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# PEDICULOSIS

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- HEAD LICE: Pediculus capitis
- CRAB LICE: Phthirus pubis ■ Pubic lice ■ Pediculus pubis ■
- BODY LICE: Pediculus corporis



# HEAD LICE - Definition

- Lice are bloodsucking, wingless insects belonging to the suborder Anoplura.
- Twelve million cases per year occur in the US alone, and resistance to traditional treatments is increasing.



# HEAD LICE - History

- Head lice have infested mankind for thousands of years.
- Nits have been found on the hair of Egyptian and Peruvian mummies



# HEAD LICE - Epidemiology

- Head lice are found worldwide with no strict limitations based upon age, sex, race, or socioeconomic class.
- Children 3–11 years of age have the highest incidence, with prevalences as high as 60% in some countries.
- Infestation with head lice is more frequent in girls, probably due to their tendency to have longer hair as well as to exchange brushes, barrettes and other hair accessories.
- Head lice are distinctly uncommon in African-Americans, as head lice in the US are unable to properly position themselves to lay eggs on coarse curly hair.



# CRAB LICE - Introduction

- Infestation with *Pthirus pubis*, the crab louse, causes discomfort, pruritus and embarrassment and may coexist with other sexually transmitted infections.



# CRAB LICE - History

- The parasitic relationship between humans and crab lice dates back to prehistoric times





# CRAB LICE - Epidemiology

- The incidence rate may be slightly higher in men, probably because they have a greater amount of coarse body hair.
- Infestations with crab lice can be found in all socioeconomic and ethnic groups, although those of Asian descent or with minimal pubic hair are rarely affected.
- The highest prevalence is in men who have sex with men.
- Infestation is most frequently observed in those 15 to 40 years of age, correlating with increased promiscuous sexual activity.
- Although infestation is often considered a sexually transmitted disease, individuals who have had no sexual exposures are occasionally infested via fomite transmission from contaminated clothing, towels, or bedding.



# BODY LICE - Introduction

- Body lice infestations are associated with overcrowding, poor hygiene, poverty, war, and natural disasters.
- These insects are the primary vectors for diseases caused by Rickettsia, Borrelia and Bartonella spp.
  - Epidemic typhus (*Rickettsia prowazekii*)
  - Relapsing fever (*Borrelia recurrentis*)
  - Trench fever, bacillary angiomatosis and endocarditis (*Bartonella Quintana*)
- Body lice resemble head lice but are larger in size.



# BODY LICE - Epidemiology

- Body lice are found worldwide.
- Increased prevalence rates of body lice are tied to poor hygiene, poverty, and homelessness.
- There are no racial, age or sex restrictions.



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Mehran Heydari Seraj, MD



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# Diagnosis of Pediculosis

Mehran Heydari Seraj, MD



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# Definition

- Lice infestation in humans:
  - Head louse (*Pediculus humanus capitis*)
  - Body or clothing louse (*P. humanus humanus*)
  - Pubic or crab louse (*Phthirus pubis*)
- *P. capitis*, or head lice, is the predominant infestation in childhood.





# Etiology and pathogenesis

- Lice are wingless, dorsoventrally flattened, crawling insects.
- They are obligate ectoparasites of humans and complete their life-cycle on the human host.
- They feed by directly inserting their mouthparts into a blood vessel to draw blood.





# Etiology and pathogenesis

- Each has three pairs of legs with claws adapted to clinging to hair in the case of head and pubic lice, and to clothing fibres in the case of the body louse.
- *P. humanus capitis* and *P. humanus humanus* appear almost identical with an elongated shape measuring 2-4 mm in length; the head louse is slightly smaller than the body louse.



# Etiology and pathogenesis

- Phth. pubis has a broad, squat body shape measuring 1-2 mm in both dimensions.
- It has two huge hind claws designed to cling to adjacent, widely spaced hairs in the pubic region; body and axillary hair, the beard, eyelashes and short hairs on the scalp margins may also be infested.



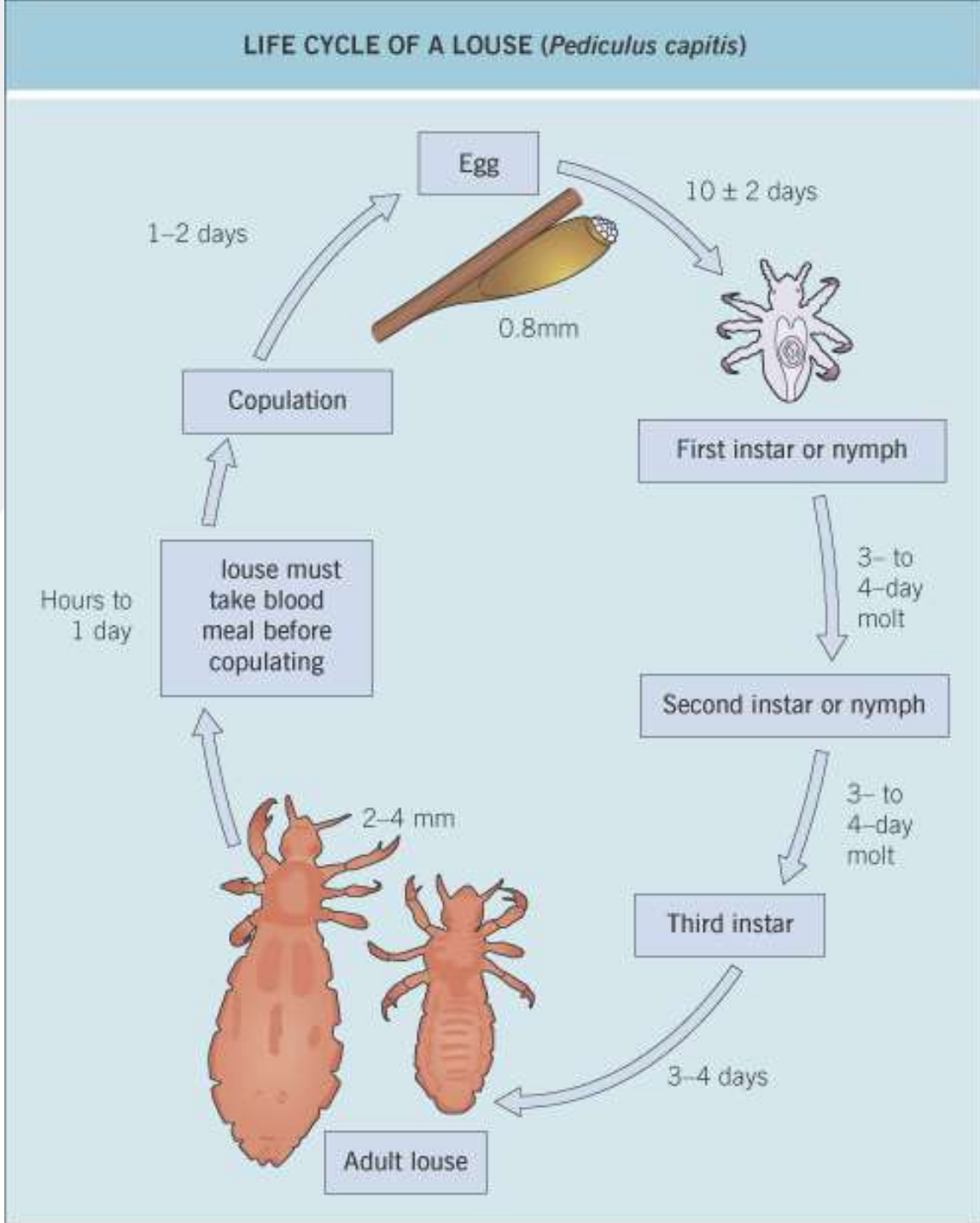
# Etiology and pathogenesis

- The female louse cements its newly laid egg, or ovum, to the proximal hair shaft close to the scalp or skin for warmth.
- In the case of the body louse, eggs are cemented to clothing fibers adjacent to the skin.
- The eggs are oval in shape with an operculum, or lid, at one end through which the nymph emerges after 6-8 days, ready for its first blood meal.
- When the ovum has hatched, the empty egg-case, or nit, remains firmly cemented to the hair shaft.





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# Etiology and pathogenesis

- The human host is not usually aware of lice feeding on the skin surface, although a slight stinging or pricking sensation may result.
- Initial infestation with lice usually remains asymptomatic for several weeks until pruritus develops. This occurs as a result of sensitization to the saliva and faecal material of the louse.
- Scratching injures the insects and limits the degree of infestation. Extensive infestation may result in constitutional symptoms such as mild fever and malaise.



# Body Louse

Pediculosis corporis  
*P. humanus humanus*



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# Diseases Transmitted

- The body louse is a major vector for epidemic typhus (*Rickettsia prowazeki*) which was previously responsible for a high mortality rate and still occurs in parts of Africa.
- Other diseases transmitted by the body louse include trench fever (*Rochalimaea* (*Rickettsia*) *quintana*) and louse-born relapsing fever (*Borrelia recurrentis*).



# Pediculosis corporis

- Body lice are rarely seen in children.
- Disease is manifested by severe nocturnal pruritus as well as bite lesions on the patient.
- Bite reactions may present as small erythematous papules and/or wheals in areas of skin covered by clothing, or as extensive excoriations, lichenification, skin infection and ulcerations.





# Pediculosis corporis

- The lice and eggs are to be found in the seams of clothing worn next to the skin.
- The disease is eradicated by a change of clothing and bedding.
- The lice are readily killed by extremes of temperature.



# Head Lice

Pediculosis capitis  
*P. Humanus capitis*



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# Pediculosis capitis

- Head lice are common infestations worldwide.
- The prevalence of infestation in schoolchildren varies from below 10% to above 40%.
- Both boys and girls are affected.
- Transmission is primarily by head-to-head contact.



# Pediculosis capitis

- The role of fomites such as shared hats and combs is controversial because, although lice may survive for several days off the human body, they are often injured or debilitated and may not be capable of infesting, or reproducing on, a subsequent host.
- A higher incidence of nits in the hair of girls may be explained by increased susceptibility to head lice as a result of longer hair and closer head-to-head contact with their peers.



# Pediculosis capitis

- Alternatively, it may be attributed to more frequent cutting of boys' hair which removes evidence of previous infestations.
- Adolescents and adults are less commonly affected than children and adult males appear to be less susceptible than women.
- **All socioeconomic groups** are affected; indeed, lice have a preference for well-nourished hosts.



# Pediculosis capitis

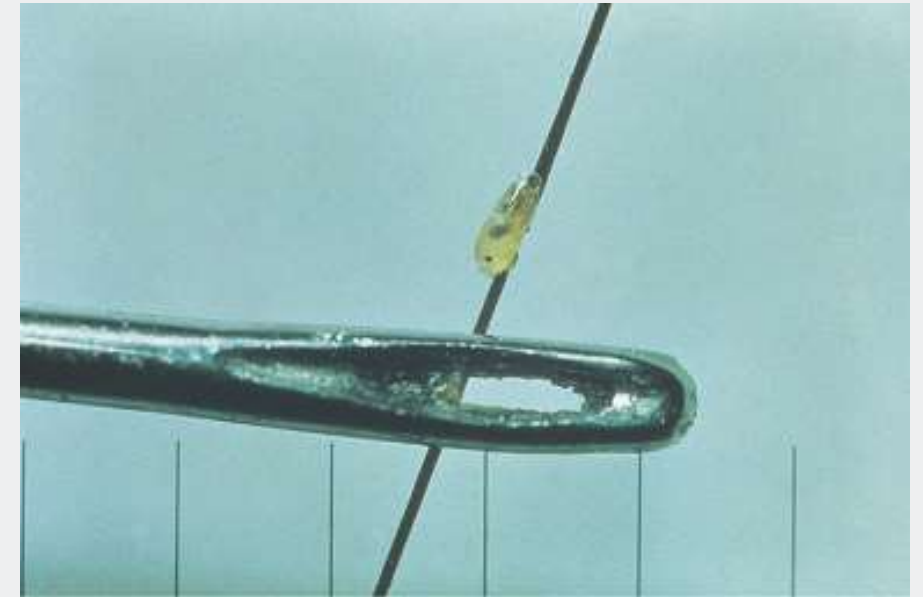
- The main symptom of head lice infestation is pruritus.
- The degree of pruritus is variable and it can be completely absent in the early days or weeks of infestation.
- Persistent scratching and excoriation of the scalp may result in secondary bacterial infection and posterior cervical lymphadenopathy.





# Pediculosis capitis

- The principal clinical finding is the presence of ova or nits firmly cemented to the hair shafts.
- The occipital and postauricular scalp are sites of predilection.
- Nits found several centimetres along the hair shaft are more likely to be empty egg-cases or non-viable ova than those found close to the scalp.
- Live adult insects are often not seen on clinical examination. Most children have few live adults (one to 10 lice) on their heads.





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# Pediculosis capitis

- Adult lice are difficult to detect clinically because they are translucent in colour, unless they have had a recent blood meal, and tend to hide from bright light.
- Rarely, a child may have more than 50, to as many as 300 live lice on the scalp in which case they are easily observed.
- Other clinical findings include excoriations, bite reactions, lymphadenopathy and evidence of secondary impetigo.
- In children with long hair, bite reactions may sometimes be seen on the back and sides of the neck.



# Pubic louse

Pediculosis pubis

*Phthirus pubis*



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# Pediculosis pubis

- The pubic or crab louse is spread by sexual or close body contact and infests the pubic hairs of adults.
- The louse has a translucent or tan colour and a reddish tinge after a blood meal. It can be well camouflaged and easily overlooked, or mistaken for freckles or 'scabs'.
- The predominant symptom is pruritus. *Phth. pubis* may not be restricted to the pubic area, and other hair bearing areas including the scalp should be carefully examined for the louse and its eggs.



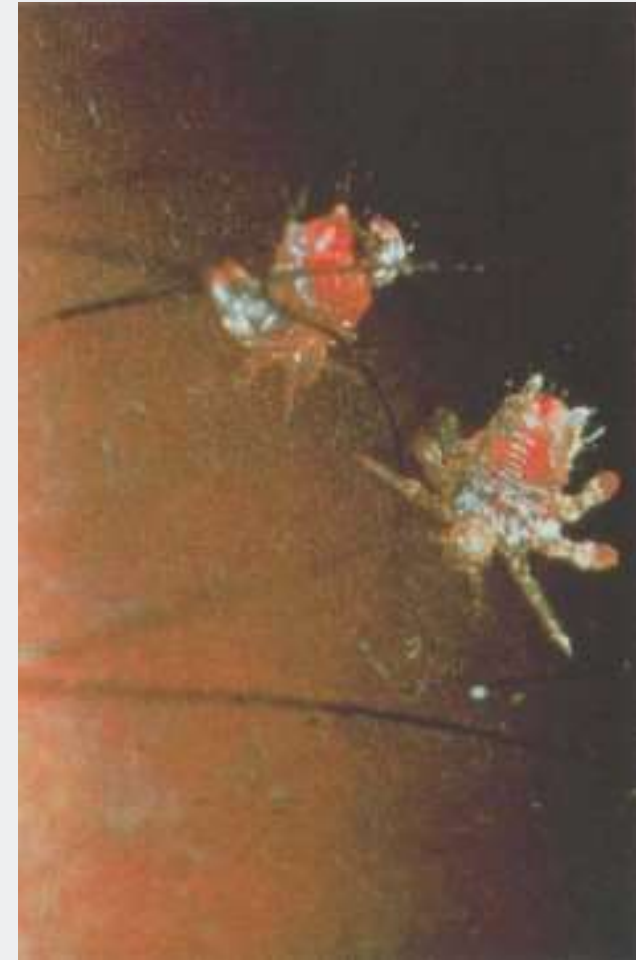
# Pediculosis pubis

- Pediculosis pubis is rare in the paediatric age group. In the absence of pubic hair or body hair, the crab louse has a predilection for eyelashes and the short hairs of the scalp margins.
- Blepharoconjunctivitis may occur in association with infestation of the eyelashes, the presenting symptoms and signs of which are red, itchy eyes.
- Extensive involvement of the scalp has been reported in an infant.



