



VERMONT

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Therapeutic Class Review Scabicides and Pediculicides

Overview/Summary

Scabies and pediculosis are caused by ectoparasites. Scabies is caused by the parasitic mite *Sarcoptes scabiei*. Pediculi or lice, which are obligate human parasites, can cause infestations either on the head (by the parasite *Pediculus humanus capitis*), body (by *Pediculus humanus corporis*), or the pubic region (by *Phthirus pubis*). While these skin conditions are associated with low morbidity, they are common causes of skin rash and pruritus, and are occurring with increasing frequency.^{1,2}

This review includes topical agents for scabies and lice treatment and the scabicides and pediculicides that are included in this review are detailed in Table 1. Lindane, permethrin, and piperonyl butoxide and pyrethrins products are available generically.

Although some data suggest a growing resistance to permethrin in the United States, all reviewed resources still recommend it as first-line antiparasitic therapy for treatment of both lice and scabies infections.³ Lindane, while still widely used, is considered second-line therapy due to its toxicity risks.⁴

Sciele Pharma Inc, the manufacturer of the newest agent in the class, Ulesfia[®], claims that benzyl alcohol is the first prescription lice treatment that is not associated with potential neurotoxic side effects.⁵ Although lindane is associated with potential neurotoxic reactions, prescription malathion and over-the-counter permethrin (Nix[®]) and piperonyl-butoxide/pyrethrin (RID[®]) are not associated with these concerns.

Medications

Table 1. Medications Included Within Class Review

Generic Name (Trade name)	Medication Class	Generic Availability
Benzyl alcohol (Ulesfia [®])	Scabicide and pediculicide	-
Crotamiton (Eurax [®])	Scabicide and pediculicide	-
Lindane (gamma-hexachlorocyclohexane)	Scabicide and pediculicide	✓
Malathion (Ovide [®])	Scabicide and pediculicide	✓
Permethrin* (Acticin [®] , Elimite [®] , Nix ^{®*})	Scabicide and pediculicide	✓
Piperonyl butoxide and pyrethrins* (Licide [®] , RID ^{®*})	Scabicide and pediculicide	✓

*Over-the-counter product is available in at least one dosage form or strength.

Indications

Table 2. Food and Drug Administration (FDA) Approved Indications⁶⁻¹⁵

Drug(s)	Scabies	Head Lice	Head and Pubic Lice	Head, Body, and Pubic Lice
Benzyl alcohol		✓ *		
Crotamiton	✓			
Lindane	✓ †		✓	
Malathion		✓		

Drug(s)	Scabies	Head Lice	Head and Pubic Lice	Head, Body, and Pubic Lice
Permethrin	✓	✓		
Piperonyl butoxide and pyrethrins				✓

* In patients ≥6 months of age.

†Lindane is reserved for patients who cannot tolerate or have failed other approved therapies.

In addition to its Food and Drug Administration-approved indication, permethrin may also be used off-label in the treatment of papulopustular rosacea.¹⁵

Pharmacokinetics

Table 3. Pharmacokinetics⁶⁻¹⁵

Drugs(s)	Peak Concentration (hours)	Absorption (%)	Serum Half-Life (hours)
Benzyl alcohol	Not reported	Not reported	Not reported
Crotamiton	24	Not reported	Not reported
Lindane	6	10	18
Malathion	Not reported	8	Not reported
Permethrin	Not reported	2	Not reported
Piperonyl butoxide and pyrethrins	0.5	Not reported	Not reported

Clinical Trials

Studies included in the table below evaluate the efficacy and safety of crotamiton, lindane, malathion, permethrin, and piperonyl butoxide and pyrethrins for the treatment of their Food and Drug Administration (FDA) approved indications.¹⁶⁻³⁴

The FDA approval of benzyl alcohol was based on the results of two multicenter, randomized, double-blind, vehicle-controlled studies in 628 patients (≥6 months) with active head lice infestation. These trials found a greater clearance of lice 14 days after final treatment with benzyl alcohol compared to placebo (76.2% vs 4.8% and 75.0% vs 26.2%, respectively; *P* values not reported).¹⁴

For the treatment of scabies, trials have demonstrated a greater efficacy (higher cure rate) with permethrin compared to crotamiton and lindane.¹⁶⁻²¹ Lindane and permethrin have also been compared to ivermectin for the treatment of scabies. While Madan et al. demonstrated that lindane had a higher cure rate compared to ivermectin, Chouelea et al. found that they were statistically equivalent.²²⁻²³ Additionally, permethrin has also been shown to have a higher cure rate than ivermectin.²⁴

