What’s eating you?
A guide to skin infestations

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Conflicts of Interest

- None for this presentation
- Warning! This lecture may cause pruritus
What we will cover today...

- Bees
- Fire Ants
- Beetlejuice!
- Mosquitoes
- Moths
- Chiggers
- Ticks
- Scabies
- Bed Bugs
- Cutaneous Larva Migrans
- Delusions of Parasitosis

I HATE INSECT PUNS

THEY BUG ME
Arthropods

Insects
- Winged biting: Flea, Mosquito, Sandfly, Blackfly, Tsetse fly
- Winged non-biting: Housefly

Arachnids
- Ticks and mites and other copepods

Crustaceans
- Cyclops and other copepods

Arthropod Skin Reactions

- **Stage 1**—bite is non-reactive
- **Stage 2**—delayed red papule 24 hrs later
- **Stage 3**—an immediate wheal, delayed papule 24 hrs later
- **Stage 4**—Immediate wheal, no papule
- **Stage 5**—immunologic tolerance, no reaction after prolonged exposure

**Bite vs Stings???

Venomous insects sting, injecting venom through their stingers. Non-venomous insects bite and inject anti-coagulant saliva
Hymenoptera Order

- Bees, Wasps, Ants
  - 1% children, 3% adults, 40 die each year without history of sting
  - Yellowjackets, honey bees, fire ants, wasps
  - Honey bee (*Apis mellifera*) - leave a barbed ovipositor and paired venom sacs impaled in its victim; dies after stinging since it eviscerates itself after depositing its venom sac
  - Bumblebee, wasp - do not have barbed stingers and may sting repeatedly

Cause of Morbidity

- Age - children and elderly
- Presence of other skin disease
- Immune status
Local and Systemic Effects

- Immediate burning, pain followed by intense local erythematous wheal
- “Normal” reaction subsides in several hours
- More severe local reactions can last up to 7 days (due to venom-specific IgE antibodies, cell mediated immune response)
- Massive stings -> multiorgan failure b/c venom is rich in phospholipases
- Occur in 0.4-3% of patients
- Generalized urticaria, angioedema, bronchospasm
- Treatment: subcutaneous epinephrine, oral/parenteral diphenhydramine, systemic steroids for persistent symptoms. Needs to be monitored.
- Intradermal skin puncture tests with very dilute venom identify patients with circulating venom-specific IgE
- Venom immunotherapy and EpiPen
Note on Stings

- Remove the stinger if present by gently scraping the skin horizontally.
- Don’t remove with forceps—will force venom into the skin.
- RICE, antihistamines.
- Watch for systemic symptoms.
  - Carry EpiPen!!!
- Home remedies:
  - Meat tenderizer paste = papain!
  - Thanks, Mom!
  - Baking soda and water paste.

https://medlineplus.gov/ency/imagepages/19629.htm
Red Imported Fire ants

- *Solenopsis invicta*, arrived in 1930’s
- Most adverse reactions in the US compared to native fire ants and harvester ants
- Southeastern and western US and are now in southern California
- Attack in groups, aggressive
  - Anthill is disturbed -> swarm and inflict multiple sting any passerby with venomous apparatus at base of abdomen
  - Up to 3000 stings on one person are not uncommon
  - Pseudo pustule; one fire ant sting can precipitate allergic reaction
  - Ants bite then pivot and sting in circular pattern -> ring shape pustules and become bullous
- Piperidines, alkaloid compounds that are highly neurotoxic, cytotoxic, and hemotoxic, and create an intense burning sensation
- Immunotherapy with fire ant whole-body extract
Treatment and Prevention

Local Care
Avoidance
Exterminator
Shoes/Gloves
Immunotherapy
Epi-pen
Bugs in your practice: Beetlejuice (cantharidin)

- Order Coleoptera (*Lytta vesicatoria*)
  - Found in alfalfa fields and Southern U.S in flower beds
  - Do not bite or sting
- Lost FDA approval in 1962
- Absorbed by lipids in skin
- Acantholysis and intra-epidermal blistering, should not scar!!
- Wash off in 2-6 hours
- May see reaction in 24-48 hrs
- Ring warts (can happen with any treatment)

Arch Dermatol. 2001;137(10):1357-1360
Mosquitoes—”The world’s smallest biggest killer”

