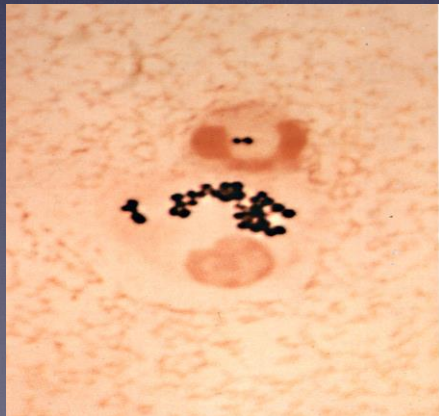
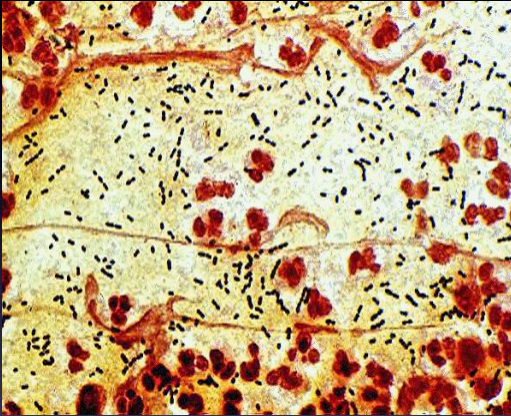


# Clinical Microbiology

ACOI Board Review 2019  
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“No Disclosures”

# S. aureus skin/soft tissue infection:



- abscess (rather than diffuse cellulitis), w/ purulent drainage
- common in diabetes
- “Community-acquired” (CA) MRSA more likely scenario
  - spontaneous
  - body contact sports
  - hx of “spider bite”

Rx of MSSA bacteremia?

- Nafcillin (side effect: AIN; dx: eosinophils in urine)

Rx if non-anaphylactic allergic rxn (rash) to PCN?

- Cephalosporin - cefazolin



## Rx if MRSA (if susceptible)?

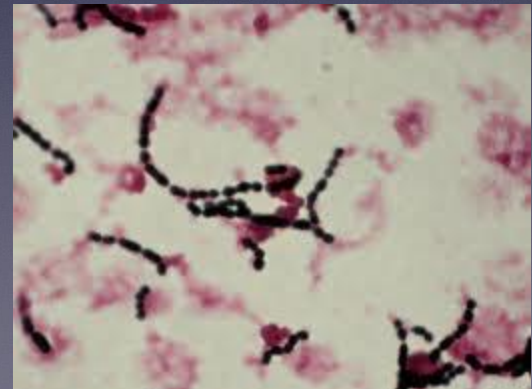
- Vancomycin
- Daptomycin (but NOT pneumonia)
- Linezolid (but NOT bacteremia)
- Trimethoprim/sulfa - especially SSTI
- Clindamycin - especially SSTI
- Quinolones (?) - not Cipro

Rx of acute parotiditis (*S. aureus* most common);  
assoc. w/ surgery, dehydration, mouth breathing



# Typical streptococcal SSTI (Grp A, B, G):

- Intense erythema
- (Often recurrent) cellulitis rather than abscess
- Lymphangitis
- Often (preceding) systemic symptoms
- Areas of pre-existent lymphedema, venous insufficiency
- Drainage, when present, often watery or serous



# Erysipelas

(superficial cellulitis of Streptococcal etiol.)



Rx: penicillins  
if allergy: cephalosporin;  
vancomycin; clindamycin  
NOT trimethoprim/sulfa



