				

‡—Off-label use.

Non-pharmacological approaches to head lice treatment

- Wet combing, a non-pharmacological method for treating head lice, involves washing with regular shampoo, dampening the hair with a commercially available leave-in conditioner, detangling with a wide-tooth comb, and systematically combing the hair from root to tip using a lice comb. Afterward, the conditioner is rinsed out, and the hair is combed with a lice comb again. Wet combing, while devoid of adverse effects, is time-consuming and is preferred by parents seeking to avoid chemical treatments. It should be performed every three days until no lice are detected on four to five consecutive occasions.
- Several substances, including vinegar, formic acid solution, nit-removal conditioners, water, regular conditioner, and almond oil, have been evaluated for removing nits by loosening them from the hair shaft. In vitro studies indicate water and regular conditioner are most effective in nit removal. The use of herbal and alternative products (e.g., tea tree oil, eucalyptus oil) in children is not recommended due to the lack of evaluation by the U.S. Food and Drug Administration, limited evidence of benefit, and uncertainty about safety.
- Head-to-head contact is the primary mode of lice transmission, while fomite transmission is rare. Items in direct contact with the head within the two days before treatment (e.g., pillowcases, hats, clothing) should be washed, and exposing them to a temperature of at least 130°F (54°C) in the washing machine or dryer effectively eliminates lice. Alternatively, sealing items in a plastic bag for two weeks proves effective. The use of sprays, carpet treatments, and other chemical environmental decontamination measures is not recommended.

Scabies

- Permethrin 5% cream (Elimite) is the primary treatment for scabies. Physicians should

	instruct patients on the correct application of permethrin cream, emphasizing its application to all areas of the body from the neck down. It should be left on the skin for eight to 14 hours or overnight, washed off, and reapplied after one week. Patients need to be aware that itching may persist for up to two weeks post-treatment, and persistent symptoms should prompt consideration of misdiagnosis, treatment failure, or treatment-related skin irritation. Sex partners from the past two months should also undergo treatment. o Oral ivermectin (200 mcg per kg, two doses 14 days apart) is an alternative for scabies, recommended by the Centers for Disease Control and Prevention if topical permethrin treatment proves unsuccessful. However, its use is often limited to second-line therapy due to cost and availability constraints. o Environmental control measures for scabies involve washing items like sheets and clothing at a temperature of at least 122°F (50°C) and drying them in a hot dryer. For items that cannot be machine-washed, isolating them in a sealed plastic bag for at least one week is sufficient.
Addition of a new section: UKHSA guidance on the management of scabies cases and outbreaks in long-term care facilities and other closed settings (2023)[13]	**Management of single cases of scabies:** o The recommended treatment involves applying either permethrin (5%) cream (Lyclear) or malathion (0.5%) aqueous liquid (Derbac-M) if permethrin is not suitable. o Individuals affected by scabies can return to work, school, or nursery after completing the first 24-hour treatment dose as prescribed by a clinician. o They should avoid close physical contact with others until completing the first 24-hour treatment dose. o Symptoms may persist for up to 6 weeks after treatment, and clinicians may consider prescribing antipruritics for persistent or distressing itch. o In cases where scabies is acquired from a sexual partner, a referral for a sexually transmitted infection (STI) screen is advised. o Staff and carers should wear appropriate personal protective equipment (PPE) when handling and providing personal care until the first 24-hour treatment dose is completed. o Transfer of cases to other settings should be avoided until the first 24-hour treatment dose

	is completed. **Management of contacts:** o Defined as individuals with close physical contact with the case without appropriate PPE, treatment should be administered at the same time as the index case on two occasions 7 days apart, even if asymptomatic. o Contacts who are off duty at the time of treatment should complete the first 24-hour treatment dose before returning to work. o A low index of suspicion is recommended for identifying potential contacts of a case of crusted scabies due to the increased risk of transmission. o Staff should be vigilant for signs and symptoms of scabies for an 8-week period, and if two or more cases are identified in the setting, management should proceed as per an outbreak scenario. o If the case has been transferred within 8 weeks of symptom onset from another setting, staff should inform management at that setting to investigate for possible close contacts and consider implementing other control measures. **Laundry and environmental considerations** o All clothes, soft slippers, towels, and bed linen of the affected case should be washed at a minimum of 50°C (122°F) on the day of the first treatment application. o If clothes cannot be washed at a high temperature, they can be sealed in plastic bags for 4 days at room temperature. o Alternative methods include pressing clothes with a warm iron, dry cleaning, and putting items into a hot cycle in the dryer for 10 to 30 minutes. o Appropriate PPE should be worn when handling these items, and there is no necessity to fumigate living areas, furniture, or treat pets. **Outbreak management in closed settings** **Coordinating Mass Treatment**: o To disrupt the transmission cycle, all cases and contacts should undergo treatment simultaneously. If staff members are off duty during the treatment, they should complete the initial 24-hour treatment dose before returning to work. Individual case management

	should occur concurrently for all cases and contacts within the outbreak. o Environmental measures are generally implemented to minimize the potential risk of fomite transmission and reinfection. While there is limited evidence for a single optimal approach to environmental management, an approach found feasible in the experience of contributing Health Protection Teams (HPTs) is described. o In cases where staff requires treatment due to occupational exposure, it is recommended that employers consider funding the treatment to encourage uptake and facilitate a prompt return to normal working conditions. Social care settings can explore alternative funding options with local authority public health or social care commissioning teams. o Ivermectin, an off-label single- or double-dose oral treatment for scabies, is recognized within closed settings, particularly when logistical challenges exist for successful topical therapy delivery, or in the context of immunosuppression or crusted scabies. The decision to prescribe ivermectin in such contexts rests with local specialist dermatology and infectious diseases services. **Exclusion or Isolation of Cases in Closed Settings:** o For classical scabies, isolation of residents diagnosed with scabies is generally not warranted during an outbreak, assuming contacts are wearing appropriate personal protective equipment (PPE) or undergoing treatment simultaneously. o Close contact with individuals not undergoing concurrent treatment or unable to wear appropriate PPE should be minimized, especially for those finding treatment challenging, such as individuals with dementia or learning difficulties. **Crusted Scabies** o In the case of crusted scabies, which is highly transmissible, standard infection control principles and wearing appropriate PPE should suffice to prevent transmission. Isolation of individuals with crusted scabies is not recommended. Close contact with those not undergoing concurrent treatment or unable to wear appropriate PPE should be limited. o Individuals with crusted scabies may require multiple treatment applications or oral ivermectin for complete resolution. The decision on when a patient is no longer infectious should be guided by the specialist clinician involved in care. Minimizing skin-to-skin

	contact is advisable until non-infectious. **Staff:** ○ Staff members diagnosed with scabies or identified as contacts should refrain from returning to work until after completing their first 24-hour treatment dose. They should coordinate treatment doses to align with the care home's treatment dates. Staff identified as cases with household or other contacts in the community should advise their contacts to coordinate treatment doses to prevent further transmission. ○ The setting management team is responsible for determining the most appropriate route for staff to access treatment, such as through occupational health services, setting healthcare teams or GPs, or their personal GPs. Agency staff diagnosed with scabies should inform their other places of work, including home care recipients, for risk assessment and client identification in those settings. **Control Measures:** ○ **Personal Protective Equipment (PPE):** Adhering to standard infection control principles is generally effective in preventing transmission. For activities involving close personal care or handling where skin contact with patients' skin, infested linen, or clothing may occur, the use of single-patient, long-sleeve gowns or sleeve protectors is advisable to minimize transmission risk. ○ **Environmental Management:** 3. **Cleaning:** Cleaning aims to remove skin scales and dust from the environment. While the role of fomites in scabies transmission is unclear, normal cleaning routines are typically sufficient for classical scabies cases and outbreaks. For crusted scabies, more frequent vacuuming and a deep clean post-treatment cycles are recommended due to increased skin shedding. 4. **Laundry**: Compliance with guidelines for decontamination of laundry is essential. Residents' clothing worn before completing the first 24-hour treatment dose should be handled with appropriate PPE. Items can be collected in a dissolvable alginate bag for laundering. If unable to undergo a hot wash, items can be sealed in a plastic bag for at least 4 days. Linen and towels of cases should be treated as infected linen.