# Pediculosis pubis

- Bites on the skin of patients infested with *Phth. pubis* appear as bluish maculas known as maculae ceruleae.
- These can be mistaken for bruises and may raise a suspicion of child abuse.
- The bluish colour is believed to be caused by an anticoagulant substance secreted in the louse saliva.
- Although pediculosis pubis in childhood is usually acquired innocently by close body contact with an infested parent, a case of sexual abuse presenting as eyelash infestation has been reported.





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# Lice traditional treatments

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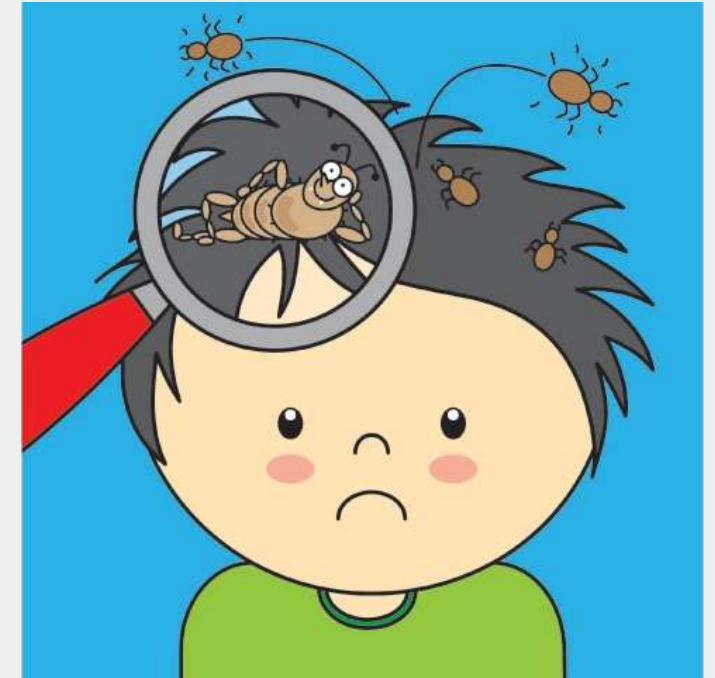




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# Lice tx

- **Head lice**
  - efficacy
  - access
  - not expensive
    - easily applied, easily washed off
  - resistance..( geographic area)
  - pediculocides are mainstay of therapy
  - 2 application, 1 wk apart ( to kill survived nits)



# Lice tx....

## Prevention ....

- 0.5 hr , 55 ° C water
- Vacuum cleaner
- Plastic bag for 2 wks ??
- Clothings: Laundry . Machine washing, ironing



# Lice tx

- Claims

**alternative non pediculicidal**

petrolatum jelly

hair pomade

olive oil

mayonnaise

vegetable and mineral oils

- no –nit policy : no product aids in complete nit removal



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## Lice tx...

- Oral agents
  - ivermectin : paralysis . Single dose
  - Oral cotrimoxazol improves the efficacy of topical agents but not curative
  - Levamizol: 3.5 mg/kg . 10 days later 2th dose.
  - albendazole .....anti- worm : 400 mg single dose . Repeat next wk





# No nit policy



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# Lice tx...

- **Pyrethrins**

- derived from *chrysanthemum cinorariaefolium*
- *pyrethrins* and *permethrin* are FDA –approved OTC pediculocides
- lotion, shampoo, foam, cream rinse
- applied to head (dry hair) for 10 minutes ,then rinse
- not ovicidal , 1 wk apart
- resistance
- **≥ 2 years**
- pregnancy :B



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# Lice tx.....

## Permethrin •

- synthetic pyrethroid
- cream rinse and lotion
- 10 minutes cream rinse
- resistance
- not ovicidal

or 8-12 hr cream



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# Lice tx....

- **Lindane**

- a chlorinated hydrocarbon
- neurotoxic
- 1% shampoo for 4 minutes
- reapply 7-10 days
- convulsion, breast feeding, pregnancy, inflamed, or wounded skin
- who fail to respond
- resistance



# Lice tx.....

- **Malathion**

- organophosphate malathion; cholinesterase inhibitor
- apply 8-12 hrs, 20 minutes is sufficient
- resistance in UK
- Ovide lot

- -  $\geq 6$  yr-o      2 year- old ???
- flammable ; care for smoking, hair ironing,  
electric Hair dry

pregnancy: B



# Lice tx....

- **Carboryl**

- cholinesterase inhibitor
- 0.5% shampoo
- more toxic than malathion for human , less for lice
- carcinogen , mutagen



# Lice tx....

- **Ivermectin**

- 400 microgram/Kg , day 1 & 8
- not in : children  $\leq$  15 Kg
- pregnancy
- breast feeding



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# lice tx ....

## Benzoyl alcohol

- 5% lotion ...approved by FDA in 2009 for head lice
- children  $\geq$  6 mo.
- **not** ovicidal
- act via asphyxia
- 10 minutes , wash, next week
- erythema, itch, irritation



Lice tx....

- Spinosad
  - approved by FDA in 2011
  - neuropathy
  - children  $\geq 4$  yr
  - fermentation of a saprophyte bacteria .
  - muscle spasm
  - **ovicidal**
  - **10 minutes**



# Crab lice

- Standard therapy is insecticides
  - treat partners
  - permethrin 1 or 5% , 1 week apart
  - 5% permethrin is the best tx
  - Lindane

Oral ivermectin for perianal and eyelash ,  
or when topical is unsuccessful



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## Lice tx....

- Eyelid lice:
  - physostigmin oc drop 0.25%
  - pilocarpin gel ...
  - Fluoresceine 20%
  - Vaseline 2 hr, permethrin shampoo 1% , wash after 10 min.
  - argon laser .....cryo



# Body lice

- Discard bedding and clothings or disinfect
- machine washing or ironing (55 C)
- Topical insecticides
  - permethrin 5% cream
  - 5-10% sulfur ointment
  - crotamiton 10 % lot or cream
  - Ivermectin









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# Resistance and side effects Of treatment



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# Pharmacological treatment of head lice

- Pharmacologic treatment of head lice is focused on three general mechanisms:
  - neurotoxicity resulting in paralysis of the lice (insecticidal treatments),
  - suffocation via “coating” the lice,
  - dissolution of the wax covering on the exoskeleton.

## 1- Insecticidal agents that are neurotoxic to lice include :

- Permethrin or pyrethrins,
- malathion 0.5% lotion,
- spinosad 0.9% suspension,
- ivermectin 0.5% lotion,
- oral ivermectin (off-label use).

## 2,3- Noninsecticidal agents that rely on suffocation or exoskeleton dissolution include:

- benzyl alcohol 5% lotion ,
- dimethicone solution,
- Isopropyl myristate solution (approved by the U.S. FDA in May 2017 but not yet marketed).



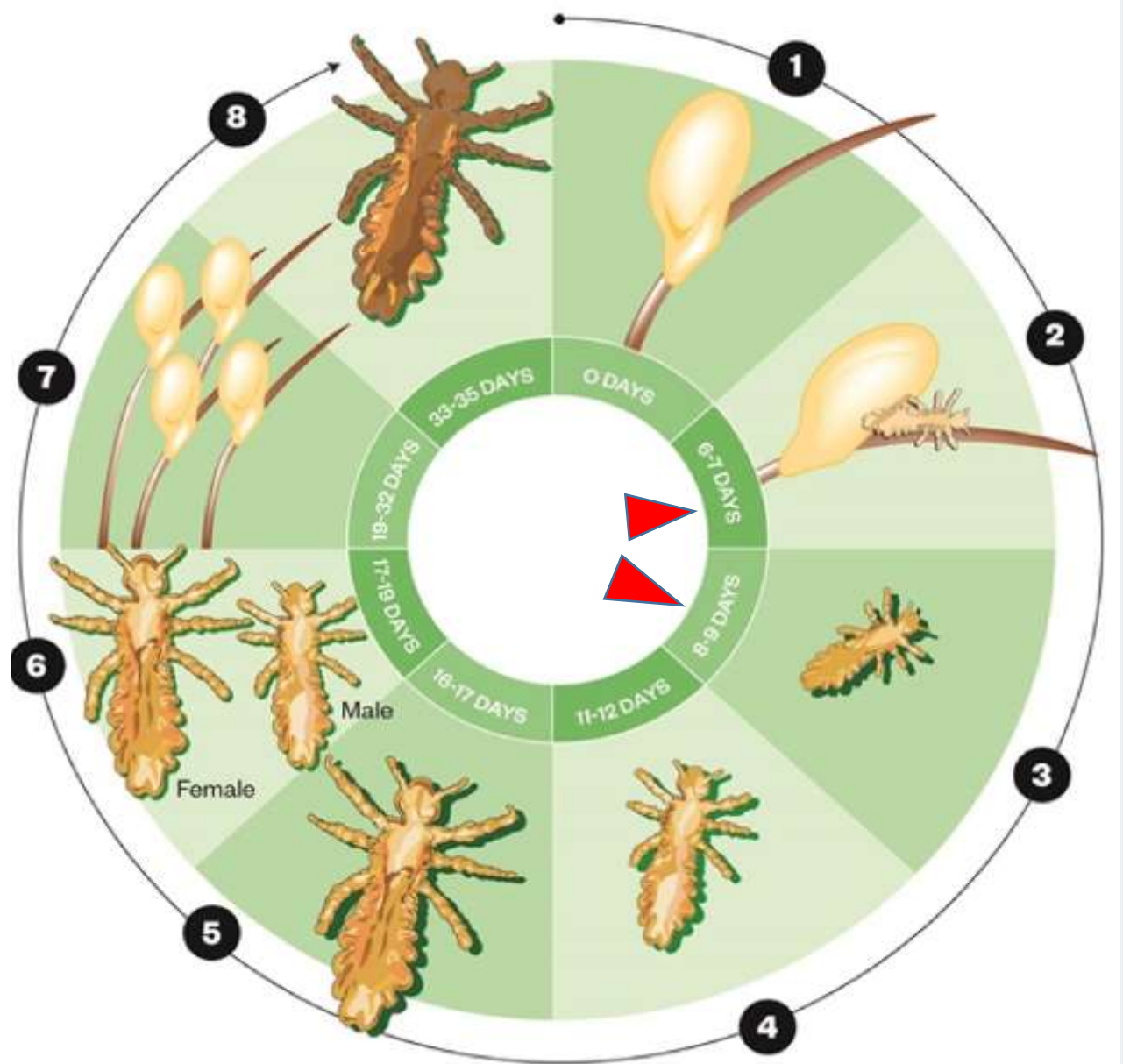
- A key to formulating an effective treatment regimen is recognizing the effectiveness of available treatments in destroying viable eggs because this dictates if retreatment is necessary.
- **Ovicidal agents** : they will kill both live lice and eggs in one treatment
  - Malathion,
  - spinosad,
  - topical ivermectin
- **Nonovicidal agents** : typically require a repeat application for complete eradication.
  - Permethrin and pyrethrins,
  - benzyl alcohol,
  - dimethicone,
  - oral ivermectin,
  - isopropyl myristate





## ❑ Life cycle of the head louse

- 1) Egg (nit) is laid on the hair shaft.
- 2) Nymph emerges from eggs laid on day 0.
- 3) Nymph moults for the first time.
- 4) Second moult.
- 5) Third moult.
- 6) Adult male and female lice mate.
- 7) Female lays first eggs two days after mating and can lay four to eight eggs per day for the next 16 days.
- 8) Louse dies.



## ❑ Resistance and Pseudoresistance :

- **Pseudoresistance** may be due to :
  - poor adherence,
  - incorrect product use (under dosing or not following directions),
  - reinfestation.
- Timing for nonovicidal treatments is based on the life cycle of the louse.
- An initial application followed by a second application seven to 10 days later (nine days is optimal) should be sufficient to eradicate most lice.
- Some authors have postulated that the most effective retreatment schedule for permethrin or pyrethrins might be three doses, on days 0, 7, and 13 to 15.



- Hair conditioner and combination shampoo/conditioner products should not be used prior to pediculicide application.
- Hair conditioners may prevent binding of the pediculicides to the hair shafts.
- The hair should not be re-washed for 1-2 days after the pediculicide is removed.
- After trials of two appropriately administered courses of permethrin, an alternative agent should be used.
- If, after 8–12 hours of treatment, no dead lice are found and lice seem as active as before, the medicine may not be working.
- Nit removal is not needed when treating with spinosad topical suspension.





## ☐ Efficacy :

### ➤ Poor

- ☐ Pyrethrins and Permethrin
- ☐ Lindane (1%)
- ☐ Carbaryl (0.5%)

### ➤ Good

- ☐ Benzyl alcohol (5%)
- ☐ Dimethicone (4%)
- ☐ Spinosad (0.9%)

### ➤ Excellent

- ☐ Malathion (0.5%)
- ☐ Ivermectin (0.5%)
- ☐ Oral ivermectin

## ☐ resistance :

### ➤ common

- ☐ Pyrethrins and Permethrin
- ☐ Lindane (1%)
- ☐ Carbaryl (0.5%)

### ➤ Low or no resistance

- ☐ Benzyl alcohol (5%)
- ☐ Dimethicone (4%)
- ☐ Spinosad (0.9%)
- ☐ Malathion (0.5%)
- ☐ Ivermectin (0.5%)
- ☐ Oral ivermectin



### ❑ First-line therapies

- Malathion 0.5%
- Benzyl alcohol 5%
- Ivermectin 0.5%
- Spinosad 0.9%
- Permethrin

### ❑ Second-line therapies

- **Dimeticone 4%**
- Isopropyl myristate
- Nit picking

### ❑ Third-line therapies

- **Oral ivermectin**

# Considerations when treating head lice

1. Do not use extra amounts of any lice medication unless (The drugs used to treat lice are insecticides and can be dangerous if they are misused or overused) .
2. All the medications should be kept out of the eyes. If they get onto the eyes, they should be immediately flushed away.
3. Do not treat an infested person more than 2–3 times with the same medication if it does not seem to be working. This may be caused by using the medicine incorrectly or by resistance to the medicine.
4. Do not use different head lice drugs at the same time unless instructed to do so by your physician and pharmacist.
5. The AAP recommends rinsing all topical pediculicides from the hair over a sink, rather than in the shower or bath to limit skin exposure, and to use warm water rather than hot water to minimize absorption.





# Permethrin and Pyrethrins

- Organic compounds originally derived from a flower species (chrysanthemum)
- Care should be taken in patients with an allergy to ragweed as cross-reactions may occur.
- Permethrin, a synthetic pyrethroid, is the drug of choice recommended by most authorities as the first line of treatment in head, pubic, and severe body louse infestation.
- Pyrethrins and permethrin can only kill live lice, not unhatched eggs (nits). A second treatment is recommended 9 to 10 days after the first treatment to kill any newly hatched lice before they can produce new eggs.





