Emergency Medicine for Rural and Indigenous Communities Conference

September 15th - 17th, 2022

ID Emergencies in Indian Country

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for Infectious Diseases

September, 16, 2022

Presentation prepared by:

Date prepared:

Case History

- The patient is a 35-year-old man who presents to the ED complaining of severe right groin pain of 24 hours duration. He has been staying in a hogan at his family's sheep camp in the Chuska Mountains of New Mexico. He has had marked myalgias and fever at home. He complains of headache and chills.

Case History

- On physical examination the patient appears very toxic with a fever of 104 degrees F, blood pressure of 92/46 and heart rate of 124. You note marked tenderness and induration in the right groin.

- The nurse hands you the CBC report: WBC 19K (85%P, 13% B, 2%L), Hct 47% and Platelets 175.

Differential Diagnosis

- Group A Strep or Staph aureus purulent adenitis
- Plague
- Tularemia
- Acute HIV Infection
- Lymphogranuloma venerum
- Primary Syphilis

Plague History

- First reported in the world's medical literature among the Philistines (Zabud et al, the Bible, 1320 BC)
- 100 million deaths in Europe in 542 AD during the reign of Justinian
- The Black Death pandemic of 1347 led to 25 million death
- Alexander Yersin discovers the bacillus 1894


A LEANING "BONE CHURCH" NEAR PRAGUE HOUSES THE SKELETONS OF 30,000 VICTIMS OF THE PLAGUE.

Plague Epidemiology

- Enzootic worldwide in small mammals
- Prairie dogs and squirrels are the carriers in the USA in the Four Corners region
- Rats are the carrier in urban outbreaks
- Plague is contracted from flea bites, contamination of open wounds or rarely through human-to-human respiratory spread