	○ **Family and Visitors:** Family members and regular visitors should be informed about the outbreak, educated on scabies symptoms, and advised to seek treatment if they meet case or contact criteria. Notices should be displayed, and visits should be risk-assessed, emphasizing avoiding skin-to-skin contact and wearing appropriate PPE. ○ **Essential Visits and Transfers, Healthcare Workers, and Health Care Settings:** Healthcare workers with close or prolonged contact with residents should be informed of the outbreak and reminded to wear appropriate PPE. Transfers out of the setting should be coordinated after the first 24-hour treatment dose, considering completion, avoidance of close skin-to-skin contact, and staff's ability to use PPE during close contact. **Recurrent Infections and Outbreaks:** ○ It's crucial to recognize that symptoms such as itch or rash may persist for up to 6 weeks after completing treatment, and this persistence doesn't necessarily indicate treatment failure or re-infestation. Residents or staff members experiencing ongoing symptoms post-treatment should be evaluated by their GP to explore alternative causes of their symptoms and receive relief for itching. ○ In the event of subsequent scabies outbreaks within 12 weeks of the initial outbreak, prompt notification to the Health Protection Team (HPT) and relevant infection prevention and control teams is imperative. This notification enables a thorough review to determine whether it's a new outbreak or a continuation of the original one. In either case, a meticulous examination of infection control procedures and treatment protocols is essential to identify potential shortcomings in interrupting the transmission chain or achieving de-infestation.
Addition of a new section: European guideline for the management of scabies (2017)[10]	**Recommended treatment regimens for scabies** ○ Permethrin 5% cream applied head to toe and washed off after 8–12 h. The treatment must be repeated after 7– 14 days {evidence Ib; grade A recommendation}. ○ Oral ivermectin (taken with food) 200 micrograms/kg as two doses 1 week apart {level of evidence Ib; grade A recommendation}. ○ Benzyl benzoate lotion 10–25% applied once daily at night on 2 consecutive days with re-application at 7 days {level of evidence IV; grade C recommendation}

	Alternative treatments o Malathion 0.5% aqueous lotion {level of evidence IV; grade C recommendation}. o Ivermectin 1% lotion was reported to be as effective as permethrin cream 5% {level of evidence Ib; grade A recommendation}. o Sulphur 6-33% as cream, ointment or lotion is the oldest antiscabetic in use. It is effective and requires application on three successive days {level of evidence Ib; grade A recommendation}. o Synergized pyrethrins are available as a foam preparation in some countries and are as effective as permethrin cream 5% {level of evidence IIa; grade B recommendation}. o Lindane is no longer recommended because of its potential to cause neurotoxicity. **Crusted scabies** o A topical scabicide (permethrin 5% cream or benzyl benzoate lotion 25%) repeated daily for 7 days then 2x weekly until cure AND o Oral ivermectin 200 micrograms/kg on days 1, 2 and 8. For severe cases, based on persistent live mites on skin scrapings at follow-up visit, additional ivermectin treatment might be required on days 9 and 15 or on days 9, 15, 22 and 29 {level of evidence IV; grade C recommendation}. **Post-treatment itch** o Post-treatment itch should be treated with repeated application of emollients. Oral antihistamines and mild topical corticosteroids may also be useful. **Special situations** o Permethrin is safe in pregnancy {level of evidence III; grade B recommendation} and lactation and is licensed for use in children from age 2 months onwards. o Benzyl benzoate and sulphur are considered safe in pregnancy {level of evidence III; grade B recommendation}. o Ivermectin should not be used during pregnancy or in children weighing less than 15 kg.44 o Malathion was not studied in pregnant women. Animal studies suggest that there is no

	risk. However, animal reproductive studies are not always predictive of human responses. Inappropriate use of agricultural grade malathion for treating human infestations can induce acute toxicity {level of evidence IV; grade C recommendation}. **Mass population treatment** {level of evidence Ib; grade A recommendation} o Mass population treatment is recommended for the control of scabies in endemic areas, for example remote communities or mass population displacements, and in the management of epidemics in closed communities such as nursing homes or jails. o All individuals should be treated irrespective of symptoms. o Oral ivermectin is easier to administer than traditional topical scabicides, thus facilitating treatment of large populations. o A single dose of oral ivermectin 200 micrograms/kg of bodyweight is effective. o Ivermectin may not sterilize scabies eggs, and a second dose given after one week has been shown to increase the response. o The administration of a second dose of ivermectin is recommended {level of evidence Ib; grade A recommendation} although the importance of this second dose for scabies control needs to be further evaluated. o Drug resistance to scabicides including permethrin and ivermectin is an emerging concern, and the impact of mass treatment programmes on development of drug resistance requires future study. **Follow-up** o A follow-up visit 2 weeks after completion of treatment is recommended for a test of cure by microscopy examination {level of evidence IV; grade C recommendation}. **Partner management** o Patients should be advised to avoid close contact until they and their sexual partners have completed treatment {level of evidence IV; grade C recommendation}. o Infestation in children due to sexual abuse is rare and is more usually associated with close non-sexual contact. Assessment and epidemiological treatment is recommended for sexual partners over the past 2 months {level of evidence IV; grade C recommendation}. **Prevention/health promotion**

	○ The risk of scabies can be reduced by limiting the number of sexual partners and observing strict personal hygiene when living in crowded spaces (e.g. no sharing of underwear clothing, bedding and towels and avoidance of skin-to-skin contact). ○ Transmission is not prevented by condom use. ○ No additional preventive measures have been shown to be effective.
Addition of a new section: Guideline for the diagnosis and treatment of scabies in Japan (third edition**)** (2017)[9]	○ There is little clear scientific evidence on the efficacy of sulfur, but it may be used. The use of the treatment may be considered, but there is insufficient evidence (C1). ○ The efficacy of crotamiton monotherapy is not highly evaluated, but it is effective depending on the patient. The use of the treatment may be considered, but there is insufficient evidence (C1). ○ The treatment method differs depending on the referenced article, and while it is difficult to determine the efficacy and safety of this treatment clearly, it is effective to a degree, so it may be used. The use of the treatment may be considered, but there is insufficient evidence (C1). ○ Lindane was designated in Annex A of the Stockholm Convention relating to persistent organic pollutants, so its use is now prohibited. (D, recommended not to use the treatment). ○ Permethrin is superior for treating scabies in terms of both efficacy and safety, and it can be used in infants aged 2 months and older, as well as in pregnant and lactating women. The use of the treatment may be considered, but there is insufficient evidence (C1). ○ Based on clinical data and the data on permethrin, phenothrin is superior in terms of efficacy and safety. The use of the treatment is strongly recommended (A). ○ There are no results that demonstrate the efficacy of malathion. The use of the treatment cannot be recommended, as there is no evidence (C2). ○ Ivermectin is effective for treating scabies. The use of the treatment is strongly recommended (A). ○ Ivermectin is more effective in the treatment of scabies than lindane (A). ○ Permethrin is more effective in the treatment of scabies than lindane. The use of the treatment may be considered, but there is insufficient evidence (C1).

