Infestations and Bites

Basic Dermatology Curriculum

Updated September 2015
The purpose of this module is to help the learner develop a clinical approach to the evaluation and initial management of patients presenting with bites and infestations.

After completing this module, the learner will be able to:

- Identify and describe the morphology of scabies
- Recognize risk factors for lice infestation and scabies
- Identify nits and adult lice as diagnostic of pediculosis
- Select skin scraping as the diagnostic test of choice for scabies
- Identify common causes and clinical presentations of insect bite reactions, with an emphasis on bedbugs and brown recluse spider bites
- Discuss treatment options and patient education for pediculosis capitis, scabies and insect bite reactions
CASE ONE

Mary Thompson
Case One: History

- **HPI:** Mary is a 6-year-old girl with a two-week history of an itchy scalp. It has not improved with over-the-counter dandruff shampoo. She recently stayed over at her cousin’s house who now has the same problem.
- **PMH:** no chronic illnesses or prior hospitalizations
- **Allergies:** no known allergies
- **Medications:** none
- **Family history:** noncontributory
- **Social history:** lives with her parents and attends first grade
- **ROS:** negative
Exam of the Occipital Scalp

Structures on the hair are not freely movable
Case One: Question 1

How would you describe Mary’s exam?

a. Multiple hair casts present. No nits or lice noted.
b. Multiple lice present. No nits noted.
c. Multiple nits present. No lice noted.
d. Negative exam, no nits or lice noted.
Case One: Question 1

**Answer:** c

How would you describe Mary’s exam?

- a. Multiple hair casts present. No nits or lice noted.
- b. Multiple lice present. No nits noted.
- c. **Multiple nits present. No lice noted.**
- d. Negative exam, no nits or lice noted.
Exam Findings

Numerous nits (oval egg capsules) firmly fixed to the hair shaft
Pediculosis (Lice)

- Three different varieties of lice may infest humans
  - Head louse – *Pediculus humanus* var. *capitis*
  - Body louse – *Pediculus humanus* var. *corporis*
  - Pubic or crab louse – *Phthirus pubis*

- Head lice are spread by close physical contact and fomites (e.g., brushes, helmets, bedding)
- Commonly affects school-age children
- Affects all ethnic and socioeconomic groups, but is less common in African-Americans
Pediculosis: Clinical Features

- Frequently has associated scalp pruritus
- May also have posterior cervical lymphadenopathy
- Dermatitis may be present on the posterior neck
- Nits are noted more commonly than lice on exam (live lice scurry away from light)
Pediculosis: Clinical Features

- The most common sites to find nits are on the retroauricular and occipital scalp.
- Nits within 1 cm of the scalp are typically viable. The distance may be greater in warm environments.
- Nits must be distinguished from hair casts.
  - Hair casts encircle the hair shaft and move freely in contrast to the nit which is cemented to the hair.
Pediculosis: Pathogenesis

- Female adult lice live 30 days and lay 5-10 eggs (nits) per day at the base of the hair where it meets the scalp.
- Eggs hatch in 8-12 days.
- Live eggs remain close to the scalp to maintain warmth and moisture but as the hair grows, the nits move off the scalp with the hair.
- Because hair grows at a rate of ~ 1 cm per month, the duration of infestation can be estimated by the distance of the nit from the scalp.
The adult head louse is 2-3 mm in length and has six legs.

The presence of live adult lice, immature nymphs, and/or viable eggs indicate active infestation.

