Tuberculosis

• **Etiology**
  – *Mycobacterium tuberculosis*
    • Acid fast bacilli
      – Transmitted by respiratory droplets
      – Most exposed patients do not progress to clinical illness

• **Clinical Features**
  – Fever, chills, **night sweats**, anorexia, **weight loss**, fatigue, and **chronic non-productive cough, hemoptysis**

• **Labs**
  – Positive PPD (see next slide)
  – AFB cultures (*Gold standard*) and smears
PPD Interpretation (induration)

- 5mm is positive IF:
  - HIV+; immunosuppression
  - On steroid therapy
  - Known close contact with +TB

- >10mm is positive IF:
  - Pt. has DM or renal failure
  - Health care workers
  - Injection drug users
  - Prison population/institutional settings

- >15mm is positive IF:
  - No known risks for TB

- IFN γ release assays (e.g. Quantiferon gold, T-spot) – highest sens/spec; use if unlikely to return for reading; prior BCG
  - cannot differentiate latent/active
  - [https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5905a1.htm](https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5905a1.htm)
Tuberculosis

Acid-fast stain showing bacilli

TB lesion
<table>
<thead>
<tr>
<th>Drugs</th>
<th>Duration</th>
<th>Interval</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Isoniazid            | 9 months | Daily          | • Preferred treatment for: Persons living with HIV  
• Children aged 2-11  
• Pregnant Women (with pyridoxine/vitamin B6 supplements) |
|                      |          | Twice weekly*  |                                                                                                                                         |
| Isoniazid            | 6 months | Daily          | • Preferred treatment for:  
Pregnant Women (with pyridoxine/vitamin B6 supplements)                                                                                   |
|                      |          | Twice weekly*  |                                                                                                                                         |
| Isoniazid and Rifapentine | 3 months| Once weekly*   | Treatment for:  
• Persons 12 years or older  
• Not recommended for persons who are:  
  Younger than 2 years old,  
  Living with HIV/AIDS taking antiretroviral treatment,  
  Presumed infected with INH or RIF-resistant M. tuberculosis, and  
  Women who are pregnant or expect to become pregnant within the 12–week regimen. |
| Rifampin             | 4 months | Daily          |                                                                                                                                         |
Preferred Regimen

Intensive Phase
Daily INH, RIF, PZA, and EMB* for 40-56 doses** (8 weeks)

Continuation Phase
Daily INH and RIF for 90-126 doses** (18 weeks)
or
three-times-weekly INH and RIF for 54 doses (18 weeks)

Alternative Regimen

Intensive Phase
Daily INH, RIF, PZA, and EMB* for 14 doses (2 weeks), then three-times-weekly for 18 doses (6 weeks)

Continuation Phase
Three-times-weekly INH and RIF for 54 doses (18 weeks)

Alternative Regimen

Intensive Phase
Three-times-weekly INH, RIF, PZA, and EMB* for 24 doses (8 weeks)

Continuation Phase
Three-times-weekly INH and RIF for 54 doses (18 weeks)
TB Drugs: Side Effects

- Isoniazid: hepatitis, peripheral neuropathy (Give vitamin B6)
- Rifampin: hepatitis, flu syndrome, orange body secretions
- Ethambutol: optic neuritis (red-green vision loss)
- Pyrazinamide – GI/muscle joint pain
Atypical Mycobacterial Disease

- *Mycobacterium avium* complex
  - Disseminated disease, pulmonary disease, osteomyelitis
    - Fever, weight loss, anorexia, diarrhea
  - Seen in HIV / AIDS patients
  - Diagnosis: blood cultures, bone marrow bx
  - Treatment: multiple drugs
    - Rifabutin (Mycobutin), azithromycin, clarithromycin, ethambutol

- Leprosy
  - *Mycobacterium leprae*
  - Skin lesions
  - Treatment: months or years (Dapsone, Rifampin, Clofazimine)
Cholera

• Caused by *Vibrio cholerae*, gram (−) comma-shaped rod
• Acute diarrheal illness leading to profound hypovolemia and death
• Epidemics - crowding and famine, Gulf coast
• Acquired from contaminated water and food
• Stool is liquid and gray in color – secretory (rice water stool) – toxin mediated