For the treatment of lice, lindane has been compared to permethrin with permethrin being found to have a higher percentage of treatment success after just one treatment.²⁵⁻²⁸ Studies, have compared permethrin and the combination of pyrethrins and piperonyl butoxide. While both studies demonstrated that permethrin was more efficacious at 7 days, one of the studies found the agents equally effective at 14 days.²⁹⁻³⁰ Additionally, trials that have included malathion have found it to be pediculicidal and ovicidal when compared to permethrin.³¹⁻³²

Table 4. Clinical Trials

Study and Drug Regimen	Study Design and Demographics	Sample Size and Study Duration	End Points	Results
Scabies				
Haustein et al ¹⁶ Lindane (1% and 0.3%) vs permethrin (5% and 2.5%) vs benzyl benzoate (20% and 10%)*	Open, not blinded 114 adults and 80 children with scabies	N=194 3 weeks	Primary: Efficacy Secondary: Side effects	Primary: While permethrin and benzyl benzoate were 100% effective, lindane was 92% effective (treatment failures in three adults and two children). Results demonstrated that lindane was less effective ($P<0.025$). Secondary: Benzyl benzoate had more immediate (22%) and late (42%) adverse effects compared to the other treatment arms.
Schultz et al ¹⁷ Lindane lotion 1% vs permethrin cream 5%	MC, RCT Patients with scabies	N=467 1 month	Primary: Efficacy Secondary: Side effects	Primary: One hundred and eighty one of 199 (91%) and 177 of 205 (86%) patients treated with permethrin and lindane, respectively had complete resolution after treatment ($P=0.18$ and $P=0.30$). Secondary: The most frequent adverse effects were transient burning or stinging and new or increased pruritis; Events were more frequent following permethrin treatment and appeared to be related to the severity of the infestation.
Zargari et al ¹⁸ Lindane cream 1% vs permethrin cream 5%	DB, RCT Patients older than 5 years of age with scabies	N=99 2 weeks	Primary: Efficacy Secondary: Not reported	Primary: After two weeks permethrin provided an improvement in 84.6% of patients compared to 48.8% of patients receiving lindane ($P<0.0001$). Secondary: Not reported
Taplin et al ¹⁹ Lindane lotion 1%	RCT Patients with microscopically	N=23 1 month	Primary: Efficacy Secondary:	Primary: Three of 23 (13%) patients who received lindane were free of scabies at study midpoint (2 weeks). At study completion (1 month) 15 of 23 (65%) patients who received lindane were considered cured.

Study and Drug Regimen	Study Design and Demographics	Sample Size and Study Duration	End Points	Results
vs permethrin cream 5%	confirmed scabies		Not reported	At study midpoint (2 weeks) 11 of 23 patients who received permethrin were considered cured (48%). At study completion (1 month) 2 patients who received permethrin had scabies resulting in a cure rate of 91% ($P<0.025$). Secondary: Not reported
Taplin et al ²⁰ Permethrin cream 5% vs crotamiton cream 10%	DB, RCT Treatment of scabies in children 2 months to 5 years of age	N=47 1 month	Primary: Efficacy Secondary: Not reported	Primary: Fourteen of 47 (30%) children were considered cured two weeks after permethrin treatment compared to only 6 of 47 (13%) subjects treated with crotamiton. Four weeks after treatment 89% of patients treated with permethrin and 60% of patients treated with crotamiton were considered cured. These results found permethrin to be significantly better than crotamiton ($P=0.002$). Secondary: Not reported
Amer et al ²¹ Lindane 1% vs permethrin 5% vs crotamiton 10%	RCT Patients with scabies	N=150 1 month	Primary: Efficacy Secondary: Adverse effects	Primary: After 4 weeks, the cure rates for the treatment arms were 84%, 98% and 88% for the lindane, permethrin and crotamiton groups respectively. Secondary: No adverse events were reported during this trial.
Chouela et al ²² Lindane solution 1% vs	DB, DD, PG, PRO, RCT Patients with scabies that were outpatients,	N=53 1 month	Primary: Clinical healing Secondary: Adverse effects	Primary: At day 15, 14 patients (74.0%) in the ivermectin group showed healing of their scabies (95% CI, 48.8% to 90.8%) compared to 13 patients (54.0%) in the lindane group (95% CI, 32.8% to 74.4%). Both treatments resulted in statistically equivalent efficacy at 29 days. Eighteen

