Clinical Microbiology

ACOI Board Review 2020

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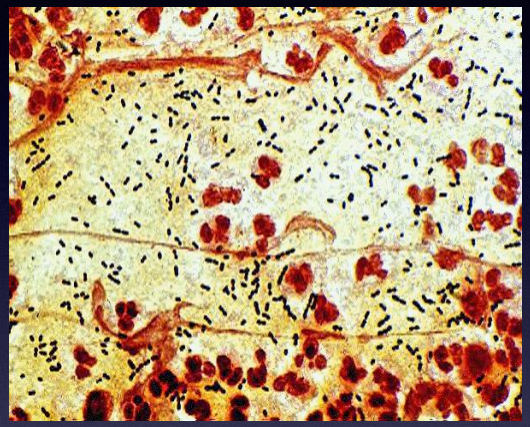
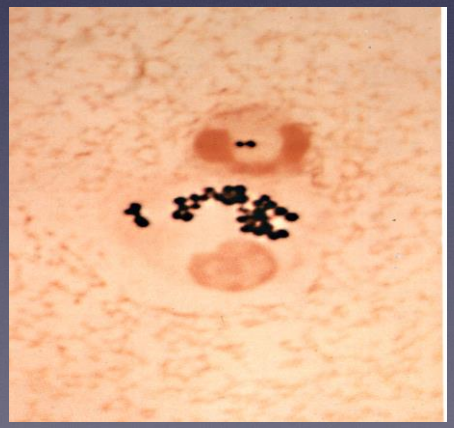
S. aureus skin/soft tissue infection:





- 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?

- First generation cephalosporin - cefazolin

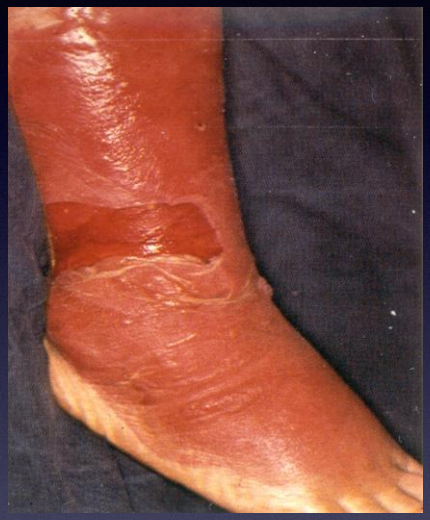
Rx if MRSA (if susceptible)?

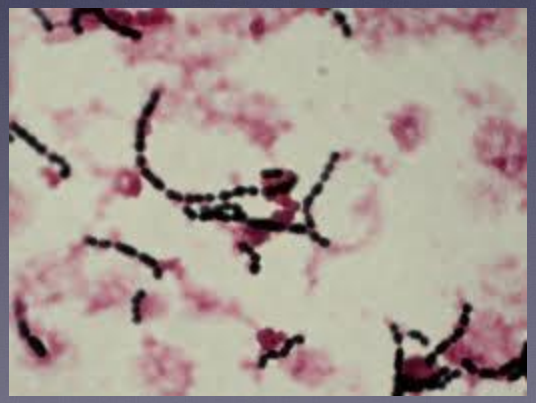
- Vancomycin
- Daptomycin (but NOT pneumonia)
- Linezolid (but NOT bacteremia)
- Ceftaroline
- Trimethoprim/sulfa - especially SSTI
- Clindamycin - especially SSTI
- Quinolones (?) - not Cipro

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

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

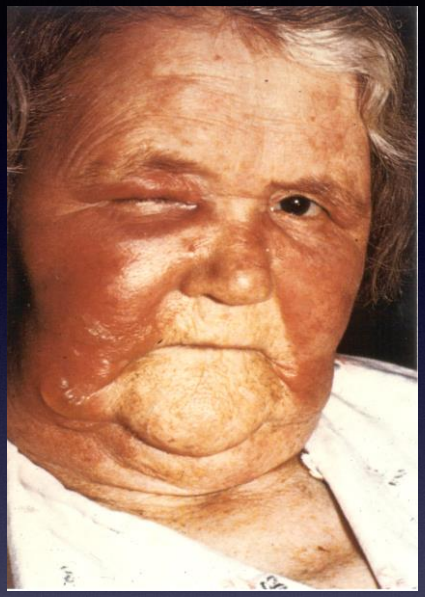
- Intense erythema
- (Often recurrent) cellulitis rather than abscess
- Lymphangitis
- Often (preceding) systemic symptoms
- Areas of pre-existent lymphedema, venous insufficiency
- Drainage, when present, often watery or serous

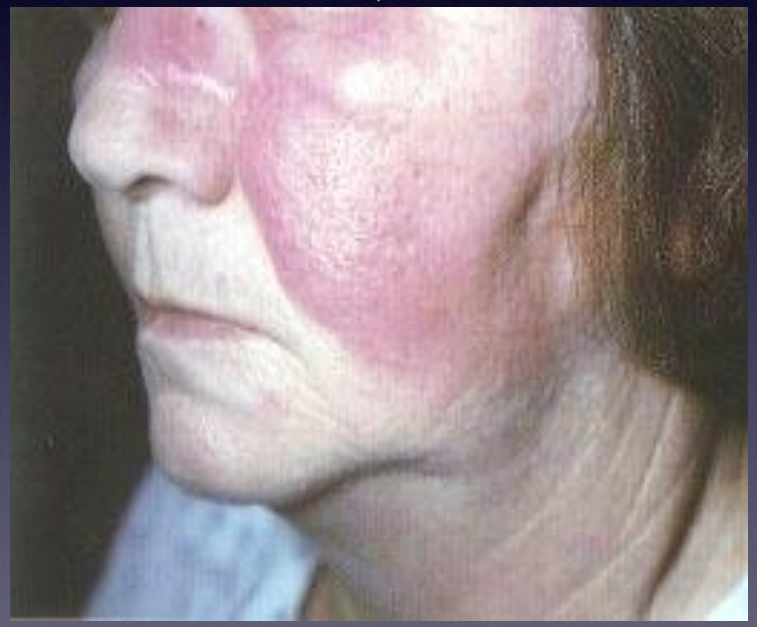




Erysipelas

(superficial cellulitis of Streptococcal etiol.)





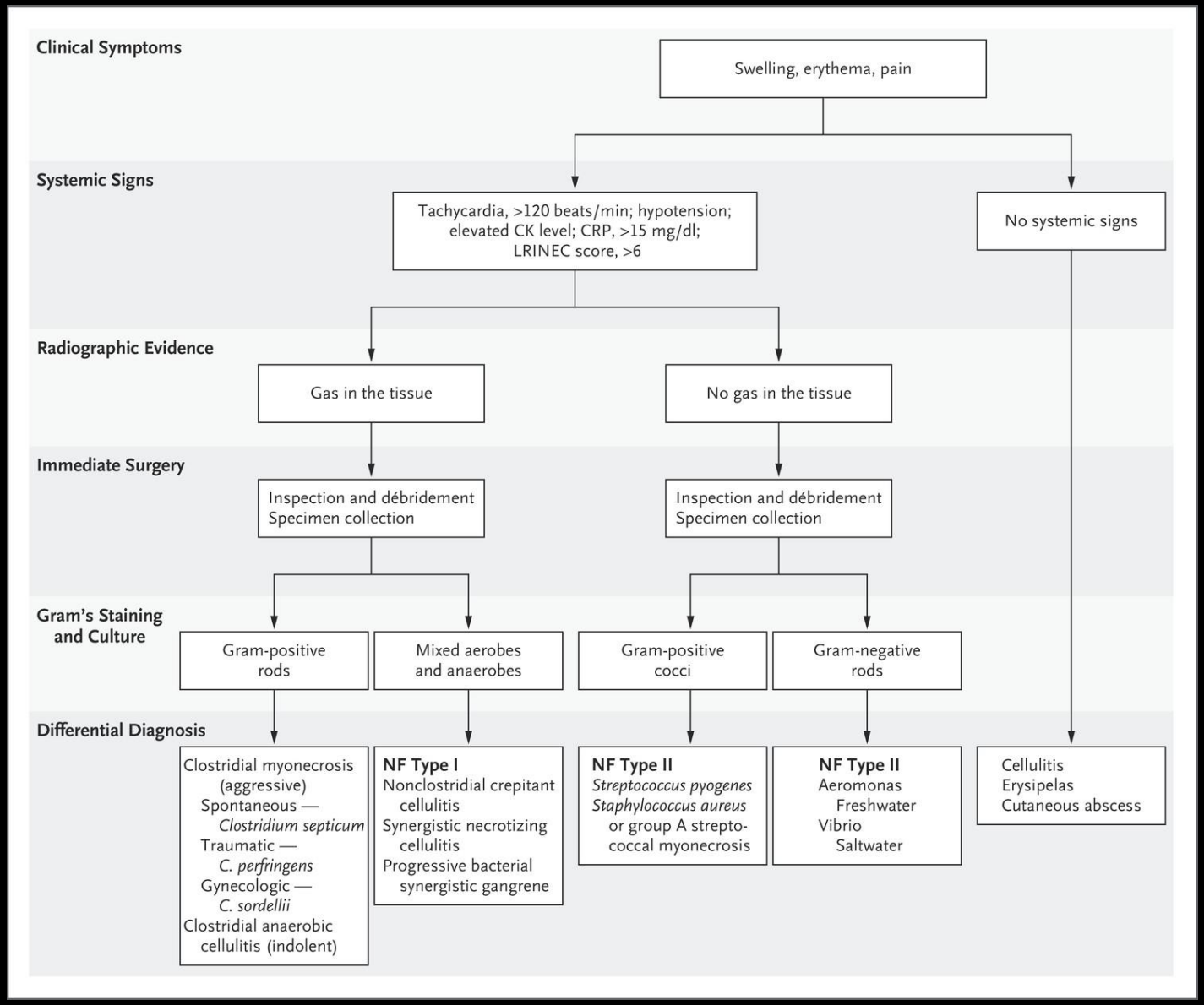
Rx: penicillins
if allergy: cephalosporin; vancomycin; clindamycin
NOT trimethoprim/sulfa

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



Stevens DL, Bryant AE. N Engl J Med 2017;377:2253-2265.