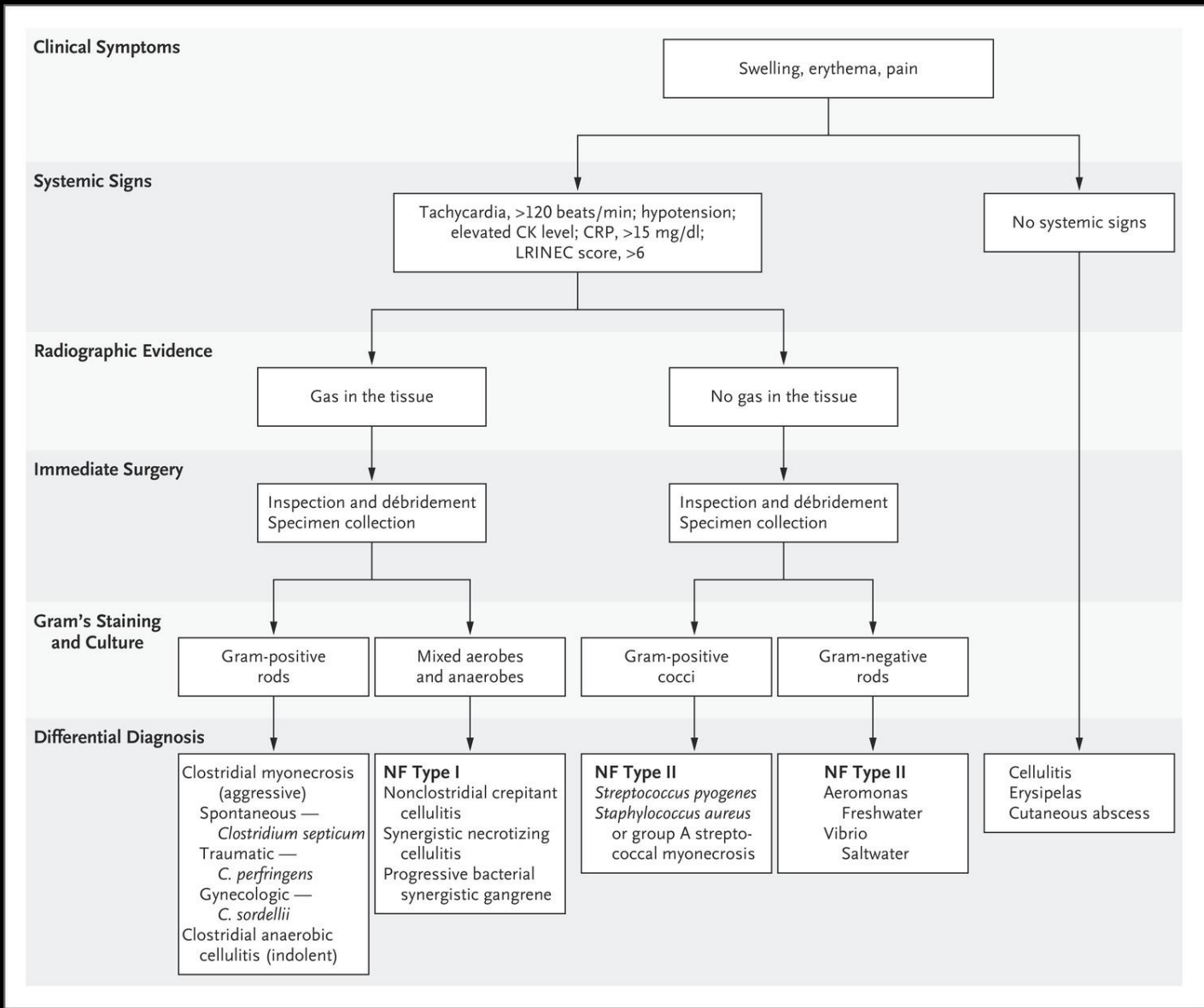
# Additional Streptococcal Syndromes:

- “Viridans” strep bacteremia - endocarditis
- S bovis/gallolyticus bacteremia - GI malignancy
- Grp A strep - necrotizing fasciitis “flesh eating bacteria” Rx: Beta-lactams + clindamycin
- TSS - source usually obvious; often + blood culture (as can S. aureus - but....source often not obvious; blood cultures negative)
- Note: 1/3 of Grp B strep are resistant to clindamycin (e.g. diabetic foot infection)



# Necrotizing Soft Tissue Infections

- Group A strep: pain out of proportion to initial clinical findings
- Clostridium perfringens: progression over hours
- Mixed flora, most always including anaerobes
  - Most commonly in diabetics; obesity
  - Wounds involving/crossing mucous membranes
  - Foul odor
  - Mixed flora on gm stain
  - Delayed or no growth on culture



# Diabetic Foot

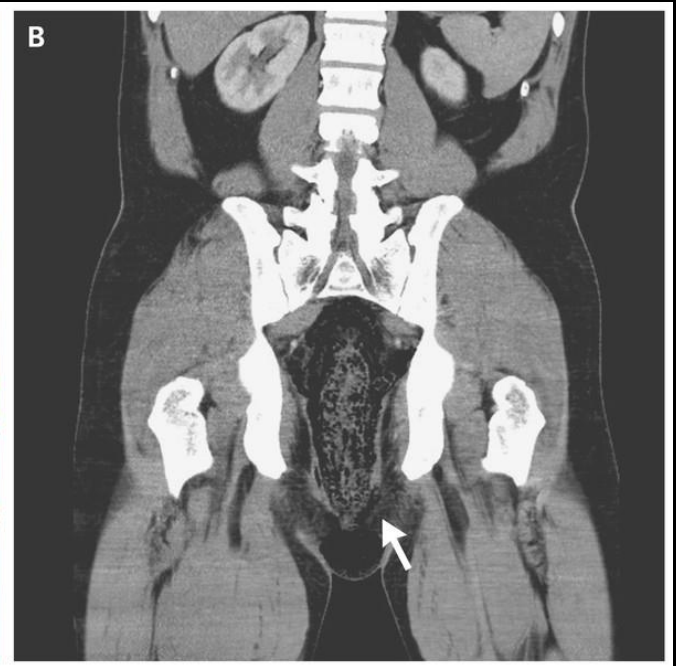
- Usually polymicrobial, w/ foul odor -
  - Anaerobes
  - Gm negatives
- Many feel **pseudomonas** commonly involved
- Rx (including **pseudomonas coverage**)?



