

Infectious Diseases: Take-Home Messages and Clinical Pearls

James H. Maguire, MD
Senior Physician
Division of infectious Disease and Department of Medicine
Brigham and Women's Hospital
Professor of Medicine
Harvard Medical School

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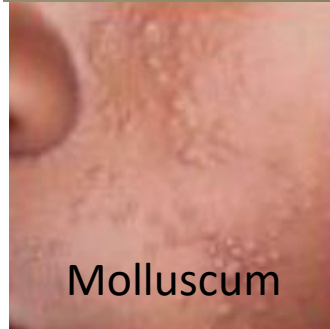
- Harvard Medical School
- Internal Medicine Residency and Infectious Disease Fellowship, Peter Bent Brigham Hospital
- Professor of Medicine, Harvard Medical School; Senior Physician, Brigham and Women's Hospital
 - Focus: parasitic disease, musculoskeletal infections

Disclosures

- I have no financial disclosures

Differential diagnosis: fever vesicular rash

- Varicella
- Enterovirus (hand, foot mouth disease)
- Herpes simplex
- Impetigo
- Rickettsialpox
- Monkeypox
- Smallpox
- Cowpox
- Orf
- Molluscum contagiosum
- Noninfectious



Rickettsialpox

- *Rickettsia akari*
- Eschar at site of mite bite
- Tops of papular lesions develop vesicles, pustules
- Rash follows systemic symptoms by 2-3 days



J Am Acad Dermatol 2004;51:S137-42



CDC

Monkeypox

- Monkeypox: remote parts of central and West Africa
- Milder than smallpox, fatality 1-10%
- Transmitted primarily from rodents > nonhuman primates, pet prairie dogs (USA outbreak 2003)
- 2022 outbreak: close person-to-person contact , sexual networks implicated
- Diagnosis: real-time PCR of skin lesion material, serology
- Rx: antivirals (tecovirimat, brincidofovir), ?vaccinia immune globulin
- Prevent: infection control, attenuated smallpox vaccine

Infections and immunodeficiency

<u>Organism</u>	<u>Humoral</u>	<u>Complement</u>	<u>Phagocyte</u>	<u>Cellular</u>
Bacteria	Pneumococcus, meningococcus, <i>H. influenzae</i>	Meningococcus gonococcus (terminal components)	<i>S. aureus</i> , <i>enterics</i> , <i>P.</i> <i>aeruginosa</i>	<i>Salmonella</i> , <i>Listeria</i> , <i>Legionella</i>
Viruses	Enterovirus	-	-	Herpesviruses Hepatitis B,C
Fungi	-	-	<i>Candida</i> , <i>Aspergillus</i> , <i>Mucor</i>	<i>Cryptococcus</i> , endemic fungi, <i>Candida</i> , <i>Pneumocystis</i>
Mycobacteria	-	-	-	TB, atypicals
Protozoa	<i>Giardia</i>	-	-	<i>Toxoplasma</i> , <i>Cryptosporidium</i> , <i>T. cruzi</i> , <i>Leishmania</i>
Helminths	-	-	-	<i>Strongyloides</i>

Opportunistic infections in HIV

- Previously undiagnosed HIV, not taking antiretroviral therapy (ART) for financial, psychosocial or medical reasons
 - CD4 200-500: pneumococcal and other respiratory infections, tuberculosis, lymphoma zoster, thrush, AIDS-related complex (“ARC”)
 - CD4 <200: PCP, toxoplasmosis, endemic fungi, cryptococcosis
 - CD4 <50: *M. avium* complex, CMV
- Recently started on (effective) ART (immune reconstitution inflammatory syndrome -- IRIS)

Immune reconstitution inflammatory syndrome (IRIS)

- Recommend initiation of ART within 2 weeks of diagnosis of opportunistic infection (exception=CNS infections)
- IRIS: paradoxical worsening of infection or disease process following initiation of effective ART and restoration of immune response
- Most common with mycobacterial, viral and fungal infections; incidence 10-20%