Lice typically survive 1-2 days away from the scalp. Eggs may survive up to 10 days away from the scalp.
Hair Mount

- This image shows a nit without an intact cap (operculum), and is not viable (no larva inside).
- Viable eggs are usually tan to brown in color.
- Hatched eggs are clear to white.
- Empty egg casings are often easier to see b/c they appear white against darker hair.
Pediculosis: Treatment

- Individual patient factors should be assessed prior to choosing a topical therapy (age, allergy history, prior treatment, etc.).
- It is prudent to re-treat with topical therapies 7-9 days after initial therapy to kill the newly hatched lice.
- First-line over-the-counter and prescription topical therapies are listed on the following slide.
  - Use OTC permethrin 1% or pyrethrins when resistance is not suspected.
  - Use malathion 0.5% when resistance to permethrin or pyrethrins is documented or when treatment with these products fails.
<table>
<thead>
<tr>
<th>Therapy</th>
<th>Use</th>
<th>Ovicidal</th>
<th>Risks</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over-the-counter pyrethrins (natural botanical)</td>
<td>Topically to clean, dry hair for 10 minutes.</td>
<td>Pediculocidal. Re-treat at day 9. Or consider treatment on days 0, 7 and 14.</td>
<td>Potential allergic reaction in patients sensitive to chrysanthemums and ragweed. + Resistance</td>
<td>2 years +</td>
</tr>
<tr>
<td>Permethrin 1% lotion (synthetic pyrethroid)</td>
<td>Topically to clean, dry hair for 10 minutes.</td>
<td>Pediculocidal. Re-treat at day 9. Or consider treatment on days 0, 7 and 14.</td>
<td>+ Resistance</td>
<td>2 months +</td>
</tr>
<tr>
<td>Malathion 0.5% lotion (prescription)</td>
<td>Topically to clean, dry hair for 8-12 hours.</td>
<td>Pediculocidal AND ovicidal. A single application is usually effective. Reapply at day 9 if live lice are seen.</td>
<td>Alcohol base is flammable (avoid heat sources during use). + Resistance (UK formulation, less so in the US).</td>
<td>6 years +</td>
</tr>
<tr>
<td>Benzyl alcohol 5% (prescription)</td>
<td>Topically to clean, dry hair for 10 minutes.</td>
<td>Pediculocidal. Re-treat at day 9. Or consider treatment on days 0, 7 and 14.</td>
<td></td>
<td>6 months +</td>
</tr>
</tbody>
</table>
Pediculosis: Treatment

- Adjunctive nit combing can be performed.
- Occlusive methods have also been used to suffocate head lice using substances such as petroleum jelly and mayonnaise, but study results have been variable.
- Patients with refractory lice should be referred to a dermatologist.
Case One: Question 2

Mary returns to clinic one month after treatment with topical permethrin 1% lotion. If Mary had live lice in the scalp on follow-up, which of the following answer choices would be possible causes of treatment failure?

a. Did not clean daily hair care products
b. Did not re-treat in 7-10 days
c. Did not treat contacts
d. Incorrect application of the medication
e. Resistance of the organism to medication
f. All of the above
Case One: Question 2

Answer: f

If Mary had live lice in the scalp on follow-up, which of the following answer choices would be possible causes of treatment failure?

a. Did not clean daily hair care products
b. Did not re-treat in 7-10 days
c. Did not treat contacts
d. Incorrect application of the medication
e. Resistance of the organism to medication
f. All of the above
Pediculosis: Patient Education

All persons living in the home should be examined to avoid re-infestation.

- Those with live lice or nits within 1 cm of the scalp should be treated.
- It is prudent to treat family members who share a bed with the person with infestation, even if no lice are found.
- If it is not possible to examine household members, treat without an exam if the treatment is not contraindicated.
Pediculosis: Patient Education

- Clothing and bedding should be washed and dried on the hot cycle of the dryer.
- Brushes, combs and other hair care items can be placed in hot (> 60°C) water for 10 minutes.
- Non-washable items may be placed in the dryer or stored in a sealed plastic bag for 3 days.
- Children should not be restricted from attending school because of lice.
CASE TWO

Michael Miller
Case Two: History

- **HPI:** Mike is a 21-month-old boy who was referred to dermatology clinic for a rash that has been present for two weeks. The itch has disturbed his sleep.
- **PMH:** no chronic illness or hospitalizations
- **Allergies:** no known drug allergies
- **Medications:** none
- **Family history:** noncontributory
- **Social history:** lives with his parents and attends day care
- **ROS:** negative
Case Two: Skin Exam