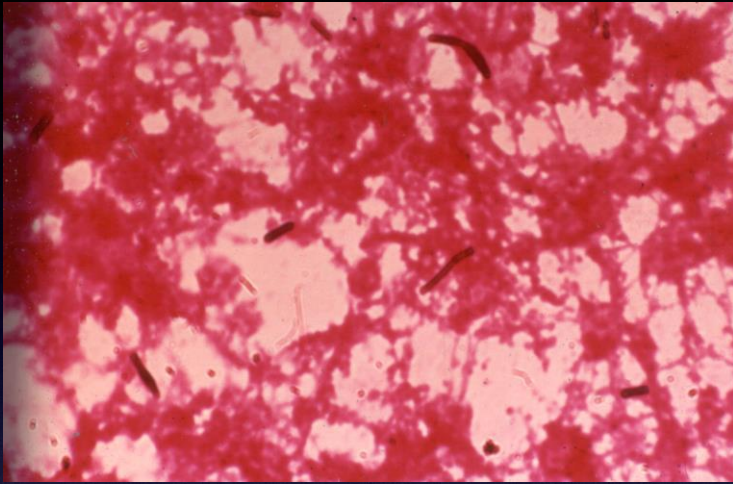


Hx, Gm stain, speed of progression, location of wound, useful in predicting organism(s)

Now what?







C. perfringens “gas gangrene”

Rx:

Surgery

+

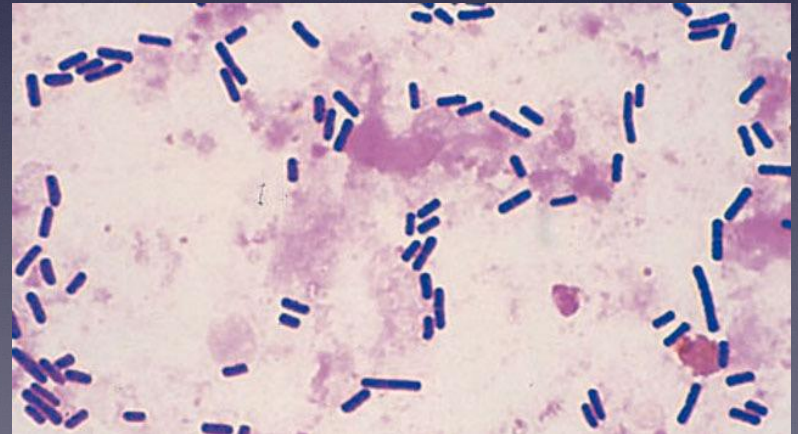
Penicillin

+

Clindamycin

+

? IVIG, HBO?





- C. perfringens -> gas gangrene
- C. septicum bacteremia/sepsis
  - GI/gyn malignancy (sometimes occult),
  - chemotherapy-induced neutropenia
- C. botulinum -> skin popping w/ “black tar”  
heroin

# Cat Bite

- *Pasteurella multocida*
- Rapid onset - painful, throbbing, cellulitis
- gm neg rod
- RX:
  - amoxicillin +/-clavulanate
  - cefuroxime
  - doxycycline
  - quinolones
  - NOT CEPHALEXIN (Keflex®)



# Additional “Pearls” re: Bites

- Dog bites/splenectomy: overwhelming sepsis due to *Capnocytophaga* sp. (DF-2)
- Human bites: *Eikenella* - can't use clindamycin
- Snake bites: gm negs
- Rabies - any wild carnivore
  - most common domestic animal (in U.S.)? - cat
- Lagomorphs don't get rabies (exception: woodchucks)



# Aeromonas hydrophila

- Gm neg rod
- Fresh water injuries, medicinal uses of leeches

Rx:

- fluoroquinolone
- 3rd gen cephalosporin
- trimethoprim/sulfa









“Nodular” lymphangitis

Working in yard:

Dx?

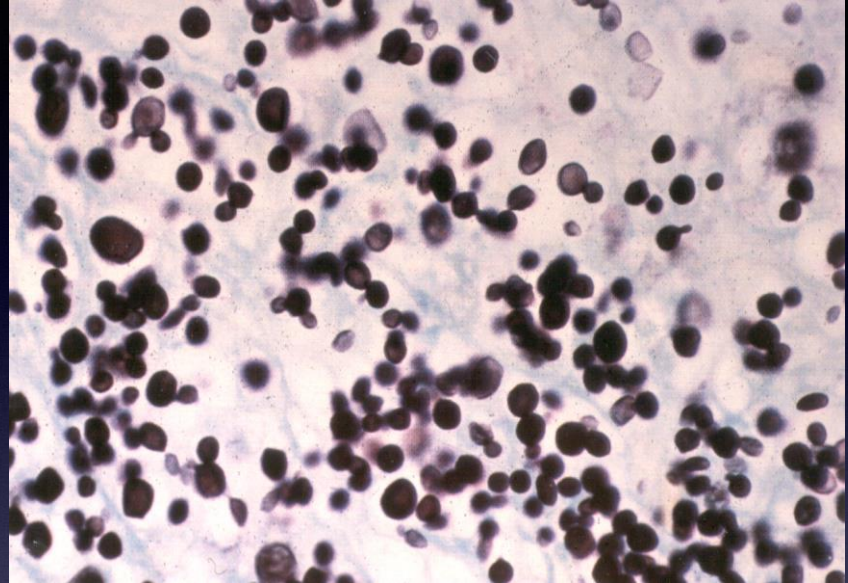
Tx?