- An over-the-counter (OTC) 1% concentration (permethrin lotion) may be insufficient for treatment of pubic lice and for some cases of head lice.
- The 5% prescription preparation marketed for scabies may be more effective in some cases although resistance to even the higher-concentration products has developed in head lice and other insects.
- Mean systemic absorption of the permethrin 5% cream is less than 1% to 2%.
- It is metabolized through ester cleavages and virtually all of the absorbed permethrin is excreted in the urine within 1 week.
- Permethrin and Pyrethrin are approved for use in patients older than 2 months and 2 years of age, respectively.

### ❑ Adverse Effects (1-10%):

- Mild and transient burning and stinging (10%)
- Pruritus (7%)

### ❑ Contraindications :

- Hypersensitivity
- < 2 months of age (OTC)

### ❑ Cautions :

- May exacerbates itching, swelling, and redness temporarily
- Avoid contact with eyes
- May cause difficulty breathing or asthmatic attack in patients with ragweed allergies

### ❑ Pregnancy & Lactation :

- Pregnancy Category: B
- These medications are thought to be safe to use in pregnancy and lactation.
- Lactation: It is not known whether permethrin is secreted in human milk; however, the manufacturers suggest that nursing should be discontinued if the drug will be used while the patient is nursing.



## ❑ Resistance :

- Permethrins preferentially bind to voltage-gated sodium channels at a site away from the pore when it is in an open or active state.
- Mutations in the sodium channel have led to several species of scabies and lice to become resistant to permethrins because of a knockdown resistance (kdr) mechanism.
- These mutations cause some of the channels to maintain a closed state, thereby reducing the binding affinity (Point mutations in the gene encoding the  $\alpha$ -subunit of the insects' voltage-sensitive sodium channel).
- An increase in kdr-type mutations has increased from 37% in 2001 to 98% in 2015.
- This correlates to a decline in lice-free patients after the use of permethrin from close to 100% in 1998 to 25% in 2011.
- However, recent studies have found >85–90% success rates for treatment with permethrin in children whose lice had these mutations, suggesting that other factors have a role in pyrethroid resistance.



## Permethrin at a Glance

Indications	Scabies (US FDA-approved) Pediculosis capitis and pubis Demodex folliculitis
Dosage forms	Permethrin 5% cream (Elimite) Permethrin 1% cream (Nix)
Dosing	Scabies: Apply for 8 hours overnight from the neck down. Repeat in 1 week. Pediculosis capitis: Apply to scalp and neck overnight and rinse in the morning. Repeat in 1 week.
Pregnancy category	B
Cost	Permethrin 5% cream 60 g US\$60.73
Adverse effects	Pruritus Mild and transient burning and stinging



# Benzyl Benzoate/Benzyl Alcohol

- Benzyl alcohol lotion 5% ( an aromatic alcohol) has been approved by the FDA for the treatment of head lice and is considered safe and effective when used as directed.
- It is nonneurotoxic and kills head lice by asphyxiation.
- It kills lice but it is not ovicidal →→ A second treatment is needed 7 days after the first treatment to kill any newly hatched lice before they can produce new eggs.
- Benzyl alcohol lotion is intended for use on persons who are 6 months of age and older and its safety in persons aged more 60 years has not been established.
- It is no longer registered for lice control in the USA, and in Canada it is only available on prescription.





### ❑ Side effects :

- pruritus, erythema, pyoderma
- ocular irritation
- allergic reactions
- skin irritations

### ❑ Contraindications :

- None listed by manufacturer

### ❑ Cautions

- May cause contact dermatitis
- Avoid in neonates (**Gaspingsyndrome**)
- Avoid eye exposure



## ❑ Pregnancy & Lactation :

### ➤ Pregnancy category B

Topical use is **unlikely to be absorbed** through skin in clinically relevant amounts; therefore, maternal use is not expected to result in fetal exposure to drug.

### ➤ Lactation

There is no information available on presence agent in human or animal milk, effects of drug on breastfed infant, or on milk production; when used as prescribed, topical benzyl alcohol is **unlikely to be absorbed** through skin in clinically relevant amounts; therefore, breastfeeding is not expected to result in exposure of infant to drug.



## Ivermectin 0.5%

- In 2012 the FDA approved ivermectin 0.5% lotion to treat pediculosis.
- Ivermectin 0.5% lotion is applied to the scalp and hair while dry and after 10 minutes the hair is rinsed with warm water.
- Shampoos and conditioners should be avoided for 24 hours after application to avoid decreasing efficacy.
- Although not ovicidal, because of the prolonged half-life, it is approved as a one-time use.
- Nit combing is not required. After a single treatment, 95% of patients have been found to be louse-free after 2 days.
- Topical ivermectin, malathion, and spinosad have all demonstrated similar safety and efficacy and can be considered first-line agents.



## ❑ Adverse Effects :

- No serious systemic or toxic AE have been reported with topical ivermectin.
- The most common reactions are **skin irritation and localized burning**.
- Approved for individuals **≥6 months of age**

## ❑ Pregnancy and Lactation :

- **pregnancy category B**  
Because there is minimal systemic absorption, topical ivermectin lotion is thought to be safe during pregnancy even though no human data are available.
- Ivermectin lotion can be used by breastfeeding women, but patients should avoid applying the lotion directly on the nipple and areola.



## Malathion lotion 0.5%

- Malathion is an organophosphate (an irreversible cholinesterase inhibitor) .
- Malathion is pediculicidal (kills live lice) and partially ovicidal (kills some lice eggs).
- The FDA recommends applying Ovide 0.5% lotion to dry hair and rinsing with shampoo after 8 to 12 hours.
- Postmarketing studies show similar efficacy after a 20-minute treatment with Ovide 0.5% lotion.
- Malathion is intended for use on persons 6 years of age and older.



## ❑ Adverse Effects :

- No serious systemic AE have been reported with the topical application of malathion.
- Additionally, no significant absorption of malathion was noted in a study of healthy volunteers after malathion was applied to the scalp.
- Any absorbed malathion is rapidly metabolized by tissue A-esterases and carboxylesterases to inactive metabolites that are excreted in the urine.
- Systemic toxicity has been reported only with oral ingestion, where the symptoms are similar to those of other organophosphate poisonings, with cholinesterase depletion.
- Malathion can be irritating to the skin : Stinging sensation, Contact hypersensitivity reaction, Skin and scalp irritation, Conjunctivitis, accidental contact with eyes (mild)





### ❑ **Contraindications ;**

- Hypersensitivity
- neonates (<28 days) and infants

### ❑ **Cautions :**

- Ovide is flammable: avoid hair dryer, smoking, etc.
- for use on persons **6 years of age and older**

### ❑ **Pregnancy and Lactation ;**

- **Pregnancy Category: B**  
Based on limited human data, malathion is not teratogenic
- Although there are no data on use in breastfeeding women, topical malathion may be used because there is **minimal maternal system** absorption.



## ❑ Resistance and Clinical Comparisons :

- Numerous studies have proven that malathion has superior pediculicidal and ovicidal activity compared with permethrin.
- Malathion 0.5% lotion (Ovide) is one of the most effective agents for treating pediculosis capitis in the United States (US).
- Resistance to malathion has been reported in the United Kingdom; however, the UK formulation contains only malathion, whereas, in the US formulation, malathion is coupled with isopropyl alcohol and terpineol (ovide) so there is no reported resistance to malathion in the United States.
- Although drug resistance continues to be a problem with other treatments for pediculosis, Ovide lotion continues to be an effective treatment.
- Malathion along with topical ivermectin and spinosad are reliable first-line agents in the treatment of head lice.



## Malathion at a Glance

Indications	Pediculosis capitis (US FDA-approved)
Dosing	Apply to scalp and neck overnight and rinse in the morning. Repeat in 7–9 days.
Pregnancy category	B
Cost	59 mL bottle US\$118.00
Adverse effects	Potentially <u>flammable</u> Skin irritation



# Spinosad

- Spinosad, available as a topical 0.9% solution, is approved by the FDA to treat pediculosis capitis in 2011 in children over 6 months of age.
- Derived from soil bacterium, it is both ovicidal and pediculicidal by exciting the motor neurons of arthropods, resulting in muscle contractions, paralysis, and death.
- One noted advantage of spinosad is its rapid effect.
- After application to dry hair, the solution can be rinsed out after 10 minutes.
- If live lice are observed after 1 week, a second treatment may be used.
- Spinosad 0.9% solution has been shown to be more effective and easier to use than permethrin 1%.





## ❑ Adverse Effects :

- 1-10%
  - Application site erythema irritation (1-3%)
  - Ocular erythema (2%)
- <1%
  - Application site dryness and exfoliation
  - Alopecia

## ❑ Cautions :

- Contains **benzyl alcohol**; toxicity and deaths reported in neonates and infants **below the age of 6 months** with systemic exposure to benzyl alcohol ( neonatal gasping syndrome)

## ❑ Pregnancy & Lactation :

- Pregnancy **Category: B**; low systemic exposure
- Lactation:
  - ❑ Active ingredient (spinosad) is **not distributed in breast milk**.
  - ❑ however, caution advised because the **benzyl alcohol** component may be systemically absorbed.
  - ❑ Spinosad can be used in breastfeeding women, but breastfeeding should be **avoided for 8 hours** after application. (5 half-lives of benzyl alcohol)

## ❑ Efficacy & resistance :

- Good
- no resistance noted to date





## Spinosad at a Glance

Indications	Pediculosis capitis (US Food and Drug Administration-approved)
Dosing	Pediculosis capitis: apply to the scalp and hair and rinse after 10 minutes. Repeat in 1 week if necessary.
Pregnancy category	B
Cost	120 mL bottle US\$147.00
Adverse effects	Erythema and skin irritation



# Dimethicone

- Dimethicone is a silicone oil that is used as an emollient in skin care products.
- Dimethicone-containing products may suffocate lice or block their ability to excrete water and result in death due to osmotic stress.
- In several randomized controlled studies, a 15-minute or overnight application of 4% dimethicone liquid gel or lotion on day 1 ± day 8 resulted in 70–97% of patients being lice-free on day 14, representing significantly higher efficacy than treatment with 1% permethrin cream rinse or (in the UK) 0.5% malathion liquid.
- Additional agents that are being developed combine dimethicone with penetrating excipients that may improve its effectiveness.
- May serve as a potentially less toxic and an alternative to resistance-prone pesticide-containing products.



### ❑ Adverse Effects :

- (1-10%) Itching or irritation of scalp or neck
- (<1%) Eye irritation

### ❑ Contraindications :

- Hypersensitivity

### ❑ Pregnancy & Lactation :

- Pregnancy **Category: A**
- Lactation: Safe during human breast milk

### ❑ Efficacy & resistance :

- Good
- Used in many clinical trials, its effectiveness may depend on product
- However, resistance to dimethicone is unlikely due to its physical mode of action.



❑ Comparative efficacy of permethrin 1%, lindane 1%, and dimeticone 4% for the treatment of head louse infestation in Iran.

Environ Sci Pollut Res Int.

2020 Sep 12

- Cure rates on days 8 and 15, respectively :
  - Permethrin → 69.4 and 90.1%
  - Lindane → 73 and 86.5%
  - Dimeticone → 60.4 and 94.6%
- It is recommended dimeticone lotion (4%) as a very effective and safe pediculicide for pediculosis control. With proper application, dimethicone can rapidly cure head lice infestation with minimal reinfestation.



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# Lindane

- Lindane is an organochlorine insecticide that inhibits neurotransmission, inducing respiratory and muscular paralysis in parasitic arthropods.
- Repeated exposure or ingestion adversely affects the central nervous system, with multiple reports of seizures attributed to this drug.
- Numerous systemic toxic effects have been reported, including multiple cases of aplastic anemia and leukemia.
- Lindane is widely distributed throughout the body, is slowly metabolized, and is stored in fatty tissues as well as in the brain.
- Moreover, minute amounts of lindane can be detected in the body for months after application.
- Levels are reported to be higher in infants, young children, and those with reduced body fat levels, such as premature infants.





- Although lindane shampoo 1% is approved by the FDA for the treatment of head lice, it is not recommended as a first–line treatment.
- its use should be restricted to patients for whom prior treatments have failed or who cannot tolerate other medications that pose less risk.
- Retreatment should be avoided.
- Lindane carries a boxed warning for neurotoxicity and possible seizures and has been banned in California since 2002.
- Additionally, 52 countries have banned the use of lindane.



## ❑ Adverse Effects (Frequency Not Defined) :

- Slight local irritation (including eczematous eruptions, rash, conjunctivitis)
- CNS toxicity (seizures) , Ataxia, Dizziness, Restlessness, Paresthesia
- Cardiac arrhythmia
- Alopecia
- Urticaria
- Hematuria
- Pulmonary edema
- Hepatitis/Nausea/vomiting
- Aplastic anemia

## ❑ Efficacy & resistance :

- Poor
- resistance common :
  - Physiological resistance among both head and body louse populations to lindane is **widespread.**
  - Due to developed **resistance and safety concerns**, the use of these products should be discussed.



## ❑ Black Box Warnings

- Neurotoxicity, including seizures and death, has been reported with repeat or prolonged application, and rarely with single application.
- Use with caution in those at risk for neurotoxicity including infants, children, elderly persons, those who weigh <50 kg, or those with a history of seizures.
- Use only in patients who have failed first line treatments

## ❑ Contraindications

- Premature neonates (<28 do) (increased absorption)
- Infants and children, elderly, and persons who weigh less than 110 pounds.
- uncontrolled seizure disorder
- Hypersensitivity
- Norwegian (crusted) scabies and skin conditions that may increase systemic absorption



## ❑ Cautions ;

- Not first-line
- Risk of serious neurotoxicity in children weighing <50 kg
- Use caution in **hepatic impairment**
- **HIV infection**
- history of head trauma or a prior seizure, CNS tumor
- excessive use of alcohol
- abrupt withdrawal from alcohol or sedatives
- concomitant use of medications known to lower seizure threshold

## ❑ Pregnancy & Lactation :

- Pregnancy **Category: C**
- Lactation: distributed in breast milk, **not recommended** for breastfeeding mothers or pregnant women
- do not nurse for **24 hr** post-application



# Carbaryl

- Like malathion, carbaryl is a cholinesterase inhibitor.
- This product is not presently available in the US.
- In comparison to malathion, carbaryl is potentially more toxic to patients, while being less lethal to lice.
- Used since 1976, more recent reviews have reported carbaryl to be less effective than previously thought.
- Potentially carcinogenic in rodents, its prescription was restricted in UK.

## ❑ Efficacy & resistance :

- Poor–fair
- Resistance common (not approved in the US)



# Nonpharmacologic Therapy for Head Lice

- Many nonpharmacologic treatments have been recommended as adjunct therapy for head lice.
- Wet combing has been advocated by many in Europe, although it has been shown to be only minimally effective.
- Wetting the hair temporarily immobilizes the lice, facilitating removal when combing. Using diluted vinegar or 8% formic acid can increase efficacy by helping to loosen the nits from the hair during wet combing.
- However, wet combing should not be advocated as a first-line therapy by itself in the treatment of head lice as it is far less effective than either malathion or permethrin.



- Unsubstantiated claims of successful treatment with alternative, non-pesticidal products, including petroleum jelly, hair pomade, olive oil, mayonnaise, vegetable oil, and mineral oil, persist.
- Such products may slow the movements of adult lice and allow them to be more easily combed out of the scalp, but these substances are **not lethal to lice.**
- There is less risk for development of resistance because of the physical mode of action of mineral oil.
- Several essential oils have been reported to be effective as lice therapy, and they have been incorporated into various products that are typically found in health food stores.
- However, appropriate clinical studies are needed to confirm their safety and efficacy.