- Diagnosis
  - Stool culture – gold standard
  - Rapid dipsticks, but poor sens/spec
  - Serology helpful in 1st or 2nd weeks
Cholera

• Treatment
  – Fluids and electrolytes at 50-100mL/kg/hr to start, switch to oral after 4 hours
  – Vaccination if travel to endemic areas (not usually indicated)
  – Antibiotics
    • Single dose *doxycycline* and many others (macrolides, fluoroquinolones) shorten duration of vibrio excretion
  – 50% of untreated cases are fatal, usually due to dehydration.
Gonococcal Infections

- **STI**
  - *Neisseria gonorrhoeae*
- **G (-) diplococci, intracellular**
- Incubation period is 2-8 d
- Purulent profuse **urethral discharge**
- Disseminated disease
  - Fever, skin lesions, tenosynovitis, monoarticular arthritis (knee, ankle, wrist)
- Other sites of infection
  - Conjunctivitis, pharyngitis, proctitis, endocarditis, meningitis
Gonococcal Infections

• Evaluation
  – Gram stain/culture, **NAAT of urine/secretions**
  – HIV, RPR, **Chlamydia**
  – If febrile → joint pains, consider disseminated GC and get blood culture and aspirate painful joint.

• Treatment
  – **Asx:** azithromycin 2 g po
  – Ceftriaxone 250mg IM x 1
  – Treat also for Chlamydia, using azithromycin or doxycycline
  – **PID: mild/moderate** – ceftriaxone 250, doxy 100 BID x 10 d, +/- metronidazole
  – If disseminated, give ceftriaxone 1g IM or IV until 24-48 hours after clinical improvement
Chlamydia

• **C. trachomatis**: trachoma - worldwide leading cause of blindness; prophylaxis in **neonates**;
  – reactive arthritis - +urethritis, conjunctivitis (Reiter’s syndrome); also caused by enteric G-
  – lymphogranuloma venereum (travel hx, sexual hx)

• **Chlamydophilae**
  – C. Pneumoniae – atypical pneumonia
  – C. psittaci – psittacosis pneumonia, inhalation of dried bird “products”
Salmonellosis

• Caused by *Salmonella typhii, typhimurium, enteritidis*
• Transmitted by ingestion of **contaminated foods** (eggs, milk, poultry)
• Signs/symptoms
  – Nausea, headache, fever
  – High-volume diarrhea (**pea soup**) but no blood in stool, *S. typhii* infections usually produce constipation
  – Cramping, abdominal pain 8-48 hours after ingestion
  – **Rash**: Rose spots (2-3mm papule on trunk)
• Diagnosis
  – Normal or low WBC count
  – **Stool culture for ID**
  – Blood cultures: bacteremia rare
Salmonellosis

• Treatment
  – Fluids and potassium
  – Antibiotics
    • Cipro and ceftriaxone in sickle cell (osteomyelitis) and immunosuppression (AIDS, chemo)
    • Abx not recommended for self-limited non-typhii disease
    • If chronic carrier (stool positive 1 month after resolution of illness) – consult ID
Shigellosis

• Caused by *Shigella sonnei, flexneri, and dysenteriae*
• Fecal oral transmission (Day care)
• ~ 3 day incubation period
• Signs/symptoms
  – Fever, malaise, toxic appearing (decrease BP)
  – LLQ cramping abdominal pain with **bloody diarrhea in 50%** (**dysentery**)
• Labs
  – Positive fecal WBC, **Stool culture**, Blood cultures often positive
• Treatment
  – Supportive care – no Abx for mild disease! Do not use anti-motility agents
  – Antibiotics
    • **Based on sensitivity patterns**
      – Ciprofloxacin – first line, ceftriaxone
      – Trimethoprim-sulfamethoxazole; Ampicillin (not amoxicillin)
        » (resistance increasing against both, only use if strain is susceptible)
Botulism

• Gram (+) rod

• *Clostridium botulinum* - neurotoxin
  • A = Western US
  • B = Eastern US
  • E = Alaska