# D/D nodular lymphangitis

- Staph, strep
- **Sporotrichosis**: 1° lesion is painless
- Nocardia: 1° lesion is a tender ulceration
- **M. marinum**: 1° lesion is a tender papule
- Tularemia: 1° lesion is a painful ulceration, w/ systemic symptoms (classically associated w/ skinning rabbits)



## Sporotrichosis:

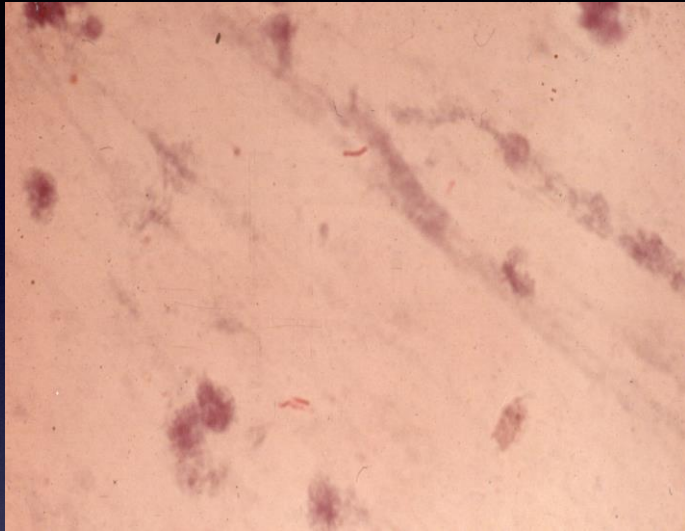
-minor

trauma from roses or sphagnum moss

-variable size yeast cells w/ multiple buds

Tx: itraconazole





**Mycobacterium marinum:**  
cleaning fish tanks, water  
injuries, **fish hooks, splinter**  
**from a boat**



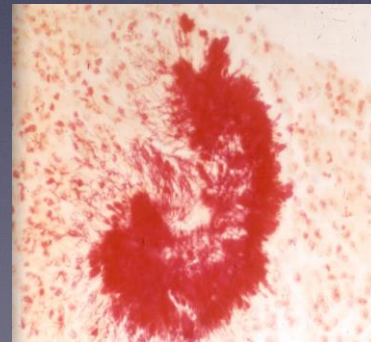
Rx:

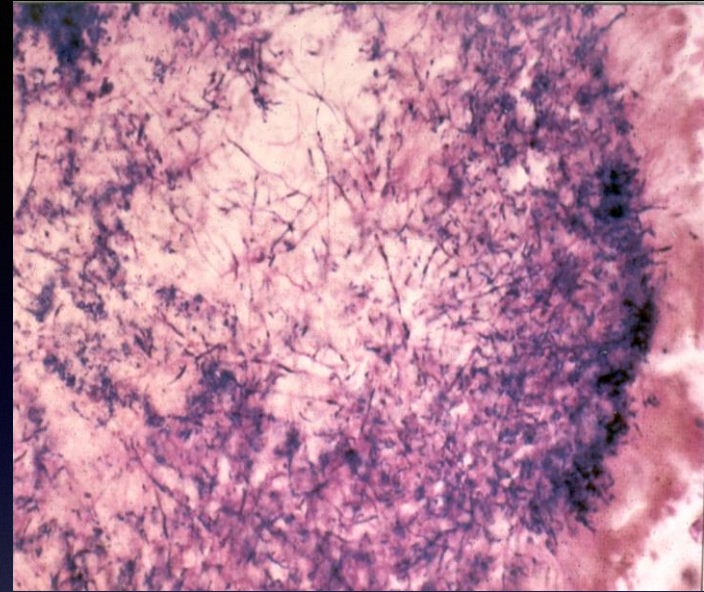
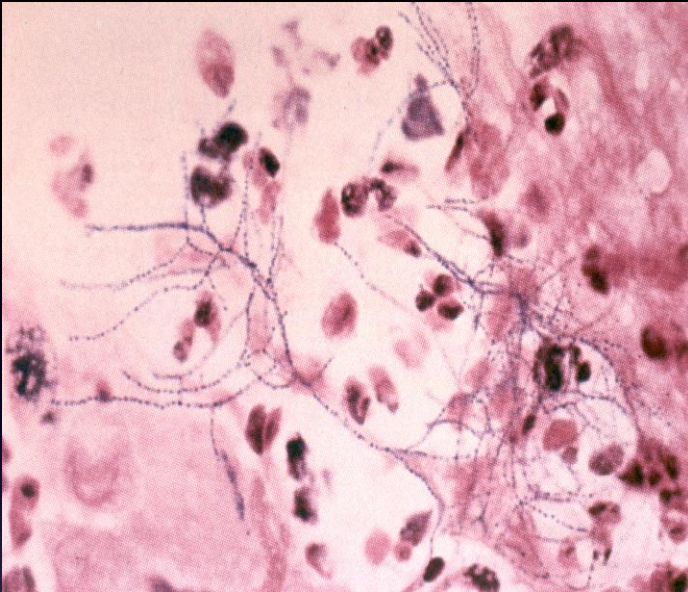
- Clarithromycin
- Doxycycline
- Minocycline
- Rifampin/ethambutol



# Actinomyces

- Spontaneous drainage from head (“lumpy jaw”), neck, or chest
- Often dental or oral mucosal origin
- Indolent, “wooden” mass effect; often confused w/ malignancy
- Assoc. w/ IUD’s
- “sulfur granules” ->