Immune reconstitution inflammatory syndrome (IRIS)

- Fever, adenopathy common; localized symptoms and signs
- Usually occurs within a week to a few months after starting ART
- Continue ART and directed therapy for opportunistic infection in most cases
- NSAIDs, steroids

Infections and immunodeficiency

- Neutrophils
 - Decreased numbers
 - Impaired function
- Neutropenia
 - Cytotoxic chemotherapy, drug hypersensitivity, marrow disorders, other
 - Severe: ANC ≤ 500 ; profound < 100
 - Signs of infection often masked
 - Infections can progress rapidly, life-threatening

Neutropenia and infections

- Common pathogens
 - Gram-negative enterics (*E. coli*, *Klebsiella*, *Enterobacter*) > *Pseudomonas aeruginosa*
 - Gram-positive organisms (intravascular catheters): *S. aureus*, coagulase-negative staphylococci, enterococci
 - Fungi (prolonged neutropenia, antibiotics): *Candida* spp., *Aspergillus*, Zygomycetes

Neutropenia and infections

- High risk patients-empirical therapy:
 - Antipseudomonal β -lactam (cefepime, others)
 - Vancomycin – only when indicated
 - Prolonged fever : echinocandin (e.g., micafungin)
- Low risk: oral therapy (e.g., amoxicillin-clavulanate/ciprofloxacin; moxifloxacin)

Impaired neutrophil function

- Genetic: Chronic granulomatous disease, hyper-IgE (Job) syndrome, others
- Acquired: steroids, diabetes
- Infections in diabetics
 - Impaired phagocytosis
 - Vascular insufficiency
 - Neuropathy
 - Colonization (*S. aureus*, *Candida*)
 - (Impaired cellular immunity (TB, *Coccidioides*))

Infections in diabetics

- *S. aureus*-skin and soft tissue, pneumonia, bacteremia
- *Pseudomonas aeruginosa*: malignant otitis externa
- Rhinocerebral mucormycosis (acidosis)
- Candidiasis: cutaneous, mucosal, urinary
- Enteric organisms: UTIs, emphysematous cystitis/pyelonephritis, papillary necrosis
- Diabetic foot infections
- Necrotizing soft tissue infections

Skin and soft tissue infections

- Erysipelas (superficial): β -hemolytic streptococci > *Staphylococcus aureus*
- Cellulitis: β -streptococci, *S. aureus*
- Necrosis, purulence, abscess: *S. aureus*, especially MRSA
- Recurrent cellulitis (β -streptococci)
 - Lymphedema
 - Strategy: edema control, antifungals, foot care, prophylactic penicillin

Skin and soft tissue infections: special cases

Dog/cat bites	<i>Pasteurella multocida</i> , <i>Capnocytophaga canimorsus</i>
Saltwater	<i>Vibrio vulnificus</i>
Freshwater	<i>Aeromonas</i> , <i>Pseudomonas</i>
Hot tubs	<i>Pseudomonas</i>
Human bites	Skin and mouth flora
Fish, raw meat, poultry	<i>Erysipelothrix rhusiopathiae</i>

Treatment of MRSA skin and soft tissue infections

- Incision and drainage
- Oral antibiotics
 - TMP-SMX
 - Doxycycline
 - Clindamycin if susceptible
 - Linezolid, tedizolid
- Intravenous antibiotics: vancomycin, daptomycin, ceftaroline, linezolid
- Attempt decolonization for recurrences

Necrotizing soft tissue infections

- Necrotizing fasciitis
 - Group A β -hemolytic streptococci
 - Polymicrobial including anaerobes
 - Marine *Vibrios*, *Aeromonas*, rare MRSA
- *Clostridium perfringens* necrotizing cellulitis, myonecrosis
- Pain → erythema, edema → necrosis
- Treatment: antibiotics, surgical debridement, supportive therapy