	○ Permethrin is more effective in the treatment of scabies than ivermectin. The use of the treatment may be considered, but there is insufficient evidence (C1). **Actual treatment method** ○ With common scabies, the usage method for topical agents is application of the medication over the entire body below the neck, including areas free of eruption. Ensure all areas are coated, including behind the ears, between the fingers, the external genitalia and the buttocks. ○ With children and elderly patients, ensure the entire body is coated, including the face and the head, even with cases of common scabies. ○ With crusted scabies, the entire body is to be coated, including the face and the head. ○ With sulfur, crotamiton and benzyl benzoate, the topical agents are to be washed off in a bath or shower 24 h after application. The same process applies to phenothrin 12 h or more after application. Consider wearing gloves and socks as needed to prevent the medication entering the mouth. ○ Treatment is completed once S. scabiei is no longer detected, or no new formation of eruptions characteristic of scabies, such as the scabies burrows, occurs. However, be aware of itching sensation, eruptions, reinfestation and relapse after scabies treatment. **Common scabies management:** ○ **Topical treatment**. Phenothrin (recommendation level A) is recommended as the first-line drug, and it should be applied at least twice with a 1-week interval between applications. ○ The topical medication is washed off in the bath or shower at least 12 h after application. ○ There is limited experience with phenothrin use, so it should be administrated while checking efficacy and safety. ○ Second-line drugs are crotamiton (C1), sulfur (C1) and benzyl benzoate (C1). ○ **Oral treatment.** Ivermectin (A) is administrated on an empty stomach at a dose of 200 microgram/kg. The patient is requested to come back after 1 week, and if S. scabiei are detected with a microscope or dermoscope, or if new formation of the characteristic scabies eruption (e.g. scabies burrows) is seen, then ivermectin is re-administrated. Liver

	function tests should be conducted as necessary for patients with liver dysfunction or elderly patients. o Normally, the scabies are cured in approximately 1 month with two doses. When insufficient response is seen with topical treatment or oral treatment, consider changing the treatment method after checking treatment compliance with the patient. o Patients on steroids or those taking immunosuppressants, patients with malignant tumors and diabetes, those on dialysis and elderly patients may have a reduced immune status, which may prolong the treatment period. For such cases, combined treatment with topical and oral medication should be considered. **Crusted scabies** o The basic treatment is: (i) removal of the hyperkeratotic layer; and (ii) topical, oral, or a combination of topical and oral treatment. o As there is no experience in Japan of combining phenothrin lotion and ivermectin, careful consideration should be given to drug interactions, efficacy and safety when using these drugs in combination. o As a measure to prevent the spread of infection, the patient needs to be isolated in a private room for 1–2 weeks after obtaining consent for this procedure. **Treatment of itching sensation** o Oral antihistamines are administrated to control the itching sensation. o However, first-generation antihistamines have anticholinergic action, so they cannot be used in patients with benign prostatic hypertrophy, glaucoma, epilepsy or other related disorders. In elderly patients and children, consideration must also be given to the adverse reaction of somnolence, reduced work efficiency and the risk of falls. o Thus, classical antihistamines should be administrated with adequate care. Therefore, it is preferable to use non-sedating second-generation antihistamines. **Treatment for patients with diseases that require steroid therapy** o Oral and topical steroid therapies may exacerbate scabies and prolong the time until the scabies are cured. o Therefore, it is preferable to refrain from steroid therapy when treating scabies. However,

	when a patient has a disease that requires steroid therapy, the attending physician should be consulted regarding continuing with steroid therapy. o When steroid therapy is essential, the dose should be kept to the minimum required dose. If continuing with topical steroid, the patient's condition should be carefully monitored. **Children treatment:** o Regarding children aged 2 months and older, or with a bodyweight of less than 15 kg, the safety of phenothrin has not been established (no usage experience), but phenothrin (C1) can be used. o However, when using the drug, the patient and guardian (family) should be fully informed that there is no usage experience in children as it is a new drug. Otherwise, sulfur (C1) or crotamiton (C1) may be used. o Regarding children younger than 2 months of age, there is no evidence on therapeutic agents. o Phenothrin is highly safe, but this drug should only be used after the patient's guardian (family) has been fully informed and consent obtained. **Pregnant woman treatment:** o Phenothrin (C1) has low toxicity, and the plasma concentration after application is low, so it can be administrated. o However, it is a new drug, and there is no usage experience; thus, the patient and their family should be fully informed before use. o Ultimately, the drug should only be used when it has been determined that the medical benefits outweigh the risks. o Otherwise, sulfur (C1) or crotamiton (C1) may also be used. o Ivermectin must not be used. o Many drugs, including drugs to treat scabies, are excreted in breast milk, so it is recommended to stop breast-feeding when using these drugs.
Addition of a new section: Australian STI	**Principal Treatment Option** **Scabies:** o Apply 5% permethrin cream topically on dry skin from the neck down, especially on hands

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<tr>
<td>Management Guidelines; Ectoparasites (2021)[11]</td>
<td>
and genitalia, and under nails with a nailbrush. Leave on for a minimum of 8 hours, usually overnight. Reapply to hands if washed.
• Consider extending to 24 hours in case of treatment failure. Repeat after 1 week for improved success.
o Alternatively, apply 25% benzyl benzoate emulsion topically on dry skin, emphasizing hands and genitalia, and under nails with a nailbrush. Leave on for 24 hours, reapplying to hands if washed. Repeat treatment after 7 days.
Crusted Scabies:
o Seek specialist advice for treatment due to the high mite population in this severe condition.
Treatment Advice:
o For scabies, avoid close body contact, complete treatment for the patient and recent partner(s), apply cream at night (including finger webs), isolate and launder clothes, towels, and bed linen, limit applications to prevent irritation, and use antipruritic treatments if needed.
Other Immediate Management:
o Advise abstaining from sexual contact for 7 days after treatment initiation or until completion and symptom resolution, whichever is later.
o Conduct contact tracing.
Special Considerations:
It is advisable to consult a specialist before addressing any intricate or persistent conditions.
<table>
<tr><th>Situation</th><th>Recommendation</th></tr>
<tr><td>Complicated or Disseminated Infection</td><td>For less severe crusted scabies, consider:
• Ivermectin 200mcg/kg orally on days 1, with a second dose between days 8-14.
• Seek specialist advice for an additional dose in moderate-severe cases.
• In cases of severe secondary bacterial infection (impetigo), administer antibiotics targeting S. aureus and/or S. pyogenes before initiating</td></tr>
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<tr><td></td><td>antiscabetic treatment.</td></tr>
<tr><td>Persistent Infection</td><td>Ivermectin 200 mcg/kg orally on days 1 and 8-14, not before 4 weeks post-failure of both topical permethrin and benzyl benzoate.</td></tr>
<tr><td>Pregnancy</td><td>Permethrin is considered safe during pregnancy and breastfeeding.</td></tr>
<tr><td>Regional and Remote</td><td>No distinct variations; however, in regional and remote areas, entire small communities may be affected by scabies, necessitating a community-wide treatment approach. Seek local advice.</td></tr>
<tr><td>Eyelash Infestation</td><td>Use ophthalmic-grade petrolatum ointment twice daily for 10 days (requires a prescription, and a compounding pharmacist may be needed).</td></tr>
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<tr><td>Addition of a new section:
AAP; Head lice (2022)[14]</td><td>

The medical provider should initiate treatment only if there is a diagnosis of active head lice infestation. The ideal treatment of head lice should be safe, free of toxic chemicals, readily available, simple to apply, effective, and inexpensive.
Topical treatments approved by the FDA for head lice are considered safe for use during pregnancy and lactation. These formulations have minimal systemic absorption, posing low risk to the fetus or breastfeeding child.
The FDA-approved pediculicides include Permethrin and Pyrethrins, which act as neurotoxins causing spastic paralysis in lice.
Pyrethrins are extracted from chrysanthemum flowers, while pyrethroids like Permethrin are synthetic but demonstrate consistent and stable activity. Permethrin (1% Lotion) is widely used in the U.S., and despite a discernible smell, additional ventilation is unnecessary during use.
Although caution is advised due to reported symptoms with exposure, true allergic reactions are rare.
Permethrin is the preferred treatment for head lice in individuals aged 2 months and older, including pregnant women. To enhance its effectiveness, avoid using conditioners or silicone-based additives found in many shampoos on the day of application, as they can hinder permethrin adherence. After washing the hair with a nonconditioning shampoo and towel drying, permethrin is applied to damp hair, left on for 10 minutes, and then rinsed off. Hair should not be shampooed for 24 to 48 hours after application to allow the