## Actinomyces:

- Gm + anaerobic, filamentous, beaded rods
  - not acid fast (vs
- Nocardia: aerobic, weakly acid fast)
- Tx - prolonged course of:
    - ampicillin
    - doxycycline
    - clindamycin





# H. Zoster



Source: Comp Ophthalmol Update © 2004 Comprehensive Ophthalmology Update, LLC



- Type of isolation?
- **Hutchinson's sign**
- Ramsey Hunt syndrome (H. zoster oticus), involving facial nerve (VII), w/ facial palsy, otalgia, dermatomal vesicles, occasional hearing loss

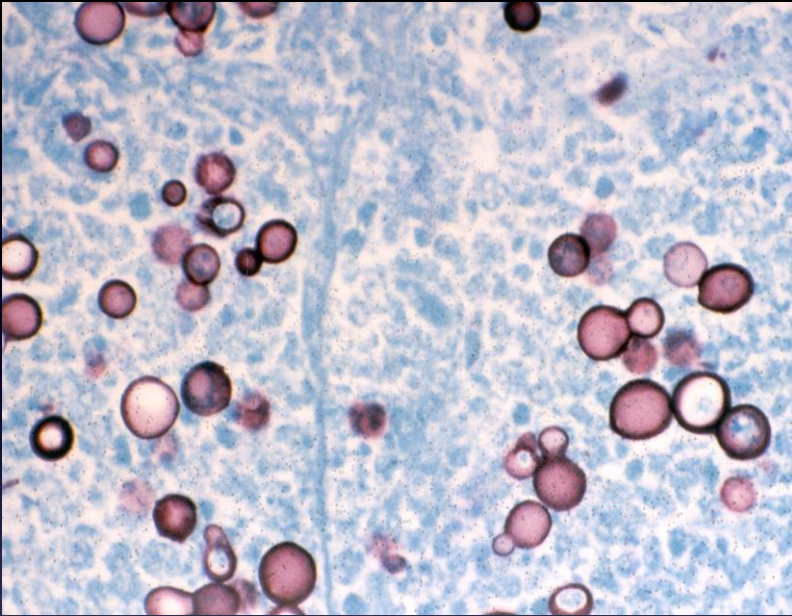


# Blastomycosis



Mackowiak P A et al. Clin Infect Dis. 2012;55:1390-1391

# Blastomycosis



- single, broad-based buds
- decaying vegetation, e.g. beaver dams
- Tx: Itraconazole



- often involves skin, bone; GU tract in males
- regardless of presentation, always considered as disseminated disease, w/ lungs being the primary entry site



# Neutropenia/immunosuppression

...including initial approach to the febrile neutropenic patient as well as the persistently febrile patient

- most common bacteremia: E. coli
- most lethal organism: pseudomonas -  
initial empiric rx always includes anti-  
pseudomonas coverage
- when remains febrile: antifungals

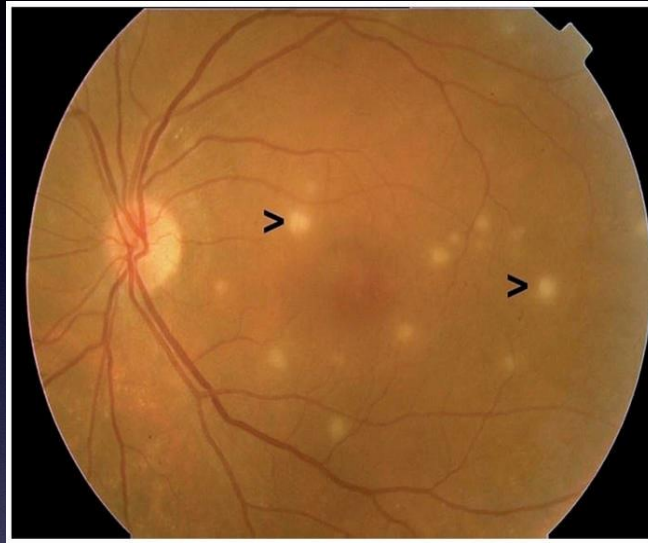
# Ecthyma gangrenosum

- Most frequently assoc. w/ **pseudomonas** bacteremia
- Neutropenia, or other severely impaired immunity
- Erythematous / hemorrhagic pustule, evolving into central necrosis

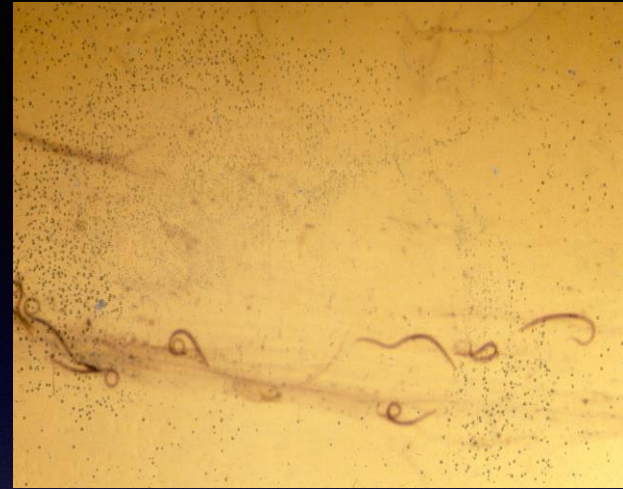




# Candida endophthalmitis



- severe neutropenia; may become apparent as neutrophils are recovering
- other setting/risk factors: ICU, multiple IVs/central lines, multiple antibiotics, TPN
- initial rx: echinocandins