Toxic shock syndromes

- *S. aureus*: menstrual, non-menstrual
- Group A streptococci: skin, soft tissue infections, other
- Exotoxin, super-antigen
- Hypotension, diffuse erythematous rash, end organ failure
- Treatment
 - Clindamycin plus beta-lactam antibiotic or vancomycin +/-IVIG (Streptococcal)
 - Source control: remove foreign body, surgery
 - Supportive care

Respiratory infections

- 22-year-old: 6-day history sore throat, difficulty swallowing admitted to ICU with fever, shortness of breath, hypotension, leukocytosis with left shift , ↑creatinine
- CXR/CT of chest: nodular opacities, effusion
- CT of neck: paratonsillar abscess, thrombosis of right internal jugular vein
- Cultures: *Fusobacterium necrophorum*
- Diagnosis: Lemierre syndrome
- Pressors, surgery, antibiotics, anticoagulation

The Clinical Presentation of *Fusobacterium*-Positive and Streptococcal-Positive Pharyngitis in a University Health Clinic

A Cross-sectional Study

Robert M. Centor, MD; T. Prescott Atkinson, MD, PhD; Amy E. Radtke, MLS; Li Xiao, PhD; Donna M. Crabb, MT (ASCP); Carlos A. Estrada, MD, MS; Michael B. Faircloth, MD; Lisa Oestreich, DO; Jeremy Hatchett, MD; Walid Khalife, PhD; and Ken E. Walters, MD

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- Young adults with pharyngitis
 - 21% *Fusobacterium necrophorum*
 - 10% group A streptococcus
- *Fusobacterium* is resistant to macrolides
- Recommend: treat severe sore throat (3 or 4 of following: fever, no cough, tender anterior nodes, tonsillar exudate) with penicillin not azithromycin

Extrapulmonary tuberculosis

- Seen in 50% or more of patients with HIV/TB coinfection but also in not HIV-infected
- Clues
 - Sterile pyuria
 - Chronic lymphadenopathy (especially cervical)
 - Monoarthritis, spinal osteomyelitis (esp thoracic)
 - Lymphocytic predominant ascites
 - Chronic lymphocytic meningitis
 - Exudative pleural effusion
 - Pericarditis

Nontuberculous mycobacterial infection

- Acquired from environment
- Immune compromised; immune competent often with risk factor (lung disease, trauma, surgery)
- Sensitivity testing helpful, but not always predictive of response
- Treatment: combination therapy, prolonged, may require surgery

Nontuberculous mycobacterial infection

Disseminated (esp. HIV)	<i>M. avium-intracellulare</i> (MAC) <i>M. kansasii</i>
Pulmonary	MAC <i>M. kansasii</i> <i>M. abscessus</i>
Skin and soft tissue	<i>M. marinum</i> <i>M. abscessus, fortuitum, chelonae</i>
Catheter-associated	<i>M. abscessus, fortuitum, chelonae</i>
Cervical lymphadenitis	MAC, <i>M. scrofulaceum</i>
Leprosy	<i>M. leprae</i>
Buruli ulcer	<i>M. ulcerans</i>

Fungal infections of the lungs

- “Endemic” mycoses (dimorphic fungi)
 - Histoplasmosis: river valleys, guano in soil
 - Coccidioidomycosis: SW USA, Latin America
 - Blastomycosis: USA (south, south central)
 - South American blastomycosis (CA, SA)
 - Sporotrichosis (sphagnum moss, thorns)
 - Talaromycosis [penicilliosis] (China, SE Asia)
- Cryptococcosis (soil contaminated with bird droppings; *C. gatti* in Pacific Northwest)

Tick-borne infections in the USA

Bacteria

- *Borrelia burgdorferi*
- *Anaplasma phagocytophilum*
- *Ehrlichia chafeensis*
- *Rickettsia rickettsii*
- Rickettsia 364D, others
- STARI
- *Francisella tularensis*