Study and Drug Regimen	Study Design and Demographics	Sample Size and Study Duration	End Points	Results
ivermectin, oral dose, 150-200 µg/kg of body weight	hospitalized patients, and those referred to the hospital from nursing homes and asylums			patients (95.0%; 95% CI, 74.0% to 99.9%) were healed after ivermectin therapy and 23 patients (96.0%; 95% CI, 78.9% to 99.9%) were healed after lindane therapy ($P<0.02$). Secondary: Adverse effects from the treatments were few, mild, and transient.
Madan et al ²³ Lindane lotion 1% vs ivermectin in a single oral dose of 200 µg/kg body weight	RCT Patients with scabies	N=200 1 month	Primary: Efficacy Secondary: Adverse effects	Primary: In the ivermectin group 82.60% of the patients showed marked improvement after 4 weeks compared to 44.44% of patients in the lindane group. Secondary: One severe headache from ivermectin was reported.
Usha et al ²⁴ Permethrin cream 5% vs ivermectin in a single oral dose of 200 µg/kg body weight	RCT Patients older than 5 years of age with scabies and family contacts	N=85 2 months	Primary: Efficacy Secondary: Not reported	Primary: A cure rate of 70.0% was reported after a single dose of ivermectin, and increased to 95.0% with 2 doses at a 2-week interval. Permethrin was 97.8% effective after a single application. One (2.2%) patient responded to 2 applications at a 2-week interval. It was reported that patients treated with permethrin recovered earlier. Secondary: Not reported
Head, Body, or Pubic Lice				
Brandenberg et al ²⁵ Lindane shampoo 1% vs permethrin cream rinse 1%	RCT Patients with the head louse <i>Pediculus humanus var capitis</i> (head lice)	N=573 (559 assessable for tolerance; 508 assessable for efficacy) 2 weeks	Primary: Efficacy Secondary: Tolerance	Primary: At 14 days, 99% of patients treated with permethrin were considered lice free compared to 85% of patients treated with lindane ($P<0.001$). Secondary: Adverse events reported with both treatments, were infrequent, mild, and usually difficult to distinguish from the symptoms of head lice infestation.

Study and Drug Regimen	Study Design and Demographics	Sample Size and Study Duration	End Points	Results
Taplin et al ²⁶ Permethrin crème rinse 1% vs lindane shampoo 1% vs placebo	DB, RCT Patients with Pediculus humanus var capitis (head lice)	N=93 2 weeks	Primary: Efficacy Secondary: Safety	Primary: Ninety seven percent of patients treated with permethrin were free of lice at 14 days, compared to 6% of placebo-treated patients ($P<0.001$) and 43% of the lindane-treated patients. Permethrin was 70% ovicidal compared to 14% for placebo ($P<0.001$) and 45% for lindane. Secondary: No adverse events were reported during this study.
Bowerman et al ²⁷ Lindane shampoo vs permethrin crème rinse 1%	RCT Patients with head lice in the Nezahualcoyotl community of Mexico city (296 family groups)	N=1,040 2 weeks	Primary: Efficacy (cure rate) Secondary: Adverse effects	Primary: Ninety eight percent of patients treated with permethrin and 76.0% treated with lindane were louse-free 2 weeks after treatment ($P<0.001$). Secondary: Mild dermal reactions, such as pruritus or erythema, occurred in 1.2% of permethrin-treated patients and 2.6% of lindane-treated patients.
Kalter et al ²⁸ Lindane shampoo 1% vs permethrin crème rinse 1%	RCT Men with the diagnosis of pediculosis pubis	N=53 10 days	Primary: Efficacy (cure rate) Secondary: Tolerability	Primary: Ten of 25 (40%) and 12 of 28 (43%) patients in the lindane and permethrin groups, respectively, were infested at the final assessment ($P>0.05$). Overall lindane was found to be 60% effective and permethrin 57%. Secondary: Only one mild adverse reaction was reported in each group.
Carson et al ²⁹ Permethrin 1% vs pyrethrins and piperonyl butoxide	RCT Patients with Pediculus humanus var capitis (head lice)	N=58 2 weeks	Primary: Efficacy (cure rate) Secondary: Tolerability	Primary: Permethrin was determined to be significantly better than the combination of pyrethrins and piperonyl butoxide at 7 days after the initial visit in eradication of lice infestation. Twenty six of 27 patients who received permethrin were lice free compared to 14 of 31 patients who received pyrethrins and piperonyl butoxide ($P<0.005$). There was no statistically significant difference between the treatment groups in