- Pruritic wheals and papules
  - injection of irritating salivary secretions
- Depending on individual sensitivity, bites may have an urticarial, vesicular, eczematoid or granulomatous appearance
- Viruses: malaria, dengue, West Nile virus, chikungunya, yellow fever, filariasis, tularemia, dirofilariasis, Japanese encephalitis, Saint Louis encephalitis, Western equine encephalitis, Eastern equine encephalitis, Venezuelan equine encephalitis, Ross River fever, Barmah Forest fever, La Crosse encephalitis, and Zika fever
- Can mosquitoes transmit HIV?
  - HIV is unable to replicate within the mosquito's gut and therefore is broken down. HIV particles are therefore digested by the mosquito alongside the actual blood meal. During the digestion process, the HIV particles are "completely destroyed."

West Nile Virus

- *Culex* mosquitoes are responsible for outbreaks of West Nile virus in US
- Birds, horses, humans
- West Nile fever develops in 20% of infected persons
  - Flu-like illness
  - Erythematous macular, papular, morbilliform or psoriasiform eruption of neck, trunk, extremities
  - Rare severe neurologic manifestations (meningitis, encephalitis) 1/10 die
  - Advanced age most important risk factor for fatal outcome 1/150
- Therapy is supportive
- WNV IgM ab
Zika Virus--Transmission

- *Aedes aegypti*—Possibility that Zika may adapt and then be able to be transmitted by *Aedes albopictus* is a concern
- Same mosquito that transmits dengue and chikungunya viruses.
- Sexually transmitted
  - + in semen despite - serum
- Through transfusion
  - FDA Aug 2016: testing Zika in all donated blood and blood components in the US and US territories
- Perinatal: mother sick within 2 wks of delivery
- Vertical/intrauterine/congenital transmission: mother sick during pregnancy
  - 20 fold increased rate of microcephaly
  -- No transmission via breast feeding so far

Zika Virus--Symptoms

- Approximately 80% are asymptomatic
- Symptoms similar to dengue and chikungunya, usually mild “Rash”, fever, arthralgia, myalgia, conjunctivitis
- 91.3% of symptomatic patients develop “rash”
- Most common maculopapular eruption
  - Trunk, extremities > face, neck
  - Medium duration 6 days
  - Worsening of pre-existing skin disease (psoriasis)
Zika Virus Management

- Supportive
- Unknowns:
  - Roles of antibody-dependent enhancement
  - Relationship with dengue virus?
- No antiviral or vaccine yet
  - As of 1/25/18, Clinicaltrials.gov has ~ 30 ongoing studies
- Check with CDC website before you travel
- Zika Virus-Prevention
  - Screens for windows
  - Air conditioning
  - Mosquito control: Removal of household or yard debris and containers
  - Wearing long sleeves and pants
  - Permethrin-treated clothing and gear
  - Insect repellents
  - Men reside or travel to endemic area: abstinence, consistently use condoms
Notes on Insect Repellants

- Insect repellent: a chemical or organic agent that makes the atmosphere within 4 cm of human skin so noxious as to discourage contact and biting
- Insecticide: a chemical or organic agent that kills insects, typically with a neurotoxin
- Some repellents are also insecticides (e.g., permethrin and synthetic pyrethroids)
- FDA approves insect repellents
- EPA approves insecticides
- Many insecticides are approved for outdoor use only
- Pyrethroids are the only insecticides approved for indoor use
DEET

- N, N-diethyl- 3-methylbenzamide

- Most broad-spectrum insect repellant; effective against mosquitoes and ticks
- Available in concentrations from 5-100%; 10-35% will provide adequate protection
  - 50-75% concentrations can result in skin erythema, vesiculobullous skin necrosis and scarring
- Provides vapor barrier that prevents insect from contacting skin
- Will not damage cotton, wool or nylon clothing
- Can damage rayon, leather and spandex and dissolve plastic and vinyl upholstery
- Crosses placenta; developmental toxicity has not been reported in animals and humans
- Pediatric use: use only in children > 2 months age; 10-30% concentration
IR3535

• Ethyl butylacetylaminopropionate- derived from β-alanine
• Initially marketed as skin emollient and moisturizer (Avon Skin So Soft)
• Protects against mosquitoes, ticks, biting midges, blackflies and sandflies
• No reported adverse reactions including no demonstrated developmental toxicities
• No specific recommendations for use or avoidance in children or pregnancy
Other deterrents