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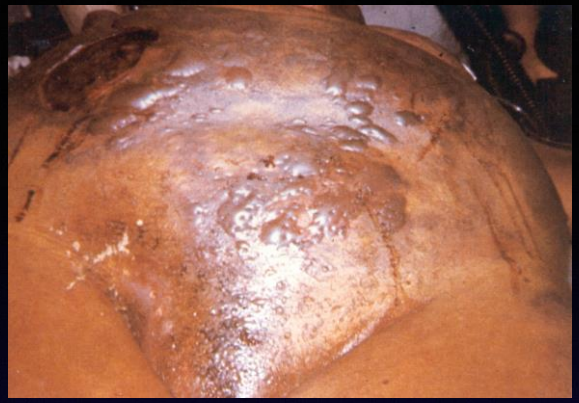
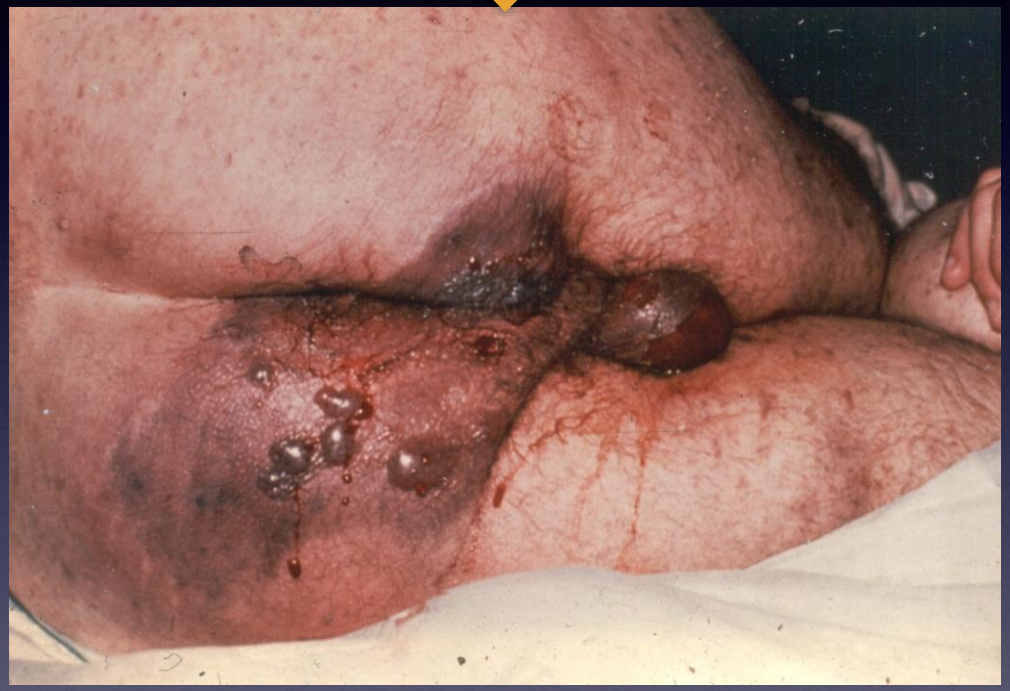
Diabetic Foot

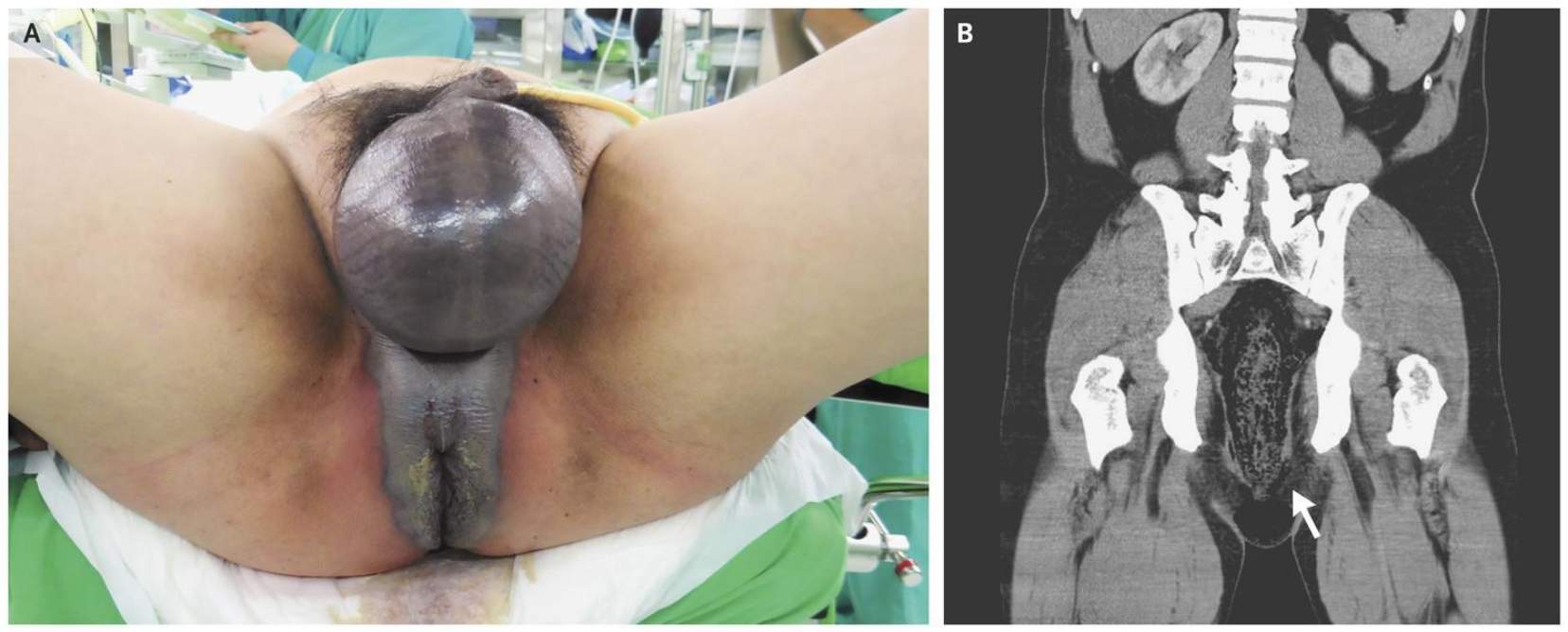
- Usually polymicrobial, w/ foul odor -
  - Anaerobes
  - Gm negatives
- Many feel pseudomonas commonly involved
- Rx (including pseudomonas coverage)?





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

Now what?



Huang C. N Engl J Med 2017;376:1158-1158.

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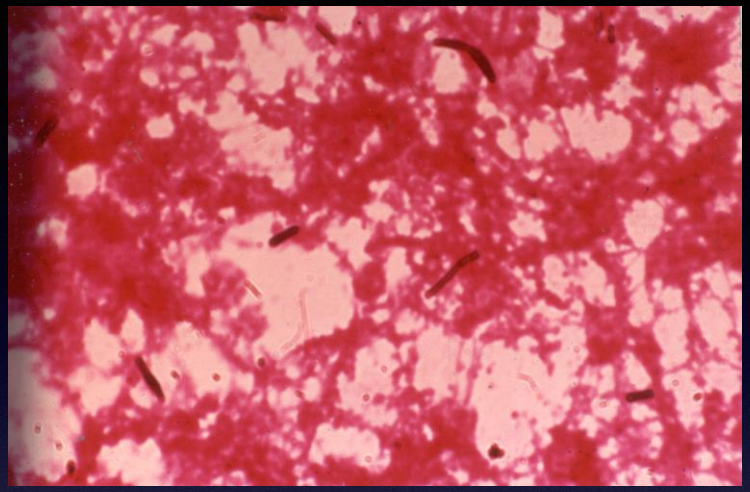


C. perfringens “gas gangrene”

Rx:

Surgery

+

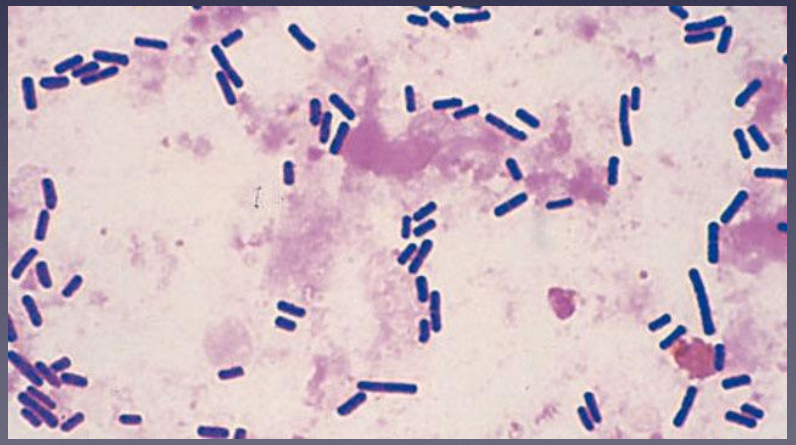
Penicillin

+

Clindamycin

+

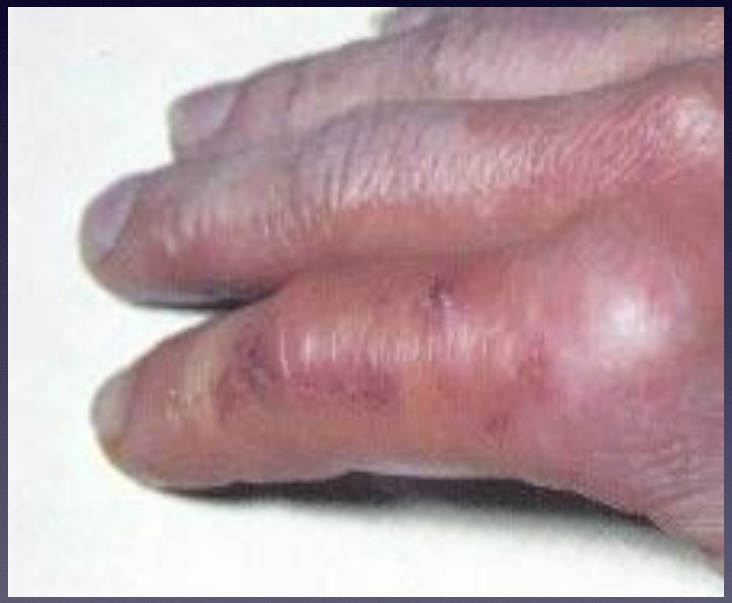
? IVIG, HBO?