Study and Drug Regimen	Study Design and Demographics	Sample Size and Study Duration	End Points	Results
				<p>subjects lice free at day 14 (27 of 27 permethrin-treated vs 29 of 31 pyrethrins and piperonyl butoxide-treated subjects; $P>0.01$).</p> <p>Secondary: No adverse events were reported</p>
<p>DiNapoli et al³⁰</p> <p>Permethrin crème rinse 1% vs pyrethrins combined with piperonyl butoxide</p>	<p>R</p> <p>Patients with Pediculosis capitis (head lice infestation)</p>	<p>N=435</p> <p>2 weeks</p>	<p>Primary: Efficacy (cure rate)</p> <p>Secondary: Adverse effects</p>	<p>Primary: A total of 98% of the permethrin-treated patients and 85% of the pyrethrins and piperonyl butoxide-treated patients were free of lice at 7 days. Prior to nit removal at 14 days, 96% of the permethrin-treated and 62% of the pyrethrins and piperonyl butoxide-treated patients were still lice free.</p> <p>Secondary: Seventeen (7%) permethrin-treated and 32 (16%) pyrethrins and piperonyl butoxide-treated patients reported adverse events.</p>
<p>Roberts et al³¹</p> <p>Malathion lotion vs wet combing with a fine-toothed comb</p>	<p>RCT</p> <p>Schoolchildren (aged 3 to 14 years) in two counties in Wales, United Kingdom</p>	<p>N=81</p> <p>2 weeks</p>	<p>Primary: Efficacy (cure rate)</p> <p>Secondary: Not reported</p>	<p>Primary: The cure rate was 78% for malathion (31 of 40) and 38% (12 of 32) for wet combing. Children assigned wet combing were 2.8 times more likely to have lice at the end of treatment compared to the malathion group (95% CI, 1.5 to 5.2; $P=0.0006$).</p> <p>Secondary: Not reported</p>
<p>Meinking et al³²</p> <p>Malathion lotion 0.5% vs permethrin crème rinse 1%</p>	<p>Observer-blinded</p> <p>Patients with head lice</p>	<p>N=66</p> <p>15 days</p>	<p>Primary: Efficacy</p> <p>Secondary: Not reported</p>	<p>Primary: At day 15, a 20-minute application of malathion was significantly more pediculicidal and ovicidal compared to permethrin ($P<0.0001$).</p> <p>Secondary: Not reported</p>
<p>Hipolito et al³³</p> <p>Permethrin crème rinse 1% vs</p>	<p>RCT</p> <p>Children with head lice ranging in age from 2 to 13 years</p>	<p>N=115</p> <p>1 month</p>	<p>Primary: Efficacy (cure rate)</p> <p>Secondary:</p>	<p>Primary: At the 2-week follow-up visit, successful treatment was reported in 79.5%, 83.0% and 95.0% of the permethrin, trimethoprim and sulfamethoxazole, and permethrin plus trimethoprim and sulfamethoxazole groups respectively.</p>

Study and Drug Regimen	Study Design and Demographics	Sample Size and Study Duration	End Points	Results
trimethoprim and sulfamethoxazole orally twice daily vs permethrin crème rinse 1% plus trimethoprim and sulfamethoxazole			Adverse effects	At the 4-week follow-up, successful treatment was 72.0%, 78.0%, and 92.5% for the permethrin, trimethoprim and sulfamethoxazole, and permethrin with trimethoprim and sulfamethoxazole groups respectively. The absolute risk reduction for recurrence comparing permethrin to trimethoprim and sulfamethoxazole was 6.0%, trimethoprim and sulfamethoxazole to permethrin combined with trimethoprim and sulfamethoxazole was 14.0%, and permethrin vs permethrin combined with trimethoprim and sulfamethoxazole was 20.0%. Secondary: There were 3 trimethoprim and sulfamethoxazole-related rashes. Of the 115 participants, 8 had minor adverse reactions to the treatment.
Meinking et al ³⁴ Malathion 0.5% gel administered for 30, 60, or 90 minutes or malathion lotion 0.5% vs permethrin crème rinse 1% administered as Nix [®] Crème Rinse	AC, PG, RCT, investigator-blinded Patients with at least 3 live lice and 10 viable eggs	N=174 15 days	Primary: Efficacy (cure rate) Secondary: Safety results	Primary: At the end of the treatment period malathion gel had a cure rate of 98%, 93% and 86% when administered for 30, 60 or 90 minutes, respectively ($P<0.0001$, $P=0.001$, and $P=0.01$). Malathion lotion had a cure rate of 97% ($P=0.0006$). All groups were compared to permethrin which had a cure rate of 45%. Secondary: Adverse events were mild to moderate with erythema, headaches, and nausea being the most common across all groups.

*Not available in the United States.