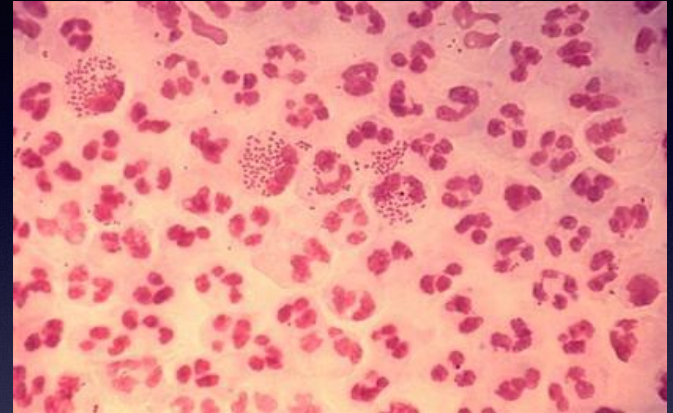


## Strongyloides:

- diffuse pulmonary infiltrates in an immunosuppressed host
- NOT grossly visible ...
- Rx: ivermectin / albendazole

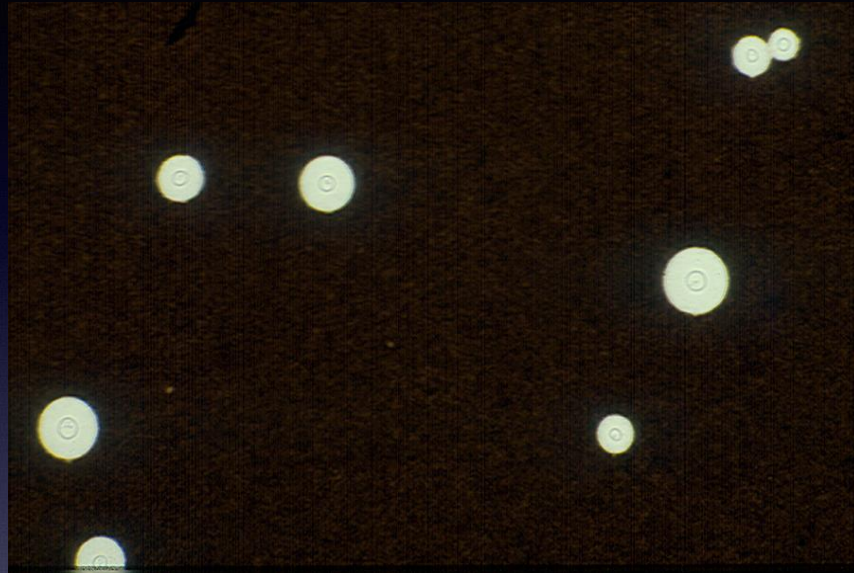


# CNS Presentations



## Neisseria meningitidis:

- acute meningitis w/ rash; Rx: ceftriaxone
- sepsis syndrome/bacteremia associated w/ terminal compliment deficiencies ( $C_5 - C_9$ ), as well as splenectomy



## Cryptococcus

- HIV+, other dx assoc. w/ t-cell deficiencies; sub-acute headache, mental status changes
- tx: amphotericin B + flucytosine / fluconazole



# Additional potential CNS questions:

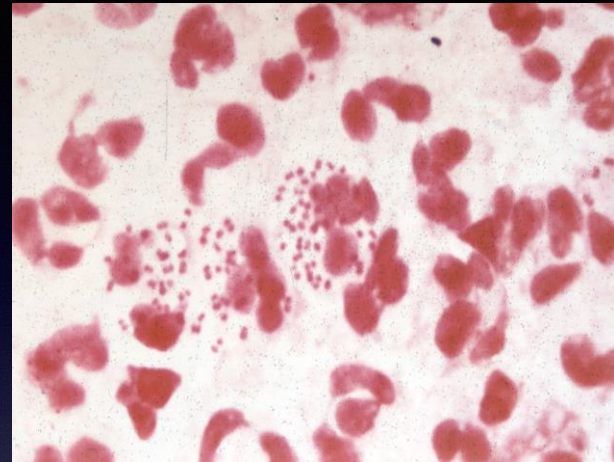
Interpretation of CSF results in a patient with fever, CNS findings

- Bacterial, viral, fungal, TB
- Meningitis vs encephalitis
- HSV encephalitis
- Meningitis w/ highest mortality (pneumococcus)
- Complement deficiency
- Most common cause of lymphocyte-predominant meningitis in a young, otherwise healthy individual
- *Listeria* scenarios - who? CSF results, including gm stain w/ gm + rods? Rx?