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	residue to kill emerging nymphs. A repeat application is recommended between day 9 and 10 if live lice are observed. An alternative treatment schedule on days 0, 7, and 13 to 15 is proposed based on the lice life cycle. ○ **Pyrethrin**, derived from the chrysanthemum flower, is often combined with **piperonyl butoxide** to boost its effectiveness in products like shampoo or mousse for individuals aged 24 months and older. Applied to dry hair, the product is left on for 10 minutes before rinsing. Unlike permethrin, there is no residual activity after rinsing. As 20% to 30% of nits may survive treatment, a second application is necessary after 9 to 10 days to eliminate newly hatched nymphs. Retreatment is advised if live lice are still present, following a similar schedule to permethrin (1%). ○ **Resistance to Permethrin and Pyrethrins**: Studies conducted over the last four decades indicate a decline in the clinical effectiveness of these compounds, dropping from nearly 100% when initially introduced in the 1980s to as low as 25%. The prevalence of clinical resistance varies significantly between communities and countries. While genetic alterations and ex vivo studies in head lice have been identified as potential indicators of resistance, they may not reliably predict actual clinical outcomes. **Other treatments** **Ivermectin (0.5% Lotion; Oral Formulation)** ○ Ivermectin, widely used as an anthelmintic agent, disrupts lice muscle cells, leading to paralysis and death. FDA-approved in lotion form (Sklice) for individuals 6 months and older, it was later approved for over-the-counter use in late 2020. The lotion, applied to dry hair, requires a single application. ○ Oral ivermectin (Stromectol) is FDA-approved for adult head lice treatment, with pediatric use allowed for other infections. Prescription-only, it's considered if topical treatments fail. Oral doses of 200 µg/kg, given 7-10 days apart, have shown effectiveness. Safety concerns for infants under 15 kg exist, with limited data on adverse effects. Potential ivermectin-resistant head lice cases outside the U.S. are reported. ○ Pregnancy safety is indicated, but permethrin remains the first-line treatment during pregnancy.

	○ Ivermectin for veterinary use is available online but not recommended for human use due to differing formulations. **Malathion (0.5% Lotion)** ○ Malathion, an organophosphate used since 1999 for head lice (prescription-only for ages 6 and older), requires a single application, but reapplication is advised if live lice persist. It has high efficacy and ovicidal activity but has a strong odor. ○ Caution is needed due to its flammability (78% isopropyl alcohol). ○ Safety for children under 6 is undetermined, and ingestion can cause respiratory depression. Resistance is documented globally, but not reported in the U.S. **Spinosad (0.9% Suspension)** ○ Spinosad, with broad insect activity, is FDA-approved for head lice (prescription-only, ages 6 months and older). Applied to dry hair, it requires rinsing after 10 minutes, with a second treatment if live lice persist. It outperforms permethrin with success rates of 84% to 87%. ○ Caution is needed for children under 6 months due to benzyl alcohol. **Abametapir (0.74% Lotion)** ○ FDA-approved in 2020 for head lice (prescription-only, ages 6 months and older), Abametapir inhibits crucial proteins for lice survival. ○ Not commercially available yet, it requires application to dry hair and rinsing after 10 minutes. ○ Success rates of 81% have been reported. Avoidance of certain drugs for two weeks post-application is advised. **Benzyl Alcohol (5%)** ○ No longer available due to discontinuation by the manufacturer in 2009, Benzyl alcohol lotion was FDA-approved for head lice (ages 6 months and older). ○ Although effective, its availability ceased with no indication of a return. **Lindane (1%)** ○ Although FDA-approved for head lice, Lindane is not recommended by AAP, CDC, or the Medical Letter due to neurotoxicity concerns. **Persistent cases of head lice:**

	○ When confronted with persistent head lice following the use of a pharmaceutical pediculicide, healthcare professionals should explore various possibilities, such as misdiagnosis, lack of adherence, inadequate treatment, reinfestation, or resistance. ○ Given the familiarity and convenience of OTC permethrin or pyrethrin-based formulations, these are recommended as first-line treatments. ○ If treatment failure occurs and is not due to misuse of OTC products, a full course of a different class of medication is suggested. ○ Age-appropriate alternatives include topical ivermectin lotion, spinosad suspension, and malathion lotion. In cases of resistance to topical agents, oral ivermectin may be considered for children over 15 kg. ○ If pediculicides are not feasible, manual removal via wet combing or an occlusive method can be employed, emphasizing careful technique over a minimum of 3 weeks (1 louse life cycle). **Manual Removal** ○ While there is limited peer-reviewed literature on the efficacy of manually removing live lice and nits, the inherent safety of this method compared to pesticide toxicity is notable. ○ Medical providers can consider manual removal as part of their treatment options. This process allows caregivers and children to spend quality time together while safely eliminating infestations and residual debris. ○ Manual nit removal has additional benefits, including reducing social stigma in school settings and addressing aesthetic concerns. ○ Since no pediculicide is 100% ovicidal, it is reasonable to manually remove nits, especially within 1 cm of the scalp, after using any product. Nit removal can be challenging, and fine-toothed "nit combs" like LiceMeister or Nit-free ○ Terminator can facilitate the process. ○ Combing on wet hair is recommended, as studies suggest that lice removed by combing and brushing are often damaged and less likely to survive. ○ Electronic louse combs claim to remove lice and nits, but their efficacy is not well-documented. Caution is advised with electronic combs, particularly for individuals with

	seizure disorders or pacemakers. o Other devices using ultrasonographic actuation or localized ionized gas are under preclinical investigation. o Some products claim to loosen the "glue" attaching nits to hair shafts, making nit-picking easier. Vinegar or vinegar-based products, applied for three minutes before combing, are among these options. **Prevention:** o Preventing all head lice infestations is unlikely, given frequent head-to-head contact among children and adolescents. o It's advisable to teach them not to share personal items like combs, brushes, hats, and pillows. o However, avoiding protective headgear due to fear of head lice is not recommended. o Prompt treatment of infested individuals in shared environments is crucial to minimize further spread. o Regular surveillance by caregivers, perhaps monthly, helps detect and treat early infestations, preventing spread to others. **Control Measures in Congregate Settings:** o Congregate settings like group homes, shelters, and long-term care facilities pose a risk for head lice transmission. In outbreaks, priorities include reducing affected individuals and educating unaffected ones to avoid activities leading to transmission. o First-line treatment with 1% permethrin is recommended post-diagnosis, covering a broad group, including young and pregnant individuals. o Close contacts, especially family members and those sharing beds, should be examined and treated if necessary. o Follow-up within the next 3 weeks is advisable to detect any surviving lice from nits unaffected by the initial treatment. o Items which have been in contact with persons undergoing treatment within the 2 days preceding the treatment should be cleaned.
Addition of a	o Decisions regarding the treatment of cutaneous leishmaniasis should be personalized,