- 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

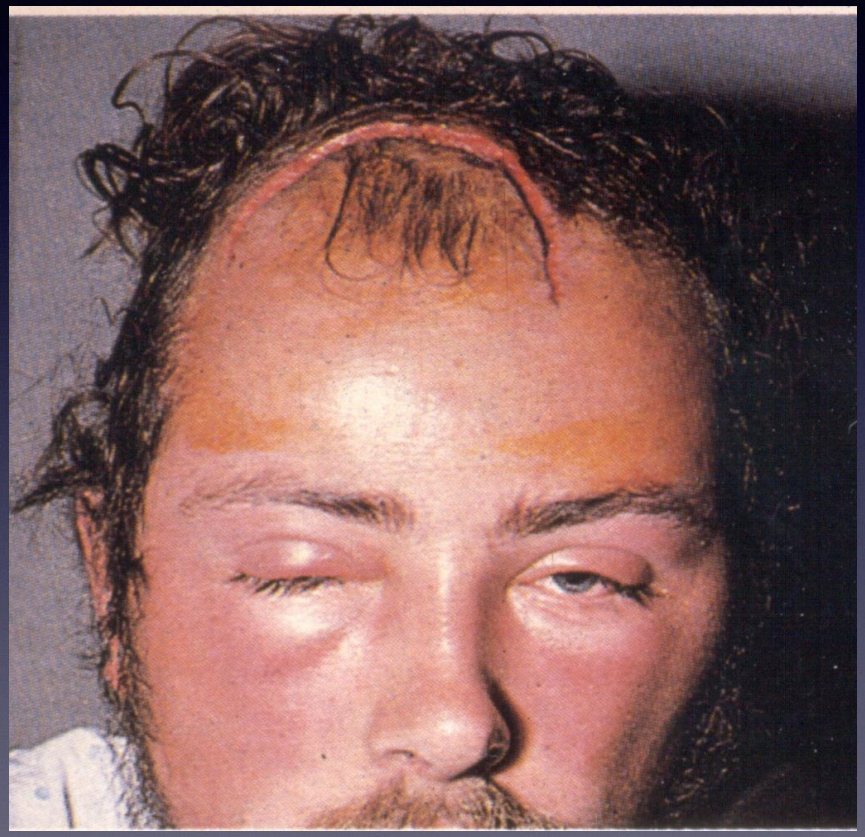
- Dog bites/splenectomy: overwhelming sepsis due to Capnocytophaga sp. (DF-2)
- Human bites: Eikenella - can’t use clindamycin
- Rabies - any wild carnivore
  - most common domestic animal (in U.S.)? - cat
- Lagomorphs don’t get rabies (exception: woodchucks)

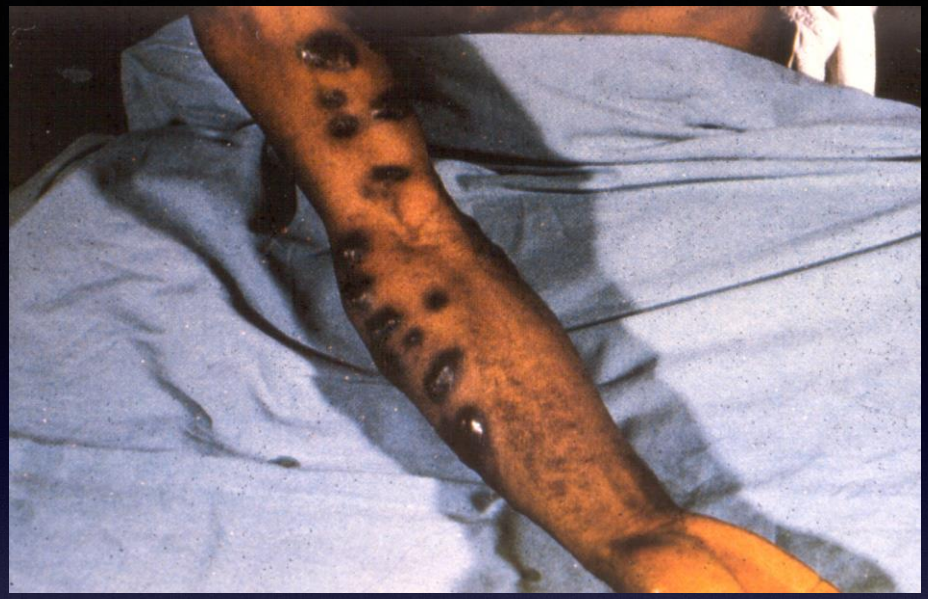
Aeromonas hydrophila

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

Rx:

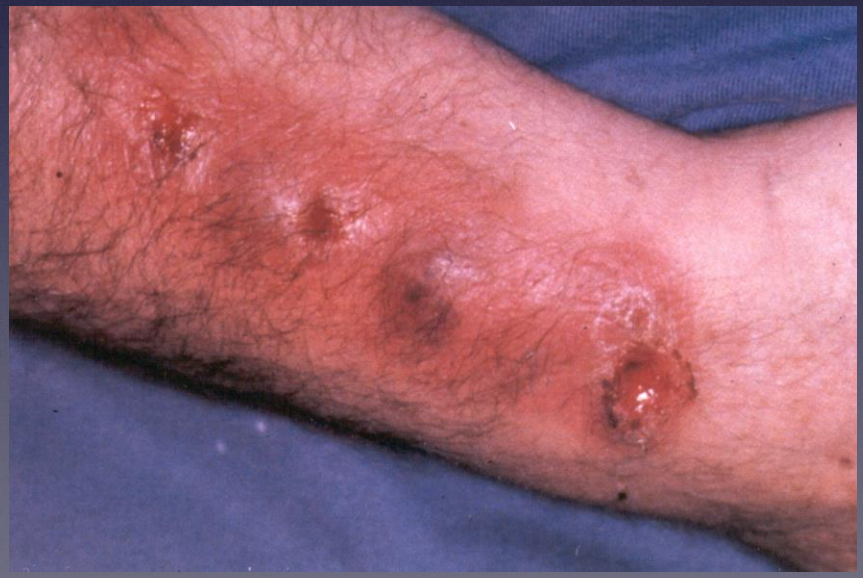
- fluoroquinolone
- 3rd gen cephalosporin
- trimethoprim/sulfa





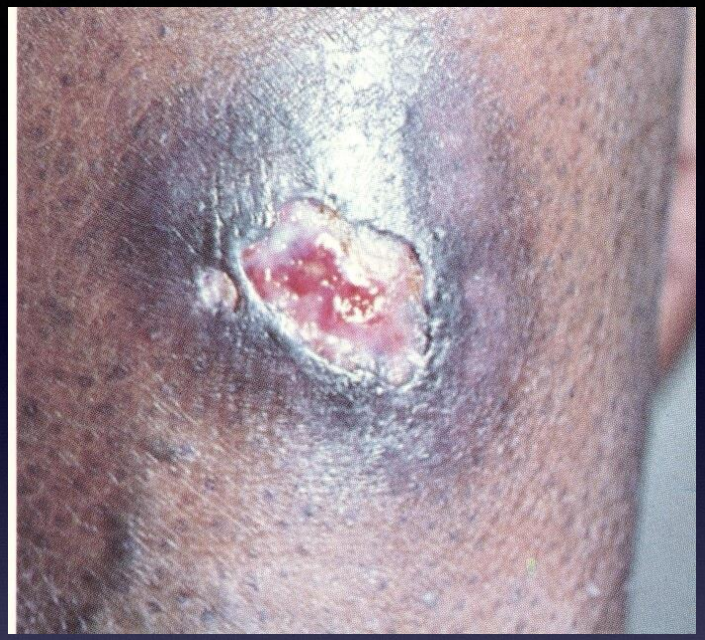
"Nodular" lymphangitis

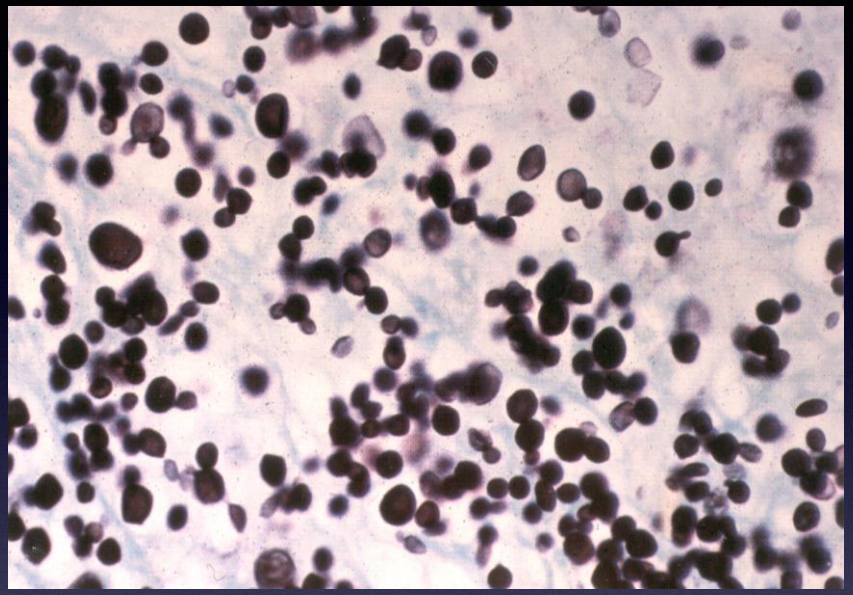
Working in yard:
Dx?
Tx?



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)

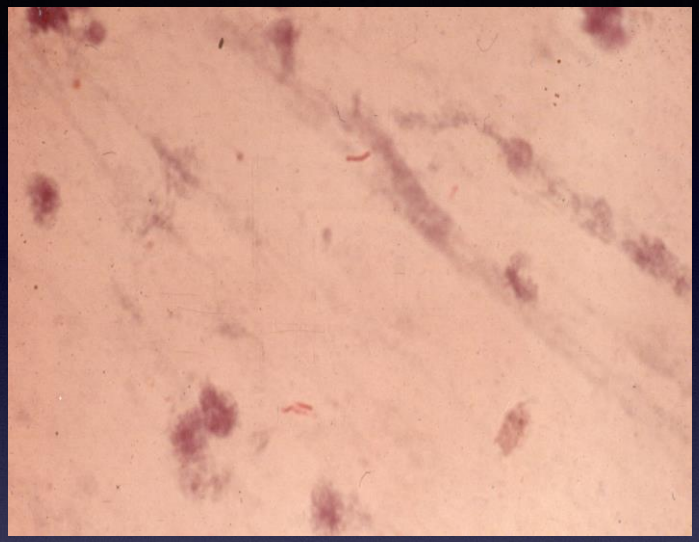


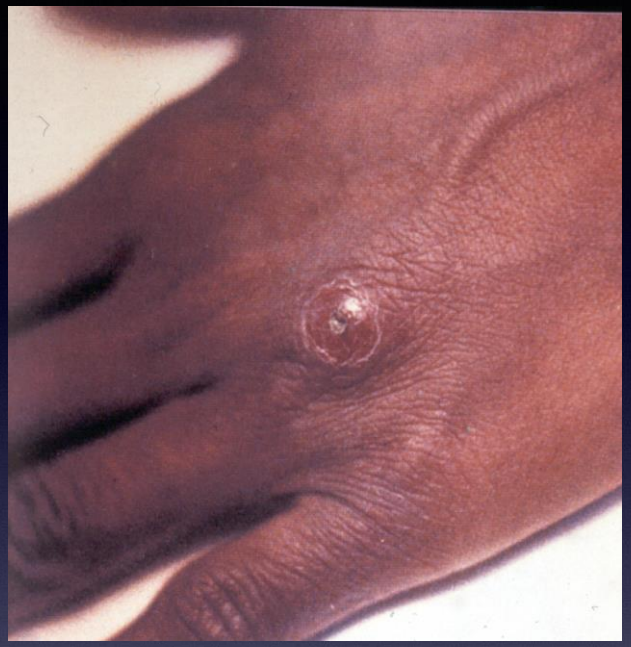


Sporotrichosis: -minor trauma from roses or sphagnum moss

-variable size yeast cells w/ multiple buds

Tx: itraconazole





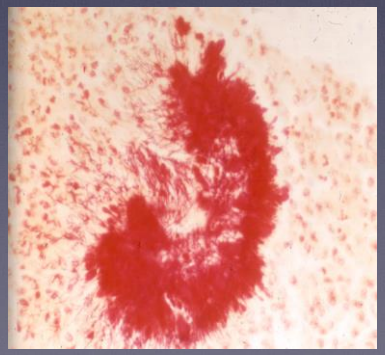
Mycobacterium marinum: cleaning fish tanks, water injuries, fish hooks, splinter from a boat

