## Infestations: Mighty Mites & Bothersome Bugs

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### Objectives

- Diagnose and treat skin infestations and insect bites
- Recognize patterns of arthropod assault
- Discuss insect repellent recommendations

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### “Secret” Objectives

- Disgust you with “creepy crawly” photos
- Make you itch!

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### Camp Lice Policy

- 60% of summer camps report head lice as an operational burden
- “no nit” policy: 34% of summer camps
- < 20% of children with nits or lice are allowed to stay at camp

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Head lice were also affected by COVID-19: a decrease in Pediculus infestation during lockdown in Buenos Aires

- With COVID19 lockdown, head lice in Buenos Aires decreased 26%

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Head lice: pediculus capitis

- 6-12 million head lice infestations annually in the US
- Mostly ages 3-11 years
  - More common among girls than boys
  - Occurs in all ethnic groups
- Estimated economic burden of lice
  - ~ $1 billion/year (2004)
- Impacts of head lice infestation
  - Scalp itch
  - Secondary infection
  - Missed school or work
  - Social disruption
  - Embarrassment

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# Selfie Spread?
"The Days of Our Lice"

- Head lice die in 1–2 days without feeding
- Nits die within a week if they are not near scalp

Hygiene recommendations
- Machine wash and dry
  - clothing and bed linens worn 2 days before treatment
- Seal un-washable items in plastic bag for 2 weeks
- Soak combs and brushes in hot water (≥ 130°F) for 5 minutes
- Vacuum floor and furniture around where infested person sits/sleeps
- Do not share hair accessories

"The Facts of Lice"

- 100 eggs per pair

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Pediculosis capitis: “Super lice”

- Pyrethroid resistant
- Knockdown resistance: (kdr) mutations
- Mutations in voltage-sensitive sodium channel (VSSC)
- “over the counter” treatments ineffective

Red states: 100% of tested lice resistant
Orange states: 50-90% of tested lice resistant
Yellow state: 0% of tested lice resistant
White states: data not analyzed yet
Blue states: data not collected yet

Yoon, et al. American Chemical Society, August 2015

Pyrethroids

- Pyrethrins (Rid, A–200, Pronto, R&C, Triple X, Licide)
  - pyrethroid extracts from the chrysanthemum flower
- Not ovicidal; repeat treatment
- Avoid use in people allergic to chrysanthemum or ragweed
- Approved ages ≥ 2 years

- Permethrin lotion 1% (Nix)
  - synthetic pyrethroid
  - Similar to naturally occurring pyrethrins
  - Not ovicidal; repeat treatment
  - Approved ages ≥ 2 months
Malathion lotion 0.5% (Ovide)

- Organophosphate pesticide
- Partially ovicidal
- Single application + nit combing
- For adults only
- Approved for ≥ 6 years of age
- Malathion resistance reported among head lice in UK

Ivermectin lotion 0.5% (Sklice)

- Neurontic to lice
- Activates glutamate-gated chloride channels in nerves
- Cell hyperpolarization -> paralysis -> death
- For adults only
- For the treatment of lice infestations
- Approved for the treatment of scabies infestations
- Not ovicidal, but kills nymphs!
- Apply to dry hair, leave on 10 min, rinse
- Single application
- Not combing optional
- Approved for children ≥ 6 months

Benzyl alcohol lotion 5% (Ulesfia)

- Aromatic alcohol
- Non-neurontic pesticide
- Kills lice via asphyxiation
- For adults only
- Not ovicidal
- Apply to dry hair, leave on 10 min
- REPEAT treatment on day 9
- Nit combing optional
- Approved: ages 6 months - 60 years

Spinosad 0.9% topical suspension (Natroba)

- Natural insecticide produced by soil bacteria
- Bacterial species Saccharopolyspora spinosa
  - Found in crushed sugar cane
- Neurotoxic to lice
- Targets nicotinic acetylcholine receptors of the insect nervous system
- Ovicidal
- Apply to dry hair, leave on scalp 10 min
- Single application
- No nit combing
- Re-treatment typically not needed
  - Re-treat if lice seen in 2 weeks
- Approved for children ≥ 6 months