new section: Guidelines for the Treatment of Leishmaniasis by the Center of Disease Control and Prevention of America **(October 5, 2023)**[20]	considering factors such as the Leishmania species, geographic origin of infection, natural history, risk for mucosal dissemination, drug susceptibilities, and clinical characteristics of skin lesions. o Treatment objectives include reducing mucosal risk, accelerating lesion healing, preventing relapse, minimizing morbidity from large lesions, and decreasing infection reservoirs in specific regions. o Therapeutic response is often marked by reduced lesion induration, with healing continuing post-treatment. Clinical reactivation (relapse) typically manifests initially at the lesion margin. **Systemic Therapy (Parenteral):** o Conventional amphotericin B deoxycholate and lipid formulations are utilized, with liposomal amphotericin B showing tolerance benefits. However, the data supporting their use for treatment of cutaneous (and mucosal) leishmaniasis are from case reports/series rather than from controlled clinical trials; standard dosage regimens have not been established. When liposomal amphotericin B has been used for treatment of cutaneous leishmaniasis, patients typically have received 3 mg per kg daily, by IV infusion, for a total of 6 to 10 or more doses. o Pentamidine isethionate is rarely used in the U.S. due to potential toxicity and variable effectiveness. o Pentavalent antimonial (SbV) therapy involves a standard daily dose of 20 mg/kg, administered IV or IM, with varying durations based on the type of leishmaniasis. The traditional duration of therapy is 20 days for cutaneous leishmaniasis (10 days may suffice in some settings) and 28 days for mucosal (and visceral) leishmaniasis. For some patients, adjustment of the daily dose or the duration of therapy may be indicated. No standard IL treatment regimen has been established, various regimens have been used depending in part on the size and characteristics of the lesions. **Systemic Therapy (Oral):** o In 2014, the FDA granted approval to the oral medication miltefosine for treating cutaneous leishmaniasis in adults and adolescents not pregnant or breastfeeding. Its

	approved use is specific to infections caused by three New World species within the Viannia subgenus: Leishmania (V.) braziliensis, L. (V.) panamensis, and L. (V.) guyanensis. The effectiveness of miltefosine therapy varies across geographic regions, and its use for other Leishmania species in the New World or any species in the Old World, as well as for children under 12, would be considered off-label. Refer to the previous section for additional insights and considerations on miltefosine. The "azoles"—ketoconazole, itraconazole, and fluconazole—administered orally have yielded diverse outcomes in different contexts. For instance: o Ketoconazole (adult regimen: 600 mg daily for 28 days) demonstrated modest effectiveness against L. mexicana and L. (V.) panamensis infections in small studies in Guatemala and Panama, respectively. Conversely, itraconazole (adult regimen: 200 mg twice daily for 28 days) proved ineffective against L. (V.) panamensis infection in a clinical trial in Colombia. o Fluconazole (adult regimen: 200 mg daily for 6 weeks) usage for treating L. major infection in various Old World countries showed mixed results. Preliminary data from Iran suggested that a higher daily dose (400 vs. 200 mg) might be more effective against L. major infection. In northeastern Brazil, adults infected with L. (V.) braziliensis exhibited a low response rate to fluconazole treatment (6.5–8.0 mg per kg per day for 28 days). **Local Therapy:** o Certain instances of cutaneous leishmaniasis may be suitable for local therapy, contingent on factors such as the risk of mucosal dissemination/disease and the specific attributes of the skin lesions, including their number, location, and size. Localized treatment approaches that could be beneficial in certain scenarios comprise cryotherapy (utilizing liquid nitrogen), thermotherapy (employing localized current field radiofrequency heat), intralesional (IL) administration of SbV, and the topical application of specific formulations of paromomycin. **Prevention and control:** o There are currently no available vaccines or drugs to prevent leishmaniasis infection. Travelers can best protect themselves by minimizing nocturnal outdoor activities, wearing

	protective clothing, and applying insect repellent to exposed skin to prevent sand fly bites. o Prevention and control measures need to be adapted to the local context and are often challenging to sustain. Effective control measures against sand fly vectors or animal reservoir hosts may be applicable in certain settings. o In regions where leishmaniasis is present in humans, the parasite transmission cycle is often maintained by animal reservoir hosts (e.g., rodents or dogs) along with sand flies. Control strategies are under evaluation, especially in areas where dogs serve as the primary reservoir hosts, as seen in L. infantum/L. chagasi-endemic regions. o In areas where infected humans are essential for the transmission cycle (anthroponotic transmission), such as the Indian Subcontinent, early detection and effective treatment of infected individuals can be a crucial control measure. Intra- and peridomiciliary transmission in these areas makes the use of residual-action insecticides in houses and bed nets treated with long-lasting insecticides potentially protective.
Addition of a new section: Diagnosis and Treatment of Leishmaniasis: Clinical Practice Guidelines by the Infectious Diseases Society of America (IDSA) and the American Society of Tropical Medicine and Hygiene	o After a thorough diagnostic evaluation, during which neither leishmaniasis nor any alternative diagnosis is confirmed, empirical treatment may be considered based on an individualized risk-benefit assessment (weak, very low). It is essential to discuss this option with the patient and periodically reevaluate it, considering the clinical evolution. o Immunocompetent individuals with clinically simple skin lesions caused by Leishmania species not associated with increased risk for mucocutaneous leishmaniasis (ML) and that are healing spontaneously may be observed without treatment if the patient agrees (strong, moderate). o For individuals with cutaneous leishmaniasis (CL) when the Leishmania species is unknown and the infection was not acquired in an increased ML-risk region, treatment of clinically simple or healing skin lesions is not required in immunocompetent patients who agree with this approach (strong, low) o Systemic treatment is suggested for individuals with healing/recently healed CL lesions caused by increased ML-risk species or when the species is unknown but the infection was acquired in an increased ML-risk region. Risks and benefits of treatment should be discussed with the patient (weak, low). Note: In some cases, watchful waiting, with

(ASTMH) (2016)[19]	vigilance for signs and symptoms of ML, may be a reasonable approach. o Any decision to observe a CL patient without treatment should be periodically reevaluated. The decision not to treat should be reconsidered if healing does not progress as anticipated (strong, very low). o In all CL cases, routine wound care, individualized documentation of lesion evolution, and patient education regarding manifestations and detection of local therapeutic failure/relapse and ML should be integral components of management (strong, low) o Potential consequences of inadequate treatment include a poor cosmetic outcome due to scarring or superinfection, the persistence of chronic wound(s), and, with some Leishmania species, destructive and disfiguring mucocutaneous leishmaniasis (ML). In immunocompromised individuals, cutaneous, mucosal, and visceral dissemination may occur (fact, no grade). o Individuals with cutaneous leishmaniasis (CL) should be actively monitored by clinical appearance, including periodic nasal and oropharyngeal examinations up to 1 year, or at least 2 years if at increased risk for ML. They should be educated about the signs and symptoms of relapse and ML and instructed to seek medical attention anytime these appear (strong, low). o Symptoms such as chronic nasal stuffiness, epistaxis, or hoarseness, or findings such as septal perforation that occur anytime in a person with a prior or current diagnosis of CL or a scar consistent with prior CL should prompt evaluation for ML, including fiber-optic examination of the affected area if relevant (strong, moderate). o Systemic treatment is recommended for individuals with complex cutaneous leishmaniasis (CL) as defined in Table 1 (strong, moderate). o Initial systemic therapy (see XIII) may be used in individuals with CL in whom it is not practical to use local therapy or, possibly, if more rapid healing of large, cosmetically, or functionally concerning lesions is preferred (weak, very low). o Less common cutaneous syndromes, such as leishmaniasis recidivans (caused by L. tropica and occasionally other species), diffuse cutaneous leishmaniasis (caused by L. mexicana, L. amazonensis, and L. aethiopica), and disseminated cutaneous leishmaniasis