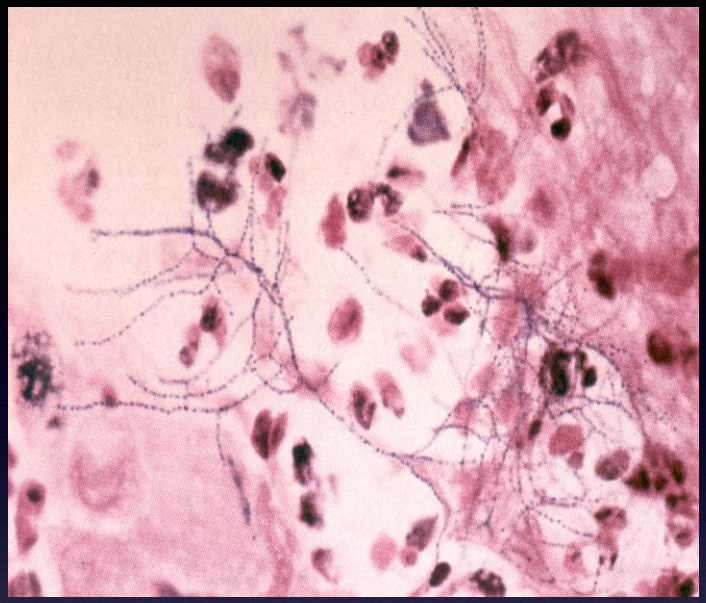
Rx:

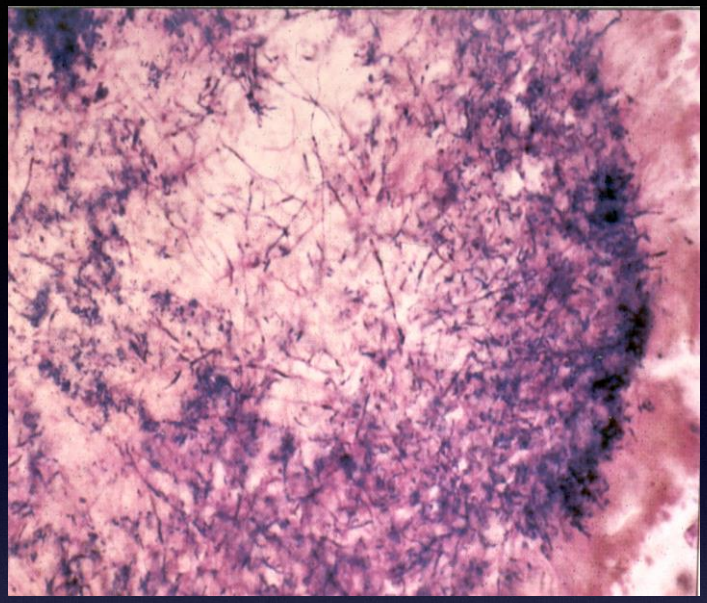
- Clarithromycin
- Doxycycline
- Minocycline
- Rifampin/ethambutol

Actinomycosis

- Spontaneous drainage from head ("lumpy jaw"), neck, or chest
- Often dental or oral mucosal origin
- Indolent, "wooden" mass; often mistaken for malignancy
- Assoc. w/ IUD's
- "sulfur granules" ->

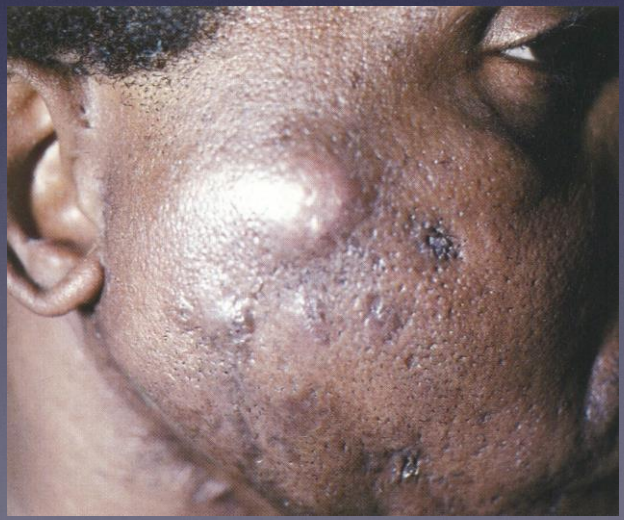




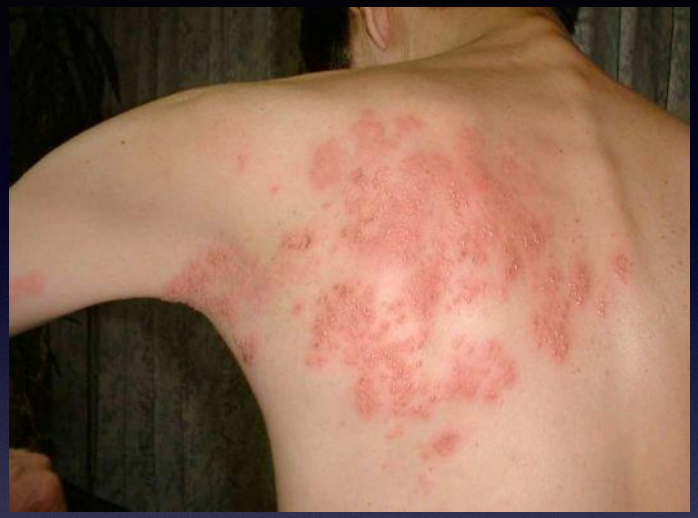


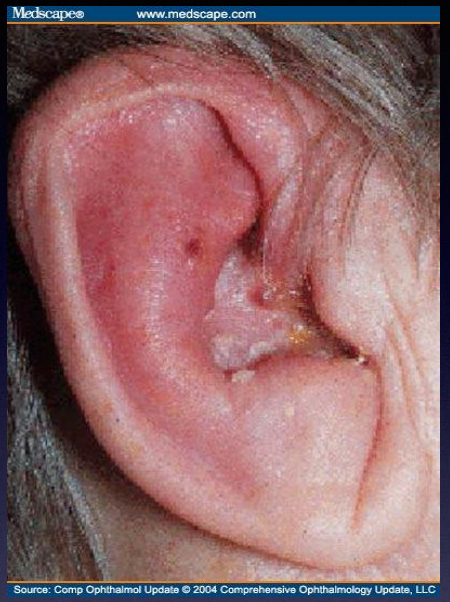
Actinomyces:

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



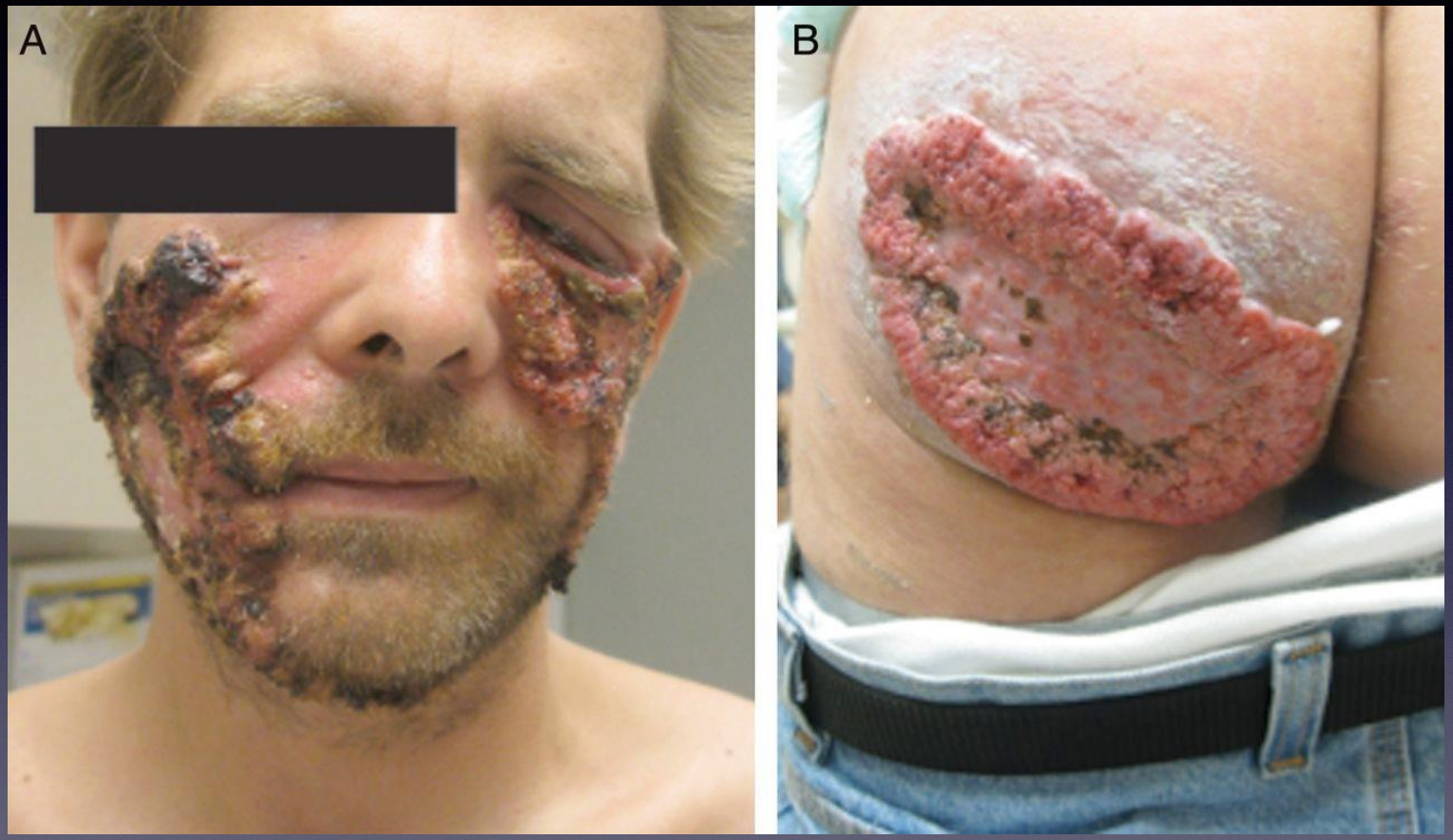
H. Zoster





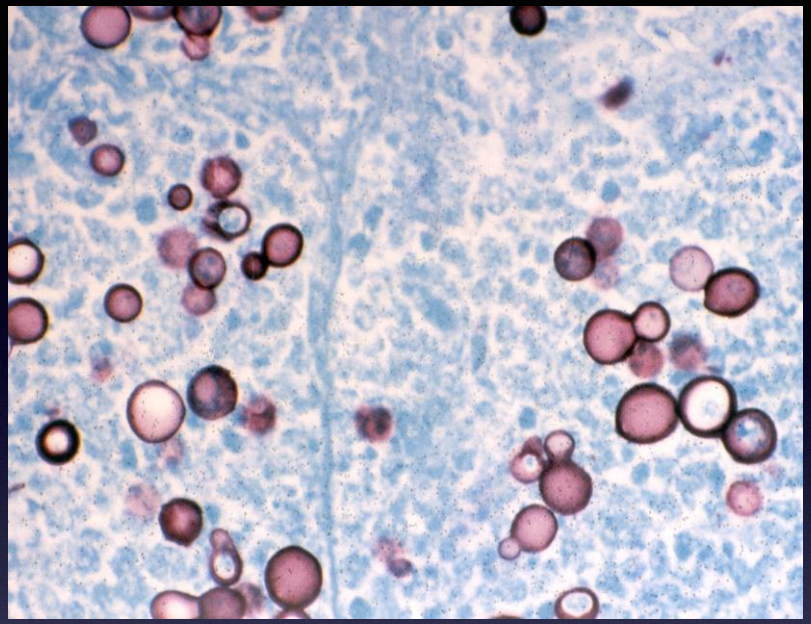
- Type of isolation?
- **Hutchinson's sign**
- Ramsey Hunt syndrome (H. zoster oticus), involving facial nerve (VII), w/ facial palsy, otalgia, dermatomal vesicles, occasional hearing loss