# D/D of Meningitis

	Bacterial	Viral	TB/Fungal
Cell count	increased; neutrophil predominant	sl. increased; lymphocyte predominant	increased; lymphocyte predominant
Glucose	decreased	normal or sl. decrease	decreased
Protein	elevated	normal or minimally elevated	elevated





## N. gonorrhoeae

- gm neg intracellular diplococci
- painful urethral/cervical discharge
- pustular rash
- Late compliment deficiency
- Tx: cefixime (?) / ceftriaxone



## Primary Syphilis:

- painless (usually genital) ulcer
- darkfield microscopy; PCR
- serology usually negative







Badri T, Ben Jennet S. N Engl J Med 2011;364:71-71.

## *T. pallidum*

- 2° stages and beyond -> dx by serology
- rash includes palms and soles
- RPR or VDRL to screen
- FTA as confirmatory (though being replaced by TP-PA)





# Treatment of Syphilis

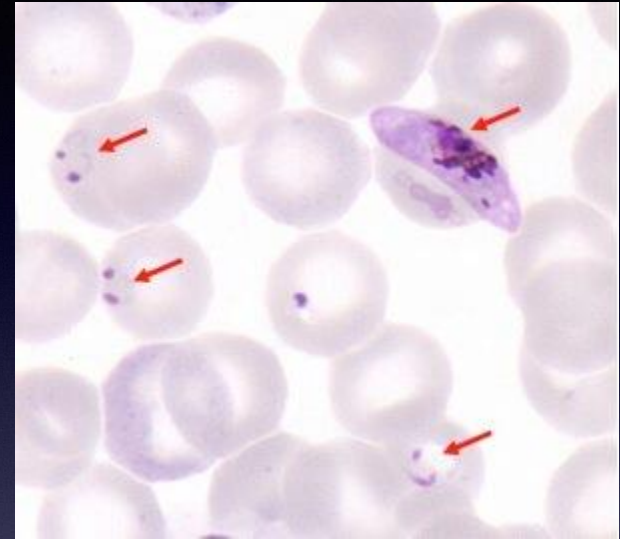
- Less than 1 yr's duration (includes primary, secondary and early latent): benzathine PCN 2.4 mill units i.m. x 1  
If HIV +, some treat weekly x 3  
Allergy: doxycycline, ceftriaxone
- Greater than 1 yr's duration (or unknown duration); late latent: benzathine PCN 2.4 mill units weekly x 3  
Allergy: ceftriaxone, doxycycline

# Treatment of Syphilis

- Neurosyphilis: 10-14 days IV PCN G, 18 - 24 mill. units/day
- If PCN allergic: desensitize or...ceftriaxone probably effective
- In pregnancy, if PCN allergy - must desensitize (though ceftriaxone probably effective)
- Jarish-Herxheimer rxn



# Malaria



- appropriate travel hx
- “black water fever”
- speciation by PCR at the CDC
- D/D Babesiosis

Banana gametocyte:  
*P. falciparum*

# Babesiosis

(*B. microti*; *B. divergens*)

- Non-specific illness w/ headache, myalgia, malaise, fever after travel to coastal northeastern U.S. in late spring, early summer, particularly if hx of tick exposure 1 - 4 weeks earlier; much more severe illness if splenectomized
- Occasionally transmitted by transfusion
- Tick vector: *Ixodes scapularis*
- Reservoir host: white footed mouse
- Note: this same tick also transmits Lyme dx (*Borrelia burgdorferi*) and anaplasmosis. Consider if severe dx or poor response to treatment for these other diseases



# Babesiosis\*

- Hemolytic anemia, thrombocytopenia
- No rash
- Dx: RBC inclusion bodies ~ malaria on blood smear; however, tetrads (“Maltese cross formations”) NOT seen in malaria
- Dx: PCR
- Rx: atovaquone + azithromycin if mild; IV clindamycin + p.o. quinine +/- exchange transfusion if severe

\*Vannier & Krause. NEJM 2012;366: 2397-2407

# Babesiosis



Noskoviak K, Broome E. N Engl J Med 2008;358:e19.



The NEW ENGLAND  
JOURNAL of MEDICINE



# Lyme Disease

(*Borrelia burgdorferi*)



Erythema migrans

# Lyme Disease

- > 300,000 cases/yr in U.S.
- Systemic symptoms, rash, joint, CNS involvement
  - erythema migrans > 90%
  - carditis w/ conduction defects <10%
  - various neurologic presentations ~15%
  - cranial neuropathies; esp. **bilateral VII nerve palsey**; meningitis; radiculopathy
- IF chronic disease exists, may be due to immune dysregulation (elevated IL-23 and/or other)
- Prophylaxis: 200mg doxycycline x 1