Study abbreviations: AC=active control, CI=confidence interval, DB=double-blind, DD=double-dummy, MC=multicenter, PG=parallel-group, PRO=prospective, R=randomized, RCT=randomized controlled trial

Special Populations**Table 5. Special Populations⁶⁻¹⁵**

Generic Name	Population and Precaution				
	Elderly/ Children	Renal Dysfunction	Hepatic Dysfunction	Pregnancy Category	Excreted in Breast Milk
Benzyl alcohol	Use in patients >60 years of age has not been studied. Approved for use in children >6 months of age.	Not studied in renal dysfunction.	Not studied in hepatic dysfunction.	B	Unknown; caution is advised.
Crotamiton	Use in patients >60 years of age has not been studied. Not approved for use in pediatric populations.	Not studied in renal dysfunction.	Not studied in hepatic dysfunction.	C	Unknown: caution is advised.
Lindane	Use in patients >60 years of age has not been studied. Should not be used in very young children or premature infants due to risk of seizures and death.	Not studied in renal dysfunction.	Not studied in hepatic dysfunction.	C	Enters breast milk; use is contra-indicated.
Malathion	Use in patients >60 years of age has not been studied. Safety and efficacy in patients <6 years of age has not been studied.	Not studied in renal dysfunction.	Not studied in hepatic dysfunction.	B	Unknown: risk cannot be ruled out; caution is advised.
Permethrin	Use in patients >60 years of age has not been studied. Safety and efficacy in patients <2 months of age has not been studied.	Not studied in renal dysfunction.	Not studied in hepatic dysfunction.	B	Unknown: risk cannot be ruled out; caution is advised.
Piperonyl butoxide and pyrethrins	Use in patients <60 years of age has not been studied. Safety and efficacy in children have not been established.	Not studied in renal dysfunction.	Not studied in hepatic dysfunction.	Piperonyl butoxide-Unknown Pyrethrins-C	Unknown: risk cannot be ruled out; caution is advised.

Adverse Drug Events**Table 6. Adverse Drug Events (%)**⁶⁻¹⁵

Adverse Event(s)	Benzyl alcohol	Crotamiton	Lindane	Malathion*	Permethrin	Piperonyl Butoxide and Pyrethrins
Central Nervous System						
Ataxia	-	-	✓	-	-	-
Dizziness	-	-	✓	-	-	-
Headache	-	-	✓	-	-	-
Pain	-	-	✓	-	-	-
Seizures	-	-	✓	-	-	-
Dermatological						
Alopecia	-	-	✓	-	-	-
Dermatitis	-	✓	✓	-	-	-
Erythema	10	-	-	-	1-10	-
Irritation of skin and scalp	-	✓	-	✓	-	✓
Mild transient burning/stinging	-	-	✓	-	1-10	✓
Numbness	-	-	-	-	1-10	-
Pruritus	12	✓	✓	-	1-10	✓
Pyoderma	7	-	-	-	-	-
Rash	-	✓	-	-	1-10	-
Urticaria	-	-	✓	-	-	-
Gastrointestinal						
Nausea	-	-	✓	-	-	-
Vomiting	-	-	✓	-	-	-
Other						
Aplastic anemia	-	-	✓	-	-	-
Cardiac arrhythmia	-	-	✓	-	-	-
Conjunctivitis (if eye contact)	-	-	-	✓	-	-
Edema	-	-	-	-	1-10	-
Hematuria	-	-	✓	-	-	-
Hepatitis	-	-	✓	-	-	-
Ocular irritation	6	-	-	-	-	-
Paresthesia	-	-	✓	-	-	-
Pulmonary edema	-	-	✓	-	-	-

* Malathion is an insecticide/pesticide. Inadvertent transmucosal will manifest as excessive cholinergic activity (e.g., increased sweating, salivary and gastric secretion, gastric and uterine motility, and bradycardia). Additionally, malathion contains flammable alcohol and should not be exposed to an open flame or electric heat, including hair dryers and electric curlers.

✓ Frequency not specified (includes post marketing and case reports).

- Event not reported.

Contraindications/Precautions

The Food and Drug Administration (FDA) has issued a Public Health Advisory regarding lindane.⁴ A new boxed warning was added to the product labeling for all forms of lindane.