Blastomycosis

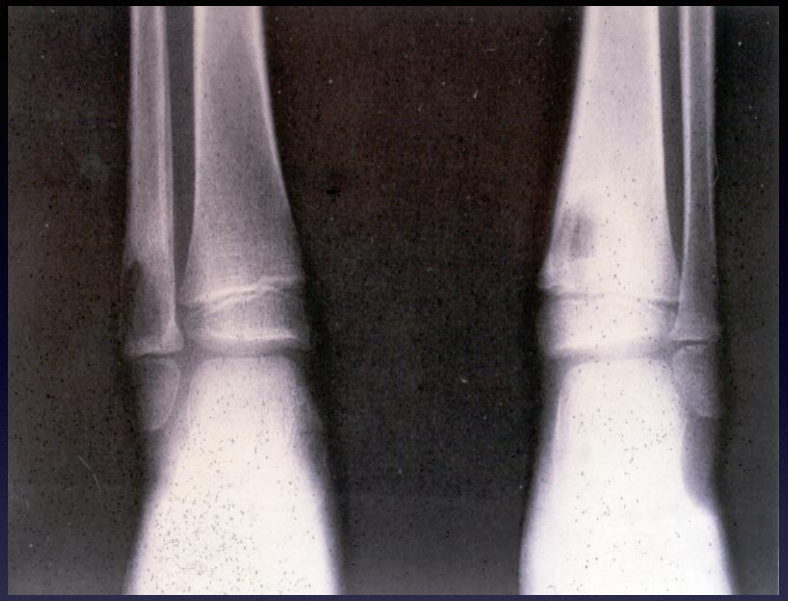


Mackowiak P A et al. Clin Infect Dis. 2012;55:1390-1391

Blastomycosis



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



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

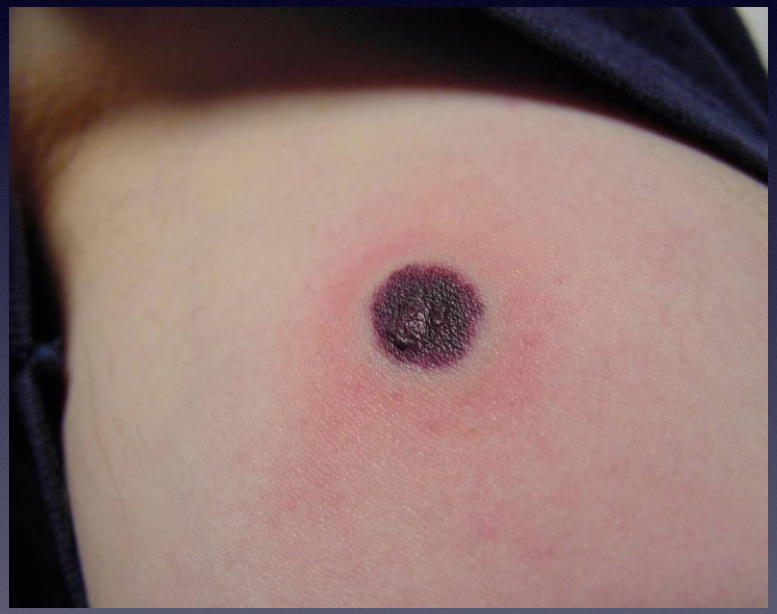
Neutropenia/immunosuppression

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

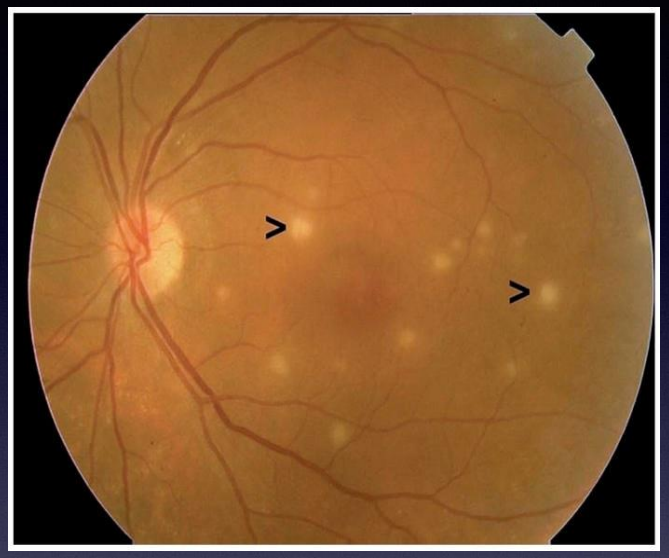
- most common bacteremia: E. coli
- most lethal organism: pseudomonas - initial empiric rx always includes anti-pseudomonas coverage
- when remains febrile: antifungals

Ecthyma gangrenosum

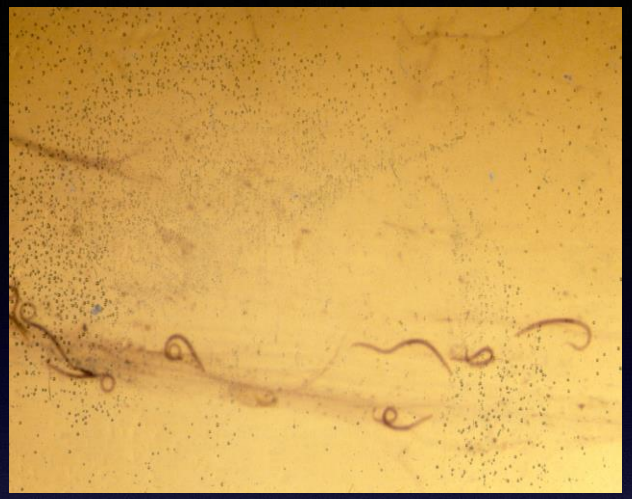
- Most frequently assoc. w/ pseudomonas bacteremia
- Neutropenia, or other severely impaired immunity
- Erythematous / hemorrhagic pustule, evolving into central necrosis



Candida endophthalmitis



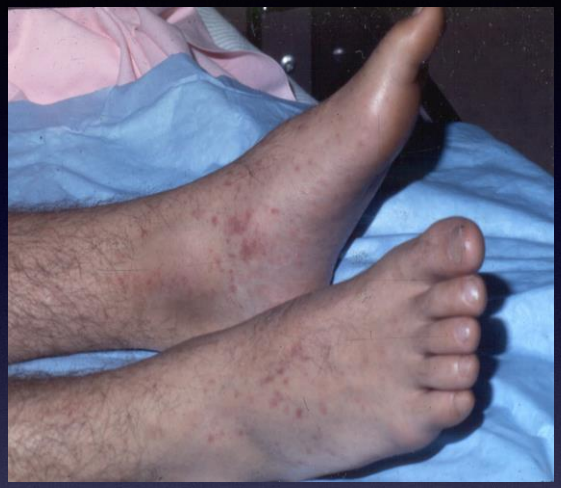
- severe neutropenia; may become apparent as neutrophils are recovering
- other setting/risk factors: ICU, multiple IVs/central lines, multiple antibiotics, TPN
- initial rx: echinocandins

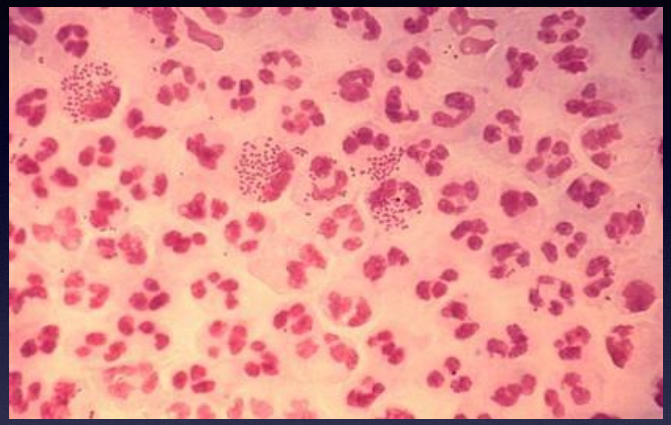


Strongyloides:

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

CNS Presentations



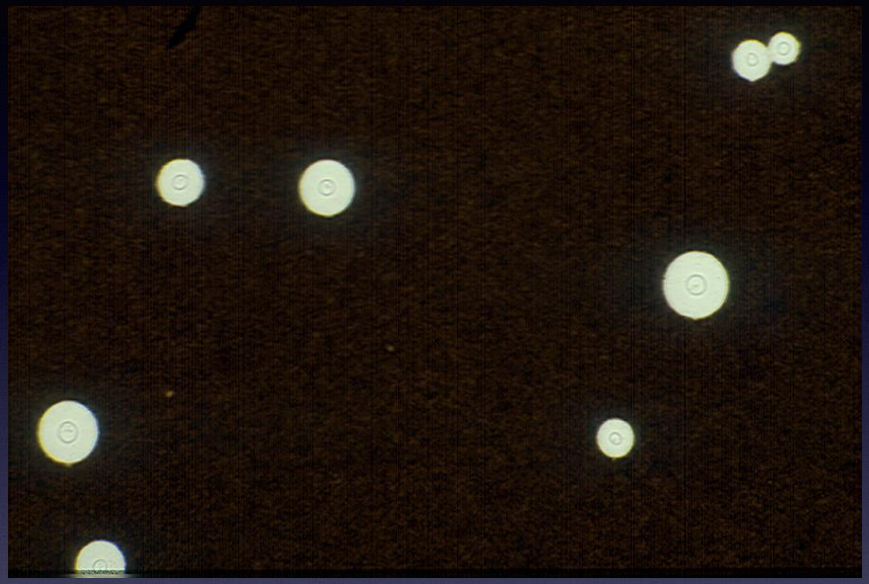


Neisseria meningitidis:

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

Alert: eclulizumab (Soliris®)

- terminal compliment inhibitor
- for Rx of PNH, aHUS, neuromyelitis optica
- 1000 - 2000 times increased incidence of meningococcal disease
- most expensive drug in the world - $409,500/yr in U.S.