	(caused by L. [V.] braziliensis), usually require systemic therapy (strong, low). o The available parenteral options for systemic therapy in North America include conventional amphotericin B deoxycholate, lipid formulations of amphotericin B, pentavalent antimonial (SbV) compounds, and pentamidine (listed in alphabetical order). Oral options include miltefosine and "azole" antifungal compounds, such as ketoconazole (if potential benefits outweigh risks for hepatotoxicity and QT prolongation) and fluconazole (fact, no grade). o To maximize effectiveness and minimize toxicity, the choice of agent, dose, and duration of therapy should be individualized (strong, moderate). No ideal or universally applicable therapy for cutaneous leishmaniasis (CL) has been identified. Some therapies/regimens appear highly effective only against certain Leishmania species/strains in specific geographic regions. Both the parasite species and host factors (e.g., comorbid conditions and immunologic status) should be considered. o Factors to consider when selecting CL treatment for an individual patient include the risk for mucosal leishmaniasis (ML), the Leishmania strain/species, and published response rates for antileishmanial agents in the relevant geographic region. Other considerations include the potential for adverse events, age extremes, childbearing competence and pregnancy, obesity, hepatic, pancreatic, renal, and cardiac comorbid conditions, preference for and convenience of various routes of administration, the rapidity with which one wishes to control the infection, the impact of lesions on daily activities and patient self-confidence, the patient/provider comfort level with logistics (e.g., Investigational New Drug protocols), and other practical issues (e.g., drug availability, various types of cost, insurance reimbursement) (strong, low). o Response to treatment is assessed by clinical criteria; repeat parasitologic testing is not recommended if the skin lesion appears to be healing (strong, low). The healing process may continue after the treatment course is completed, especially for large ulcerative lesions. o Individuals with cutaneous leishmaniasis (CL) should be monitored for 6–12 months after treatment for clinical evidence of therapeutic failure, which is initially seen at the border of

	a healed lesion (strong, low). The first sign of healing is typically flattening of the skin lesion. By 4–6 weeks after treatment, the lesion size should have decreased by >50%, ulcerative lesions should be reepithelializing, and no new lesions should be appearing. Ulcerative lesions are generally fully reepithelialized and clinically healed by approximately 3 months after treatment. o Additional therapy is recommended when there is the development of new skin lesions or worsening of existing lesions. It is also recommended if there is incomplete healing by 3 months after completing the treatment course (strong, low). o Therapeutic failure should be assessed by physical appearance. A relatively little improvement or worsening while on therapy suggests an inadequate response, and an alternate treatment approach should be planned (strong, low). A paradoxical increase in the local inflammatory response may be seen in the first 2–3 weeks of treatment, making it difficult to differentiate from therapeutic failure.

Appendix C. PubMed Search Methodology Terms

The following PubMed Search Methodology was opted:

Query	Filters	Search Details	Results
((Scabies[MeSH Terms]) OR (Mange, Sarcoptic[Title/Abstract])) OR (Sarcoptic Mange[Title/Abstract])	Guideline, in the last 10 years	("scabies"[MeSH Terms] OR "mange sarcoptic"[Title/Abstract] OR "sarcoptic mange"[Title/Abstract]) AND ((y_10[Filter]) AND (guideline[Filter]))	2
((((((((((((((((Pediculus[MeSH Terms]) OR (Pediculi[Title/Abstract])) OR (Nits[Title/Abstract])) OR (Head Louse[Title/Abstract])) OR (Head Louses[Title/Abstract])) OR (Louse, Head[Title/Abstract])) OR (Louses, Head[Title/Abstract])) OR (Head Lice[Title/Abstract])) OR (Head Lices[Title/Abstract])) OR (Lice, Head[Title/Abstract])) OR (Lices, Head[Title/Abstract])) OR (Body Louse[Title/Abstract])) OR (Body Louses[Title/Abstract])) OR (Louse, Body[Title/Abstract])) OR (Louses, Body[Title/Abstract])) OR (Body Lice[Title/Abstract])) OR (Body Lices[Title/Abstract])) OR (Lice, Body[Title/Abstract])) OR (Lices, Body[Title/Abstract])	Guideline, in the last 10 years	("pediculus"[MeSH Terms] OR "Pediculi"[Title/Abstract] OR "Nits"[Title/Abstract] OR "head louse"[Title/Abstract] OR "head louses"[Title/Abstract] OR "louse head"[Title/Abstract] OR ("Louses"[All Fields] AND "Head"[Title/Abstract]) OR "head lice"[Title/Abstract] OR (("Head"[MeSH Terms] OR "Head"[All Fields]) AND "Lices"[Title/Abstract]) OR "lice head"[Title/Abstract] OR ("Lices"[All Fields] AND "Head"[Title/Abstract]) OR "body louse"[Title/Abstract] OR (("human body"[MeSH Terms] OR ("human"[All Fields] AND "Body"[All Fields]) OR "human body"[All Fields] OR "Body"[All Fields]) AND "Louses"[Title/Abstract]) OR "louse body"[Title/Abstract] OR ("Louses"[All Fields] AND "Body"[Title/Abstract]) OR "body lice"[Title/Abstract] OR "body lices"[Title/Abstract] OR "lice body"[Title/Abstract] OR ("Lices"[All Fields] AND "Body"[Title/Abstract])) AND ((y_10[Filter]) AND (guideline[Filter]))	1
((((((((((Leishmaniasis, Cutaneous[MeSH Terms]) OR (Cutaneous Leishmaniases[Title/Abstract])) OR (Cutaneous Leishmaniasis[Title/Abstract])) OR (Leishmaniases, Cutaneous[Title/Abstract])) OR (Oriental Sore[Title/Abstract])) OR (Sore, Oriental[Title/Abstract])) OR (Leishmaniasis, Old	Guideline, in the last 10 years	("leishmaniasis, cutaneous"[MeSH Terms] OR "cutaneous leishmaniases"[Title/Abstract] OR "cutaneous leishmaniasis"[Title/Abstract] OR (("Leishmaniasis"[MeSH Terms] OR "Leishmaniasis"[All Fields] OR "Leishmaniases"[All Fields] OR "leishmaniasis vaccines"[MeSH Terms] OR ("Leishmaniasis"[All Fields] AND "vaccines"[All Fields]) OR "leishmaniasis vaccines"[All Fields]) AND	3

World[Title/Abstract])) OR (Old World Leishmaniasis[Title/Abstract])) OR (Leishmaniasis, New World[Title/Abstract])) OR (New World Leishmaniasis[Title/Abstract])) OR (Leishmaniasis, American[Title/Abstract])) OR (American Leishmaniasis[Title/Abstract])		"Cutaneous"[Title/Abstract]) OR "oriental sore"[Title/Abstract] OR ("Sore"[All Fields] AND "Oriental"[Title/Abstract]) OR "leishmaniasis old world"[Title/Abstract] OR "old world leishmaniasis"[Title/Abstract] OR (("Leishmaniasis"[MeSH Terms] OR "Leishmaniasis"[All Fields] OR "Leishmaniases"[All Fields] OR "leishmaniasis vaccines"[MeSH Terms] OR ("Leishmaniasis"[All Fields] AND "vaccines"[All Fields]) OR "leishmaniasis vaccines"[All Fields]) AND "new world"[Title/Abstract]) OR "new world leishmaniasis"[Title/Abstract] OR "leishmaniasis american"[Title/Abstract] OR "american leishmaniasis"[Title/Abstract]) AND ((y_10[Filter]) AND (guideline[Filter]))	
(((((((((Loiasis[MeSH Terms]) OR (Loiases[Title/Abstract])) OR (Loaiasis[Title/Abstract])) OR (Loaiases[Title/Abstract])) OR (Loa loa Filariasis[Title/Abstract])) OR (Filariasis, Loa loa[Title/Abstract])) OR (Loa loa Filariases[Title/Abstract])) OR (Loa loa Infection[Title/Abstract])) OR (Infection, Loa loa[Title/Abstract])) OR (Loa loa Infections[Title/Abstract])	Guideline, in the last 10 years	("loiasis"[MeSH Terms] OR "Loaiasis"[Title/Abstract] OR "loa loa filariasis"[Title/Abstract] OR "filariasis loa loa"[Title/Abstract] OR (("Loa"[MeSH Terms] OR "Loa"[All Fields] OR "Loa"[All Fields] OR "loa loa"[All Fields]) AND "Filariases"[Title/Abstract]) OR "loa loa infection"[Title/Abstract] OR (("infect"[All Fields] OR "infectability"[All Fields] OR "infectable"[All Fields] OR "infectant"[All Fields] OR "infectants"[All Fields] OR "infected"[All Fields] OR "infecteds"[All Fields] OR "infectibility"[All Fields] OR "infectible"[All Fields] OR "infecting"[All Fields] OR "infection s"[All Fields] OR "Infections"[MeSH Terms] OR "Infections"[All Fields] OR "Infection"[All Fields] OR "infective"[All Fields] OR "infectiveness"[All Fields] OR "infectives"[All Fields] OR "infectivities"[All Fields] OR "infects"[All Fields] OR "pathogenicity"[MeSH Subheading] OR "pathogenicity"[All Fields] OR "infectivity"[All Fields]) AND "loa loa"[Title/Abstract]) OR "loa loa infections"[Title/Abstract]) AND ((y_10[Filter]) AND (guideline[Filter]))	0
((((((((((((((((Larva Migrans[MeSH	Guideline, in	("larva migrans"[MeSH Terms] OR ("Dew"[All Fields] AND	5