2003 Food and Drug Administration (FDA) Warnings Added to Lindane Product Labeling^{4,6,8}

	Lindane lotion 1%	Lindane shampoo 1%
Warnings	Lindane lotion should only be used in patients who cannot tolerate or have failed first-line treatment with safer medications for the treatment of scabies.	Lindane shampoo should only be used in patients who cannot tolerate or have failed first-line treatment with safer medications for the treatment of lice.
Neurologic Toxicity	Seizures and deaths have been reported following lindane lotion use with repeat or prolonged application, but also in rare cases following a single application used according to directions. Lindane lotion should be used with caution for infants, children, the elderly, and individuals with other skin conditions (e.g., atopic dermatitis, psoriasis) and in those who weigh <110 lb (50 kg) as they may be at risk of serious neurotoxicity.	Seizures and deaths have been reported following lindane shampoo use with repeat or prolonged application, but also in rare cases following a single application according to directions. Lindane shampoo should be used with caution in infants, children, the elderly, and individuals with other skin conditions, and those who weigh <110 lb (50 kg) as they may be at risk of serious neurotoxicity.
Contraindications	Lindane lotion is contraindicated in premature infants and individuals with known uncontrolled seizure disorders.	Lindane shampoo is contraindicated in premature infants and individuals with known uncontrolled seizure disorders.
Proper Use	Instruct patients on the proper use of lindane lotion, the amount to apply, how long to leave it on, and avoiding re-treatment. Inform patients that itching occurs after the successful killing of scabies and is not necessarily an indication for retreatment with lindane lotion.	Instruct patients on proper use of lindane shampoo, the amount to apply, how long to leave it on, and avoiding retreatment. Inform patients that itching occurs after the successful killing of lice and is not necessarily an indication for retreatment with lindane shampoo.

Black Box Warning for Lindane^{4,6,8}

WARNING
<p>Only use lindane in patients who cannot tolerate or have failed first-line treatment with safer medications for the treatment of scabies.</p> <p>Neurologic toxicity: Seizures and deaths have been reported following lindane use with repeat or prolonged application, but also in rare cases following a single application used according to directions. Exercise caution when using lindane in infants, children, the elderly, and individuals with other skin conditions (eg, atopic dermatitis, psoriasis) and in those who weigh less than 110 lbs (50 kg) as they may be at risk of serious neurotoxicity.</p> <p>Contraindications: Lindane is contraindicated in premature infants and individuals with known uncontrolled seizure disorders.</p> <p>Proper use: Instruct patients on the proper use of lindane, the amount to apply, how long to leave it on, and avoiding retreatment. Inform patients that itching occurs after the successful killing of scabies and is not necessarily an indication for retreatment with lindane.</p>

Drug Interactions

There are no significant drug interactions with the scabicides and pediculicides.^{1,6-15} However, note that lindane should be used with caution with any drug that is known to lower the seizure threshold. These include antipsychotics, antidepressants, theophylline, cyclosporine, mycophenolate, tacrolimus, penicillins, imipenem, fluoroquinolones, chloroquine, isoniazid, meperidine, radiographic contrast media, centrally active anticholinesterases, and methocarbamol.^{6,8,15}

Dosage and Administration

Table 7. Dosing and Administration⁶⁻¹⁵

Drug(s)	Usual Adult Dose	Usual Pediatric Dose	Availability
Benzyl alcohol	<u>Lice:</u> Apply sufficient lotion to dry hair to completely saturate the scalp; leave for 10 minutes, then rinse off with water; repeat treatment after 7 days.	<u>Lice:</u> Apply sufficient lotion to dry hair to completely saturate the scalp; leave for 10 minutes, then rinse off with water; repeat treatment after 7 days.	Lotion: 5%
Crotamiton	<u>Scabies:</u> Prior to application, patients should bathe or shower. Shake the lotion well before using. Thereafter, a thin layer of the cream or lotion should be thoroughly massaged into all skin surfaces from the chin down to the toes including all skin folds and creases. Crotamiton is left on the skin and a second application is advisable 24 hours later. The patient should take a cleansing bath 24 to 48 hours after the last application to remove any remaining drug. Patients can be retreated after 7 days if live mites appear or if no clinical improvement is observed.	<u>Scabies:</u> Prior to application, patients should bathe or shower. Shake the lotion well before using. Thereafter, a thin layer of the cream or lotion should be thoroughly massaged into all skin surfaces from the chin down to the toes including all skin folds and creases. Crotamiton is left on the skin and a second application is advisable 24 hours later. The patient should take a cleansing bath 24 to 48 hours after the last application to remove any remaining drug. Patients can be retreated after 7 days if live mites appear or if no clinical improvement is observed. Due to potential lindane toxicity, crotamiton is a drug of choice for young children and pregnant or lactating women in the treatment of scabies. However, crotamiton is not approved by the Food and Drug Administration (FDA) for the treatment of scabies in pediatric patients.	Cream: 10% Lotion: 10%
Lindane	<u>Lice:</u> Apply a sufficient quantity of shampoo onto clean, dry hair; generally 1 oz is sufficient, no more than 2 oz should be used. Work the shampoo into hair thoroughly and allow remaining on	The use of lindane should be avoided in infants and young children due to a higher incidence of adverse reactions in this age group. Clinicians postulate that young children are predisposed to toxicity because their surface	Lotion: 1% Shampoo: 1%