• Picaridin:
  • Effective against mosquitoes, ticks, biting flies, chiggers
  • Provides vapor barrier that deters insect from biting
  • No serious adverse events reported, safe for clothing and plastics
  • Not recommended in children < 2 years of age

Oil of lemon eucalyptus:
  Effective against mosquitoes, ticks, biting flies, gnats
  Available as 40% pump; efficacy similar to lower concentration DEET (7-15%)
  Not for use in children < 3 years old

Citronella:
  Obtained from lemongrass
  One of the most widely used natural repellents on the market,
  Relatively few studies that have been carried out to determine the efficacy of essential oils from citronella as arthropod repellents.
  Deters nuisance biting from mosquitoes, 2 hrs
  Ineffective against flies, fleas, biting midges, ticks
Moths

- Setae—irritant, pets may transfer
- Clothes moth larvae—*Tineola* Species—are household pests
- Woolen items that have holes or burrows are evidence
- Prefer low light conditions
- Infested clothing articles or small blankets and rugs can be dry-cleaned or laundered. Any items not in use should be laundered before being sealed in airtight storage containers. Mothball vapor at appropriate concentrations is lethal to the moths, and when possible, clothing should be stored with mothballs
- Freezing, heating, dry ice, sunlight, vacuuming, cleaning baseboards
- Cedarwood not effective to stop infestation
Chiggers

- *Trombicula alfredi* is the most common species in the United States, and these mites mainly live in the southeastern and south central; most common mite bite
- Forests, grassy areas, gardens, and moist areas of soil near bodies of water
- Larval stage of mites and also are referred to as harvest mites, harvest bugs, harvest lice, mower’s mites, and redbugs
- Severe pruritus and cutaneous swelling as well as erythema; Papules and papulo-vesicles appear in groups, most commonly affecting the legs and waistline, 3 hours later and continue to erupt
- Local care, prevention
Tick borne illness: Lyme Disease

- *Borrelia burgdorferi* by tick *Ixodes scapularis*
  - *B. Burgdorferi* >>> *B. mayonii* (upper midwest)

- Longer the tick is there, the more possible transmission
  - Rarely transmitted diseases if attached < 48 hrs

- 75% develop *erythema chronicum migrans*—which may reach 20 cm in size

- Living and travel history

Serologic tests
  - Must applied to the appropriate patients
  - Adjunct to clinical diagnosis
  - Neither establish nor exclude the dx of lyme, simply changes the probability that a person has been infected

- Indication for serologic testing: hx of living or traveling to endemic area + risk factor to tick exposure + symptoms c/w early disseminated or late lyme disease
Erythema Chronicum Migrans

Think about typical clothing items here
Lyme Dx Treatment

- Patients w EM who lives in endemic area should be treated for early lyme
  - Doxy 100 mg bid x 10-21 d (> 8 yo)
  - Amoxicillin 500 po tid x 14-21 d
  - Cefuroxime axetil 500 po bid x 14-21 d
- Later stages may need longer tx depending on organs involved
## Lyme Treatment

### Table 1. Treatment for Early Lyme Disease With Erythema Migrans

<table>
<thead>
<tr>
<th>Drug</th>
<th>Adult Dosage</th>
<th>Pediatric Dosage</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First-Line</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doxycycline&lt;sup&gt;*&lt;/sup&gt;</td>
<td>100 mg po bid × 14 days</td>
<td>4 mg/kg/day in 2 divided doses (max 100 mg/dose)</td>
<td>10-21 days</td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>500 mg po tid × 14 days</td>
<td>50 mg/kg/day in 3 divided doses (max 500 mg/dose)</td>
<td>14-21 days</td>
</tr>
<tr>
<td>Cefuroxime axetil</td>
<td>500 mg po bid × 14 days</td>
<td>30 mg/kg/day in 2 divided doses (max 500 mg/dose)</td>
<td></td>
</tr>
<tr>
<td><strong>Second-Line</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Azithromycin</td>
<td>500 mg po daily</td>
<td>10 mg/kg/day (max 500 mg/day)</td>
<td>7-10 days</td>
</tr>
<tr>
<td>Clarithromycin</td>
<td>500 mg po bid</td>
<td>15 mg/kg in 2 divided doses (max 1,000 mg/day)</td>
<td></td>
</tr>
<tr>
<td>Erythromycin</td>
<td>500 mg po qid</td>
<td>50 mg/kg in 4 divided doses (max 2,000 mg/day)</td>
<td>14-21 days</td>
</tr>
</tbody>
</table>