Benzyl alcohol lotion 5% (Ulesfia) - application chart

Hair Length | Amount of OLESFIA Lotion per Application
--- | ---
Short | 3.2 oz bottle
2-4 inches | 8 oz bottle
5-10 inches | 16 oz bottle
Medium | 3 oz bottle
6-12 inches | 12 oz bottle
10-12 inches | 3 bottles
Long | 4 oz bottle
16-22 inches | 24 oz bottle
22-32 inches | 4 bottles

Ovicidal, “Partially, yes” “Not, usually”

Malathion 0.5% Topical 2 oz bottle

Nicosamide [8-12 hours]

Approved age ≥ 4 years

Malathion 0.5% Topical 1 oz bottle

Nicosamide [8-12 hours]

Approved age ≥ 6 months

Ivermectin 0.5% Topical (Sklice)

Inhibits the breathing apparatus

References:
Nit comb, Chile, circa 1000 AD
Nit comb, Cumbria (Hadrian’s Wall), circa 72-73 AD
Ortus Sanitatis 1517
Nit comb, India, circa 1800
Nit comb, US Civil War, c 1860

Modern head lice have smaller claws compared to ancient specimens
Nit picking practices may have resulted in selective advantage to smaller grip


Nit picking
Professional nit picking
• Cost range ~$75-100/hour
• Estimated 3 total treatments needed
• Treatments ~1.5 hours each
• Estimated minimum: $225
• “Louse calls”
  • Discrete in-home concierge nit-picking
  • Some Health Flex savings accounts cover nit-picking!

Home nit picking
• Instructions for families on Headlice.org hosted by the National Pediculosis Association (non-for profit)

AirAllé® Lice Treatment
• Heated air
  • Cooler temperature & faster flow than hair dryer
• Estimated 1 hour treatment
  • 30 minutes with device
  • 30 minutes of nit picking
• One treatment needed
• Cost ~ $170
• FDA approved for ages ≥ 4 years

Essential Oil Alternatives?
• Eucalyptus oil (EO)-lemon tee tree oil (LP)
• Eucalyptus oil: Leptospermum petersonii (EO/LP) blend vs. pyrethrin:piperonyl butoxide

• EO/LP: twice as effective
  [83% vs 36%, P < 0.0001]
• EO/LP: 100% pediculocidal with 1 application
• EO/LP: 100% of lice and eggs in vitro
• Adverse events: transient burning, itching, stinging

Pediculosis Pearls

• Lice crawl
• Lice CANNOT hop or fly!
• Pets do not transmit human lice
• Nits in hair alone do not indicate contagiousness

re-“cap”: Pediculosis capitis

• “Super head lice!”
• In most of the U.S., head lice show 100% resistance to pyrethroids
• Several FDA approved head lice medications available for pyrethroid resistant lice
  ▪ Malathion 0.5% lotion
  ▪ Ivermectin 0.5% lotion
  ▪ Spinosad 0.9% suspension
  ▪ Benzyl alcohol 5% lotion
• Nit picking
• FDA approved head lice air treatment device
  ▪ AuAlé®

Body lice

• Uncommon infestation
• War, poverty, homeless populations
• Louse lives and lays eggs in fabric, especially seams
• “seam squirrels”
• Manifestations
  ▪ Urticarial papules
  ▪ Dry, scaly, lichenified skin
• Can transmit infectious diseases
  ▪ Epidemic typhus
  ▪ Trench fever
  ▪ Relapsing fever

“Louse blouse”: body lice

Body lice

• Treatment
  ▪ Replace clothing
    ▪ Body lice live and lay eggs in the clothing
    ▪ Only come to skin to feed
  ▪ Improve hygiene and living conditions
    ▪ Ability to regularly wash clothing

Pubic lice

• “crab lice”
• Easily transmitted during sexual activity
• Usually found in pubic hair
• can occur on perianal, proximal thigh, axilla and course facial hair— including eyebrows and eyelashes
• Pruritus and crawling sensation in affected areas
• Maculae cerulea— bluish macules in areas of lice bites
• +/- Regional lymphadenopathy
Did the “Brazilian” wax fad kill the pubic louse? 
Data from the UK