Drug(s)	Usual Adult Dose	Usual Pediatric Dose	Availability
	<p>hair for 4 minutes. Add small quantities of water and massage until a good lather forms. Rinse thoroughly and towel dry briskly. Nits should be removed using a nit comb or tweezers. Retreatment is not recommended. It is not known how soon after lindane administration that a second dose can safely be readministered.</p> <p><u>Scabies:</u> One oz of lindane lotion is generally sufficient to treat the average adult. Do not use more than 2 oz for larger adults. The lotion should be applied thinly and rubbed in thoroughly. Avoid applying lindane to open cuts. The lotion should be left on for 8 to 12 hours and removed by thorough washing. Retreatment is not recommended. It is not known how soon after lindane administration that a second dose can safely be readministered.</p>	<p>area to volume ratio is larger than adults; however, there have been no studies to demonstrate that children absorb more than adults. Older children weighing greater than 50 kg (110 lb) may be treated the same as adults.</p>	
Malathion	<p><u>Head lice:</u> Apply lotion on dry hair in an amount just sufficient to thoroughly wet the hair and scalp. Allow hair to dry naturally, do not use an electric heat source, and allow hair to remain uncovered. After 8 to 12 hours, the hair should be shampooed. Rinse and use a fine-toothed (nit) comb to remove dead lice and eggs. If lice are still present after 7-9 days, repeat with a second application of lotion.</p>	<p><u>Head lice:</u> Apply lotion on dry hair in an amount just sufficient to thoroughly wet the hair and scalp. Allow hair to dry naturally, do not use an electric heat source, and allow hair to remain uncovered. After 8 to 12 hours, the hair should be shampooed. Rinse and use a fine-toothed (nit) comb to remove dead lice and eggs. If lice are still present after 7-9 days, repeat with a second application of lotion.</p> <p>Application in pediatric patients should occur only under direct adult supervision, and is contraindicated in neonates. Safety and efficacy of malathion 0.5% lotion in children younger than 6 years of age have not been established via well-controlled trials.</p>	Lotion: 0.5%

Drug(s)	Usual Adult Dose	Usual Pediatric Dose	Availability
Permethrin	<p><u>Lice:</u> Initial: A sufficient volume (25-50 mL) applied to saturate the hair and scalp. A second application may be indicated if live lice are present 7 days or more after the initial application.</p> <p><u>Scabies:</u> Initial: 30 g is usually sufficient for an average adult to provide for a single head to toe application. Repeat dose 14 days later if demonstrable living mites.</p>	<p><u>Lice:</u> Initial: A sufficient volume (25-50 mL) applied to saturate the hair and scalp. A second application may be indicated if live lice are present 7 days or more after the initial application.</p> <p><u>Scabies:</u> Initial: 30 g is usually sufficient for an average adult to provide for a single head to toe application. Repeat dose 14 days later if demonstrable living mites.</p> <p>This should be used in children 2 months or older.</p>	<p>Cream: 1% 5%</p> <p>Lotion: 1%</p>
Piperonyl butoxide and pyrethrins	<p><u>Lice:</u> If topical solution, shake well before use. The undiluted liquid should be applied to dry hair and scalp or to any infested area until entirely wet. The liquid should not be used on the eyelashes or eyebrows.</p> <p>Shampoo should be applied to the affected area until all hair is thoroughly wet and allowed to stand for no longer than 10 minutes. Then, the area should be washed with warm water and shampoo or soap. A fine-toothed comb, usually supplied with the product, should be used to remove dead lice and ova. The treatment should be repeated in 7 to 10 days to assure eradication of unhatched nits. Two consecutive applications should not be administered within 24 hours.</p>	<p>Safety and efficacy in children have not been established.</p>	<p>Shampoo: 4/0.33%</p> <p>Solution: 4/0.33%</p>

Clinical Guidelines

Table 8. Clinical Guidelines

Clinical Guideline	Recommendation(s)
Centers for Disease Control and Prevention (CDC): Treatment of Head Lice (2008) ³⁵	<ul style="list-style-type: none"> • Permethrin and pyrethrins are first-line treatments; however a second course of therapy is often needed due to resistant species. • Malathion is pediculicidal and partially ovicidal. A second treatment may be needed if the first is not successful. • Gamma benzene hexachloride should not be considered a first-line treatment due to potential neurotoxic reactions. However its use may be