- Relapsing fever

Borrelia

- *Borrelia miyamotoi*

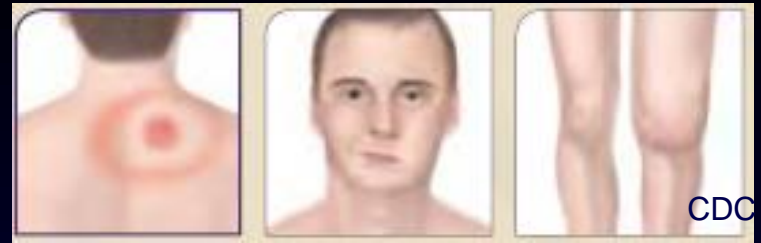
Viruses

- Colorado Tick Fever
- Powassan virus
- Heartland virus
- Bourbon virus

Protozoa

- *Babesia* spp

Lyme disease

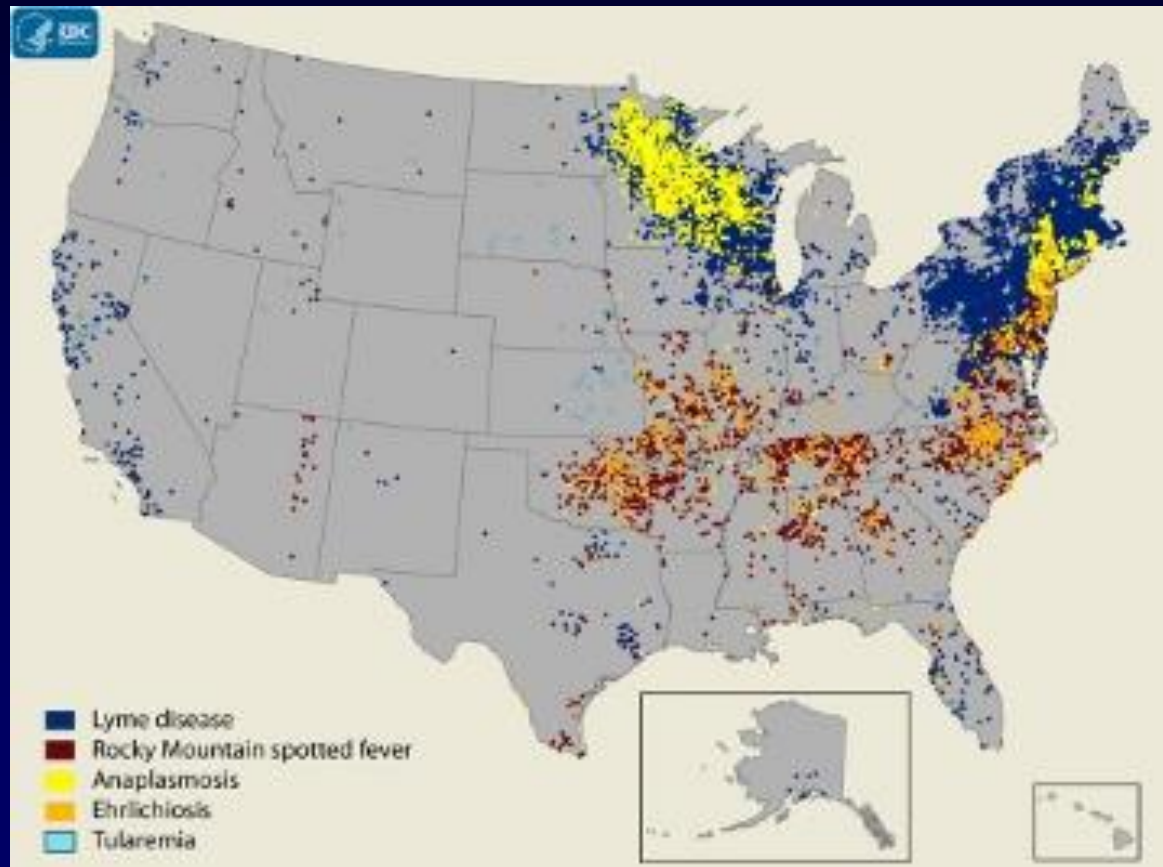


- Suspect in persons with possible exposure
- Most do not report tick bite
- Early Lyme disease
 - Diagnose clinically (serology often negative)
 - Erythema chronicum migrans
 - Fever, myalgia, Bell's palsy, meningitis, heart block, arthralgia
- Late Lyme disease: arthritis, neurological (encephalitis, neuropathy, radiculitis)

Lyme disease

- Diagnosis: two step testing: screening (immunoassay), second tier (immunoblot, immunoassay)
APHL 2021 guidelines <https://www.aphl.org/>
- Treatment
 - Oral doxycycline, amoxicillin or cefuroxime
 - Intravenous ceftriaxone: certain syndromes
 - Treatment > 28 days not indicated for chronic Lyme
 - No antibiotics for post-Lyme syndrome
- Prophylaxis for attached tick in Lyme-endemic area: doxycycline 200 mg PO x1