FRONT LINE INDIGENOUS PARTNERSHIP

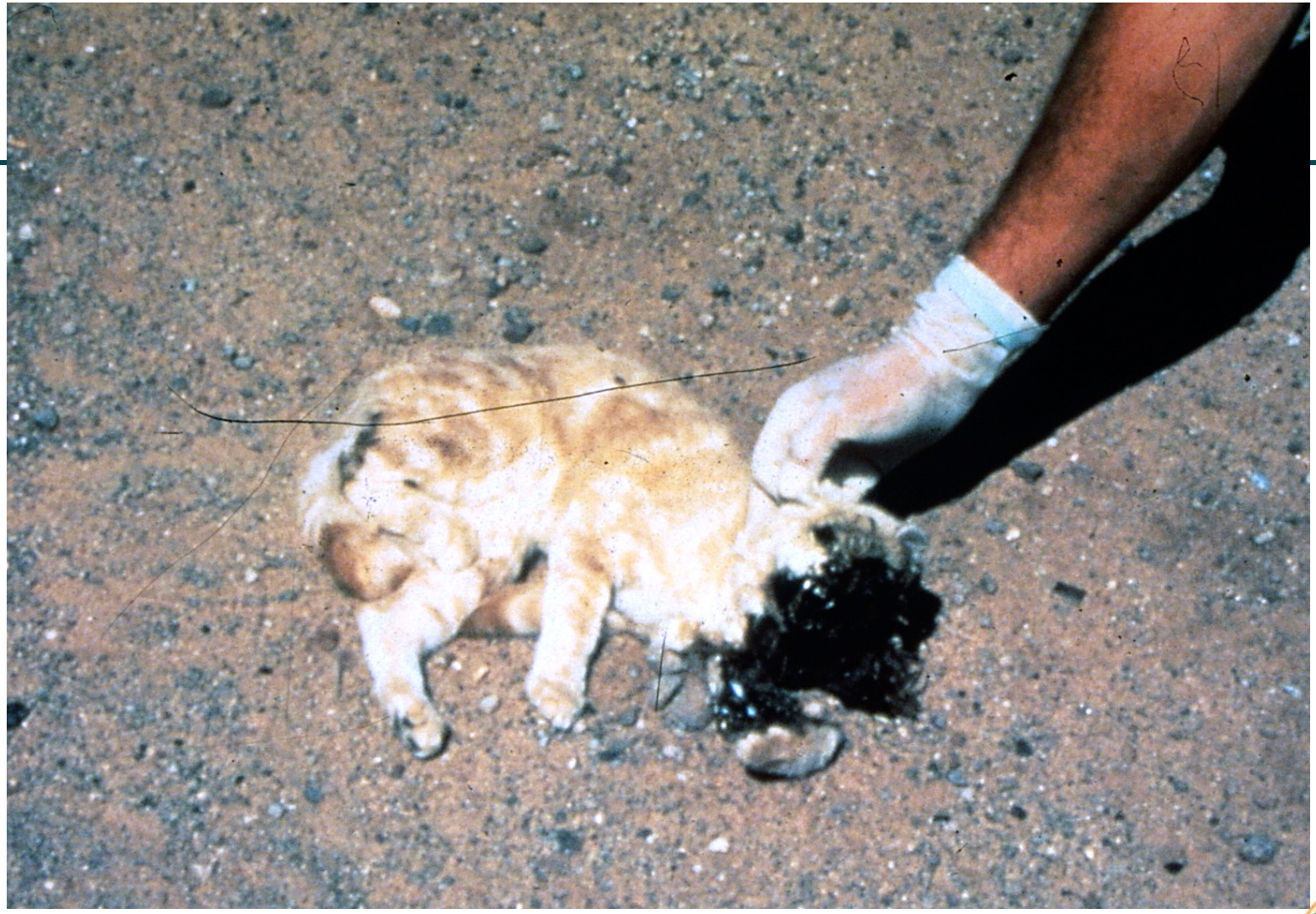
HARVARD HUMANITARIAN INITIATIVE

Mass General Brigham

Plague

- Dogs are essentially asymptomatically infected.
  - Exception to the rule: Colorado June 2014: Dog to Human transmission-
    - https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6416a1.htm

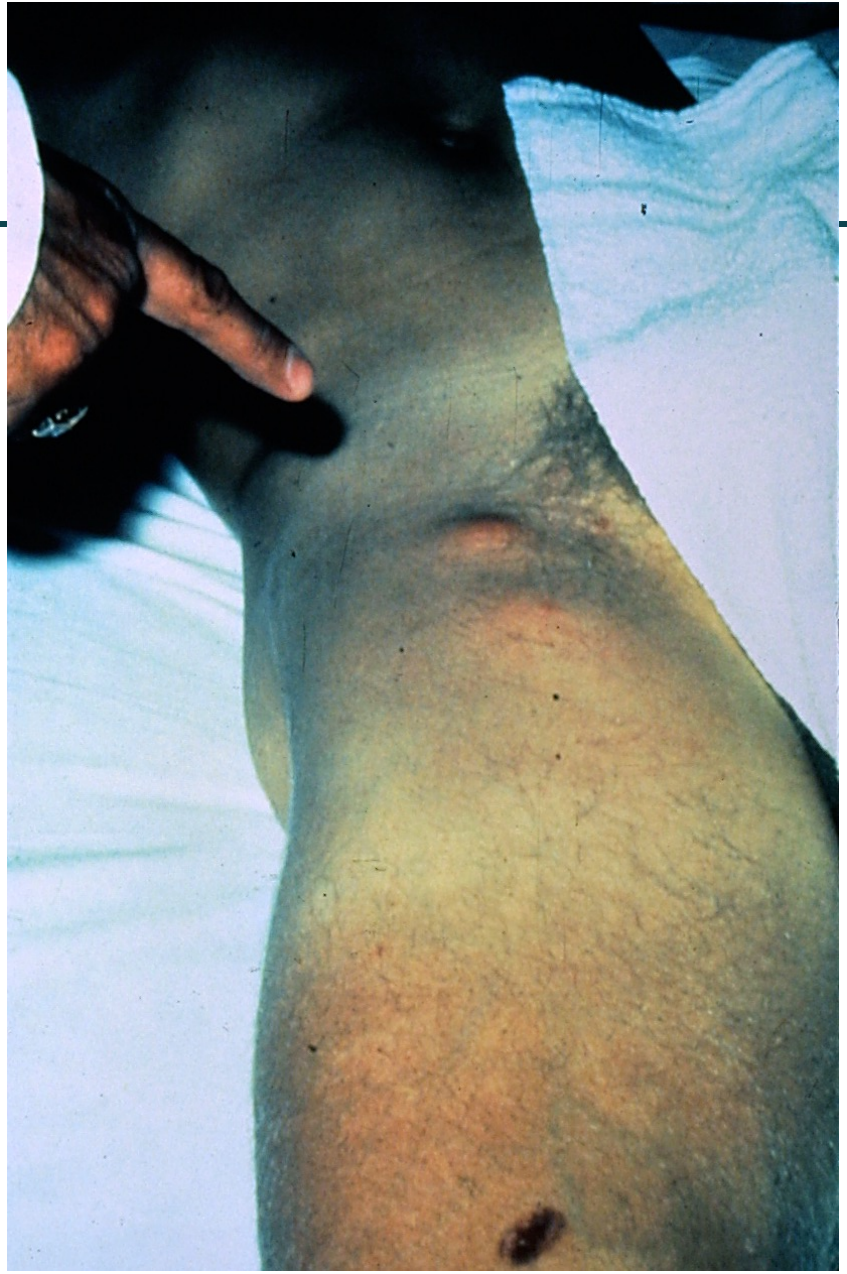
- Cats almost always die from plague
  - Numerous case reports, especially in NM of Cat to Human transmission of pneumonic plague

