Tick-borne disease

Tick Bites
3 Important US species to know

1. *Amblyomma americanum* - most important vector of human monocytic ehrlichiosis

2. *Dermacentor variabilis* & *dandersoni*
   - *D. variabilis* - RMSF (US except Rocky M states)
   - *D. andersoni* - RMSF (Rocky M states)
   - Q fever
   - Colorado tick fever
   - Tularemia

3. *Ixodes scapularis* & *pacificus*
   - *I. pacificus* - western black-legged tick, Lyme disease (Borrelia burgdorferi) in western US states
   - *I. scapularis* - Lyme disease mid-Atlantic, Great Lakes, and northeastern US states

3 Important US species to know

1. *Amblyomma americanum* - most important vector of human monocytic ehrlichiosis

2. *Dermacentor variabilis* & *dandersoni*
   - *D. variabilis* - RMSF (US except Rocky M states)
   - *D. andersoni* - RMSF (Rocky M states)
   - Q fever
   - Colorado tick fever
   - Tularemia

3. *Ixodes scapularis* & *pacificus*
   - *I. pacificus* - western black-legged tick, Lyme disease (Borrelia burgdorferi) in western US states
   - *I. scapularis* - Lyme disease mid-Atlantic, Great Lakes, and northeastern US states
Tick bites

- Correct identification of tick important for patient counseling
- Dermacentor ticks usually attach to head, neck, upper trunk
  - Important cause of tick paralysis (presumed release of neurotoxin)
  - Mortality rate of 10%
- Delayed-type hypersensitivity reactions to tick antigens occur usually when tick has been removed

Rocky Mountain Spotted Fever

- Rickettsia rickettsiae gram neg. bacteria transmitted by D. andersoni and A. americanum ticks
- Petechial or purpuric eruption in late disease - acral distribution centripetal spread
  - 88-90% of patients
  - Usually begins 3rd to 5th day of illness

Rocky Mountain Spotted Fever

- Treatment
  - Therapy should be initiated within 5 days of symptom onset
  - Use clinical judgement - if no skin rash and high suspicion, treat when in doubt (don't wait for skin rash)
  - Delay in treatment associated with increased mortality rate (almost 23% after 5 days of sx onset)
  - Patient without rash and mild symptoms with no RFs for severe disease can safely observed for up to 3 days
  - Pregnant women
    - Chloramphenical 50mg/kg/day divided QD
    - Unless 3rd trimester or life-threatening illness - use doxycycline
  - Children <45kg
    - Doxycycline 2.2mg/kg/day
    - >45kg=Adult dose
  - Non-Pregnant adults
    - Doxycycline PO/IV 100mg BID, continue until pt afebrile x 3 days (at least 10 days)
  - Risk factors for severe disease
    - Men>40, children<10, EtOH abuse, G6PD deficiency
Lyme Disease

- *Ixodes scapularis/pacificus* ticks → *Borrelia burgdorferi* (spirochete)

- Erythema migrans is first symptom (80% of patients)
  - Occurs 3-30 days after tick bite
  - Only 25% of these patients ACTUALLY recall a tick bite

- Morphology - erythematous nodule with targetoid central clearing ("bull's eye") and necrotic center distributed in axilla, inguinal region, waistline, or popliteal fossa

- Pruritus is mild, pain is rare, + warmth

**Clinical manifestations of Lyme disease**

**Early dissemination disease, occurring a few days to 4 weeks after the tick bite**

- Neurological symptoms - cauda equina syndrome, radiculopathy, cranial nerve palsy
- Cardiac symptoms - atrioventricular block, pericarditis, myocarditis
- Dermatologic symptoms - annular erythema, maculopapular rash, arthritis

**Tertiary disseminated disease, occurring months to years after the tick bite**

- Neurological symptoms - meningitis, encephalitis, peripheral neuropathy
- Arthritis - migratory, chronic, deforming
- Cardiac symptoms - conduction abnormalities
- Dermatologic symptoms - persistent annular erythema

**Late or chronic disease, occurring months to years after the tick bite**

- Neurological symptoms - ataxia, myelopathy, peripheral neuropathy
- Cardiac symptoms - conduction abnormalities
- Dermatologic symptoms - late erythema migrans