Pubic lice affecting facial hair

Pediculosis Pearls

• Lice move by crawling- they CANNOT hop or fly!
• Pets do not transmit human lice 
• Nits in hair alone do not indicate contagiousness 
• “super head lice” are common now; consider your local resistance data 
• Large, live head lice: possible re-infestation 
• Head lice of different sizes: possible resistance
• Consider sexual abuse if pubic lice in young or adolescent children

Pubic Lice: treatment

• Pubic area: Permethrin 5% cream overnight to affected hairy areas, repeat in 1 week
• Eyelashes/eyebrows:
  1. Nit comb or manual removal (if few nits)
  2. Ophthalmic-grade petrolatum ointment (prescription) to the eyelid margins 2-4 times a day for 10 days
  3. Yellow mercuric oxide 1%-4x daily x 14 days
  4. Fluorescein eyedrops 20% single application
  5. Consider oral ivermectin days 1 and 8 if topical therapy fails or extensive eyelash involvement (off label use)


Scabies

- Common parasitic infestation
  - Sarcoptes scabiei var. hominis
- Human to human transmission
- Fertilized female mite burrows into epidermis depositing eggs and feces (scybala)
- Eggs hatch in several weeks
- Delayed Type IV hypersensitivity occurs about one month after exposure
- Initial localized itching changes to widespread pruritus

Scabies: Clinical Presentation

- Itchy papules on abdomen, hands, wrists, elbows, axilla, genitalia and interdigital web spaces
- Nodules = exaggerated hypersensitivity reaction
- Children:
  - Face and scalp involvement more frequent
- Infants:
  - Scaly papules and vesicles on palms, soles
  - Eczematous eruptions of face, scalp and trunk
  - Nodules

Common Sites for Scabies

Nodular scabies

I. Kaur and D. Jakhar; Transillumination Dermoscopy of Finger Web Spaces for Scabies, Accepted Date: 22 May 2019
Scabies in babies:

Foot Fetish

Bullous scabies


Scabies: Diagnosis

• Diagnosis may be made from clinical findings alone
• Contact with persons with similar pruritic eruption supports diagnosis
• Dermoscopy helpful—jet contrail sign
• Definitive diagnosis from microscopy
  • Scraping of non-excoriated burrow
  • Mineral oil prep
• Presence of mites, eggs or scybala confirm the diagnosis

Scabies prep with Potassium hydroxide (KOH)

• Scabies mite and eggs become clearly visible after treatment with KOH

Treatment: scabies

• Asymptomatic “carriers” in household are common
  • Treat entire household at same time
• Permethrin 5% cream overnight; repeat overnight in 1 week
  • Infants and elderly: head to toes (include scalp and face)
  • Others: neck to toes
• Pregnancy: category B
• Sulfur (5–10%) compounded in petrolatum x 3 consecutive nights

• Wash clothing, linens and towels used within the previous week in hot water and dry with high heat or seal in airtight bag for 10 days
• “post-scabietic” pruritus may linger ~4 weeks after successful treatment

Ivermectin safety in infants and children under 15 kg treated for scabies: a multicentric observational study

• Use of oral ivermectin in children < 15 kg is “off label”
• Concern for neurological side effects: inhibits invertebrate glutamate-dependent chloride channels in nerve tissue
• Retrospective multicenter study
• 170 infants and children (1–64 months of age)
• Weight 4 - 14.5 kg
• Mean dose 223 mcg/kg
• Most received a second dose (89%)
• Many received concomitant topical treatment
• 4% (n=7) minor adverse events: eczema flare (5), diarrhea (1), vomiting (1)
• 119 (85%) patients healed with 2 doses
• Factors significantly associated with healing were an ivermectin dose > 200 mcg/kg-1 (P < .0001), and a delay between those two doses of > 10 days (P = .0025)

British Journal of Dermatology (2020) 182, pp1003–1006
Scabies Pearls: Think scabies if….