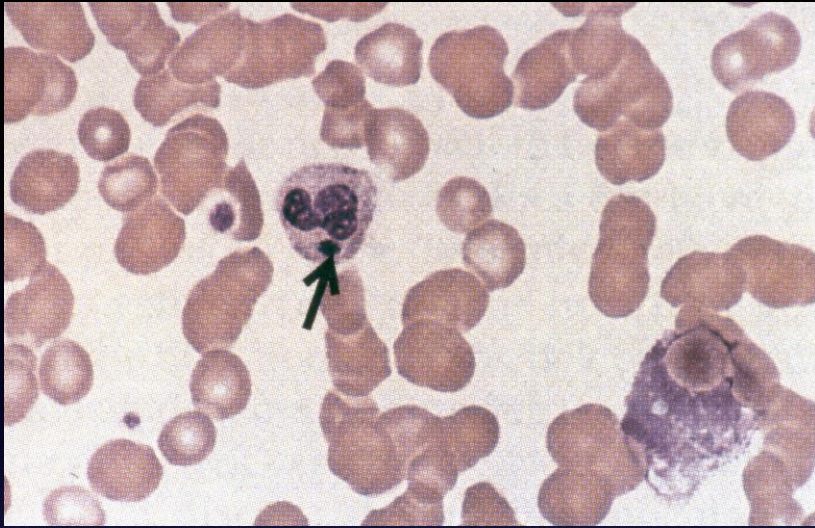
# Ehrlichiosis/Anaplasmosis

## Human Monocytic Ehrlichiosis:

- E. chaffeensis
- Monocytes
- macrophages of liver, spleen and bone marrow
- S.E, south-central, mid-Atlantic U.S.

## Human Granulocytic Anaplasmosis:

- A. phagocytophilum
- seen on peripheral smear (granulocytes)
- upper-midwest, N.E., California, Europe
- E. ewingii: as above except geography of HME



## Ehrlichiosis/Anaplasmosis:

- following tick exposure
- flu-like illness w/ leukopenia,
- thrombocytopenia
- spring/summer
- hyponatremia, elevated LFT's

- Note: “**morulae**”- cytoplasmic inclusions of “elementary bodies”  
Common only w/ **anaplasma**
- Diagnosis by PCR, blood smear
- Tx: doxycycline





# Treatment

## Warning: Questions about treatment failure

### Lyme Dx:

- Amoxicillin/cefuroxime
- Ceftriaxone
- Doxycycline

### Ehrlichiosis/Anaplasmosis:

- Doxycycline

### Babesiosis:

- Atovaquone + azithromycin



Esfandbod M, Malekpour M. N Engl J Med  
2009;361:178-178.

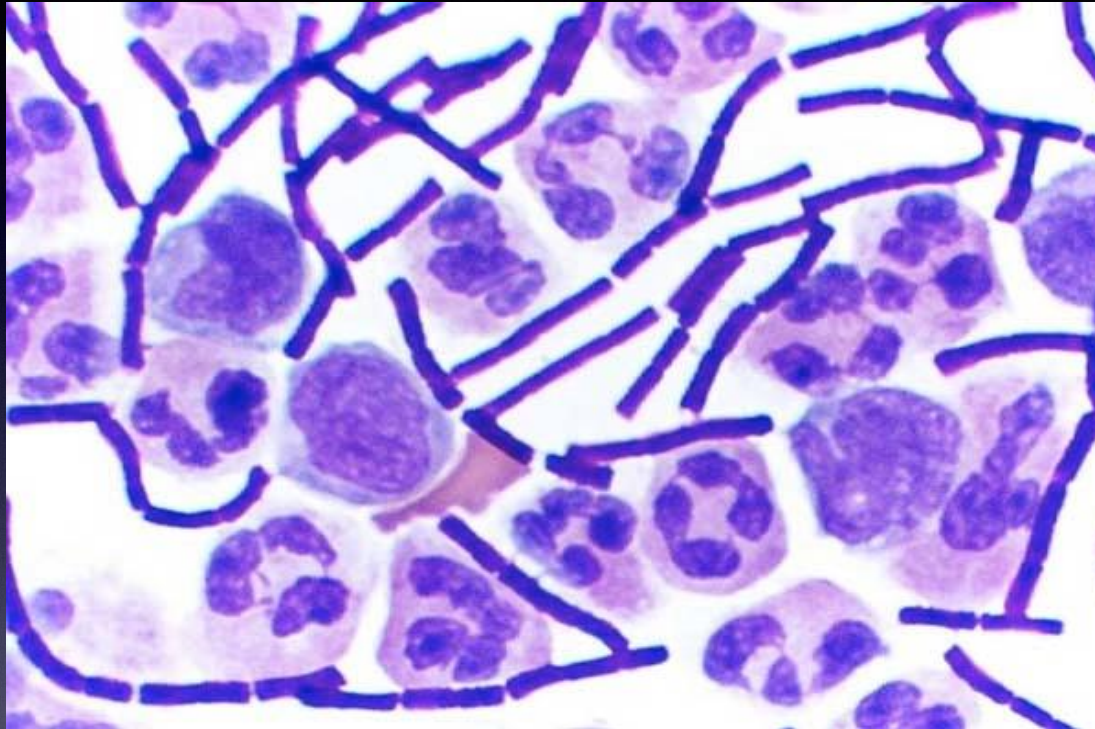
## Cutaneous anthrax

- systemically ill
- painless eschar w/ marked, localized edema
- contaminated soil, livestock



# Bioterrorism-related Anthrax

- Multiple, previously healthy pts, w/ severe, rapidly fatal, flu-like illness
- “pneumonia” uncommon
- **Widened mediastinum**
- Large hemorrhagic pleural effusions
- Hemorrhagic meningitis
- Tx: penicillin / ciprofloxacin / doxycycline



CSF Gm stain - Anthrax  
(JAMA; 2001)



# Smallpox

- Severe illness w/ painful, nodular rash
- **Severe back pain**
- All lesions in the same stage
- Rash most prominent on face and extremities, **including** palms and soles