* Contraindicated in pregnancy and in patients aged <8 yr max: maximum. Source: Reference 1.
Permethrin

- **Synthetic pyrethroid:** derived from chrysanthemums
- Repellent and insecticide effective against ticks (more effective than DEET), mosquitoes, flies, biting midges, chiggers, fleas, sandflies
- Individuals allergic to chrysanthemums must avoid permethrin use
- Pregnancy category B
- Mechanism of action requires direct contact with insect
- Causes excitation of insect’s nervous system; leads to fatal paralysis
- May be used on clothing, shoes, bed nets, and camping gear
  - Requires reapplication after every 5 washings
  - Long duration mosquito bed nets are available that maintain effective insecticide levels for 3 years
PMD

PMD (p-menthane-3, 8-diol) is derived from lemon eucalyptus (Corymbia citriodora) extract

- only plant-based repellent that has been advocated for use in disease endemic areas by the CDC due to its proven clinical efficacy to prevent malaria
- has mosquito repellent efficacy and duration equal to that of DEET and may offer better protection against ticks than DEET
- considered to pose no risk to human health
- FDA recommends not to use in children under 3 years of age
Comparative efficacies

- IR3535 (skin so soft) superior to DEET for flies and biting midges
- PMD (lemon eucalyptus) and DEET equal in repelling mosquitoes
- PMD and picardin superior to DEET in repelling ticks
- Permethrin provides better overall protection against tick bites than DEET and picardin
- DEET, PMD, picardin were able to repel Aedes and Culex mosquitoes for 6.5 hours

- Most effective use of insect repellants is to layer a topically applied repellant on the skin with permethrin or other synthetic pyrethroid-impregnated clothing that act on contact as insecticides and provide better and longer-lasting protection against mosquitoes and ticks
- EPA does not recommend sunscreen + repellant combo
If a patient has a tick,

- Grab the tick as close to the skin as possible with a very fine forceps and pulling it gradually, but firmly, out from the skin. Avoid decapitating the tick.
- Gloves should be worn when removing ticks, and the bite site should be thoroughly disinfected with alcohol or another skin antiseptic solution.
- Don’t squeeze the tick during removal, since squeezing may inject infectious material into the skin.
- Use of gasoline, petroleum, and other organic solvents to suffocate ticks, as well as burning the tick with a match, should be avoided.
- Often, the complete mouthparts do not come out with the rest of the tick. Leaving these in does not increase the risk of disease transmission, but they may cause a local infection or foreign body reaction.
Scabies

- Mite *Sarcoptes scabiei*, var *hominis*
- Severe *Intense* pruritis
- Can cause impetigo, secondary infection (group A Strep)
- Red pruritic papulo-vesicular and some burrows
- Skin to skin for 15-20 min
- Itch worse at night
- Scrape for diagnosis (fecal pellets! Plus mite, plus eggs!)
- one of the world’s leading causes of chronic kidney disease; poststreptococcal glomerulonephritis
Scabies, continued

- All ages, but more common in women and children
- Congregated facilities (ie nursing homes)
- Direct contact, but fomites can transmit
- Females lay 3 eggs/day which hatch in 4 days. Most pts have 20 mites on the skin at a time
- May take 3-4 wks to have symptoms

Patient and environment must be treated:
5% Permethrin cream—apply night from the neck down, repeat in 4-5 days
5-10% Sulfur ointment qd for 3 days
Oral Ivermectin 200 mcg/kg
Close contacts treated even if no symptoms and bed linens/clothing washed in hot water and dried
Pets do not need treatment
Crusted Scabies

- Variant called Crusted Norwegian Scabies is a massive infestation where the immune response just doesn’t cut it
- Itching minimal
- Immunocomp (HIV), sensory neuropathy, bedridden
- Over 1 million mites on the skin
- Oral Ivermectin 200 micrograms/kg instead of permethrin and keratolytics
Bedbugs!!