• Ingestion of home-canned, smoked, or vacuum-packed foods, raw honey

• Signs/symptoms
  – Sudden onset of *cranial nerve paralysis*, diplopia, dry mouth, dysphagia, dysphonia and progressive muscle weakness
  – **Descending progression, spares sensory nerves**
  – Fixed and dilated pupils in 50%
  – Children: Irritability, weakness, and **hypotonicity**
Botulism

• Diagnosis
  – clinical
  – ID toxin/ culture can take time

• Treatment
  – Removal of toxin via emesis or enema
  – Specific antitoxin (A, B, E most likely)
    • A = Western US
    • B = Eastern US
    • E = Alaska
  – Support (ventilation, nutrition)
  – Penicillin for wounds thought to be source
Tetanus

• Caused by *Clostridium tetani*
  – Found in the soil
  – Incubation 5 days to 15 weeks

• **History of wound** and possible contamination
  – Due to a neurotoxin
  – Blocks inhibitory neurotransmitters

• **Symptoms**
  – Stiffness of neck and other muscles, dysphagia, irritability, hyperreflexia

• **Complications**
  – Airway obstruction
  – Cardiac failure
**Tetanus**

- **Prevention**
  - Active immunization (DTaP, Tdap, Td)
  - Passive immunization
    - Tetanus immune globulin

<table>
<thead>
<tr>
<th>History of tetanus immunization</th>
<th>Clean, minor wounds</th>
<th>All other wounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Td*</td>
<td>Yes</td>
<td>Td</td>
</tr>
<tr>
<td>TIG†</td>
<td>No</td>
<td>TIG</td>
</tr>
</tbody>
</table>

- Uncertain or < 3 doses of an immunization series**
  - Yes
  - No

- ≥ 3 doses received in an immunization series**
  - No‡
  - No

- All other wounds
  - Yes
  - Yes

---

**Guide to Tetanus Prophylaxis in Wound Management**

- Table format changed from previous edition, but recommendations remain unchanged.
  - Adult-type tetanus and diphtheria toxoids. If the patient is < 7 years old, a tetanus toxoid-containing vaccine is given as part of the routine childhood immunization.
  - Tetanus immune globulin, given at a separate site from Td
  - The immunization series for tetanus is described in the text (Schedule and Dosage)
  - Yes, if > 10 years since last booster.
  - Yes, if > 5 years since last booster. More frequent boosters not required and can be associated with increased adverse events. The bivalent toxoid, Td, is not considered to be significantly more reactogenic than T alone and is recommended for use in this circumstance. The patient should be informed that Td has been given.
  - Yes, if individuals are known to have a significant humoral immune deficiency state (e.g., HIV, agammaglobulinemia), since immune response to tetanus toxoid may be suboptimal.
Lyme Disease (Borreliosis)

Most common vector-borne infection in USA
- Vector - Ixodes tick
- Agent: Borrelia burgdorferi
- Spirochete

Location
- Massachusetts to Maryland

Animal Hosts
- White-footed mouse
- White tail deer

Settings
- Summer months
- Camping, hunting

National Lyme disease risk map with four categories of risk
Lyme Disease

Most are not classic target lesions
Lyme disease Stages

Stage 1
- flu-like symptoms and skin rash (Erythema migrans)
- (~7% infected persons never develop Sx)

Stage 2
- About 60% progress to stage II (neuro Sx in 15%):
  - blurred vision, ptosis, fatigue, malaise
  - Arthritis in large joints,
  - muscle pains, stiff neck, loss of muscle function and feeling
  - multiple ECMs

Stage 2, cont.
- altered consciousness, photophobia, confusion, dyskinesia, Bell's palsy, hallucinations, paresthesia, speech impairment
- Nausea and vomiting

Stage 3
- 5%
- arthritis
- disease can affect the skin, brain, and nervous system, and muscles, bones, and cartilage.
Lyme Disease

• **Lab**
  - Antibody testing 2 step ELISA followed by western

• **Treatment**
  - Doxycycline
  - Ceftriaxone
  - Penicillin

**Tick bite:** No treatment

**Erythema Migrans, Bell’s Palsy:** Doxy 100mg twice daily x 2-3 weeks

**Other neuro disease:**
ceftriaxone 2g IV daily or Penicillin G 18-24 million U (both for 2-4 weeks)
Rocky Mountain Spotted Fever