**Tick Removal**

- Tick-Nipper™ - grasps tick behind mouthparts without severing
- Forceps usually less successful
- Petroleumatum, nail polish, hot matches ineffective
- DO NOT squeeze abdomen - gentle traction, twisting motion

**Prevention**

- Protective clothing tightly laced/tucked in/tied
- Pretreat with permethrin
- DEET repellent
- Removal of leaf debris
- Antibiotic prophylaxis controversial (Lyme)
- Widespread use not recommended
- When ticks correctly identified and heavily engorged, benefit of PEP outweighs risk
- 10 day course of oral doxycycline 100mg BID

Myiasis

- Infestation of skin by fly larvae
- Larvae inhabit skin wounds or burrow into dermis → furuncle
- Worldwide occurrence, but incidence highest in Africa and Americas in warm summer months
- Dermatobia hominis (human botfly) and Cordylobia anthropophaga (tumbu fly) are most common
- Transmission:
  - D. hominis lays eggs on mosquitoes, which deposit them onto intermediate host where they mature until emergence from aperture in skin
  - C. anthropophaga deposits eggs on moist clothing and soiled blankets in sand

Dermatobia hominis larva

An extracted Dermatobia hominis larva.

Courtesy of Peter Lio, MD.

Myiasis: Botfly

- Morphology
  - Pruritic papule enlarging to 1-3 cm (develops within 24 hours of inoculation) distributed on exposed body areas (scalp, face, forearms, legs)
  - Often painful with sensation of movement
Treatment

**Tungiasis**
- Endemic to Central/South America, Caribbean Islands, India, Pakistan, Africa
- Female sand flea (*Tunga penetrans*) penetrates human skin
- Favors interdigital or subungual region of feet
- Deposits eggs that are expelled through the host's skin
- **Morphology**
  - Solitary or multiple nodules with central black pigment and occasionally ulceration
- **Treatment** = Removal

**Dengue Fever**
- Most prevalent mosquito-borne viral disease
- Central/South America, Africa, Southeast Asia, Caribbean Islands
- Once mosquito infects host, viral replication occurs → symptom onset between 3-14 days
- **Symptoms**
  - Biphasic fever
  - Headache, arthralgia ("breakbone fever")
  - Nausea/vomiting
  - Diffuse maculopapular rash (30-50%) or diffuse macular erythema resembling sunburn → may become petechial/hemorrhagic
- **Treatment**
  - Supportive
  - Dengue Shock Syndrome = hospitalization
Leishmaniasis

- Worldwide distribution, but endemic in Latin America, Mediterranean, parts of Asia & Africa
- Transmitted by sandfly bites
- Cutaneous, mucocutaneous, and visceral forms

Cutaneous Leishmaniasis

- Morphology
  - Solitary painless well-circumscribed papule that enlarges into a nodule and later becomes ulcerated
  - Disseminated form
  - Skin biopsy is a helpful diagnostic tool – presence of amastigotes in dermal macrophages
  - Treatment
    - Sodium stibogluconate
    - Meglumine antimoniate
    - Majority of cutaneous lesions resolve spontaneously
    - Possibility of mucocutaneous disease months to years later
    - leishmaniasis recidivans - recurs at site of an original ulcer, usually at edge of scar
Cutaneous Larvae Migrans

- Most common migratory skin infection in travelers
- Caused by animal hookworm larvae
- Eggs shed in feces of infected animals → contaminate sand and soil → hatch → larvae that penetrate upper dermis of human hosts walking barefoot in sand/soil
- Worldwide distribution
  - Warm climates of Southern US, Central/South America, Africa most common

Larva migrates at rate of 1-2 cm/day

Morphology
- Edematous, erythematous linear and serpiginous tracks distributed on distal lower extremities and buttocks
- INTENSELY pruritic

Treatment

- Self-limited
- Ivermectin 12mg PO x 1
  - Children 150mg/kg PO x 1
  - 80-100% cure rate
- Albendazole 400mg PO x 1
  - Cure rate of 45-100%
  - 400-800mg/day x 3-5 days is recommended (80-100% cure rate)
  - Children < 2 = 10-15mg/kg/day
Cutaneous Schistosomiasis