Cryptococcus

- HIV+, other dx assoc. w/ t-cell deficiencies;

sub-acute headache, mental status changes

- tx: amphotericin B + flucytosine / fluconazole

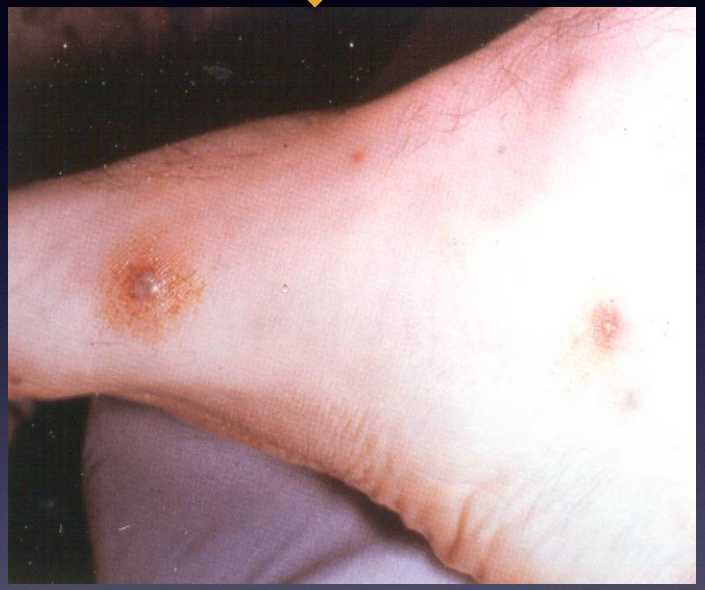
Additional potential CNS questions:

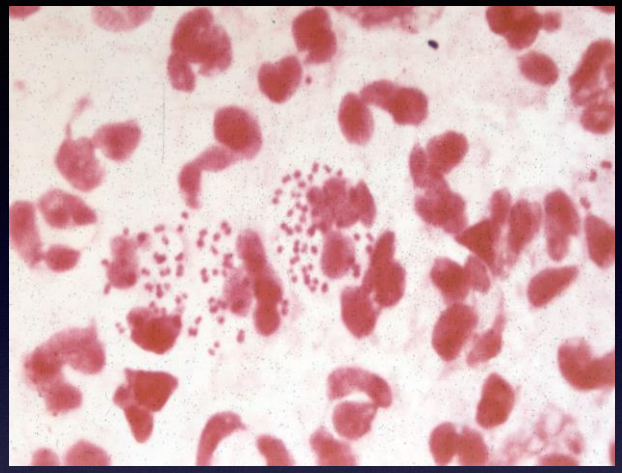
Interpretation of CSF results in a patient with fever, CNS findings

- 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?
  - Associated w/ alemtuzumab (Lemtrada ®) used in rx of M.S.

D/D of Meningitis

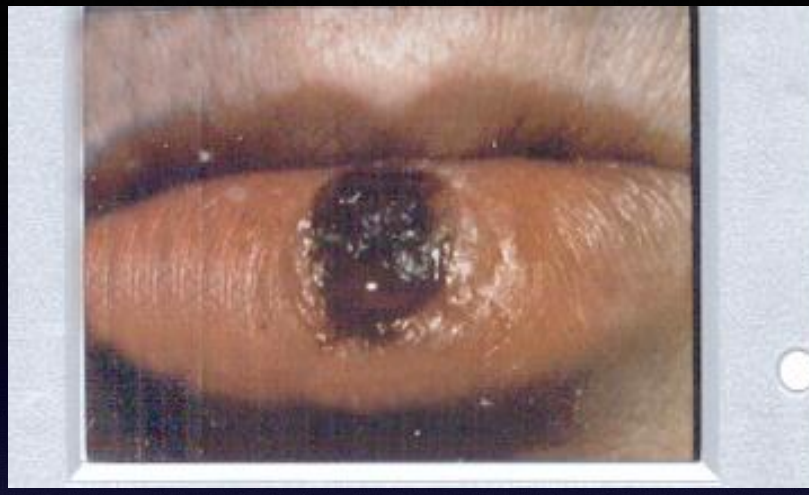
	Bacterial	Viral	TB/Fungal
Cell count	increased; neutrophil predominant	sl. increased; lymphocyte predominant	increased; lymphocyte predominant
Glucose	decreased	normal or sl. decrease	decreased
Protein	elevated	normal or minimally elevated	elevated

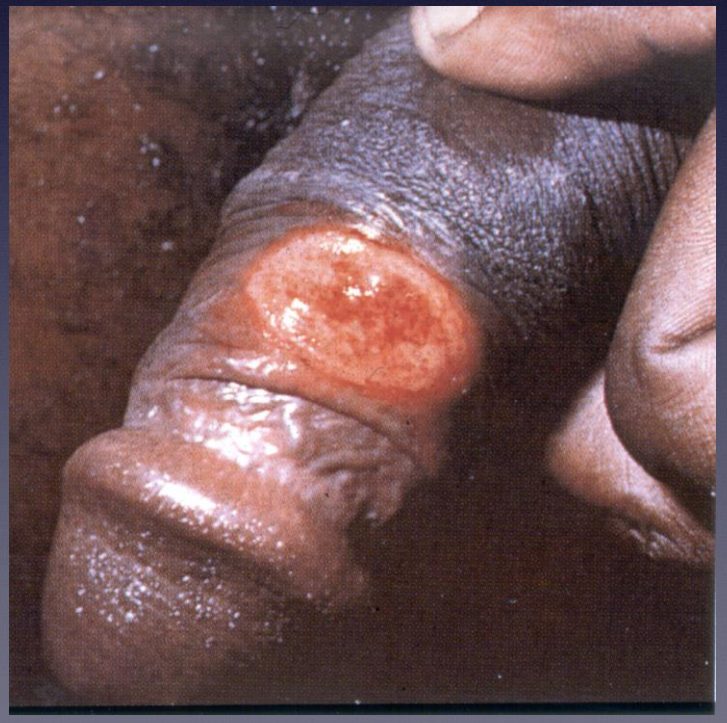




N. gonorrhoeae

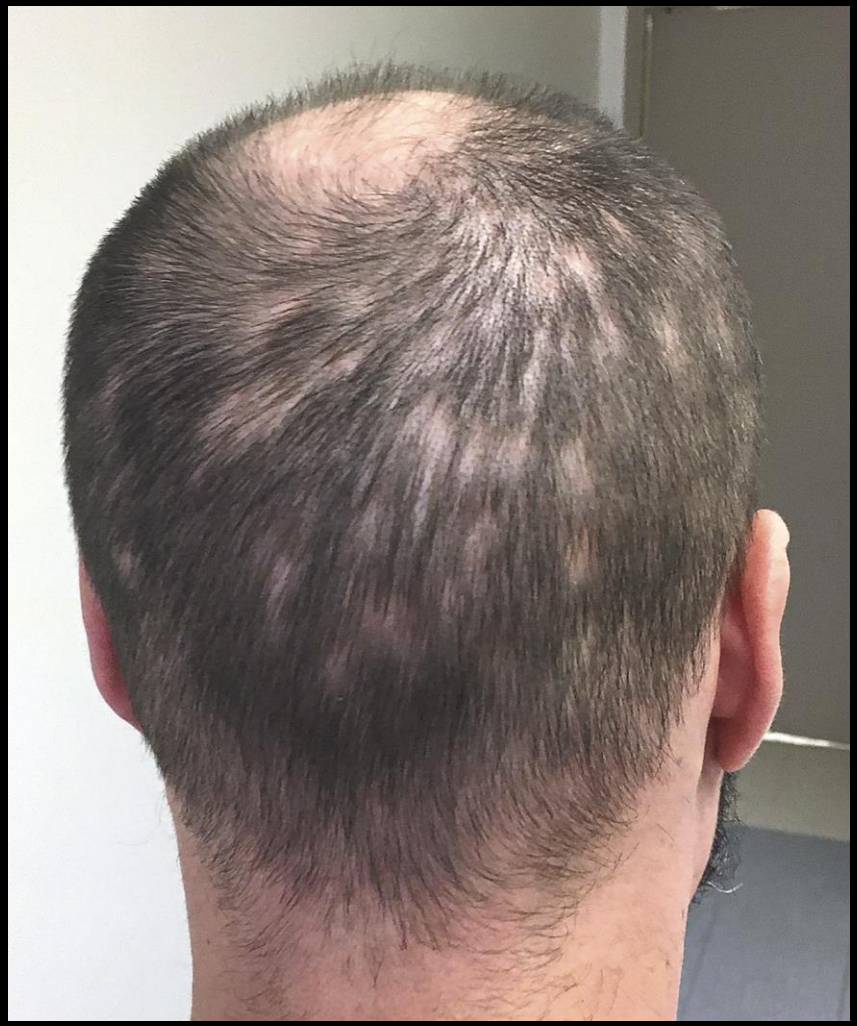
- gm neg intracellular diplococci
- painful urethral/cervical discharge
- pustular rash
- Late compliment deficiency
- Tx: cefixime (?) / ceftriaxone





Primary Syphilis:

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



AS Moshiri, A Moxam. N Engl J Med 2018;379:1657-1657.

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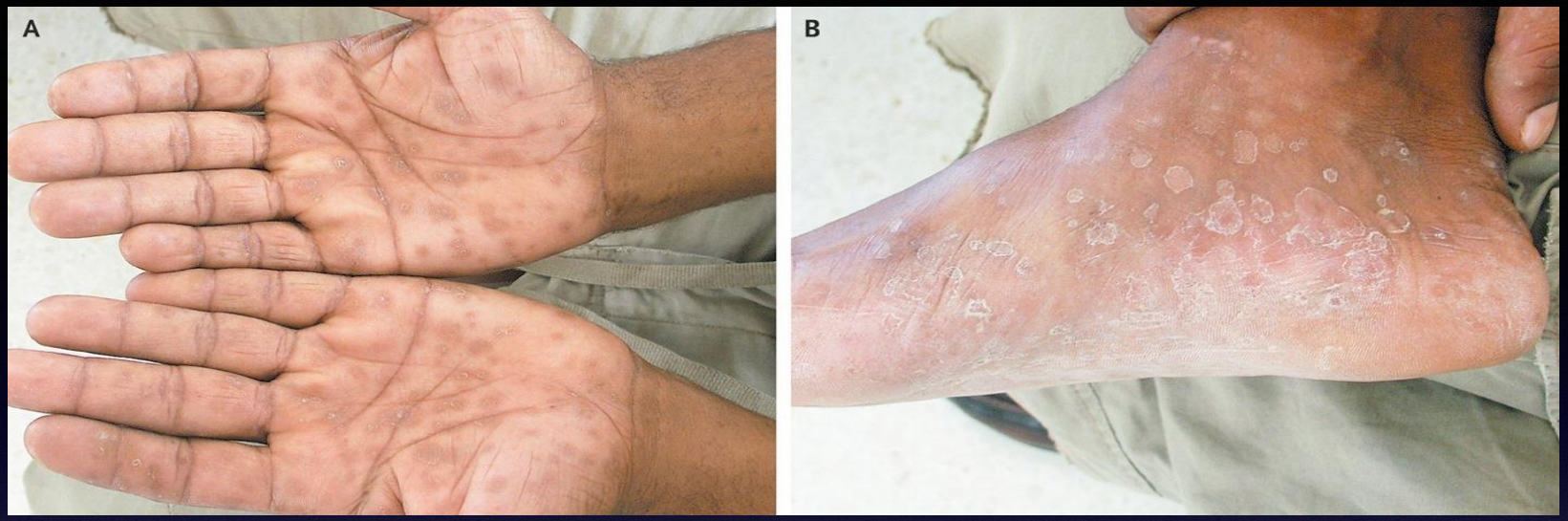
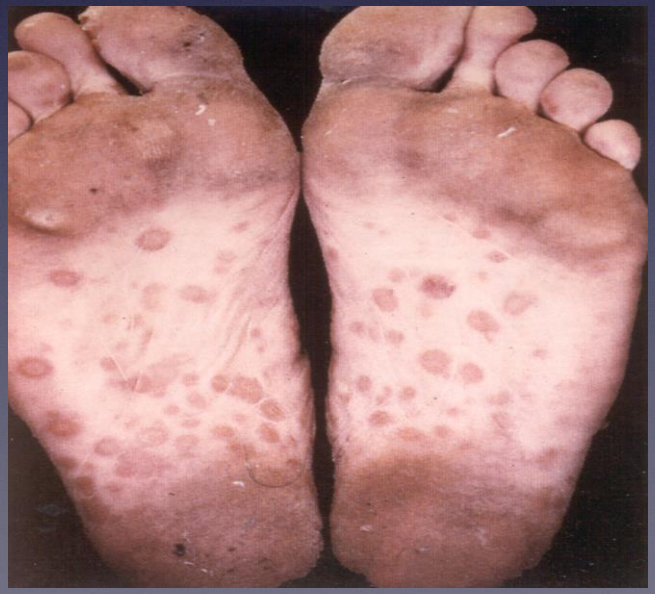