Terms]) OR (Dew Itch[Title/Abstract])) OR (Dew Itchs[Title/Abstract])) OR (Itch, Dew[Title/Abstract])) OR (Itchs, Dew[Title/Abstract])) OR (Ground Itch[Title/Abstract])) OR (Ground Itchs[Title/Abstract])) OR (Itch, Ground[Title/Abstract])) OR (Itchs, Ground[Title/Abstract])) OR (Creeping Eruption[Title/Abstract])) OR (Creeping Eruptions[Title/Abstract])) OR (Eruption, Creeping[Title/Abstract])) OR (Eruptions, Creeping[Title/Abstract])) OR (Cutaneous Larva Migrans[Title/Abstract])) OR (Larva Migrans, Cutaneous[Title/Abstract])) OR (Ocular Larva Migrans[Title/Abstract])) OR (Larva Migrans, Ocular[Title/Abstract])	the last 5 years	"Itch"[Title/Abstract]) OR (("pruritus"[MeSH Terms] OR "pruritus"[All Fields] OR "Itch"[All Fields]) AND "Dew"[Title/Abstract]) OR ("Dew"[Title/Abstract]) OR "ground itch"[Title/Abstract] OR (("pruritus"[MeSH Terms] OR "pruritus"[All Fields] OR "Itch"[All Fields]) AND "Ground"[Title/Abstract]) OR ("Ground"[Title/Abstract]) OR "creeping eruption"[Title/Abstract] OR "creeping eruptions"[Title/Abstract] OR (("erupt"[All Fields] OR "erupted"[All Fields] OR "erupting"[All Fields] OR "Eruptions"[All Fields] OR "eruptive"[All Fields] OR "erupts"[All Fields] OR "tooth eruption"[MeSH Terms] OR ("tooth"[All Fields] AND "Eruption"[All Fields]) OR "tooth eruption"[All Fields] OR "Eruption"[All Fields] OR "exanthema"[MeSH Terms] OR "exanthema"[All Fields]) AND "Creeping"[Title/Abstract]) OR (("erupt"[All Fields] OR "erupted"[All Fields] OR "erupting"[All Fields] OR "Eruptions"[All Fields] OR "eruptive"[All Fields] OR "erupts"[All Fields] OR "tooth eruption"[MeSH Terms] OR ("tooth"[All Fields] AND "Eruption"[All Fields]) OR "tooth eruption"[All Fields] OR "Eruption"[All Fields] OR "exanthema"[MeSH Terms] OR "exanthema"[All Fields]) AND "Creeping"[Title/Abstract]) OR "cutaneous larva migrans"[Title/Abstract] OR "larva migrans cutaneous"[Title/Abstract] OR "ocular larva migrans"[Title/Abstract] OR "larva migrans ocular"[Title/Abstract]) AND ((y_5[Filter]) AND (guideline[Filter]))	