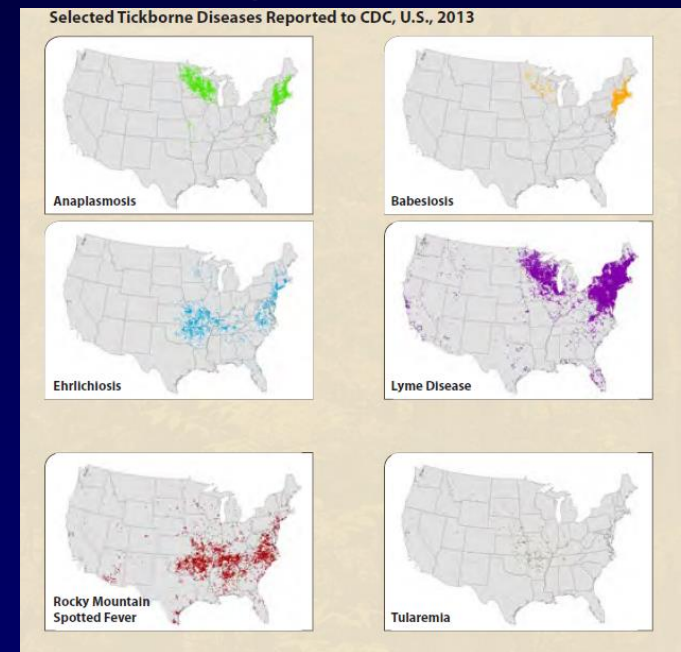
Ticks may carry and transmit multiple pathogens to same host (e.g., *Ixodes scapularis* (Lyme, anaplasmosis, babesiosis, Powassan virus, *Borrelia miyamotoi*)



Distribution of tick-borne infections (CDC)

Clinical approach to tick-borne infections

- Tick-borne infections can be rapidly fatal (e.g., Rocky Mountain Spotted Fever)
- Unexplained fever, chills, headache, fatigue, myalgia, arthralgia, rash, neurologic symptoms
- Consider place, season, activities, pets
- Rapid diagnostic testing often not available
- Early, empirical treatment can be life-saving (doxycycline)



Salmonella bacteremia

- Typhoid and other enteric fevers
- Transient bacteremia with gastroenteritis
- Endovascular infections
 - Atherosclerosis-aneurysms
 - Heart valves, especially prosthetic
 - Schistosomiasis
- Persistent infection, localized infections:
immune deficiency: AIDS, transplant, etc;
hemoglobinopathies,
- Usually do not treat salmonella gastroenteritis
unless at risk of localized or persistent
infection

Thank you!