Badri T, Ben Jennet S. N Engl J Med 2011;364:71-71.

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

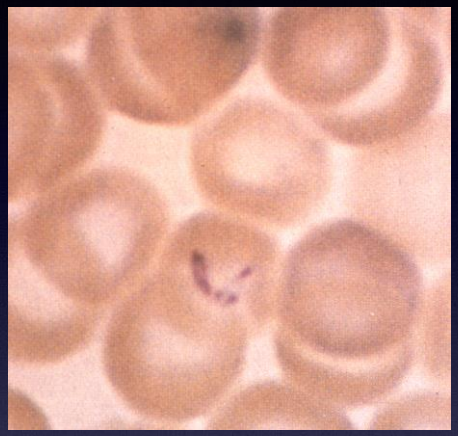
- Less than 1 yr's duration (includes primary, secondary and early latent): benzathine PCN 2.4 mill units i.m. x 1
- Greater than 1 yr's duration (or unknown duration); late latent: benzathine PCN 2.4 mill units weekly x 3

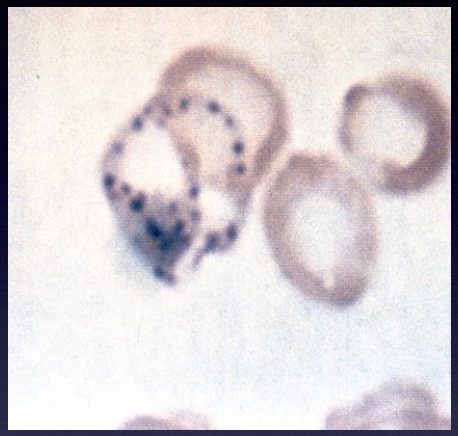
- Allergy: ceftriaxone, doxycycline

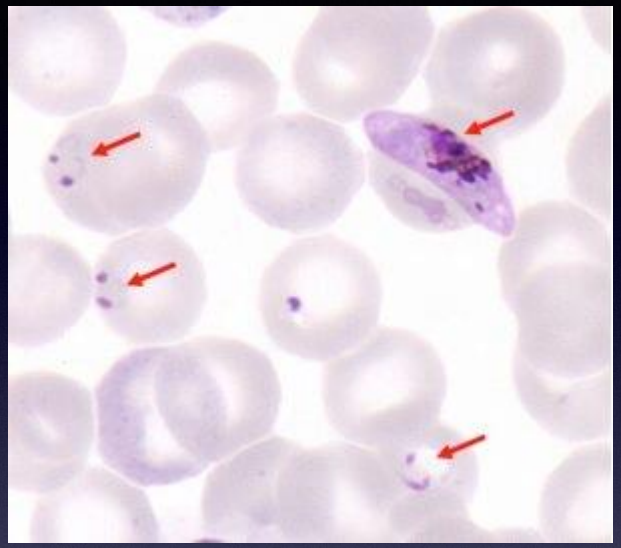
Treatment of Syphilis

- 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 densensitze (though ceftriaxone probably effective)
- Jarish-Herxheimer rxn

Malaria





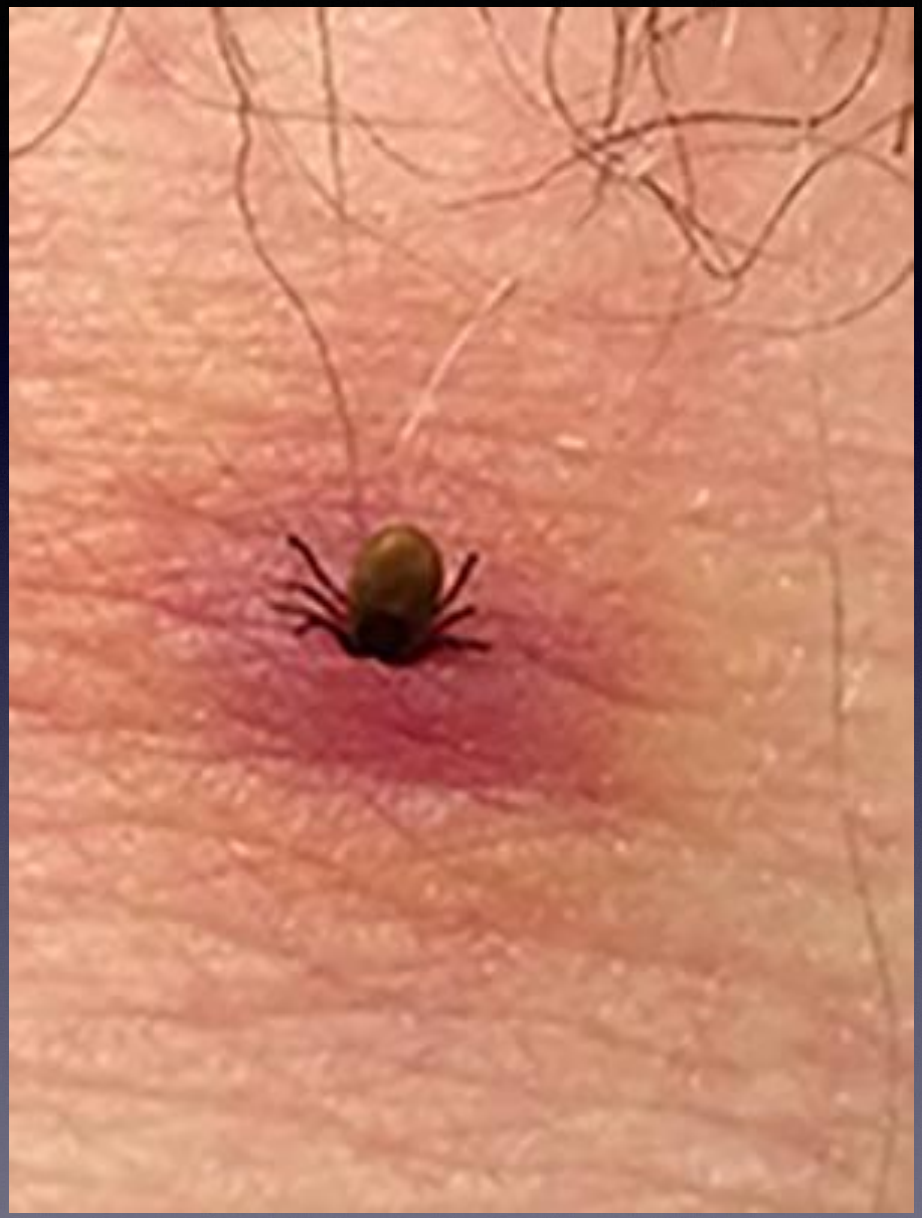


- appropriate travel hx
- “black water fever”
- speciation by PCR at the CDC
- D/D Babesiosis

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

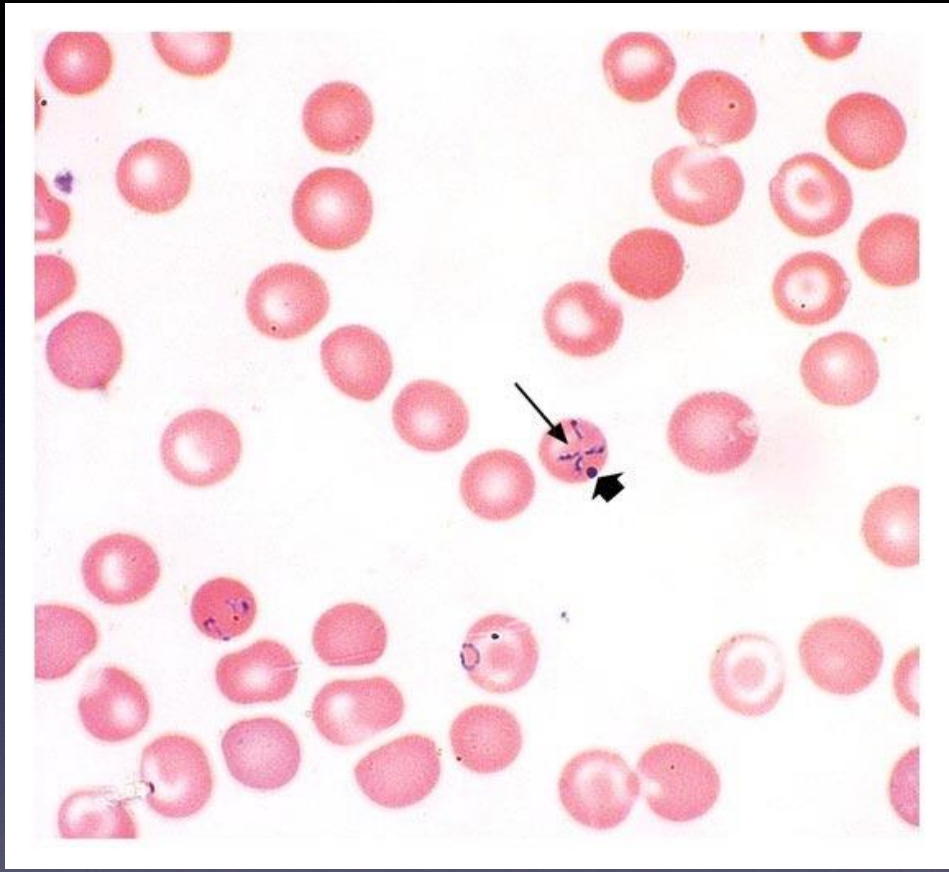


Babesiosis*

- 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

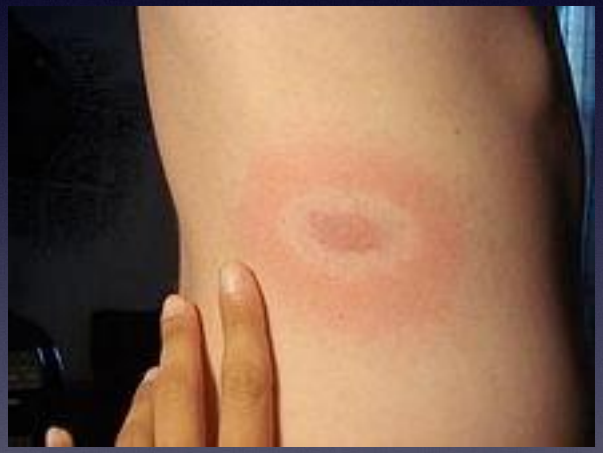
*Vannier & Krause. NEJM 2012;366: 2397-2407