- Multiple polymorphous scaly papules, nodules accentuated in the axillae and around the umbilicus
- Burrows present in the 2\textsuperscript{nd}-3\textsuperscript{rd} web space on the right hand
Case Two: Question 1

What in-office procedure would best help to confirm the diagnosis?

a. KOH preparation  
b. Nail clipping  
c. Skin scraping  
d. Wood’s light examination
Case Two: Question 1

Answer: c

What in-office procedure would best help to confirm the diagnosis?

a. KOH preparation (commonly used to diagnosis fungal infections of the skin)

b. Nail clipping (commonly used to diagnosis onychomycosis)

c. Skin scraping (mineral oil preparation)

d. Wood’s lamp examination (commonly used to assess the degree of pigment in the skin)
You perform a mineral oil preparation on the patient. You use a 15-blade scalpel and scrape a burrow on the skin. The scraped material is placed on a slide and a drop of mineral oil is added. A cover slip is placed on top and you see the image below when you look through the microscope. What do you see?
Case Two, Question 2

- scabies mite
- egg
- scybala (feces)
Sarcoptes scabiei (scabies) affects patients of all ages and all socioeconomic classes, although it is more common in women and children.

- Immunocompromised individuals and those in congregated facilities (e.g., nursing homes) are more prone to infestation.

- Most infections occur from direct contact with an infected individual; however, fomites can transmit infection.
Scabies: Clinical Features

- The time from initial infestation to symptoms is typically 3-4 weeks.
  - Once sensitized to the mite, re-infestation results in symptoms within 1-2 days.
- Papules may commonly involve the axillae, breasts, umbilicus, penis, scrotum, wrists and finger webs.
- The scalp and head are more frequently involved in infants, elderly and immunosuppressed individuals.
- The hallmark feature is itching at night.
Scabies: Clinical Findings
Scabies Mite

- The scabies mite is 0.35 x 0.3 mm in size and too small to be seen by the naked eye.
- Females lay about three eggs per day, which hatch in four days.
- Most patients have less than 20 mites on the skin at a time.
Case Two: Question 3

Which of the following clinical findings is considered pathognomonic for scabies?

- a. Burrows
- b. Diffuse involvement
- c. Erythematous papules
- d. Sparing of the groin
Case Two: Question 3

Answer: a

Which of the following clinical findings is considered pathognomonic for scabies?

a. Burrows
b. Diffuse involvement (may be diffuse, especially in infants)
c. Erythematous papules (this primary morphology is not specific to scabies infestation)
d. Sparing of the groin (genital involvement is common)
Burrows

Burrows are linear markings in the skin due to the movement of the mite. They are 1-10 mm in length and are most readily found in the interdigital spaces, wrists and elbows.
Burrows

Dermoscopy helps identify the mite at the end of a burrow
Mike’s mother tells you his uncle, who is HIV+, is currently hospitalized. Why is this important?

a. His uncle is unlikely to have been the source of infestation
b. If his uncle has scabies, it could cause an institutional outbreak
c. If his uncle gets scabies, it will likely be a less severe form
d. This is not relevant information
Case Two: Question 4

Answer: b

Mike’s mother tells you his uncle, who is HIV+, is currently hospitalized. Why is this important?

a. His uncle is unlikely to have been the source of infestation (Immunosuppressed patients are at increased risk for infestation)

b. If his uncle has scabies, it could cause an institutional outbreak

c. If his uncle gets scabies, it will likely be a less severe form (Immunosuppressed patients may develop crusted scabies)

d. This is not relevant information
Crusted Scabies

Immune suppressed or neurologically impaired individuals are at increased risk of developing crusted scabies (hyperkeratotic scabies, formerly called Norwegian scabies).