# Oral Agents

- Oral anthelmintics, including ivermectin, levamisole, and albendazole, have been found to be effective against head louse infestation, but are not approved by the FDA to treat lice.
- Administration should be repeated in 7-10 days to kill lice emerging from nits that may have survived the first treatment.
- Although Cotrimoxazole (trimethoprim/sulfamethoxazole, TMP/SMX) has also been reported as a treatment in head lice, these compounds are not currently recommended for controlling body lice.
- Moreover, using this molecule as a pediculicide was stopped due to the multiple adverse effects (nausea, vomiting, rash, transient pruritus, and allergic-type reactions) recorded in participants in clinical trials.



# Ivermectin

- Ivermectin is most widely used in dermatology for the treatment of scabies, and to a lesser extent for the treatment of pediculosis, demodicosis, and cutaneous larva migrans.
- A single dose of ivermectin has been used empirically to reduce pruritus in homeless populations.
- Ivermectin has been used in the control of hospital and institutional outbreaks of scabies and to decrease disease burden in highly endemic countries, and may be superior to topical treatment in the setting of mass infestation.
- Because lice are only exposed to the drug while feeding, oral ivermectin has no ovicidal activity and (unlike topical ivermectin) two treatments are required.
- oral ivermectin is not recommended for children who weigh <33 pounds (15 kg) and pregnant or breastfeeding women.



- Ivermectin binds selectively with glutamate-gated chloride ion channels in invertebrate nerve and muscle cells, causing cell death.
- Its half-life is 16 hours.
- It is metabolized in the liver.
- Physicians have used this drug for lice and scabies (off-label use) in cases where such therapy was in the best interest of patients and conventional therapy failed.
- Tablet 3mg, Head Lice (Pediculosis capitis; Off-label) : 200-400 mcg/kg PO once; may require 1-2 additional doses repeated after 7 days.



## ❑ Adverse Effects (Frequency Not Defined) :

- few significant adverse reactions
- Less frequent reactions include tachycardia, facial edema, orthostatic hypotension, diarrhea, and nausea.
- CNS symptoms and Stevens–Johnson syndrome (SJS) are rare.
- Liver function test abnormalities have been reported.
  - Neurologic: Asthenia, Dizziness, Headache, Insomnia, Vertigo, Tremor
  - Cardiac: Hypotension, Mild EKG changes, Transient tachycardia
  - GI: Abdominal pain, Diarrhea, Nausea, Vomiting, Hepatitis
  - Cutaneous: Pruritus, Rash, Urticaria, Mild conjunctivitis
  - Hematologic: Eosinophilia, Leukopenia
  - Hyperthermia, Myalgia
  - Mazzotti reaction (with onchocerciasis)



## ❑ Efficacy & resistance :

- Excellent
- **no significant resistance** noted to date but Currently, resistance to ivermectin has been widely demonstrated in many arthropods and is an increasing problem for ectoparasite and nematode control.
- In clinical trials, oral ivermectin, given twice at a 7-day interval, may be **more effective or as efficacious as topical 0.5% malathion lotion.**
- Several authors have suggested that **mass infestations** are the best setting for the use of ivermectin.

## ❑ Pregnancy and Lactation :

- **Pregnancy Category C**
- The manufacturer states that ivermectin **should not be used** during pregnancy and lactation (The drug **enters breast milk** )



# Summary

## ☐ Pregnancy category A

- Dimeticone

## ☐ Pregnancy category B

- Permethrin
- Benzyl alcohol
- Malathion
- Topical ivermectin
- Spinosad

## ☐ Pregnancy category C

- Lindane
- Carbaryl
- Oral ivermectin

## ☐ Use in children

- Permethrin  $\geq$  2m
- Topical ivermectin, Benzyl alcohol, Spinosad  $\geq$  6m
- Malathion  $\geq$  6y
- Oral ivermectin  $\rightarrow$  not recommended for children weighing  $< 15$  kg
- Lindane  $\rightarrow$  not recommended for infants and children





## New Approaches

- Treatment success depends on improving our knowledge of the fundamental biology and physiology of the louse.
- **The endosymbiont** *Candidatus Riesia pediculicola* is a microorganism hosted by body and head lice that appears to be **essential for the production of nutritional** components such as the B vitamins lacking in host feeding.

Human head louse nymph, showing the white, circular mycetome in the abdomen where primary endosymbionts are housed.



## ❑ Symbiotic Treatment :

- Doxycycline given at different doses (10, 20, and 50 g/mL) daily for up to 10 days affects the endosymbiont of lice and also decreases egg production.
- The symbiont *Candidatus Riesia pediculicola* is a possible target for the development of louse-control strategies, because loss of these bacteria would mean the death of their hosts.

## ❑ Synergistic Treatment (Antibiotics + Ivermectin) :

- The synergistic effect is one of the most effective means of lice treatment and also prevents reemergence and resistance.
- Drug combinations such as (doxycycline, erythromycin, azithromycin, or rifampicin) + ivermectin were recommended to treat some infections linked to lice. (increasing efficacy and intracellular concentrations)



# European guideline for the management of pediculosis pubis

## First line therapy

**Permethrin 1% cream**  
(washed off after 10 minutes).  
Repeat after 7-10 days

OR

**Pyrethrins with piperonyl butoxide**  
(washed off after 10 minutes).  
Repeat after 7-10 days

## Second line therapy

**Phenothrin**  
0.2% lotion  
(washed off after 2 hours).

OR

**Malathion**  
0.5% lotion  
(washed off after 12 hours).

OR

**Ivermectin p.o.** - 200 µg/Kg,  
repeat after 7 days  
(in severe cases, 400 µg/Kg  
repeat after 7 days)

## Other therapies

**Ivermectin**  
topical

OR

**Benzyl benzoate**  
lotion 25%

- **Topical treatment** should be applied to all suspected infested regions and nits removed from the hair (combing, using tweezers). Treatment should be reapplied in 7-10 days.
- **Clothing, bedding, towels** etc: machine washed, dry-cleaned, or sealed in plastic bag for two weeks.
- **Follow-up examination** one week after the end of treatment. The infestation is considered cleared if there is no active infestation (no presence of live lice).





Comparison of treatments	Efficacy	Safety
1,2-Octanediol versus <i>malathion</i>	More effective	Adverse effects reported
1,2-Octanediol versus <i>placebo</i>	Effective	No serious adverse events
Cocamide DEA versus <i>permethrin</i>	May be as effective	Adverse effects reported
Phenothrin versus <i>wet-combing</i>	May be as effective	No evidence of harms from combing
Tocopheryl acetate versus <i>permethrin</i>	More effective	No adverse effects reported
Dimeticone versus <i>permethrin</i>	More effective	No serious adverse events
Dimeticone versus <i>malathion</i>	More effective	No adverse effects reported
Dimeticone versus <i>dimeticone plus nerolidol</i>	As effective	No adverse effects reported
Dimeticone 4% lotion versus <i>phenothrin</i>	Equally effective	Few adverse effects reported
Ivermectin versus <i>malathion</i>	As effective	No major adverse effects observed
Ivermectin versus <i>placebo (vehicle)</i>	More effective	No adverse effects reported
Malathion lotion versus <i>phenothrin</i>	More effective	No adverse effects reported
Malathion versus <i>permethrin</i>	More effective	No adverse effects reported
Lindane versus <i>permethrin</i>	As effective	Adverse effects reported
Permethrin versus <i>lindane</i>	More effective	No adverse effects reported
Permethrin versus <i>combing</i>	More effective	No adverse effects reported
Permethrin versus <i>placebo</i>	More effective	No adverse effects reported
TMP-SMX plus permethrin versus <i>permethrin alone</i>	More effective	No major adverse effects reported
Combined insecticides versus <i>herbal oils</i>	As effective	No clinically detectable adverse effects
Soya oil-based shampoo versus <i>permethrin</i>	More effective	No serious adverse events
Coconut and anise in spray versus <i>permethrin</i>	More effective	Adverse effects reported
Combing versus <i>phenothrin</i>	More effective	No evidence of harms from combing
Bug Buster kit versus <i>malathion or permethrin</i>	More effective	No information on adverse effects

**Main products used in clinical trials in humans: efficacy and safety**

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# بررسی اثربخشی عصاره اکالیپتوس در درمان شپش سر



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MEDICAL SCIENCES



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# Introduction



- Traditional head lice treatments include a wide variety of **neurotoxins** including **organochlorines** (lindane), **organophosphates** (malathion), **carbamates** (carbaryl), **pyrethrins** (permethrin). However, this arsenal of pediculicides has failed to **obtain adequate control**
- Their repeated use, residual nature and misapplication has led to the selection of resistant populations of lice
- The increasingly **poor performance** of **neurotoxic** head lice treatments and the **growing public concern** over their use has led to an increase in the commercialisation of alternative treatments



# Introduction

- **Plant essential oils** and their constituents provide a rich source of bioactive chemicals that are easily **extractable** and **biodegradable** and generally have **low mammalian toxicity**
- However, very few in vitro and clinical studies have evaluated the effectiveness of these alternative compounds, and the bulk remain to be scientifically tested







ORIGINAL RESEARCH

# The efficacy of Australian essential oils for the treatment of head lice infestation in children: A randomised controlled trial

Kerryn A Greive and Tanya M Barnes

*Ego Pharmaceuticals, Braeside, Victoria, Australia*



# The efficacy of Australian essential oils for the treatment of head lice infestation in children: A randomised controlled trial

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## ABSTRACT

**Background:** The increase in resistance of head lice to neurotoxic pediculicides and public concern over their safety has led to an increase in alternative treatments, many of which are poorly researched or even untested.

**Methods:** A multicentre, randomised, assessor-blind, parallel-group trial (Trial 1) was conducted to compare the safety and efficacy of a head lice treatment containing Australian eucalyptus oil and *Leptospermum petersonii* (EO/LP solution; applied thrice with 7-day intervals between applications) with a neurotoxic treatment containing pyrethrins and piperonyl butoxide (P/PB mousse; applied twice with a 7-day interval) in children. A single-blind, open trial (Trial 2) was conducted to assess the efficacy of EO/LP solution following a single application. In addition, skin irritancy and sensitisation tests using EO/LP solution were performed in adults and children. *In vitro* tests were performed to further assess the ovicidal and pediculicidal efficacy of EO/LP solution.

**Results:** EO/LP solution was found to be more than

**Conclusion:** The efficacy, safety and relative ease of use of the EO/LP solution make it a viable alternative in treating head lice.

**Key words:** eucalyptus oil, head lice, lemon tea tree oil, piperonyl butoxide, pyrethrin, resistance.

## INTRODUCTION

Infestation with head lice is one of the most common parasitic infestations of humans worldwide.<sup>1</sup> Schoolchildren aged between 5 and 14 years are generally the most affected group, with the prevalence of lice infestation estimated to be between 6–12 million children in the USA annually.<sup>2</sup> The main symptoms associated with infestation include itching and discomfort, which may lead to substantial social distress, parental anxiety, embarrassment, and unnecessary absence from school and work.<sup>3</sup> The cost of head louse infestation in the USA has been estimated to be \$1 billion annually.<sup>4</sup>





Following a single application of the EO/LP solution to the hair of the 11 enrolled children, 1418 head lice were collected. All lice were observed to be putatively dead as they were wet-combed out of the hair. All head lice were re-examined 50 min after combing was finished and were confirmed dead, as shown in Table 5.

### Skin irritancy and sensitisation study

Altogether 56 participants were enrolled and 53 completed the study. There were three male and 53 female

**Table 5** Trial 2: Number of head lice detected by wet-combing following a single application of the EO/LP solution

Subject	Number of head lice detected by wet-combing		
	Alive <sup>†</sup>	Moribund <sup>‡</sup>	Dead <sup>§</sup>
1	0	0	10
2	0	0	17
3	0	0	320
4	0	0	663
5	0	0	5
6	0	0	7
7	0	0	16
8	0	0	8
9	0	0	360
10	0	0	12
11	0	0	0
Total	0	0	1418

<sup>†</sup>Alive, able to move and right itself when rolled onto its back; <sup>‡</sup>moribund, cannot right itself when rolled onto its back; <sup>§</sup>dead, no movement of any kind. EO/LP, eucalyptus oil and *Leptospermum petersonii*.

tively. The EO/LP solution was therefore found to be 100% ovicidal compared with the water control when tested under the conditions described.

The data in Table 7 show that 60 min following a 10-min exposure to the EO/LP solution 100% of the body lice were moribund or dead, while all the body lice treated

**Table 6** The percentage of hatched louse eggs up to 10 days following a 10-s immersion in either the EO/LP solution or water ( $n = 100$  eggs each for EO/LP solution and water control)

Treatment	Percentage of hatched eggs				
	Day 6	Day 7	Day 8	Day 9	Day 10
EO/LP solution	0	0	0	0	0
Water control	0	24 ± 7*	76 ± 4*	92 ± 8*	92 ± 8*

\* $P < 0.0001$ . Results presented as mean ± SEM. EO/LP, eucalyptus oil and *Leptospermum petersonii*.

**Table 7** Mortality of body lice 60 min following a 10-min exposure to either the EO/LP solution or water ( $n = 100$  lice for the EO/LP solution,  $n = 50$  lice for water control)

Treatment	Alive <sup>†</sup> (%)	Moribund <sup>‡</sup> (%)	Dead <sup>§</sup> (%)	Corrected mortality <sup>¶</sup> (%)
EO/LP solution	0	25.3 ± 2.5*	74.7 ± 2.5*	100*
Water control	100	0	0	0

\* $P < 0.0001$ . Results presented as mean ± SEM. <sup>†</sup>Alive, able to move and right itself when rolled onto its back; <sup>‡</sup>moribund, cannot right itself when rolled onto its back; <sup>§</sup>dead, no movement of any kind; <sup>¶</sup>corrected mortality (%),  $(\% \text{ alive in water control} - \% \text{ alive in test}) / \% \text{ alive in water control} \times 100$ . EO/LP, eucalyptus oil and *Leptospermum petersonii*.

# A randomised, double-blind, comparative efficacy trial of three head lice treatment options: malathion, pyrethrins with piperonyl butoxide and *MOOV Head Lice Solution*

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TABLE 1: Cure rates for the primary efficacy endpoint

Treatment product	Subjects cured	Cure rate
<i>MOOV Head Lice Solution</i>	33/40	82.5%†
<i>Banlice Mousse</i>	13/36	36.1%
<i>KP24 Medicated Foam</i>	11/37	29.7%

† Significantly better than either comparator ( $p < 0.0001$ )



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The cure rates were determined one week after the final product application: day 14 for *KP24* and *Banlice*, day 21 for *MOOV*. *KP24* had a cure rate of 29.7%, *Banlice* had a cure rate of 36.1% and *MOOV* had a cure rate of 82.5% (See Table 1).

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<i>KP24 Medicated Foam</i>	11/37	29.7%

† Significantly better than either comparator ( $p < 0.0001$ )

Using chi-squared tests with a Bonferroni adjustment to allow for multiple comparisons, it was found that *MOOV* was significantly more effective in curing head lice infestations than either *Banlice* ( $p < 0.0001$ ), or *KP24* ( $p < 0.0001$ ).

### Safety

Of the 152 subjects enrolled, 23 adverse events were reported: 18 for *MOOV*, three for *Banlice*, two for *KP24*. The adverse events related to scalp sensations experienced by the subjects during product application, i.e. itching, a hot sensation, stinging and burning. All the adverse events resolved completely within five minutes of the products being washed from the hair.