- Due to exposure to tick (*Dermacentor*) bite in endemic area (vector)
- Etiology: *Rickettsia rickettsii*
- Influenza-like prodrome followed by chills, **fever**, severe headache, **myalgias**
- Red, macular rash with onset between 2\(^{nd}\) and 6\(^{th}\) day of fever
  - Rash on hands- **petechial or purpuric (palms and soles)**
  - Then moves to the center
- Labs
  - **Leukocytosis, proteinuria, hematuria, thrombocytopenia**
Rocky Mountain spotted fever (RMSF) is caused by *Rickettsia rickettsii*. Since 2000, the number of reported cases of RMSF has increased during all but a single year. RMSF is reported throughout much of the United States, reflecting the ranges of the primary tick vectors responsible for transmission. Local and regional areas of new or increased reporting and higher incidence are evident in multiple states, including Idaho, Nebraska, North Carolina, and Tennessee.
Rocky Mountain Spotted Fever

• Diagnosis
  – Serologic tests
  – Indirect immunofluorescence assay: get sample early, then 2-4 weeks later

• Treatment
  – Don’t delay!
  – Doxycycline (even in kids!)
    • Drug of choice
  – Chloramphenicol
Syphilis

• Primary
  – Caused by *Treponema pallidum*
  – History of sexual contact
  – Also a TORCH infection ("other")
  – Painless ulcer on genitalia, perianal area, rectum, pharynx
    • **Chancre** resolves in 3-6 weeks
  – Enlarged regional lymph nodes
  – Labs: RPR (75-100%), VDRL (75%), FTA-ABS / MHATP (microhemagglutination assay) (90%)
  – Treatment: Benzathine penicillin
    • Doxycycline or tetracycline if PCN allergic
Syphilis

• Secondary (Lues)
  – Generalized maculopapular rash (palms and soles)
  – Condylomata lata
  – Fever, meningitis, hepatitis, arthritis, iritis
  – Labs: VDRL (99%), FTA-ABS (100%)
  – Treatment: same as meds as primary
Syphilis

• Late (Tertiary)
  – Infiltrative tumors (gummae) of skin, bones, liver
  – Aortitis, aneurysms, aortic regurgitation
  – CNS disorders, personality changes
  – Labs: VRDL (75%), FTA-ABS (98%)
  – Treatment: Penicillin IV x 14 days.

• Neurosyphilis
  – Can be noted at any time during course of disease
  – Meningitis may present with HA, nausea, vomiting, stiff neck, cranial nerve palsies, hearing loss, Argyll-Robertson pupil, tabes dorsalis
  – Meningovascular meningitis can lead to hemiparesis, hemiplegia, aphasia, and seizures
  – Lab: positive CSF VDRL
  – Treatment: PCN
FUNGAL
Candida albicans

• General
  – Most common opportunistic fungal infection
  – Normal flora in GI and GU tract

• Clinical
  – Oropharyngeal – thrush
  – oral candidiasis in adult, think diabetes, HIV
  – Vulvovaginitis – estrogenized tissue
  – Cutaneous: intertrigo – satellite lesions
Candida albicans

• Diagnosis
  – KOH prep
  – Budding yeast, pseudohyphae
  – Culture

• Treatment
  – Nystatin
  – Fluconazole
  – Miconazole
  – Amphotericin B
    • For disseminated disease
Cryptococcosis

• Most common cause of **fungal meningitis**
  – Organism: *Cryptococcus neoformans*
  – Predisposing factors: **Hodgkin’s, steroid therapy, HIV**

• Symptoms: Headache, mental status changes, meningismus

• Labs:
  – CSF: decrease glucose, increased protein
  – India ink prep
  – Antigen titer

• Also in lungs
  – Broncho-alveolar lavage
  – + culture

• Treatment
  o Oral fluconazole for pulmonary disease
  o Amphotericin B and flucytosine for CNS infection
Histoplasmosis

- *Histoplasma capsulatum* (Dimorphic fungi)
  - Endemic to central and eastern USA, eastern Canada, Mexico and Central America
- Related to bird droppings and bat exposure
  - Inhaled spores
- **Most patients asymptomatic**
  - Mild flu-like to multi-organ disease
    - mediastinitis, eye, CNS
  - Can resemble TB
- **May disseminate in immunocompromised**
  - Leukemia, steroids, HIV
Histoplasmosis