- Presents with thick, scaly, white-gray plaques with minimal pruritus that is often localized to the scalp, face, back, buttocks and feet.
- Fissures provide an entry for bacteria leading to increased risk of sepsis and death.
- Immunocompetent persons who come into contact with crusted scabies develop typical scabies.
Crusted Scabies

- Crusted scabies is far more difficult to treat.
- There is an incredibly high mite burden.
- Refer to the HIV Dermatology module for more information on crusted scabies.
Scabies: Treatment

- Scabies treatment includes a two-pronged approach. The patient and the environment must both be treated.
  - Two topical treatments separated one week apart with a prescription anti-scabietic medication are recommended.
  - Apply topical medication from the neck down and leave on overnight; for infants and the elderly, include the face and scalp.

- Itch and lesions can persist for 2-4 weeks after successful treatment, referred to as “post-scabietic” pruritus or dermatitis.
  - This is not a treatment failure, rather it represents the body’s response to dead mites.
Scabies: Treatment

- Environmental care includes washing all clothing and linens used within the last week in hot water and drying on high heat. For items that cannot be washed, seal items in bags for at least 3 days.
- Isolation from other people is unnecessary as the causative organism cannot jump or fly, and can survive for only approximately 72 hours away from the skin.
<table>
<thead>
<tr>
<th>Therapy</th>
<th>Use</th>
<th>Risks/Side effects</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>5% permethrin cream</td>
<td>Topically overnight on days 0 and 7. Apply from neck down. Include scalp and face in infants and elderly.</td>
<td>Low systemic absorption, ~2%. May burn or sting on application.</td>
<td>First-line treatment in patients over 2 months old</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Used off-label in patients under 2 months old</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pregnancy category B</td>
</tr>
<tr>
<td>5-10% precipitated sulfur</td>
<td>Apply overnight for three days, then wash off</td>
<td>Greasy, strong odor, stains clothing</td>
<td>Safe in pregnancy and children under 2 months old</td>
</tr>
<tr>
<td>Oral ivermectin</td>
<td>200 mcg/kg by mouth, repeat dose two weeks later</td>
<td>Generally well-tolerated. May cause pruritus and rash. CNS toxicity is possible.</td>
<td>Most useful for immunocompromised patients or when topical therapy is impractical (outbreaks).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pregnancy category C (generally not recommended in pregnancy). Safety data not established in children who weigh &lt;33 lbs (15kg).</td>
</tr>
</tbody>
</table>
Treatment of Crusted Scabies

- For difficult-to-treat or severe scabies, refer to a dermatologist.
- Combination therapy is typically used in crusted scabies.
  - Multiple doses of oral ivermectin 200 mcg/kg/dose depending on the severity of infection.
  - Topical permethrin 5% 1-2 x weekly. Frequently more than two treatments are required.
- Given the high mite burden, patients with crusted scabies need to be isolated, and strict barrier nursing procedures instituted to avoid outbreaks in health care facilities.
CASE THREE

Marsha Koehler
Case Three: History

- HPI: Mrs. Koehler is a 33-year-old woman who presented to clinic with “itchy bumps” that started over the weekend. No one else at home has a similar complaint.
- PMH: GERD
- Allergies: none
- Medications: omeprazole
- Family history: noncontributory
- Social history: works in a restaurant
- ROS: negative
Case Three: Skin Exam

Edematous papules scattered over the body, some are excoriated.
Case Three: Question 1

What is the most likely diagnosis?

a. Bedbug bites
b. Brown recluse spider bites
c. Chickenpox
d. S. aureus folliculitis
Case Three: Question 1

Answer: a

What is the most likely diagnosis?

a. Bedbug bites
b. Brown recluse spider bites (normally single site)
c. Chickenpox (presents as erythematous macules, papules and clear vesicles. Vesicles are surrounded by narrow, red halos, referred to as “dew drops on a rose petal”)
d. S. aureus folliculitis (follicular-based, may be pustular)
Bed Bugs