### Discussion

Head lice are a community concern that is not being sufficiently addressed by current treatments, be they traditional, herbal or combine. The World

combing, efficacy was determined one week after the final application, subjects were randomised, the study was double-blinded and adequately powered to allow statistical analysis. In addition, the siblings of the enrolled subjects were examined for head lice.

*MOOV Head Lice Solution* achieved an 82.5% cure rate, while *Banlice* and *KP24* achieved cure rates of 36.1% and 29.7% respectively. *MOOV Head Lice Solution* is not only significantly more effective than *Banlice* ( $p < 0.0001$ ) and *KP24* ( $p < 0.0001$ ), it is twice as effective as either product.

*Banlice* and *KP24* have promoted their ability to kill head lice and eggs in one application. In accordance with the recent recommendations from the TGA<sup>20</sup> *Banlice* and *KP24* were applied twice in this study, with seven days between each application.

*MOOV Head Lice Solution* was applied three times, each application being seven days apart. Head lice eggs can take up to 10 days to hatch, so by including a third application in the treatment regimen, any lice that hatch from an egg laid immediately before the first application will be killed by the third application. This reduces the likelihood of the primary head lice infestation continuing. While *MOOV Head Lice Solution* kills eggs and lice, the survival of only a few out of thousands of eggs is sufficient for the infestation to continue. By incorporating a third application into the regimen, it ensures that the infestation is eradicated.

Transient, mild to moderate adverse events were reported for all three treatments and were largely described as itching, stinging or burning. The sensations dissipated when the treatments were washed out after the prescribed application periods. Overall the three treatments were well tolerated by the subjects.



## research peer reviewed

prevent repeat infestation. A highly efficacious treatment in combination with constant vigilance is the best defence against reinfestation.

### Resistance

The relatively low cure rates for *Banlice* and *KP24* may be explained by resistance within the louse population, or by the stringent definition of a cure as measured one week after the last treatment application. It has clearly been demonstrated that head lice around the globe is becoming increasingly resistant to traditional head lice treatments such as malathion and permethrin.<sup>16</sup> <sup>19</sup> The residual nature of these materials results in low levels remaining in the hair for many days after product application. These persistent low levels, allow for the selection and dominance of resistant lice. Although once very effective, due to their residual nature, these treatments have now become ineffective.

*MOOV Head Lice Solution* has a volatile active combination that will enable the high cure rates observed in this trial to be maintained into the future. Once the product is washed from the hair, any residual eucalyptus oil will rapidly volatilise from the hair. This should prevent the emergence of resistance, thus helping to maintain the efficacy of *MOOV Head Lice Solution*.

### Wet combing

The best technique for detecting a head lice infestation is the wet-combing technique.<sup>27,28</sup> The conditioner that is combed from the hair provides a contrast to the black-grey lice that are combed from the hair. An infestation

children, this represents a significant improvement in the lifestyle impact of a head lice infestation.

Reinfestation is an ongoing concern for diligent parents. Although currently no product can prevent reinfestation, the availability of an effective head lice product will always make the treatment of a head lice infestation easier.

### Conclusion

*MOOV Head Lice Solution* has been shown in a randomised, double-blind clinical trial in a relevant population to be twice as effective in curing head lice infestations as two popular treatments, piperonyl butoxide with pyrethrins, and malathion.

*MOOV Head Lice Solution* is the first herbal-based head lice treatment registered by the Australian TGA. In addition it does not need to be combined with combing to effect a cure; this represents a significant time saving for parents and an improvement in the lifestyle impact a head lice infestation will have.

*MOOV Head Lice Solution* is an effective head lice treatment using natural active ingredients that provides a quick treatment protocol that is twice as effective as traditional treatments and does not require supportive combing.

#### *Declarations of interest*

*Kerym Greive and Jane Oppenheim are employed full time by Ego Pharmaceuticals, the sponsor of the clinical trial and manufacturer of MOOV Head Lice Solution. James Rowe, Philip Altman and John Staton are consultants employed by Ego Pharmaceuticals.*



# ارزیابی تاثیر اسانس های اکالیپتوس و دارچین در مقایسه با پرمترین در درمان آلودگی به شپش سر دکتر محمد باقر قوامی<sup>۱</sup>، صفورا احمدی<sup>۲</sup>



جدول ۲: فراوانی افراد درمان شده در گروه های مطالعاتی دانش آموزان آلوده به شپش سر در شهرستان زنجان در سال ۱۳۹۴

گروه درمانی (نوع شامپو)	تعداد تحت درمان	تعداد و درصد بهبود یافته	تعداد و درصد بهبود نیافته
پرمترین ۱ درصد	۳۰	۱۸ (۶۴/۳)	۱۰ (۳۵/۷)
اکالیپتوس ۴ درصد	۳۴	۲۶ (۸۱)	۶ (۱۹)
دارچین ۲ درصد	۳۱	۱۶ (۵۳/۳)	۱۴ (۴۶/۷)

اعداد داخل پرانتز به درصد بیان شده اند.



جدول ۲. فراوانی افراد درمان شده در گروه‌های مطالعاتی دانش‌آموزان آلوده به شپش سر در شهرستان زنجان در سال ۱۳۹۴

گروه درمانی (نوع شامپو)	تعداد تحت درمان	تعداد و درصد بهبود یافته	تعداد و درصد بهبود نیافته
پرمترین ۱ درصد	۳۰	۱۸ (۶۰/۳)	۱۰ (۳۵/۷)
اکالیتوس ۴ درصد	۳۴	۲۶ (۸۱)	۶ (۱۹)
دارچین ۲ درصد	۳۱	۱۶ (۵۲/۳)	۱۴ (۴۶/۷)

اعداد داخل پرانتز به درصد بیان شده‌اند.

در بررسی آزمایشگاهی قبل از مداخله میزان باز شدن تخم‌های شپش در سه گروه مطالعاتی درمان با شامپوی اکالیتوس، پرمترین و دارچین به ترتیب ۵۴/۳ درصد، ۵۰ درصد و ۵۵/۳ درصد دیده شد و میزان تلفات در تخم‌ها در گروه‌های مطالعاتی یکسان بود ( $P=0/17$  و  $X^2=0/5$ ). با به کارگیری شامپوها میزان تلفات تخم‌ها در مدت بررسی در گروه‌های فوق به ترتیب به ۸۰/۷ درصد، ۷۱/۶ درصد و ۶۳/۵ درصد رسید (جدول ۳).

میزان باز شدن تخم‌های شپش قبل از مداخله در گروه تحت درمان با شامپوی اکالیتوس ۵۴/۳ درصد دیده شد. با به کارگیری شامپو این میزان به ۱۹/۳ درصد کاهش یافت. مقایسه‌ی میزان تلفات تخم‌ها در قبل و بعد از درمان با شامپوی اکالیتوس معنی‌دار بود ( $P=0/0001$ ) و همچنین در گروه تحت درمان با شامپو دارچین قبل از مداخله میزان باز شدن تخم‌های شپش ۵۵/۳ درصد بیان شد که این میزان با به کارگیری شامپو به ۳۷/۵ درصد کاهش یافت. مقایسه میزان تلفات تخم‌ها در قبل و بعد از

درمان با شامپو تفاوتی را نشان نداد ( $P=0/08$  و  $X^2=3$ ). قبل از مداخله میزان باز شدن تخم‌های شپش در گروه مطالعاتی تحت درمان با شامپو پرمترین ۵۰ درصد بیان شد. بعد از مداخله این میزان به ۲۹/۴ درصد کاهش یافت. مقایسه‌ی میزان تلفات تخم‌ها در قبل و بعد از درمان، با شامپوی پرمترین تفاوت معنی‌دار ( $P=0/009$  و  $X^2=7/61$ ) را نشان داد (جدول ۳).

بعد از مداخله مقایسه میزان تلفات تخم‌ها در دو گروه تحت درمان با اکالیتوس و پرمترین، تفاوتی را نشان نداد ( $P=0/28$  و  $X^2=1/13$ ) همچنین در مقایسه بین شامپو دارچین و شامپو پرمترین تفاوتی دیده نشد و هر دو شامپو به یک نسبت بر روی تخم شپش موثر بودند ( $X^2=0/34$  و  $P=0/56$ ). در مقایسه میزان تلفات تخم‌ها در دو گروه درمانی اکالیتوس و دارچین با حدود اطمینان ۹۰ درصد، تفاوت معنی‌دار دیده شد ( $P=0/06$  و  $X^2=42/3$ ) و شامپوی اکالیتوس بهتر از شامپوی دارچین بر تخم‌های شپش اثر داشت.



جدول ۳. درصد باز شدن تخم شپش سر در روزهای مختلف قبل و بعد از درمان در گروه‌های مختلف مطالعه

روز بعد از نمونه‌گیری	گروه مطالعه					
	اکالپتوس ۴ درصد		دارچین ۲ درصد		پرمترین ۱ درصد	
	قبل از درمان	بعد از درمان	قبل از درمان	بعد از درمان	قبل از درمان	بعد از درمان
۳	۲۰/۱	۰	۷/۲	۰	۱۲/۹	۸/۸
۷	۴۰/۸	۱۱/۵	۳۶/۴	۲۸/۱	۴۴/۳	۱۹/۱
۱۴	۵۴/۳	۱۹/۳	۵۵/۳	۳۷/۵	۵۰	۲۹/۴

## بحث

مطالعه حاضر نشان داد که ۱۰/۶ درصد دانش‌آموزان دختر مناطق مورد مطالعه شهرستان زنجان به شپش سر آلوده‌اند. در مطالعات اخیر محققین، مقادیر مختلفی بر میزان شیوع پدیکلوز در دانش‌آموزان ایران گزارش شده است. در شهرستان زابل آلودگی دانش‌آموزان به شپش سر به میزان ۲۹/۳ درصد، بوشهر ۲۲ درصد، یاسوج ۲۱/۸ درصد، همدان ۱۳/۵ درصد، قم ۱۳/۳ درصد و اهواز ۱۱ درصد گزارش شده است (۷). در مقابل مناطق فوق آلودگی به شپش سر در دانش‌آموزان شهرستان تبریز ۳/۶۴ درصد (۸)، ساری ۱/۶۵ درصد و ریاط کریم ۱/۲۵ درصد (۷) اعلام شده است. در مطالعاتی که قوامی (۹) از شهرستان زنجان انجام داده بود

گروه مورد بررسی نمی‌تواند نماینده‌ی واقعی در بیان میزان شیوع آلودگی به شپش سر در شهرستان زنجان باشد. در هر صورت مقادیر دقیق میزان شیوع در مطالعات آینده که حجم نمونه کافی را پوشش داده باشد، می‌تواند مشخص شود. بالا بودن میزان آلودگی و ثابت بودن آن در زنجان در مقایسه با شهرستان‌های دیگر (تبریز، ساری و چند شهرستان دیگر) ممکن است به علت پایین بودن میزان مراقبت افراد و ناکافی بودن میزان تأثیر داروها مرتبط باشد.

در مطالعات اخیر در میان اسانس‌های گیاهی خاصیت شپش‌کشی اسانس اکالپتوس و دارچین بیش از اسانس‌های دیگر به اثبات رسیده است (۱۷ و ۱۶).

یافته‌های پژوهش حاضر نشان داد که به کارگیری شامپوی

قبل از انجام شده در زنجان و مطالعات کشورهای اروپایی نشان می‌دهد که نمونه‌های شپش سر در مناطق مطالعاتی نسبت به پرمترین مقاوم هستند و میزان کارایی کمتر از ۷۵ درصد است. از سوی دیگر در منطقه‌ی مطالعاتی کاهش سطح حساسیت به پیرتروئیدها در ناقلین دیگر نیز گزارش شده است (۳۱). این وضعیت در این ناقلین به کاربرد زیاد این ترکیبات و عدم به کارگیری ترکیبات جایگزین مرتبط است. بدین ترتیب جهت کاهش احتمال مقاومت بازنگری در نحوه مراقبت افراد و مدیریت کنترل پدیکولوز در این منطقه ضرورت دارد.

### نتیجه‌گیری

یافته‌های پژوهش حاضر نشان داد که شامپوی اکالیپتوس بهتر از دو شامپوی پرمترین و دارچین، افراد آلوده به شپش سر را درمان می‌کند. ضمن معرفی این شامپو در درمان افراد آلوده، انجام مطالعات الکتروفیزیولوژیک برای تعیین نحوه‌ی تاثیر ترکیبات موثر اسانس اکالیپتوس (۱) و ۸ سینئول و آلفاپاینن)، مطالعات جامع بیوتکنولوژی جهت انتخاب و اصلاح واریته‌های اکالیپتوس گلومروس که مقادیر زیادی از این ترکیبات موثر را تولید کند و مطالعات نانوتکنولوژی برای بهبود عملکرد حشره‌کش در ساختار مولکولی این ترکیبات لازم است. همچنین معرفی فرمولاسیون‌های موثر و معرفی ترکیبات همیار سینترزیست، بی‌ضرر بر انسان، و شیوه‌های

کاهش هزینه‌های اجرایی تهیه این فرمولاسیون‌ها برای پژوهش‌های آینده ضروری است. در منطقه‌ی مطالعاتی همچون مناطق دیگر ایران جمعیت‌های شپش سر نسبت به ترکیبات پیرتروئیدی متحمل و مقاوم هستند. جهت پیشگیری از گسترش مقاومت، مدیریت صحیح کنترل ناقلین و کاهش فراوانی نسبی آل‌های مقاوم، کاربرد اسانس اکالیپتوس و ترکیبات جایگزین با مکانیسم اثر متفاوت با پیرتروئیدها، بکارگیری توام و تلفیقی پرمترین و ترکیبات دیگر حشره‌کش‌های مجاز در درمان افراد و انجام مطالعات علمی برای تعیین فراوانی نسبی آل‌های مقاوم به حشره‌کش‌ها ضروری است.

### تقدیر و تشکر

این تحقیق با کد اخلاق پزشکی ZUMS.REC.۱۳۹۴/۱۶۶ و حمایت مالی معاونت تحقیقاتی و فناوری اطلاعات دانشگاه علوم پزشکی زنجان انجام یافته است. نویسندگان بر خود لازم می‌دانند از همکاری صمیمانه آقای مهندس جمشید محمدی، معاونت محترم بهداشتی دانشگاه علوم پزشکی زنجان، آقای دکتر خسرو شاهی رئیس مرکز بهداشتی درمانی شماره ۱۵، خانم جلیلی مراقب بهداشت مرکز بهداشتی درمانی شماره ۱۵ و خانم سهرابی مراقب بهداشت مدارس سپاسگزاری نمایند.



# Resistance

- The **essential oils** used in solution are **volatile** and do not remain on the scalp after treatment.
- This property, along with the fact that the solution is lethal to all head lice within a **10-min treatment** is unlikely to cause the rapid rise in resistance that has been seen for traditional neurotoxic products.







