INFESTATIONS...
What is bugging you!

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Objectives

• Define clinical presentations that can be affiliated with infestations

• Identify bugs that have implications for patients

• Review treatment options for infestations!
Scabies Mite Infestation

- *Sarcoptes scabiei* var. *hominus*
- Extremely pruritic papules
- Axillae, genitals, waist, finger webs
<table>
<thead>
<tr>
<th>Medication</th>
<th>Application/Dose</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>Permethrin 5% lotion</td>
<td>Apply overnight from neck to feet, then rinse in the morning. Repeat in 7-10 days</td>
<td>Considered first-line therapy</td>
</tr>
<tr>
<td>Oral ivermectin</td>
<td>Dosed at 200 μg/kg Repeat in 7-10 days</td>
<td>Useful for persistent infestation, treatment failure, or when unable to tolerate topical therapy Also may be important adjuvant therapy in crusted scabies Should not be used in pregnant/breastfeeding women or young children</td>
</tr>
<tr>
<td>Lindane 1% lotion</td>
<td>Apply overnight from neck to feet, then rinse in morning Repeat in 7-10 days</td>
<td>Not available in some countries due to neurotoxicity</td>
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*Combination therapy with both ivermectin and topical lotions may be necessary in the treatment of crusted scabies.*

Treat contacts, wash recently worn clothes and bedding in hot water!
Other Complications

- Post-scabecitic pruritus
- Bacterial infection!
A Dreadful Infestation

Head Lice: Pediculosis capitis

- Pruritus
- Infest the head and neck
- Spread through direct contact
Body or Head Lice (Pediculosis)

- *Pediculus humanus* var. *corporis* or *capitis*
- Body louse is vector for:
  - Epidemic typhus
  - Relapsing fever
  - Trench fever
- Check seams of clothes or bedding
- Head lice – only nits may be seen
Crab Lice (Phthiriasis)

- Pediculosis pubis
- A sexually transmitted disease by close contact
- May be in genital region, eyelashes, or axilla
- Yellow brown to gray specks on skin
- Slate blue macules – maculae cerulae
Head Lice Treatments

Pharmacologic
• Permethrin and pyrethrin
• Lindane
• Malathion
• Ivermectin
• Spinosad
• Benzyl alcohol

Non-Pharmacologic
• Wet combing
• Petrolatum ointment
• Mayonnaise
• Dimethicone lotion
• Sodium chloride gel
• AirAlle (LouseBuster)
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<tr>
<td>Permethrin 1% lotion</td>
<td>Apply to affected areas (damp hair for 10 minutes), then rinse. Repeat in 7-10 days</td>
<td>Considered first-line therapy unless there is known resistance. Should perform nit combing</td>
</tr>
<tr>
<td>Pyrethrin 0.3% + piperonyl butoxide 4% shampoo</td>
<td>Apply to damp hair for 10 minutes, then rinse. Repeat in 7-10 days</td>
<td>Useful therapy. Should perform nit combing.</td>
</tr>
<tr>
<td>Malathion 0.5% lotion</td>
<td>Apply to affected areas for 8-12 hours, then rinse. Repeat in 7-10 days</td>
<td>Flammable. Should perform nit combing.</td>
</tr>
<tr>
<td>Benzyl alcohol 5% lotion</td>
<td>Apply to affected areas, leave on for 10 minutes. Repeat in 7-10 days</td>
<td>Should perform nit combing.</td>
</tr>
<tr>
<td>Spinosad 0.9% topical suspension</td>
<td>Apply to affected areas for 10 minutes, then rinse. Repeat in 7 days if live lice are seen.</td>
<td>Nit combing not necessary.</td>
</tr>
<tr>
<td>Topical ivermectin 0.5% lotion</td>
<td>Apply to dry hair, then rinse after 10 minutes.</td>
<td>Nit combing not necessary.</td>
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<tr>
<td>Oral ivermectin</td>
<td>Dosed at 200 μg/kg. Repeat in 7-10 days.</td>
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Cimex lectularius

- Cimicidae commonly infest humans (C. lectularis), birds, rodents, and bats
- Eradicated until the 1950’s
- Increasing insecticide resistance (pyrethroids, permethrin, and deltamethrin) and travel leading to higher prevalence
- 45x increase in the number of bed bug cases from 1999 to 2006 in Australia

Bedbugs

- Appear shield-like and leathery
- Obligate, nocturnal, weekly blood feeder
- Live w/o meal for up to a year
- Infestation may be related to birds, bats, or rodents
- 1º host migrates bedbugs search for alternate food source
- Not associated with
  - Poor hygiene
  - Socioeconomic classes
  - No transmission of MRSA, Hepatitis B/C/E, HIV
- Possible transmission Kaeng Khoi virus isolated from bat bugs in Thailand (*Cimex insuetus*) to guano mine workers

Clinical Features

• Papular urticarial, targetoid, bullous, grouped (breakfast-lunch-dinner) lesions with punctum on exposed skin
• Worse in AM
• Signs manifest up to 11 days after exposure
• Only 30% of people living in infested households experience skin reaction

Where are they??

- Spread via ductwork, electric wiring, used furniture/mattresses, and travel
- Love dark small crevices
- Hiding places include:
  - Under furniture
  - Between book sheets
  - Mattress/within seams
  - Picture frames
- Avoid smooth glossy surfaces like tiles in bathrooms

OTC Repellants

• 7% picardin (Cutter Advanced/Sawyer) or 0.5% permethrin (Coleman Insect treatment Gear & Clothing/Sawyer) not effective

• N,N-diethyl-m-toluamide (DEET) provided high level of repellency against bed bugs

• Isolongifolenone and isolongifolanonone are just efficacious natural products but not yet available
  – Natural compound from South American Tauroniro tree

Temperature?