- Cimex lectularius (most common type) affect people from all racial and socioeconomic groups
- May be spread during travel on clothing, bedding, mattresses, and laundry, etc
- Stay hidden during the day and feed at night
- Bites may be multiple in a linear array; referred to as “breakfast, lunch and dinner”
Bed Bugs: Clinical Presentation

- Usually present as pruritic, erythematous and edematous papules
- Appearance and duration of lesions vary depending on the patient's degree of sensitization
  - Some individuals have little or no reaction to bedbug bites
  - Common for only one or a few family members (even among those sleeping in the same bed) to report lesions
Cimex Lectularius

Red-brown in color with a segmented abdomen and vestigial wings
Bed Bugs: Treatment

- Bites will typically resolve within 1-2 weeks
- For symptomatic relief, treat with potent topical steroids and antihistamines
- Ultimate treatment requires detection and eradication of the household infestation
  - Bed linens need to be laundered and furniture vacuumed
  - A professional exterminator may be needed to treat the home
# Other Insect Bites

<table>
<thead>
<tr>
<th>Insect</th>
<th>Clinical</th>
<th>Characteristics</th>
<th>Vectors of Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flea bites</td>
<td>Linear or clustered pruritic papules</td>
<td>Wingless</td>
<td>May transmit disease such as bubonic plague (rat flea), endemic typhus (cat flea)</td>
</tr>
<tr>
<td>Rat flea: <em>Xenopsylla cheopis</em>, X. <em>brasiliensis</em></td>
<td>May be bullous</td>
<td>May jump 18 cm</td>
<td></td>
</tr>
<tr>
<td>Cat flea: <em>Ctenocephalides felis</em></td>
<td>Bites often localized to lower legs, shoulders and waistline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mosquito bites</td>
<td>Poplar urticaria</td>
<td>Males lack mouthparts</td>
<td>May transmit malaria, dengue fever, etc.</td>
</tr>
<tr>
<td></td>
<td>Bites typically on exposed skin of the face and extremities</td>
<td>Females inflict human bites</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Can cause exuberant bite reactions in children</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CASE FOUR

Stacey Dean
Case Four: History

- **HPI:** Miss Dean is a 23-year-old woman who presented to clinic with a “painful bump” that started yesterday evening. She had been cleaning out her attic earlier that day.
- **PMH:** asthma
- **Allergies:** penicillin
- **Medications:** albuterol inhaler
- **Family history:** noncontributory
- **Social history:** college student
- **ROS:** malaise
Case Four: Skin Exam

Hemorrhagic bulla with surrounding ischemia and peripheral erythema
Arachnid Bites

- Only three genera of spiders found in the United States have bites toxic to humans: *Latrodectus*, *Loxosceles*, and *Tegeneria*

- Approximately 12,500 spider bites were reported to the American Association of Poison Control Centers and zero deaths secondary to spider bites in 2008

- This module will review the characteristics of the *Loxosceles reclusa*, brown recluse spider
Brown Recluse Spider

Characteristic violin-shaped dark brown marking on the cephalothorax
Case Four: Question 1

Which of the following statements is most accurate about brown recluse spiders?

a. Bites frequently occur on outdoor hikes  
b. Bites frequently occur when areas where the spiders seek shelter are disturbed  
c. These spiders are very aggressive  
d. These spiders are commonly found in the Northwest
Case Four: Question 1

**Answer: b**

Which of the following statements is most accurate about brown recluse spiders?