**No-lice®**  
Eucalyptus Extract





# No-Lice

Topical solution

محلول ضد شیش با شانه مخصوص

قابل استفاده در کودکان بالای ۶ ماه و بزرگسالان



**No Lice with No-Lice**



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تلفن: ۸۸۹۶۲۹۸۱ فکس: ۸۸۹۶۲۶۵۳

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# راهنمای آموزشی و دستورالعمل کشوری مراقبت پدیکولوزیس

وزارت بهداشت درمان و آموزش پزشکی

معاونت بهداشت

مرکز مدیریت بیماریهای واگیر - دفتر سلامت جمعیت، خانواده و مدارس

اداره مدیریت بیماریهای منتقله از آب و غذا و عفونتهای بیمارستانی - اداره سلامت نوجوانان، جوانان و مدارس

سال ۱۳۹۹





### ۳) محلول موضعی نولایس:

محلول موضعی گیاهی نولایس عصاره هیدرو الکلی اکالیپتوس است که برای شپش سمی بوده و باعث تخریب سیستم عصبی و از بین رفتن آنها می شود. این دارو خطر سمیت بسیار پایینی دارد. طریقه مصرف محلول نولایس: ابتدا باید از ریشه تا نوک موهای خشک به محلول نولایس آغشته شود (موها نباید خیس یا مرطوب باشد). باید دقت نمود که تمامی موها و پوست سر کاملاً توسط محلول آغشته گردد سپس یک کلاه پلاستیکی روی سر و موها گذاشته شود. پس از ۱۰ دقیقه، بایستی موها را با شامپوی معمولی شستشو داد. زیر فشار آب به کمک شانه دندانه ریز، شپش های مرده و تخم شپش ها را از موها جدا نمود. برای اطمینان از درمان، می توان یک هفته بعد نیز استفاده از محلول را مجدداً تکرار کرد.



### ۴) شامپوی گامابنزن (لیندان) :

ابتدا باید موها را با مقدار کافی شامپو آغشته کرده، به دقت ماساژ داده شود. بعد از ۴ دقیقه موها را به طور کامل با آب شستشو داد. با شانه دندانه ریز و زیر فشار آب نسبت به حذف شپش های مرده و رشک اقدام گردد. یک هفته بعد نوبت دوم درمان توصیه می شود. توجه داشته باشید لیندان به علت سمیت بالا و تشنج در افراد عادی خصوصاً کودکان و زنان باردار توصیه نمی شود.

مصرف لیندان در مکان های پرخطر مانند زندان ها، کمپ ها و اردوگاه های معتادین با نظر پزشک بلامانع است.





### ویژگی جعبه جدید نولایس

- ری مدلینگ در طراحی بصری و ارتقا کیفیت و جنس جعبه
- درج توضیحات و معرفی شانه استیل نولایس بر روی جعبه، به عنوان کالایی که مجزا میتوان تهیه کرد.
- درج راهنمای چرخه ی نابودی شپش با 3 مرتبه استفاده از محلول در دوره ی 14 روزه.
- اشاره به تاییدیه بالینی دارو
- اشاره به اثر بخشی سریع 10 دقیقه ای
- حاوی کلاه مخصوص چند بار مصرف
- گسترده شدن جعبه از محل پرفراژو تبدیل به
- بروشور با توضیحات کامل
- درج شماره مرکز پشتیبانی و مشاوره علمی







برای اولین بار در ایران

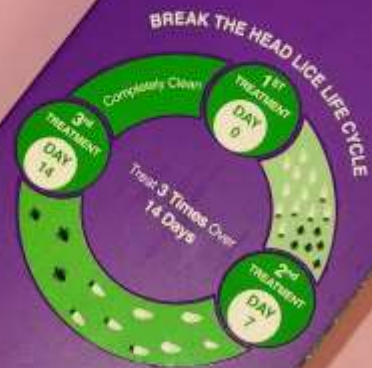




۳ مرتبه استفاده در مدت ۱۴ روز  
تا از بین بردن کامل چرخه عمر شپش



۳ مرتبه استفاده در مدت ۱۴ روز  
تا از بین بردن کامل چرخه عمر شپش



هر ۱۰۰ میلی لیتر محلول حاوی:  
روغن اکالیپتوس ۱٪ وزنی  
استاندارد شده بر اساس ۷۰-۹۰٪ وزنی اسپینول

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بسمه تعالی

شماره : ۴/۱۶۸۰  
تاریخ : ۱۳۹۶/۰۷/۰۱  
پیوست :

... سال اتمام تحصیلاتی، تولید...

## رئیس محترم مرکز مدیریت بیماریهای واگیر

موضوع: اجرای طرح پابلوت ارزیابی محلول نولایس در درمان موارد آلوده به پدیکلوزیس سر

با احترام

عطف به نامه شماره ۱۳۴۴/د ۳۰۴ مورخ ۹۶/۲/۳ در خصوص اجرای طرح پابلوت ارزیابی اثربخشی محلول نولایس در درمان موارد آلوده به پدیکلوزیس سر در استان مازندران ، بدینوسیله نتایج حاصل از اجرای طرح فوق الذکر در ۵ شهرستان منتخب دانشگاه علوم پزشکی مازندران جهت استحضار حضورتان ارسال می گردد.

دکتر حسن اعرابی

رئیس مرکز بهداشت استان  
و معاون بهداشتی دانشگاه



دانشگاه علوم پزشکی و خدمات بهداشتی درمانی  
استان اصفهان  
مرکز بهداشت استان

رئیس محترم مرکز مدیریت بیماریهای واگیر دار وزارت بهداشت

با سلام و احترام،

پس از حمد خدا و درود و صلوات بر حضرت محمد و آل محمد (ص)، عطف به نامه شماره ۳۰۴/۱۳۴۴ مورخ ۳ اردیبهشت ماه سال جاری، گزارش استفاده از داروی معرفی شده No-lice به پیوست ارسال می گردد.

دکتر رضا خدیوی  
معاون بهداشتی و رئیس مرکز  
بهداشت استان  
از طرف دکتر بهمن همدانی  
معاون فنی مرکز بهداشت استان

اصفهان: خیابان ابن سینا، جنب بیمارستان امین - حوزه معاونت بهداشتی  
تلفن: ۳۲۶۶۰۰۰۹  
پست الکترونیکی: Health@mul.ac.ir

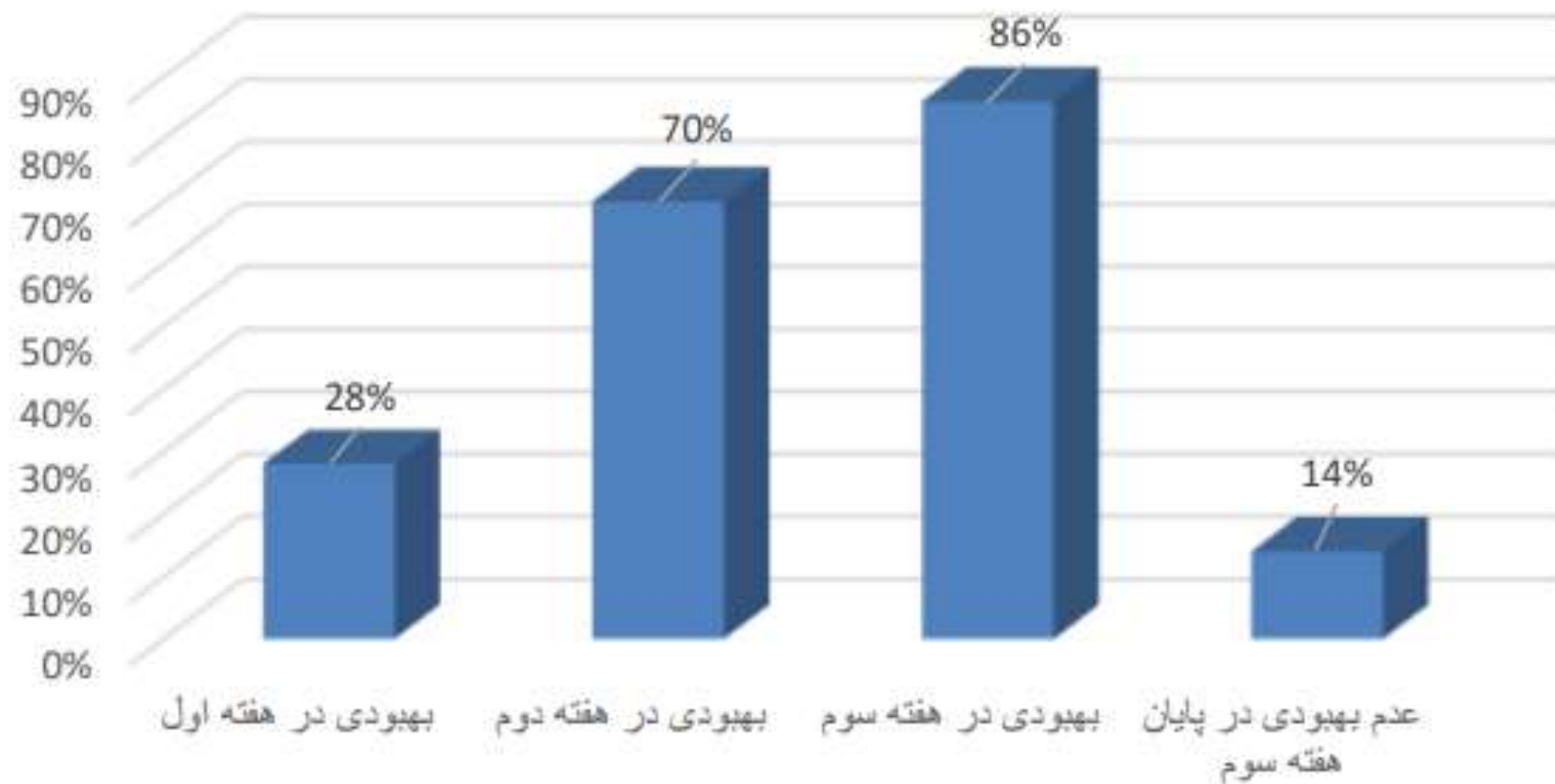
ورود به دبیرخانه: ۱۴۸۰  
شماره: ۱۹۰۴

تعداد ۵۰ نفر زن و مرد آلوده به پدیکلوزیس سر در این مطالعه شرکت کردند. تعداد ۴۴ نفر (۸۸ درصد) زن و ۶ نفر (۱۲ درصد) مرد بودند. میانگین سنی این افراد  $11/91 \pm 8/68$  بود. در هیچ یک از داوطلبان هیچ کدام از معیارهای خروج از طرح محقق نشد. درصد بهبودی در هفته های مختلف به تفکیک مراکز بیمارگیری در جدول شماره ۱ آمده است.

جدول شماره ۱: میزان بهبودی در هفته های مختلف درمان نو-لایس، به تفکیک مراکز بیمارگیری

ردیف	شهرستان	نتیجه درمان					
		پایان هفته اول درمان		پایان هفته دوم درمان		پایان هفته سوم درمان	
		تعداد بهبودی	درصد بهبودی	تعداد بهبودی	درصد بهبودی	تعداد بهبودی	درصد بهبودی
۱	نوشهر	۱	۱۰	۷	۷۰	۱۰	۱۰۰
۲	گلوگاه	۶	۶۰	۷	۷۰	۹	۹۰
۳	قائم شهر	۰	۰	۹	۹۰	۹	۹۰
۴	عباس آباد	۴	۴۰	۴	۴۰	۵	۵۰
۵	بابل سر	۳	۳۰	۸	۸۰	۱۰	۱۰۰
۶	کل	۱۴	۲۸	۳۵	۷۰	۴۳	۸۶





نمودار شماره ۱: میزان موفقیت درمان در هفته های مختلف درمان با نو-لایس



تا تاریخ ۹۶/۴/۲۶ تعداد ۳۶ نفر افراد آلوده به پدیکولوز در استان اصفهان با داروی نولایس تحت درمان قرار گرفته اند. از این تعداد ۳ نفر زیر ۶ سال، ۱۸ نفر بین ۶-۱۲ سال، ۱ نفر بین ۱۲-۱۸ سال و ۱۴ نفر بالای ۱۸ سال بوده اند.

نتیجه بهبودی برای ۴ نفر در همان بار اول طوری بود که نیاز به درمان بار دوم نداشت. برای ۶ نفر بهبودی با مصرف دومین بار به دست آمد چرا که در مرحله اول به توصیه های بهداشتی عمل نشده بود. برای ۲۴ نفر بعد از استفاده اولیه نیاز به استفاده مجدد دیده شد و بهبودی حاصل گردید و برای ۲ نفر با بار سوم هم درمان حاصل نشد. پرس و جو از بیمار نشان داد که به توصیه های مراقبین به درستی عمل نشده است.









# نو- لایس®

مکانیسم اثر: این دارو حاوی عصاره هیدروالکلی اکالیپتوس است که برخی ترکیبات متشکله از جمله مونوترپنوئیدها و مشتقات تترالین ، برای شپش سمی بوده و باعث تخریب سیستم عصبی و از بین رفتن آنها میشود. حاوی بنزیل الکل است که منجر به اختلال در سیستم تنفسی و منجر به خفگی شپش می گردد. این عصاره مقاومت دارویی ایجاد نمیکند. همچنین خطر سمیت بسیار پایینی نسبت به پرمترین و محصولات مشابه دارد و این مساله بویژه در کودکان حائز اهمیت است و قابل استفاده در کودکان بالای ۶ ماه می باشد. همچنین در خانم های باردار کاملاً ایمن می باشد.

دارای تاییدیه کارایی از استان مازندران و اصفهان می باشد.

دارای کلاه قابل شستشو و **شانه مخصوص فلزی استیل دابل استریپ و دارای ذره بین** با بزرگنمایی بالا در ایران است و بدلیل جنس استیل و زنگ نزن آن قبل هر بار استفاده به مدت ۳ دقیقه در آب جوشانده شود و دوباره استفاده گردد.



**روش مصرف:** روی موهای خشک استفاده شود. پوست سر نباید آغشته به هیچ ماده ای از جمله روغنهای گیاهی طبیعی باشد به دلیل اینکه ممکن است با مکانیسم بیوشیمیایی دارو تداخل ایجاد کند. از تماس دارو با چشم خودداری شود.

در ابتدا محصول را به موهای ناحیه پشت گوش و پشت گردن بمالید سپس به بقیه مو استعمال شود برای اطمینان از اینکه مو به طور کامل با دارو مرطوب شده است محصول را به اندازه کافی به موها بمالید مقدار مورد استفاده به طول و ضخامت مو بستگی دارد.

تمام مو از جمله گوش و پشت گردن را با کلاه بپوشانید. روی مو باید به مدت ۱۰ دقیقه بماند سپس کلاه را برداشته مو را با شامپو به صورت نرمال بشویید. سپس موها را تقسیم کرده و موهای هر قسمت را به سمت بالا نگه دارید با شانه مخصوص چندین بار از کف سر به سمت بالا تا نوک مو بکشید و شانه آغشته با شپش را با یک دستمال تمیز پاک کنید. کلاه مجددا قابل استفاده است با آب گرم و صابون بشویید و خشک کنید. مراحل بالا را ۷ و ۱۴ روز بعد از اولین استفاده مجدد تکرار شود. قبل از هر بار استفاده از شانه آنرا به مدت ۳ دقیقه در آب جوش بجوشانید. این دارو در صورت نیاز با نظر پزشک برای تمامی اعضا خانواده نیز تجویز میشود.