- Severe itch, worse at night
- Multiple family members with itchy bumps
- Interdigital web space involvement
- Inflammatory nodules on genitals or in infants
- Vesicopustules in infants, especially on palms/soles
- Treat everyone in the house
- Permethrin 5% cream overnight x 2 --- (1 week apart)

2-year-old healthy child

- Itchy red bumps on arms and legs only
- No one else at home with bumps or itching
- No pets

Papular urticaria

- Insect bite hypersensitivity reaction
- Recurrent nature
- New bites induce delayed hypersensitivity reaction at old sites
- Crops of highly pruritic papules
  - 5-10 mm in diameter
  - Exposed areas of arms and legs
  - Frequently with linear or triangular clusters
  - Central punctum
  - May vesiculate in center then crust
- Resolve with post-inflammatory hyperpigmentation frequently

Insect bite–induced hypersensitivity (papular urticaria)

The SCRATCH Principles

S Symmetric distribution (scalp, neck, face, torso, extremities)
C Crops/Clusters of different coloration (erythema, hypo-/hyperpigmentation)
R Rover not required: pets are not necessary criteria for diagnosis
A Age specific (usually occurring between 2 and 10 y of age)
T Target lesions and time (may take weeks to years to resolve)
H Households with single family member affected

Bullous arthropod bite reaction
Papular Urticaria/Bullous arthropod

Treatment
• Antihistamines
  • Non-sedating antihistamine daily
  • Hydroxyzine at bedtime PRN itch
• Cool compresses
• Ultrapotent topical corticosteroid applied twice daily to pruritic areas on extremities

Prevention
• Protective clothing
• Insect repellent

Insect bite Hypersensitivity Reactions

Cannot typically distinguish the offending insect from skin lesion alone
• Mosquitos
• Fleas
• Ants
• Bed bugs
• Midge
• Gnats
Bed bugs: *Cimex lectularius*

Breakfast, lunch and dinner sign

• 332 bed bug–infested patients and 4952 controls

• In an ED setting, patient with bed bug infestations had lower

  - Hemoglobin
  - Hematocrit
  - RBC
  - MCHC values

Biting midges: “no see-ums”

“All You Can Eat Buffet” Sign

Puss caterpillar: *Megalopyge opercularis*

“Toxic Toupee”

Biting gnats & flies vs. Mosquitos
Insect Repellents

- Select coverage needed to protect from the appropriate biting insect for duration of activity planned.
- AAP, CDC: DEET between 20-30% for children >2 months of age to exposed skin.
- Apply directly to the child, avoiding open skin and orifices.
- Insect repellent use is not recommended for children < 2 months of age.

Sunscreen and Insect repellent

Combination products are NOT recommended.

- Sunscreen needs to be:
  - applied in larger amounts
  - re-applied more frequently
- Up to 1/3 decrease in sun protection factor (SPF) when DEET-containing insect repellents are used after a sunscreen is applied.

DEET alternatives

- Picaridin 20%
  - Equivalent to 20% DEET
- IR3535 7.5%
  - Not as effective as DEET against the Anopheles spp mosquitoes which transmit malaria.
- ‘Oil of Lemon Eucalyptus’ (64% PMD)
  - age > 3 years

Ineffective Insect repellents

- Wristbands soaked in chemical repellents
- Garlic or vitamin B1 oral supplements
- Tea tree oil
- Lemon Eucalyptus Essential Oil
- Ultrasonic insect repellent devices

“Way-Far Off-label” Mosquito Repellent

- Methyl dihydrojasmonate
  - Plant derived fragrant compound
- Lilial
  - Synthetic aromatic aldehyde
  - Commonly used in cosmetics
- Activate CuquiOR136
  - Mosquito odorant receptor
- Not recommended as an alternative to DEET.

Barefoot Tampa Bay area man contracts hookworm

- Cutaneous larva migrans
- “Creeping Eruption”
- Moves 1-2 mm/day
- Ancylostoma braziliense
- Transmitted from stool of infected dogs & cats
- Treatments:
  - Ivermectin
  - Thiabendazole
  - Albendazole


THANK YOU