- a. Bites frequently occur on outdoor hikes
- b. **Bites frequently occur when areas where the spiders seek shelter are disturbed**
- c. These spiders are very aggressive
- d. These spiders are commonly found in the Northwest
Brown Recluse Spider

- As noted by the name, the spider is typically not aggressive, and is reclusive
- Found in the Midwest and Southeast
- Bites frequently occur when patients are disturbing areas where the spiders seek shelter (attics, closets, etc.) or putting on clothing containing the spiders
- Cardboard boxes may harbor the spiders as the corrugated structure mimics their natural habitat
Clinical Presentation

This case shows the characteristic “Red (peripheral erythema), White (blanching) and Blue (central violaceous area)” sign of the brown recluse bite.
Clinical Presentation

Initial wound may progress to necrosis and deep ulcer formation
Brown Recluse: Differential

<table>
<thead>
<tr>
<th>History/Finding</th>
<th>MRSA Infection</th>
<th>Brown Recluse Bite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insect seen</td>
<td>-</td>
<td>-/+</td>
</tr>
<tr>
<td>History of similar occurrence</td>
<td>Common</td>
<td>Uncommon</td>
</tr>
<tr>
<td>Close personal contacts affected</td>
<td>Common</td>
<td>Uncommon</td>
</tr>
<tr>
<td>Multiple areas affected on exam</td>
<td>Common</td>
<td>Uncommon</td>
</tr>
<tr>
<td>Progression</td>
<td>Days to weeks</td>
<td>Hours to days</td>
</tr>
<tr>
<td>Red, white and blue sign</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Geographic location</td>
<td>Throughout the U.S.</td>
<td>Southeast and Midwest (endemic areas)</td>
</tr>
</tbody>
</table>

MRSA infections may frequently be mistaken for spider bites. Pyoderma gangrenosum and erythema migrans (Lyme disease) may be considered also.
Case Four: Question 2

Which of the following statements is most accurate about brown recluse spider bites?

a. All bites lead to ulcer formation
b. Most bites require surgical debridement
c. Most bites can be treated with rest, ice and elevation
d. Systemic reactions are common
Case Four: Question 2

Answer: c

Which of the following statements is most accurate about brown recluse spider bites?

a. All bites lead to ulcer formation
b. Most bites require surgical debridement
c. Most bites can be treated with rest, ice and elevation
d. Systemic reactions are common
Brown Recluse: Management

- Most bites can be treated with rest, ice and elevation
- Tetanus toxoid should be given if the patient has not received the immunization within 10 years
- Supportive care, including cleansing the wound, applying cold compresses, and controlling pain is important
- Multiple treatments have been suggested, but are not consistently shown to be beneficial
Brown Recluse: Management

The wound at right healed with close monitoring, topical therapy with antibiotic ointment and nonstick wound dressings without requiring surgical debridement.
Brown Recluse: Complications

- Tissue necrosis may occur due to the presence of multiple proteins in the venom
- Some patients may develop systemic symptoms, including malaise, nausea, vomiting, etc.
- Uncommonly significant hemolysis, renal failure, anemia, and/or hypotension may occur
**Take Home Points**

- Pediculosis capitis commonly affects school-aged children.
- Adult lice and/or nits within 1 cm of the scalp are diagnostic of pediculosis capitis.
- Scabies affects all classes of patients, but those in group settings or in an immunocompromised state are at increased risk of infestation.
- The primary diagnostic test for scabies is the skin scraping or mineral oil prep.
- 1\textsuperscript{st}-line treatment for scabies in patients over two months of age who are not pregnant is permethrin 5\% cream.
Take Home Points

- Bedbugs typically feed at night and infest all populations
- Bedbug bites cause edematous papules which may be arranged in a “breakfast, lunch and dinner” pattern
- Brown recluse spiders are found in the Midwest and Southeast
- They have a characteristic violin-shaped marking on their cephalothorax
- MRSA infection is frequently misdiagnosed as brown recluse spider bites
- The primary therapy for a brown recluse spider bite is supportive care
Acknowledgements

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References


- Goldstein BG, Goldstein AO. Scabies. In: UpToDate, Basow, DS (Ed), UpToDate, Waltham, MA, 2011.

References

To take the quiz, click on the following link:

https://www.aad.org/quiz/infestations-and-bites-learners