- **Labs**
  - RIA/DNA probes
  - Bone marrow positive
  - Increase alk phos, LDH
  - Urine antigen test
  - Skin test
  - CXR: Pneumonia, miliary pattern

- **Treatment**
  - Itraconazole
  - Amphotericin B
Pneumocystis jiroveci

- In AIDS patients CD4 <200
- Symptoms
  - Fever, dyspnea, nonproductive cough
- CXR
  - Bilateral diffuse interstitial disease without hilar adenopathy
- Exam:
  - Bibasilar crackles or normal
Pneumocystis jiroveci

• Labs
  – Low $O_2$ sats, $P_aO_2$
  – Elevated LDH
  – Gallium lung scan: diffuse uptake
  – Lung tissue stains via bronchoscopy
    • (Gold Standard)

• Treatment
  – Bactrim
  – Pentamidine
  – Prednisone if $PaO_2 < 70$ mm Hg
HELMINTHS
Hookworms

- *Necator americanus*
- Moist tropics and southeastern USA
- Penetrate skin, migrate in blood to lung, ciliary action brings organism to mouth, swallowed, move to upper bowel, mature and release eggs
- Symptoms
  - Skin penetration: ground itch (tunnels)
  - Lungs: dry cough, blood-tinged sputum
  - GI: anorexia, diarrhea, vague abdominal pain
- Labs
  - Iron deficiency anemia
  - Stool positive for blood
  - O&P
- Treatment
  - Pyrantel
  - Albendazole
Ascaris lumbricoides

• Roundworm
  – 2-3 cm long
  – Reside in small intestine

• Oral ingestion
  – Contaminated soil

• Asymptomatic
  – Fever, cough, GI distention

• Labs
  – Eosinophilia
  – O&P

• Treatment
  – Albendazole
Trichuris

- Whipworm
- **Southern US**
- **Poor sanitation; fecal-oral spread thru poor hygiene or unwashed vegetables**
- Asymptomatic to diarrhea
- Rectal prolapse with large infestations
- **O&P for eggs**
Pinworms

- Enterobius vermicularis
- Human parasite exclusively
- Anal pruritis
- Usually kids <12 yrs
- Scotch tape technique – use clear tape
PARASITES
Malaria

- History of **travel to endemic area** (See next slide)
- Transmitted by *Anopheles* mosquito
- Episodes of **recurring fever, chills and sweating**
- **Headache, myalgias, splenomegaly, anemia, leukopenia**
- Diagnosis: parasites in RBCs on smear (merozoites, schizonts, gametocytes)
  - ‘Thin and thick’ smear is classic
  - New rapid diagnostic test available
Malaria

- Plasmodium
  - Vivax: fever every 48 hours
  - Malariae: every 72 hours
  - Ovale: every 48 hours
  - Falciparum: continuous

- Complications
  - Hemolytic anemia
  - Cerebral malaria
    - P. falciparum
  - Blackwater fever
    - P. falciparum
Malaria

• Treatment
  – Control the vector
  – Medications
    • Atovaquone – for uncomplicated cases
    • artemether-lumefantrine
    • Chloroquine – much resistance
    • Mefloquine
    • Doxycycline - prophylaxis
    • Quinidine gluconate + doxy, tetra, or clindamycin if complicated
Toxoplasmosis

- Caused by *Toxoplasma gondii*
- Cats are the host – pregnancy concern
- Infection results from
  - Ingestion of cysts in raw undercooked food
  - Ingestion of contaminated food
  - cat litter
- Signs/Symptoms
  - Asymptomatic
- TORCH infection
Toxoplasmosis

• Primary infection - immunosuppression
  – Fever, malaise, headache, lymphadenopathy (cervical), myalgia, arthralgia, stiff neck, sore throat

• Labs
  – Serology
  – CT scan
    • Ring-enhancing lesions

• Treatment
  – Pyrimethamine
    • Plus sulfadiazine
  – Clindamycin as alternative
  – Proper cooking
  – Avoid cat litter