جدیدترین  
فرمولاسیون  
ضد شپش  
موجود در بازار

## مزایای نو- لایس

✓ فراورده ای با پایه گیاهی

✓ دارای سمیت بسیار پایین تر نسبت به ترکیبات شیمیایی

✓ دارای تاییدیه از دانشگاه های علوم پزشکی اصفهان و مازندران

✓ قابل مصرف در کودکان بالای ۶ ماه

✓ دارای شانه مخصوص فلزی دنداندار و ذره بین دار با کارایی بالا

✓ ۲۰۰ میلی لیتر

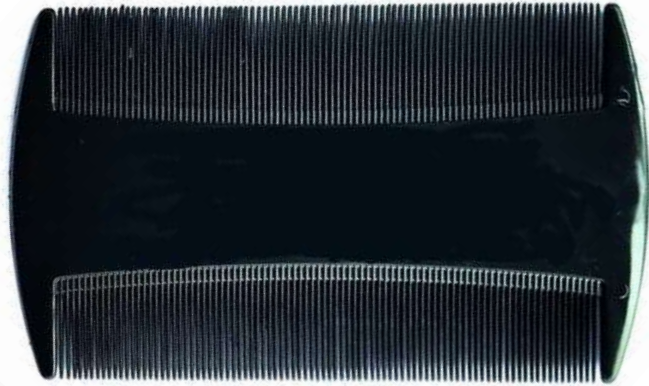


# wet-combing technique

- It is common for head lice products to recommend that product application be followed with the wet combing procedure.
- Fine **combing** of **wet** hair is **effective** for eliminating head lice
- Lice and **nits** can be **removed** by **wet combing**



# شانه ضد شپیش



شانه پلاستیکی

- کارایی کم به علت فاصله‌ی زیاد بین دندان‌ها و همین‌طور یکنواخت بودن دندان‌ها



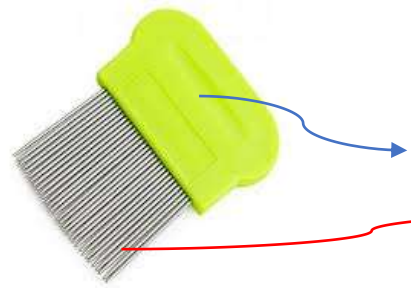
شانه فلزی

- ✓ کارایی بالا به‌علت دندان‌های نزدیک بهم و شیاردار
- ✓ عمر مصرف طولانی
- ✓ قابل شستشو و ضد عفونی با الکل یا در آب جوش





# طبقه بندی شانه های فلزی



جنس بدنه: پلیمر پلی پروپیلن و آکریلونیتریل بوتادین استایرن  
جنس نوک شانه: تمام استیل ضد زنگ



**Plain needle**  
دندانه های نزدیک به هم



**Screw needle**  
شیارهای هم جهت



**Double strip needle**  
شیارهای ضربدری







پایه نگهدارنده



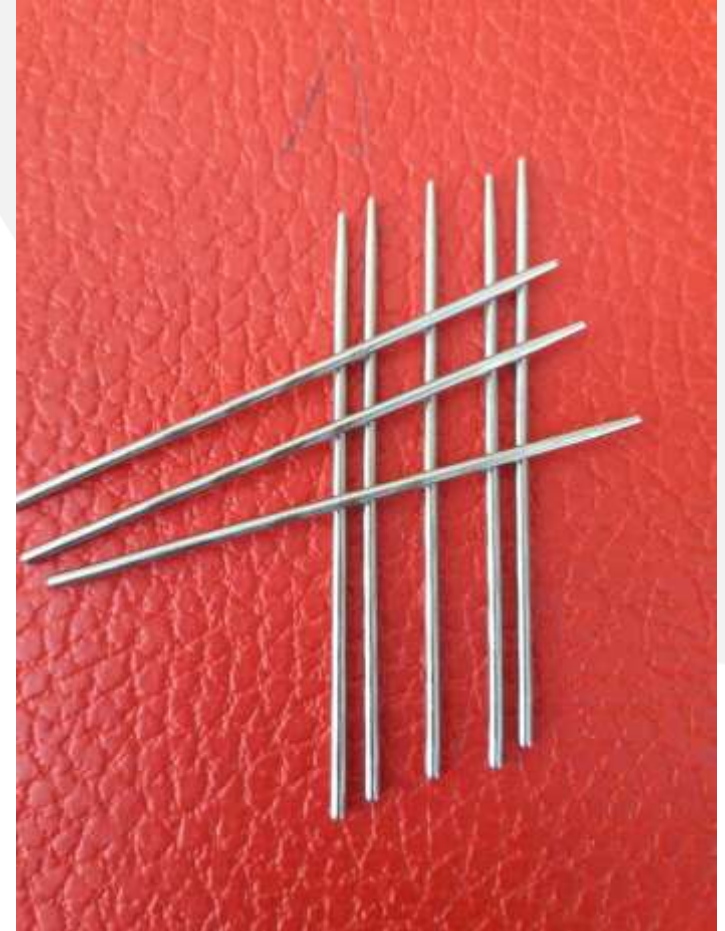
نیدل



ذره بین







# طریقه صحیح استفاده از شانه

موها به ۴ قسمت تقسیم و هر قسمت با شانه فلزی شیاردار چندین بار از کف سر تا نوک مو کشیده شده و شانه آغشته به شپش و کلاه با آب گرم و صابون شسته و خشک شود.



شانه آغشته به شپش را با یک دستمال تمیز پاک کنید.



شانه استیل را از کف سر به سمت بالا، تا نوک مو بکشید.



ابتدا موها را قسمت بندی کنید.





# References



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W W W . A R G A N O . I R



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Eucalyptus Extract



# Fateme Rajabi

M.D. Dermatologist

Center for Research and Training in Skin diseases and Leprosy



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# New strategies

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# Natural oils

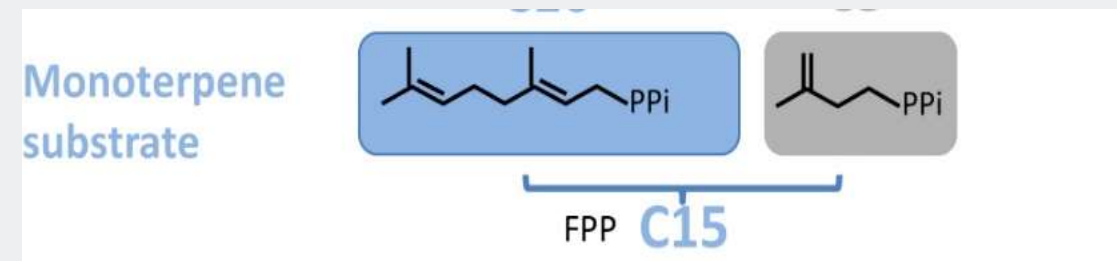
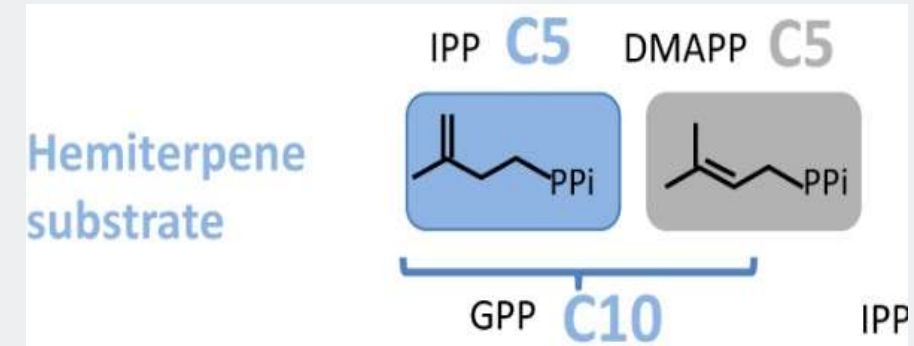


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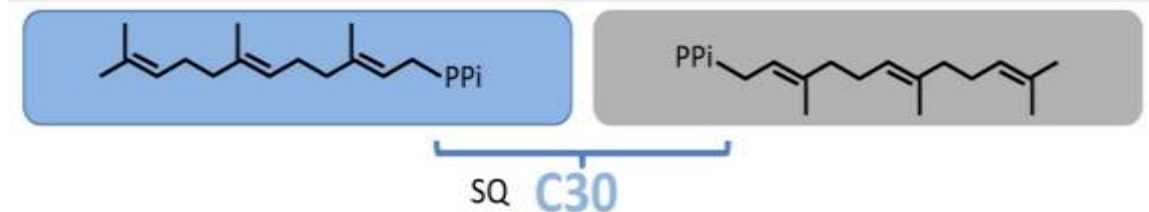


# عصاره گیاهی : Essential oils

- An essential oil is a concentrated hydrophobic liquid containing volatile chemical compounds from plants.
- They are composed of different compounds, terpenoids are the most abundant and present either as
  - Hemiterpenes,
  - Monoterpenes
  - Sesquiterpenes



Sesquiterpene substrate

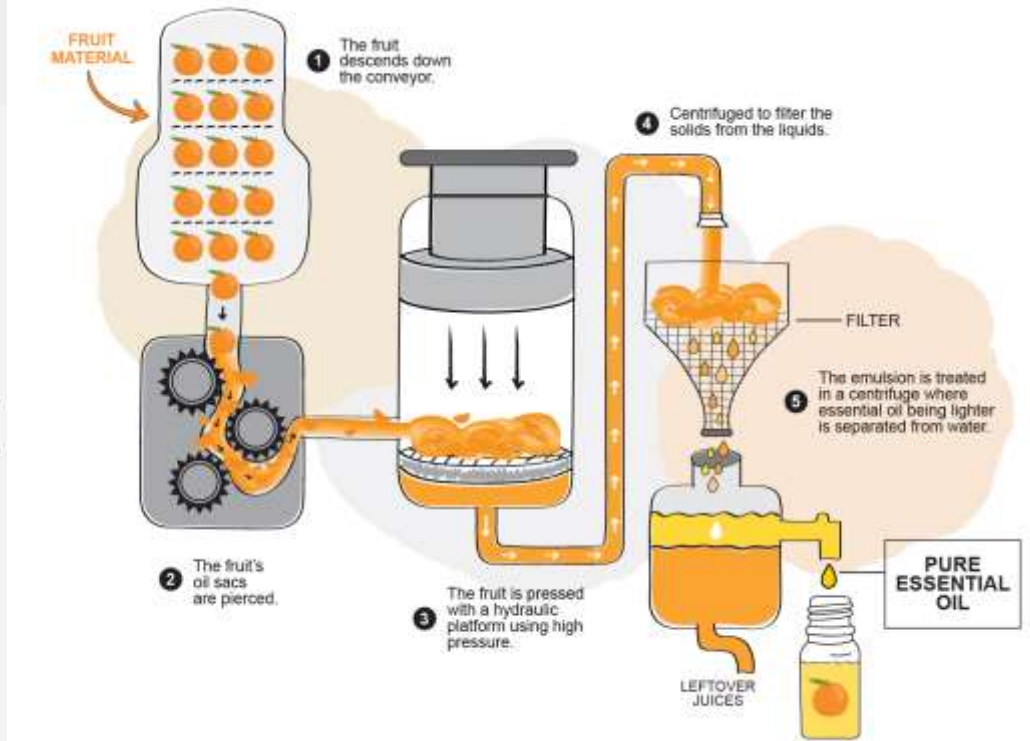
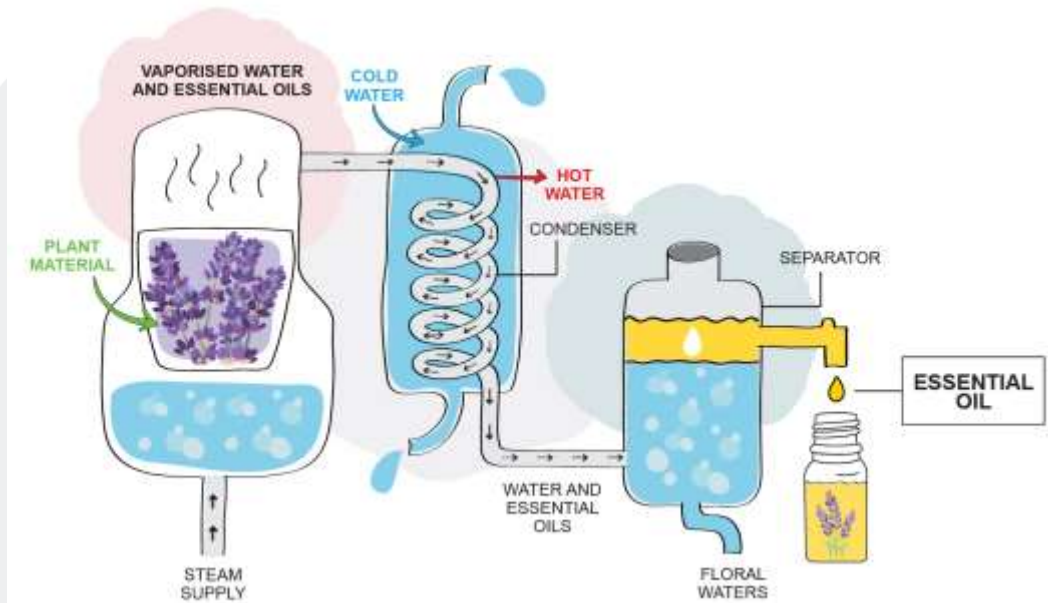
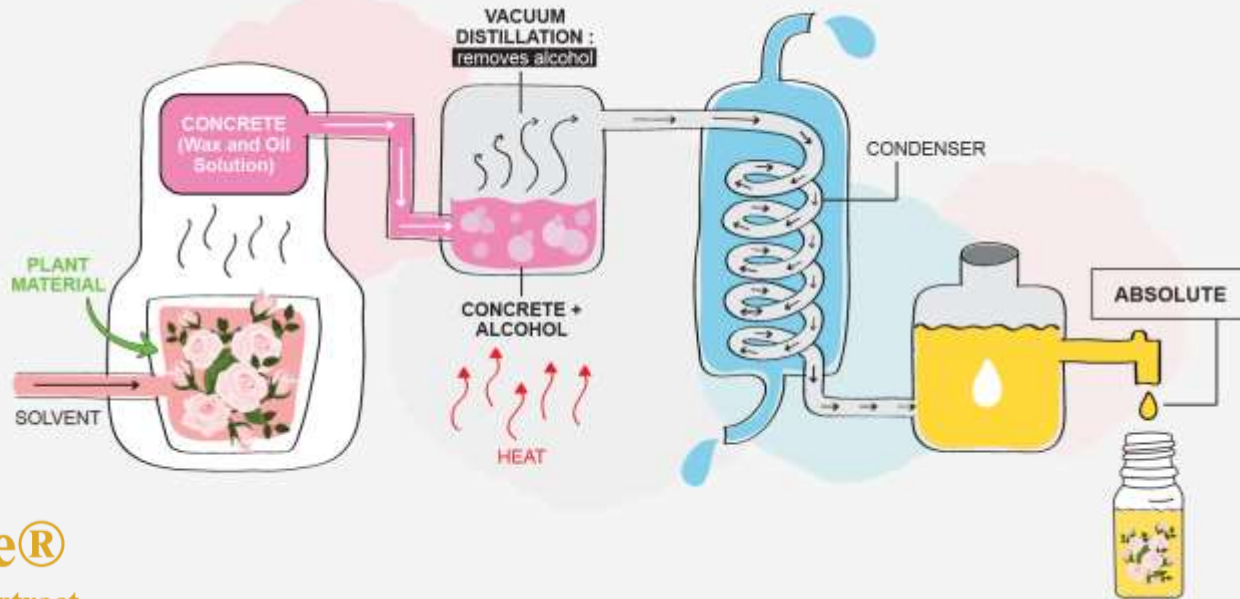


# Essential oils : عصاره گیاهی

- Extracted by steam distillation, cold pressed extraction, solvent extraction, absolute oil extraction, etc.
- Due to variability of their constitution, the effects may not be reproducible.