- *Cimex lectularius* affect all folks
- Nocturnal, stay hidden in Clothing, bedding, mattresses, wallpaper, laundry while traveling
- Stay hidden during day and feed at night
  - Eat q 3-5 days for 4-10 minutes
  - May live a year without feeding!
- Warmth and CO2, pierce with their forelegs
- Breakfast, lunch, and dinner! Pruritic, erythematous papules
- Local care
- Traps use heat or semiochemicals
Cutaneous Larva Migrans

- AKA creeping eruption from “sandworms”
- Larva of dog and cat hookworms: *Ancylostoma braziliense* or *Ancylostoma caninum*
- Sole of foot most common, also buttocks, backs, and thighs; but can’t invade dermis
- Pruritis within 30 min, Move 3 cm/day
- Unilateral, Erythematous, serpiginous burrow; clinical diagnosis
- Self-limiting
- Treatment: 10% topical thiabendazole applied 4x/day for 2 days, or one dose of ivermectin
“Woman loses her toenails due to fish pedicure”

- JAMA Dermatol. 2018 Jul 3
- 6 months passed and patient developed onychomadesis—direct trauma to nail?
- Garra rufa fish
- Infection from the fish themselves or from the recycling from person to person
- Strep infection reported in these fish in the UK
A Patient walks in...
What kind of patients come in with ‘something in their skin’?

- Primary Dermatologic problem
- Primary Medical problem (causing psych)

Delirium: Polypharmacy: anticholinergic effects
(elderly, decreased hepatic metabolism)
H1 and H2 blockers
Oral steroids
Dementia (Parkinsons, Alzheimers)
  – Dopaminergic drugs
Skin picking often triggered by ADHD meds
Opioids may hit itch receptors

- Primary Psychiatric Problem
The Spectrum of Delusional Ideation

**Therapeutic Approach**

**Characteristics**
- Skin Picking
  - Insight into uncertainty of infestation
- Somatic Preoccupation
  - Relief from symptoms is more important than validation of infestation
- Delusional State
  - Lack of insight, ideation is fixed
- Terminal Delusional State
  - Validation of infestation becomes dominant focus

**Therapeutic Approach**
- Treat with reassurance
- Behavioral therapy/SSRIs
- Treat underlying depression or anxiety
- Antipsychotic treatment
- Treatment is difficult if not impossible
Ask the question: “What do you think is causing the problem?’

“There is something bothering my skin”

“I don’t know, but it feels like bugs crawling.”

“There are insects in my skin. Get rid of the insects and I’ll be fine”

Skin Picking Disorder  Somatic Preoccupation  Delusional State  Terminal Delusional State

Insight into uncertainty of infestation

Relief from symptoms is more important than validation of infestation

Lack of insight, ideation is fixed

Validation of infestation becomes dominant focus
Delusions of Parasitosis: Goal
(aka Perceptions of infestation)

– You may not rid the patient of his/her bugs.
– **Goal is to improve** his/her quality of life.
– Sensations resolve first; the belief in bugs may resolve much later (or never)
– poor prognosis unless caught early
– Psychiatric and medical considerations
  – Take them off medications that might be the cause
  – Risperidone is TOC (Risperdal)
  – Olanzapine (Zyprexa)
  – Aripiprazole
  – Pimozide (Orap)—extrapyradimal symptoms
Don’t use the delusion to get them care...

- “I know you feel strongly that parasites are there, and I am sure you are itchy, but I can’t prove that parasites are or have been the cause”

- Skin picking: out of sight, out of mind, cognitive behavioral therapy, rule out other disease/meds

- Somatic preoccupation: may be dealing with depression, PTSD, guilt

- Delusional state: validation, may have no skin findings

- Terminal delusional state: validation is reason for seeking care

- Therapeutic alliance with patient, but most are lost to follow up
Psychogenic: Morgellon’s

- Unfortunate choice of name
- Delusions of parasitosis, self-dx
- Try to extract the foreign substance
- Fibers extracting from skin
- Matchbox sign---collect specimens

Accordino et al Derm Therapy 2008

- Asymmetrical (dominant hand)
- Elaborate stories, infecting others
- Obsessive cleaning, extermination
- Doctor Shoppers, Rapport enhancing
- Pimozide; Eurax; oral antibiotic
- It is non-infectious

PloS ONE, CDC 2012

https://www.mayoclinic.org/morgellons-disease/art-20044996
Thank you! traceyv@temple.edu