Appendix D. Parasitic Skin Infections Treatment Algorithms

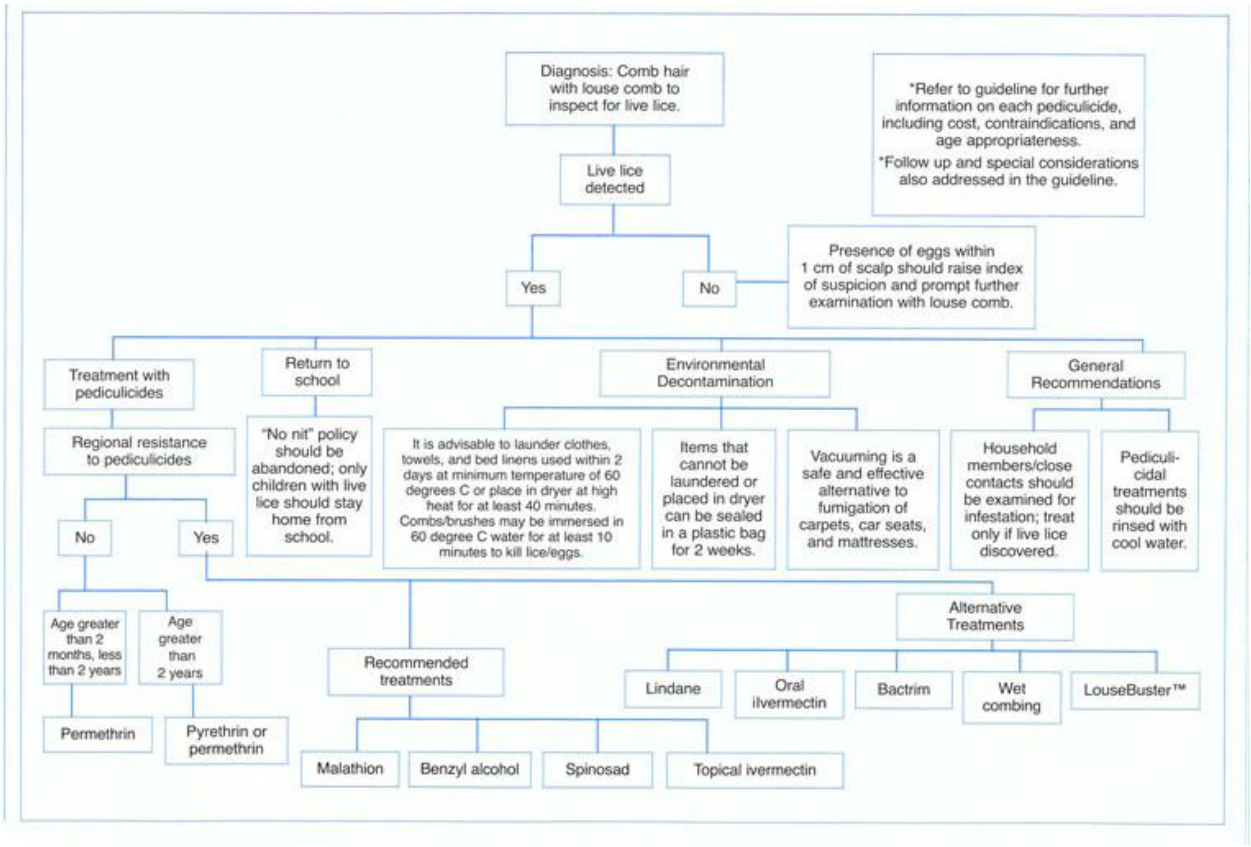

Figure 1. *Clinical algorithm for the treatment and management of head lice*

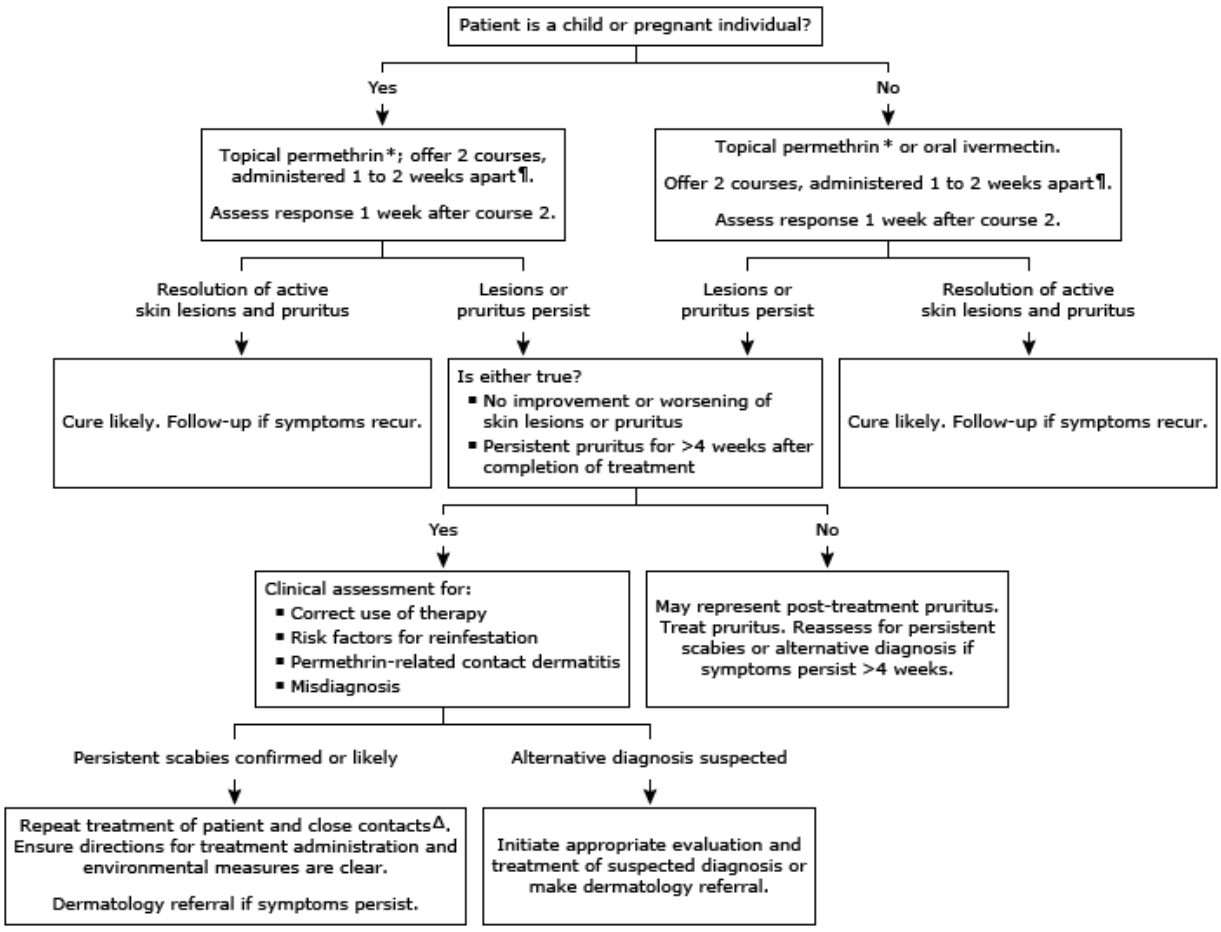

***Figure 2**. Treatment of classic scabies in the community setting of adults and children at least 2 months of age*

* Alternative topical therapies include benzyl benzoate, precipitated sulfur, topical ivermectin, and spinosad. These therapies have not been proven more effective than permethrin and are primarily used when permethrin therapy is not feasible. Refer to additional UpToDate content for details on preferred alternatives for children and pregnant individuals. Use of lindane has fallen out of favor due to risk for systemic toxicity.

¶ Repeating treatment is generally considered to improve efficacy. However, superiority of 2 applications of permethrin versus 1 application of permethrin has not been proven.

Δ The best approach to retreatment has not been established. We typically switch to another first-line therapy (e.g., from permethrin to oral ivermectin) or treat with permethrin or ivermectin simultaneously.

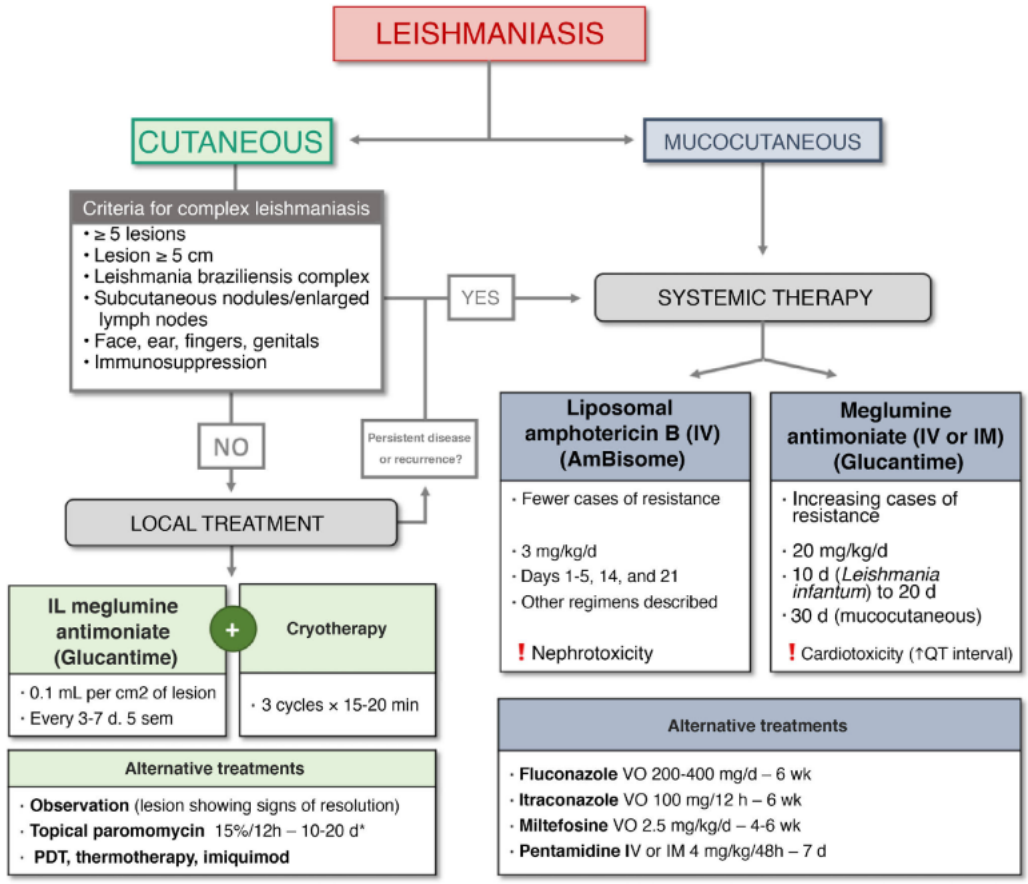

Figure 3. *Treatment algorithm for cutaneous and mucocutaneous leishmaniasis*

I.L. indicates intralesional; IM, intramuscular; IV, intravenous; PDT, photodynamic therapy; VO, oral.

*foreign medication.