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# عصاره گیاهی : Essential oils

- Various mechanisms of action:
- Neurotoxic agents: Causes neuronal hyperstimulation and paralysis of the louse
  - Eucalyptus oil
  - Lavender oil
- Topical occlusive agents:
  - Block the excretory system of the lice, causing osmotic stress which results in the rupture of internal organs
  - Prolonged immobilization
  - Cause suffocation or respiratory asphyxiation of the lice
    - Coconut oil





# Recent Studies

# Recent studies:

- Efficacy of monoterpinoid constituents was assessed in vitro:
  - Mono-oxygenated compounds, those structures with a single alcohol, phenol or ketone functional group, were the most active against adult lice.
  - Flat, compact terpenoids were more effective pediculicides than extended or bulky structures.
  - The ovicidal activity of the mono-oxygenated monocyclic terpenoids
  - Terpinen-4-ol (tea tree oil) most effective against adult lice.
  - Nerolidol (neroli) lethal to eggs, but ineffective against adult lice.





# Recent studies:

- Efficacy of lotions based on aromatic plants was assessed in vitro:
  - Tea tree oil > lavender > lemon oil.
  - Effective against permethrin-resistant pediculosis:
    - Lavender+ peppermint + eucalyptus oils in a 5% composition
    - eucalyptus + peppermint in a total concentration of 10%, dissolved in 50% ethanol + isopropanol (1+1) in water have been shown to be effective against



# Recent studies:

- Efficacy of Eucalyptus oils against permethrin-resistant pediculosis:
  - The most effective:
    - Eucalyptus sideroxylon,
    - Eucalyptus globulus ssp globulus,
    - Eucalyptus globulus ssp maidenii.



# Recent studies:

- The essential oil extracted from rhizomes of *Hedychium spicatum* was evaluated for *in vitro* pediculicidal activity.
- At 5%, 2%, and 1% concentration the essential oil showed more significant activity than 1% permethrin-based product.





# Recent studies:

- The efficacy of extract and oil obtained from fruits of *Melia azedarach* L. was assessed in vitro.
- The highest lice mortality rate was obtained with a combination of 20% ripe fruit extract with 10% ripe fruit oil.
- A formulation made with both extract and oil at 10% plus the addition of emulsifier and preserving agents showed 92.3% pediculicidal activity.
- The products were also successful in delaying or inhibiting nymph emergence



# Recent studies:

- *Cinnamomum* bark essential oil has got ovicidal and adulticidal properties, which need further exploration.





# Recent studies:

- Neem (*Azadiracta indica*) seed extract shampoo:
  - Highly effective against all stages of head lice.
  - No obvious differences regarding the efficacy of the shampoo were observed between an exposure time of 10, 15, or 30 min.
  - No side effects



# Recent studies:

- Grape fruit
  - Very quick and efficient activity
  - Advantages of being noninflammable, skin safe, and nice smelling.



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# Therapies with Physical Mechanisms



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# Occlusive agents

- Nontoxic dry-on suffocation-based pediculicide (DSP):
  - Nuvo lotion is the first from this category
  - Applied wet and then blown dry with a hair drier, to form an adherent film. This “shrink-wrapped” film layer completely covers the louse, plugging its breathing holes (spiracles) and causing death by suffocation.



Fig 1. An untreated head louse standing on a hair (from Speare et al,<sup>33</sup> with permission). (Magnification:  $\times 37.5$ .)

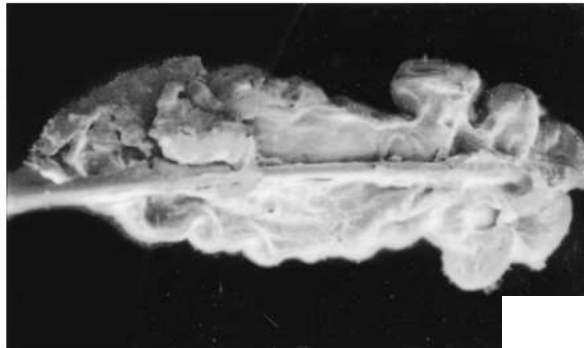


Fig 2. A Nuvo-treated head louse coated with dried-on DSP lotion. (Magnification:  $\times 37.5$ .)



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Activate Windows  
Go to Settings to activate Windows.

# Occlusive agents

- They are water soluble
- Composed of stearyl alcohol, propylene glycol, sodium lauryl sulfate, cetyl alcohol, water, methyl 4-hydroxybenzoate, propyl p-hydroxybenzoate, and butyl p-hydroxybenzoate.
- Must be repeated once per week for 3 weeks.
- Does not require nit removal or extensive house cleaning
- A 96% cure rate



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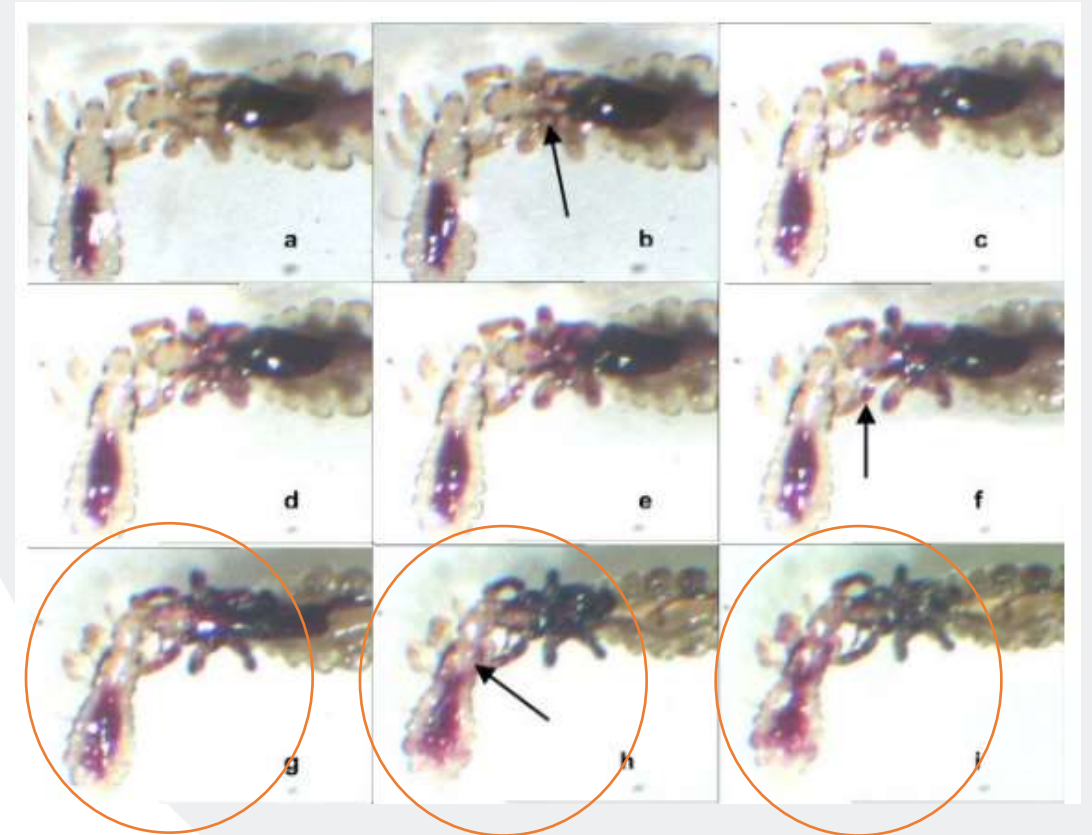
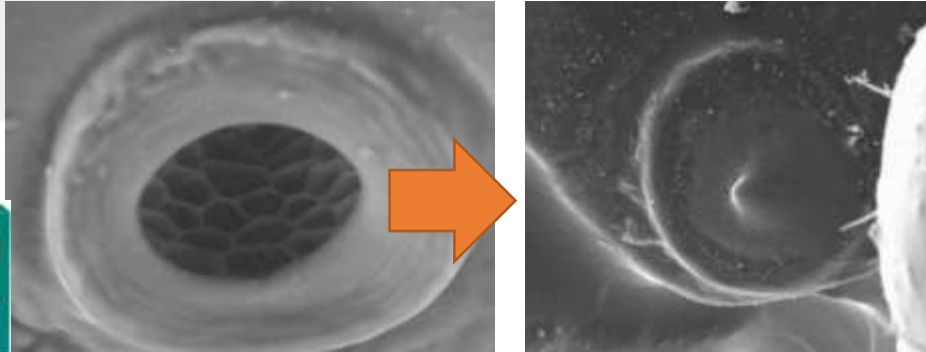
# Occlusive agents

- Petroleum jelly:
  - Massaged on the entire surface of the hair and scalp
  - Left on overnight with a shower cap.
  - Diligent shampooing is usually necessary for at least the next 7-10 days
  - The viscous substance obstructs the respiratory spiracles of the adult louse as well as the holes in the operculum of the eggs and blocks efficient air exchange.
  - Greatest egg mortality, allowing only 6% to hatch
- Hair pomades:
  - Easier to remove but may not kill eggs
  - Should be repeated weekly for 4 weeks
- Other occlusive substances and home remedies
  - mayonnaise, tub margarine, herbal oils, and olive oil, vinegar, isopropyl alcohol
  - Minimal efficacy



# Dimethicone

- long-chain linear silicone in a volatile silicone base
- Inhibition of the louse's ability to excrete water by transpiration through the spiracles. Inability to excrete water that is ingested as part of the louse blood meal appears to subject the louse gut to osmotic stress resulting in rupture.



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# Dimethicone

- 4% Lotion, two 8-h treatments, a week apart
- Eradicates head lice in 69%
- Resistance is unlikely



# Isopropyl myristate

- 50% Solution of isopropyl myristate dissolves the waxy exoskeleton of the louse, resulting in dehydration and death of the louse.
- Resultz is available in Canada and Europe and received FDA approval for treatment of head lice in 2017, although it is not yet marketed in the United States.





# Desiccation

- The Louse Buster:

- A custom-built machine uses one 30-min application of hot air.
- Nearly 100% mortality of eggs and 80% mortality of hatched lice
- The machine is expensive, and the operator requires special training in its use.
- A regular blow-dryer should not be used in an attempt to accomplish this result, because it has been shown that wind and blow-dryers can cause live lice to become airborne and, in thus, potentially spread to others in the vicinity.





# Manual removal

- Manual removal of nits with fine toothed combs (especially the ones within 1 cm of the scalp) after treatment with any product is recommended though the evidence is mixed.
- Combing dry hair does not seem to have the same effect. Vigorous dry combing or brushing in close quarters may even spread lice by making them airborne via static electricity



# Manual removal

- “bug-buster” combs and ordinary shampoo, instructed to shampoo hair twice per week for 2 weeks and to vigorously comb out wet hair each time.
  - One study found it to be the most effective OTC treatment
  - One study found malathion (also OTC) to be twice as effective as bug busting



# Manual removal

- Battery-powered “electronic” louse combs with oscillating teeth claim to remove live lice and nits as well as combs that resemble small bug zappers that claim to kill live lice.
  - No randomized, case-controlled studies have been performed with either type of comb.
  - Their instructions warn not to use on people with a seizure disorder or a pacemaker.



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# Manual removal

- Some egg-loosening agents claim to loosen the glue that attaches nits to the hair shaft, thus making the process of nit-picking easier.
  - Vinegar or vinegar-based formulations may be applied to the hair for 3 min before combing out the nits. However, no clinical benefit has been demonstrated.
  - It is not recommended for use with permethrin, as it may interfere with permethrin's residual activity.



# Hedrin Stubborn Egg Loosener lotion

- A product that loosens old eggshells from hair and makes removing them easier.
- Ingredients:
  - Aqua, Isononyl isononanoate, Sodium acrylate/sodium acryloyldimethyl taurate copolymer, Phenoxyethanol, Ethylhexylglycerin.
- Thornton & Ross



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# Apaisyl Détect Lentés,

- A gel that dye louse eggs to make them easier to see
- Merck Médication Familiale



**Rapide :**  
colore les lentés en 2mn

**Pratique :**  
formule gel, ne coule pas

**Efficace :**  
100% des lentés colorées,  
visibles à l'œil nu

Dispositif Médical

# Future treatment options



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# Abametapir (Xeglyze)

- Lotion 0.74%
- Metalloproteinase inhibitor, metalloproteinases have a role in physiological processes critical to egg development and survival of lice.
- Ovicidal activity (90-100% in vitro) of abametapir allows for a single administration, in contrast to many other topical treatments.
- Leave on the hair and scalp for 10 min and then rinse off with warm water.
- Approved for medical use in the United States in July 2020 for individuals six months of age and older.



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# Conclusion



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# Overview of known treatments for head lice

## Physical

- Bald shaving of the head
- Bug busting ([Bingham 2000](#))
- Electronic louse comb ([O'Brien 1998](#))
- Fine-toothed comb ([De Souza Bueno 2001](#))
- Hot air ([Goates 2006](#))
- Metal comb combined with formic acid ([DeFelice 1989](#))



## Oral agents

- Albendazole ([Akisu 2006](#))
- Co-trimoxazole ([Hipolito 2001](#))
- Diethylcarbamazine (DEC) ([Munirathinam 2009](#))
- Ivermectin ([Nofal 2010](#))
- Levamisole ([Namazi 2001](#))
- Thiabendazole ([Namazi 2003](#))



# Overview of known treatments for head lice

## Topical, presumed non-neurotoxic

- Anise, *ylang-ylang* and coconut oils ([Mumcuoglu 2002](#))
- Coconut and anise spray ([Burgess 2010](#))
- Coconut-derived emulsion ([Connolly 2009](#))
- Eucalyptus oil ([Greive 2007](#))
- Grapefruit extract ([Abdel-Ghaffar 2010](#))
- Melaleuca oil (tea tree oil) and lavender oil ([Barker 2010](#))
- Natural plant extract ([El-Basheir 2002](#))
- Neem seed extract (azadirachtin) ([Abdel-Ghaffar 2007](#))
- Paw paw tree extract (twigs), thymol, and tea tree oil ([McCage 2002](#))
- Quassia tincture ([Jensen 1978](#))
- Dimeticone ([Heukelbach 2008](#))
- DSP (Nuvo lotion)
- Petroleum jelly
- Hair pomade
- Tub margarine
- Melted butter
- Herbal oil
- Mayonnaise
- Vinegar
- Olive oil



# Overview of known treatments for head lice

## Topical, presumed neurotoxic

- **Benzyl alcohol**
- Benzyl benzoate ([Rajan 1975](#))
- Bioallethrin ([Fan 1992](#))
- Bioresmethrin ([Maunder 1981](#))
- **Carbaryl** ([Maunder 1981](#))
- Chlorphenamidine ([Maunder 1981](#))
- Clophenothane ([Jensen 1978](#))
- **Crotamiton** ([Karacic 1982](#))
- Dichlorodiphenyltrichloroethane DDT ([Nelson 1957](#))
- Deltamethrin or decamethrin ([Camasmie Curiati 1984](#))
- Deltamethrin and piperonyl butoxide ([De Souza Bueno 2001](#))
- D-phenothrin, phenotrin or sumithrin ([Chosidow 1994](#))
- **Isopropyl alcohol**
- Isopropyl myristate ([Kaul 2007](#))
- **Ivermectin** ([Youssef 1995](#))
- **Lindane** ([Brandenburg 1986](#))
- **Malathion** ([Chosidow 1994](#))
- **Permethrin** ([Brandenburg 1986](#))
- Piperonyl butoxide
- Pirimiphos-methyl ([Sinniah 1983](#))
- **Pyrethrin** ([Clore 1993](#))
- **Spinosad** ([Stough 2009](#))
- Stearyl alcohol
- Abametapir



# THANK YOU FOR YOUR ATTENTION



W W W . A R G A N O . I R



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