• Cimex highly resilient to environmental stress
• 48°C (118.4°F) for 1 hr → complete mortality (tolerant to 46°C)
• -16°C for 1 hour (3.2°F) -20°C → complete mortality
• Cold hardened of 0°C for 1 hour allowed for survival at -16°C
• Steam

Chemical + Non-chemical Treatment Methods

- **Patient education**
  - Removal of all non-treatable furniture (mattresses)
  - Washing in hot water followed by hot drying for 30 minutes
  - 10 hours in home-freezer
  - Membrane mattress covers impervious to bedbugs (small nymphs can pass though zippers)
  - Surveillance of sleeping area for insects (home and hotels)
  - Place closed luggage in bathtub

- **Pest control**
  - Combination insecticides due to high rates of resistance
  - Steam killing + insecticide
  - Heat-killing focusing on problem areas
  - Professionals with experience in bed bug infestation
  - Bug sniffing dogs

Public Health Concern

• Significant mental and economic public health impact although exact costs cannot be identified

• Bed Bug Chasers of Iowa City
  – $2000-4000 for whole house heat treatment 122 F+ chemical treatment (organophosphate for non-treatable items and 6 product combination including chlorfenapyr and amorphous silica)
  – $1000 for apartment

• Springer Bed Bug Services:
  – $1200 for heat treatment + chemical treatment plus additional cost for warranty
  – Dogs sniff out bedbugs if not visualized
**Cimex lectularius**

- Female feeds at night needs blood meal to lay eggs
- Linear urticarial plaques (Breakfast, Lunch, Dinner)
- Hepatitis B surface antigen carrier - ? Role in transmission
Lyme Disease

- Borrelia burgdorferi spirochete

1. www.cdc.com/lyme
2. A Tightly Regulated Surface Protein of Borrelia burgdorferi Is Not Essential to the Mouse-Tick Infectious Cycle. 
Erythema migrans

- Seen in 60–90%
- 1-2 weeks after tick detachment
- Erythematous, annular plaque
- Light colored center or “bull’s-eye” appearance
- **Primary lesion** must reach at least 5 cm (per CDC)
- Multiple plaques appear in 20-25% of patients
  - Multiple bites
  - Disseminated disease
  - Lymphatic spread
- Pathology is often non-specific
Other complications

• Arthralgias (knee is common)

• Neurologic (facial nerve palsy)

• Cardiac (AV nodal block)

• Ocular (conjunctivitis, uveitis, optic neuritis – rare)
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<tr>
<th>Clinical features</th>
<th>Antibiotic</th>
<th>Alternative choice*</th>
</tr>
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<tr>
<td>Early localized disease</td>
<td>First choice for adults and children ≥8 years*</td>
<td>Cefuroxime axetil 500 mg (15 mg/kg) po q12h, 14–21 days</td>
</tr>
<tr>
<td></td>
<td>(100 mg) po q12h, 14–21 days†</td>
<td></td>
</tr>
<tr>
<td>Early disseminated disease or chronic disease, mld</td>
<td>Doxycycline 100 mg (2 mg/kg) po q12h, 14–28 days†</td>
<td>Amoxicillin 500 mg po q8h (50 mg/kg po per day divided q8h), 14–21 days†</td>
</tr>
<tr>
<td>Cranial nerve palsy, 1st or 2nd degree heart block</td>
<td></td>
<td>Cefuroxime axetil 500 mg (15 mg/kg) po q12h, 14–28 days</td>
</tr>
<tr>
<td></td>
<td>First choice for children &lt;8 years and pregnant women; second choice otherwise*</td>
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</tr>
<tr>
<td></td>
<td>(75–100 mg/kg) iv once daily, 14–28 days</td>
<td></td>
</tr>
<tr>
<td>Early disseminated disease or chronic disease, severe</td>
<td>Ceftriaxone 2 g (75–100 mg/kg) iv once daily, 14–28 days</td>
<td>Penicillin G 18–24 million units (200,000–400,000 units/kg) iv per day divided q4h, 14–28 days</td>
</tr>
<tr>
<td>Meningitis, radiculopathy, 3rd degree heart block</td>
<td>Cefotaxime 2 g (50–70 mg/kg) iv q8h, 14–28 days</td>
<td></td>
</tr>
</tbody>
</table>

*No comparative trials for early localized disease, so no established superior treatment; doxycycline also treats human anaplasmosis.
†Avoid doxycycline in children <8 years and pregnant women.
‡In a randomized, double-blind, controlled trial, similar outcomes were observed for a 10-day versus 20-day course of doxycycline.
§Recommended for 21 days for pregnant women.
Reported Cases of Lyme Disease—United States, 2012

One dot is placed randomly within the county of residence for each confirmed case. Though Lyme disease cases have been reported in nearly every state, cases are reported based on the county of residence, not necessarily the county of infection.

1 dot placed randomly within county of residence for each confirmed case

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
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<tbody>
<tr>
<td>2008</td>
<td>85</td>
</tr>
<tr>
<td>2009</td>
<td>77</td>
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<tr>
<td>2010</td>
<td>68</td>
</tr>
<tr>
<td>2011</td>
<td>72</td>
</tr>
<tr>
<td>2012</td>
<td>92</td>
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(+73 prob)

“A single 200-mg dose of doxycycline given within 72 hours after an *I. scapularis* tick bite can prevent the development of Lyme disease.”

- Adult or nymph stage *Ixodes scapularis* tick
- Estimated to have been attached for >36 hours
- Within 72 hours of tick removal
- Local rate of infection is greater than or equal to 20 percent
- No contraindication to doxycycline

Not recommended for other antibiotics