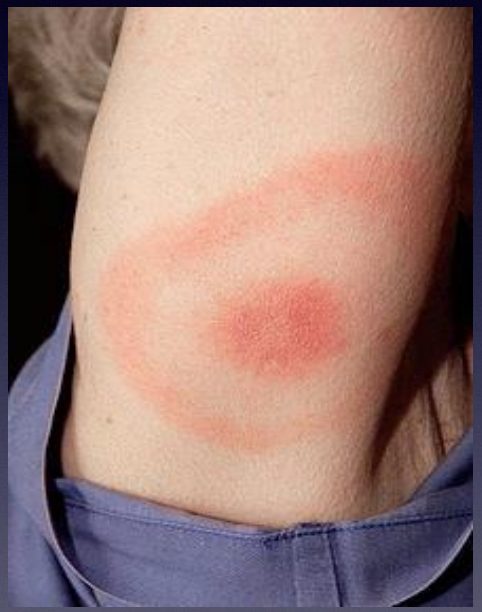
Babesiosis



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

Lyme Disease
(Borrelia burgdorferi)





Erythema migrans

Lyme Disease

- Est. 430,000 cases/yr in U.S. (2017)
- 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

Post-Treatment Lyme Disease Syndrome (PTLDS)

- Infrequently, non-specific symptoms are reported to exist for several weeks - months following standard Rx
- May be due to immune dysregulation (elevated IL-23 and/or other)
- In some instances, some patients describe vague, incapacitating, but non-specific symptoms lasting for years
  - there are no tests to confirm this presumptive dx
  - there are no tests to confirm “seronegative Lyme dx”
  - multiple studies have failed to demonstrate any benefit from prolonged courses of antibiotics

Lyme Disease

- Prophylaxis: 200mg doxycycline x 1
- Tx:
  - doxycycline 100mg bid x 10-21 days
  - cefuroxime axetil (Ceftin®) 500mg bid x 14-21 days
  - amoxicillin 500 tid x 14-21 days

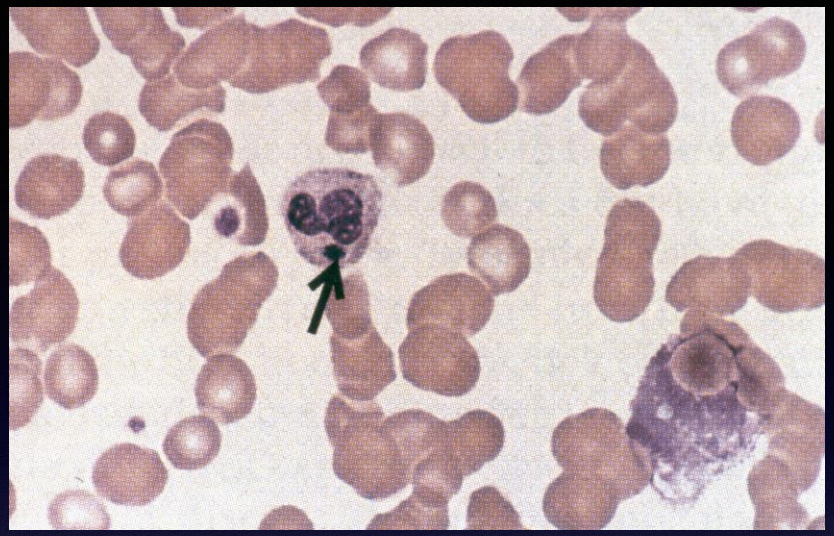
Ehrlichiosis/Anaplasmosis

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



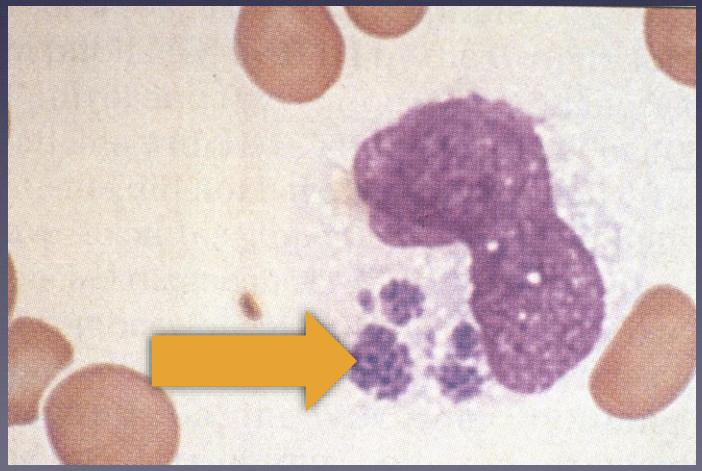
Ehrlichiosis/Anaplasmosis:

- 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:

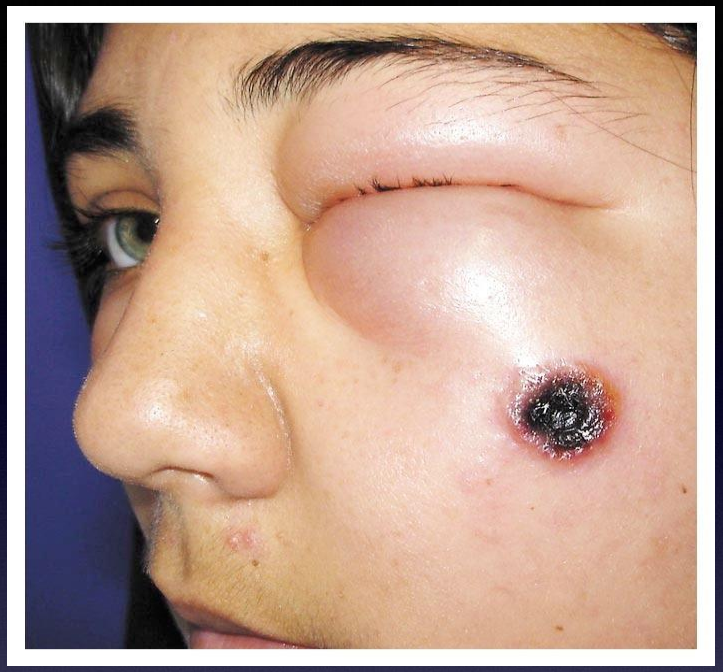
- Amoxicillin/cefuroxime
- Ceftriaxone
- Doxycycline

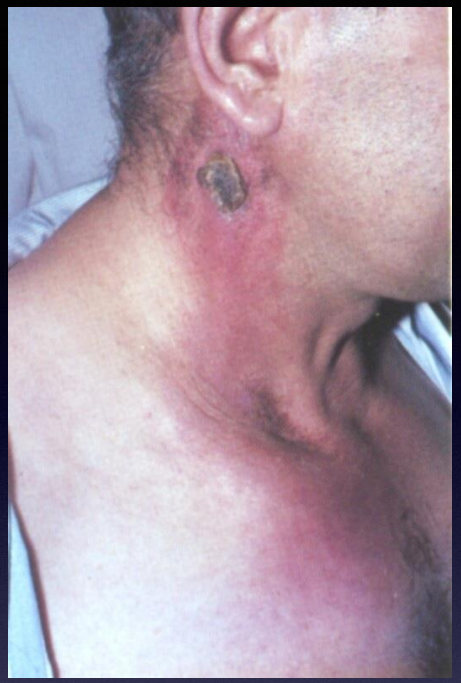
Ehrlichiosis/Anaplasmosis:

- Doxycycline

Babesiosis:

- Atovaquone + azithromycin





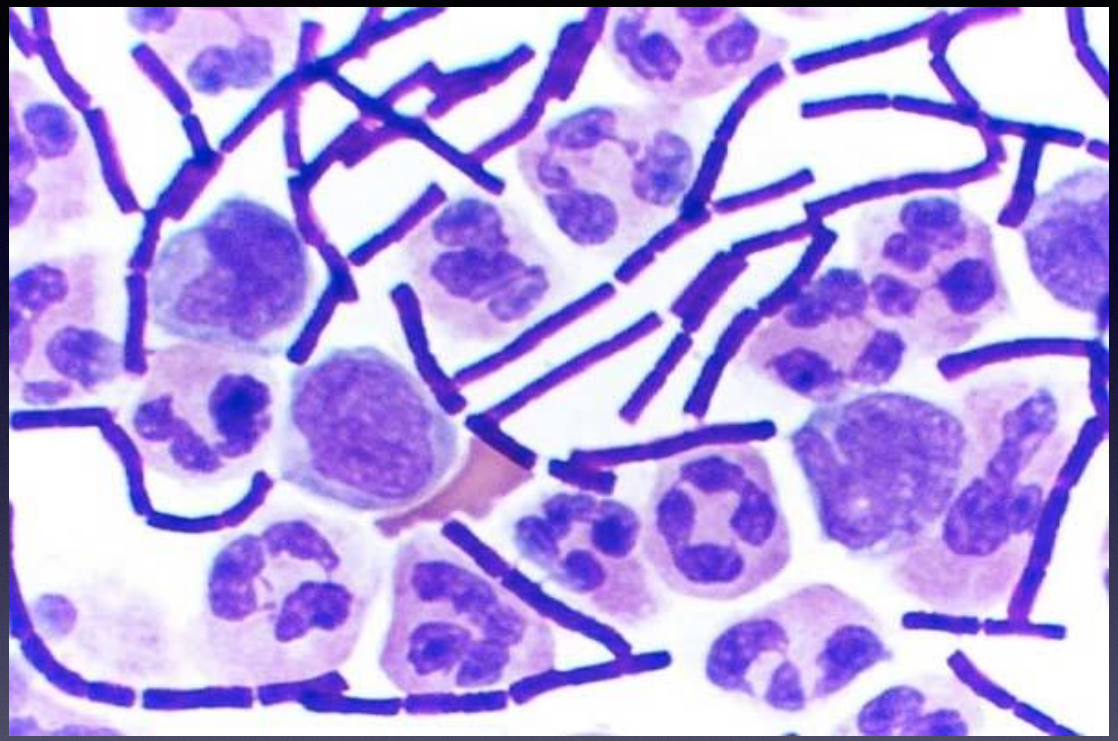
Esfandbod M, Malekpour M. N Engl J Med 2009;361:178-178.

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 / ciprofloxicin / 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