- Africa, Far East, Middle East, South America
- Trematode (fluke) infection caused by 5 species of schistosomes
  - Each with unique distribution
  - Common intermediate host = snails
  - Humans are the major hosts
    - Adult worms live in portal hepatic system, rectum, or urinary bladder
    - Eggs penetrate rectum or bladder to be passed in feces or urine
    - Eggs hatch in fresh-water environment
    - Miracidia released
    - Penetrate body of snail
    - Develop internally into cercariae
    - Penetrate human skin

Schistosome Life Cycle

- Morphology
  - Erythematous pruritic papules or urticarial wheals at site of inoculation
- Katayama fever
  - Systemic allergic reaction during acute phase
  - Fever, chills, sweats, and headaches
  - Peripheral blood eosinophilia
**Schistosomiasis**

- **Diagnosis**
  - Microscopic detection of eggs in urine or feces
  - Antischistosomal IgG, IgM, IgE by ELISA
- **Treatment**
  - Praziquantel (anthelminthic agent)
    - 20mg/kg BID-TID for 24 hours
  - Effective against all 5 human schistosomal species
- **Prevention**
  - Avoid freshwater swimming
  - In endemic areas, Pass on the Escargot!

**Filariasis**

- Endemic to South America, Africa, Asia, and Pacific Islands
- Mosquito vectors transmit tissue nematodes (roundworms) → infect lymphatic system
- Acute, chronic, and asymptomatic forms exist
  - Acute phase = lymphangitis and fever typically recurrent and frequent (6-10 episodes/year), avg duration 1 week
  - Orchitis, epididymitis
  - Chronic phase = lymphedema and elephantiasis, hydroceles

- Two most common sites affected are lower extremities and genitalia
- **Diagnosis**
  - Microfilariae in blood, urine, or other body fluids/tissues
  - Nocturnal = collect at 2 am
Treatment

- Diethylcarbamazine 6-8mg/kg/day x 12 days
- PO Antihistamines
- Topical corticosteroids
- Ivermectin
- Albendazole

Cutaneous Tuberculosis

- Uncommon (1-2%)
- Lupus vulgaris (Tuberculosis lupus)
  - Reactivation of TB in patients with high immunity against the bacillus
  - Most common form of cutaneous TB in Europe
  - High risk - rural population, contact with cattle, exposure to infected milk
  - Morphology variable, mostly asymptomatic isolated plaque
- Erythema Induratum
  - Nodular vasculitis (considered a form of panniculitis)
  - Mildly tender, dull red, subcutaneous nodules on the posterior lower legs
  - Primarily occurs on lower legs
Secondary Syphilis

- Disseminated Treponema pallidum
- Usually develops 6-12 weeks after appearance of primary chancre
- Systemic symptoms common: fever, myalgia, malaise
- “The Great Imitator” - variable morphologies
  - Scaling papules and plaques most common

“The Great Imitator”

- Macular
- Non-scaling papules and annular plaques
- Scaling papules, patches, and plaques
- Color is a clue (reddish brown or copper hue)
- Generalized distribution, including palmoplantar involvement

Secondary Syphilis

- Diagnosis
  - Serologic Test for Syphilis (STS)
    - RPR/VDRL
  - FTA-ABS

- Treatment
  - Penicillin
    - Benzathine PCN G 2.4 million units IM
  - PCN Allergy:
    - Doxycycline 100mg BID x 2 weeks
  - Jarisch-Herxheimer (febrile) reaction within 12 h of treatment, resolves in 24 hours
Patient Preparedness
• CDC Travelers’ Health website - infographics, registry of Travel Health Clinics and Public Health Departments (wwwnc.cdc.gov/travel)
  – Clinician resources - Travel Medicine Reference books (Yellow Book), Destination-specific information, vaccine recommendations

Patient Preparedness
 Mobile Apps
   TravWell
   Can I Eat This?
   CDC Health Information for International Travel (the Yellow Book)

"Sleep tight, don’t let the bedbugs bite."
References