Clinical Guideline	Recommendation(s)
	appropriate after failed trials of first-line alternatives. <ul style="list-style-type: none"> The use of benzyl alcohol is not addressed in these guidelines.
CDC Morbidity and Mortality Weekly Report (MMWR): Sexually Transmitted Diseases Treatment Guidelines (2006) ³⁶	<u>Pediculosis pubis (pubic lice infestation)</u> <ul style="list-style-type: none"> Recommended regimens include permethrin 1% cream rinse applied to affected areas and washed off after 10 minutes or piperonyl butoxide and pyrethrins applied to the affected area and washed off after 10 minutes. Alternative regimens include malathion 0.5% lotion applied for 8-12 hours and washed off or ivermectin 250 µg/kg orally repeated in 2 weeks. <u>Scabies</u> <ul style="list-style-type: none"> Recommended regimens include permethrin 5% cream applied to all areas of the body from the neck down and washed off after 8-14 hours or ivermectin 200 µg/kg orally, repeated in 2 weeks. Alternative regimens include lindane 1% lotion (1 oz) or cream (30 g) applied in a thin layer to all areas of the body from the neck down and thoroughly washed off after 8 hours.
American Academy of Pediatrics: 2002 Head Lice Guidelines (2002) ³⁷	<ul style="list-style-type: none"> Permethrin 1% is currently the recommended treatment for head lice, with retreatment in 7 to 10 days if live lice are seen. Instructions on proper use of products should be carefully relayed. Safety and efficacy should be taken into account when recommending any product for treatment of head lice infestation. None of the currently available pediculicides are 100% ovicidal and resistance has been reported with lindane, permethrin and pyrethrins. Treatment failure does not equate with resistance, and most instances of such failure represent either misdiagnosis/misidentification or noncompliance with the treatment regimen.

Conclusions

A number of effective topical scabicides and pediculicides are available. Permethrin products are recommended as first-line therapy for treatment of scabies and lice. The permethrin products reviewed here, as well as their generic equivalents, are available over-the-counter (OTC). Lindane, a well-known older agent, has been relegated to second-line therapy due to risk of toxicity. Other available agents offer alternative options should a resistant case occur.

A comparison of the overall success rates of topical scabicides shows 89%-100% success with permethrin, 65%-92% with lindane, and 60%-88% with crotamiton. Permethrin is recommended as first-line therapy and lindane as second-line in the Centers for Disease Control (CDC) guidelines.³⁵ Crotamiton also has a role as an antipruritic for those with scabies.³⁵ All patients treated for scabies should expect the rash and itching to continue for about 2 weeks after treatment.²

Overall, the comparative success rates of topical pediculicides are 57%-99% with permethrin, 45%-95% with piperonyl butoxide and pyrethrins, 60%-88% with lindane and 78% with malathion. Combing or 'bug-busting' was only 38% successful in a comparison to malathion (78%), and should not be considered a first-line therapy for treatment of head lice. The CDC recommends permethrin or the combination of piperonyl butoxide and pyrethrins as equivalent therapies for pediculosis pubis.³⁶ Both of these products are available generically and OTC. The American Academy of Pediatrics recommends permethrin for head lice.³⁷

Reasons for treatment failures for the topical scabicides and pediculicides include misdiagnosis, noncompliance, failure to follow instructions correctly, not enough pediculicide applied, reinfestation, and

resistance. If resistance is suspected, retreatment should be with a different chemical entity than initially used.²

Lindane possesses an extensive adverse reaction profile and should not be used as a first-line agent.

Recommendations

In recognition of the well-established role of the scabicides and pediculicides for the treatment of scabies, body, head, and pubic lice, the similar efficacy between all agents in the class, and the availability of generic agents in the class, it is recommended that:

New Product:

Ulesfia® (benzyl alcohol 5% lotion) – Prior Authorization required

Current Criteria for already reviewed products: No changes recommended

CRITERIA FOR APPROVAL:

- The patient has had a documented side effect or allergy to permethrin or treatment failure with two treatments of permethrin.
- For approval of Elimite® Cream or Ovide® Lotion, the patient must have a documented intolerance to the generic equivalent product.

Dermatological Agents: Scabicides and Pediculicides	
<i>Length of Authorization: date of service only, no refills</i>	
Key: † Generic product, *Indicates generic equivalent is available without a PA	
PREFERRED DRUGS (No PA Required)	PA REQUIRED
EURAX® (crotamiton) C, L NIX® (permethrin) CR, G, Sp PERMETHRIN† (compare to Elimite®) C PERMETHRIN† L PIPERONYL BUTOXIDE AND PYRETHRINS† G, S, Sh RID® (piperonyl butoxide and pyrethrins) G, Sh, Sp All other brand and generic Scabicides and Pediculicides	Elimite®* (permethrin 5 %) C Lindane† L, Sh Malathion †L (compare to Ovide®) Ovide® (malathion) L

C=cream, CR=crème rinse, G=gel, L=lotion, S=solution, Sh=shampoo, Sp=spray

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