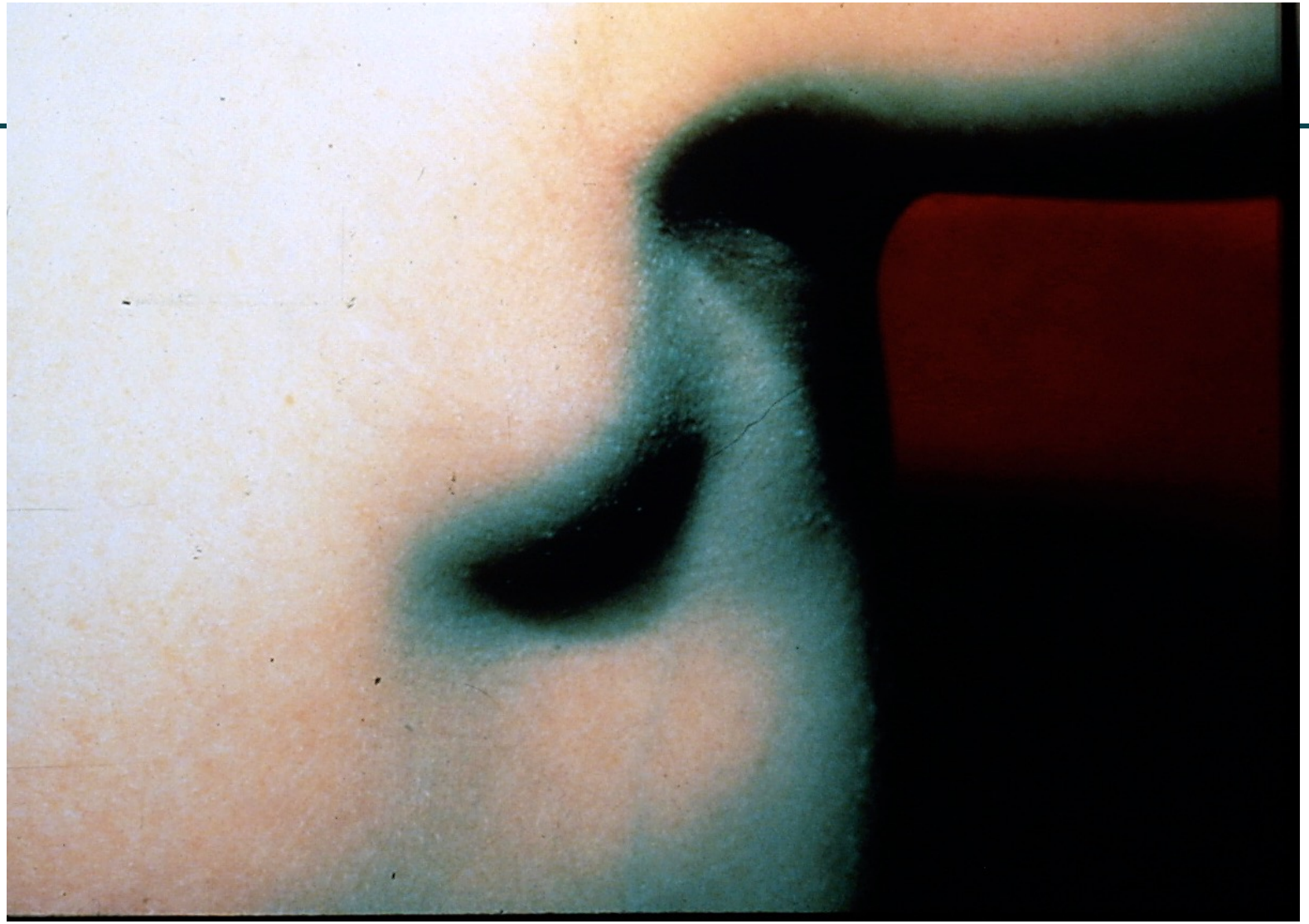


Plague

Clinical manifestations

- Bubonic Plague
  - Seen in summer months
  - Incubation period is 2-8 days
  - extremely tender, non fluctuant lymph node seen proximal to site of flea bite
  - Skin is red, shiny and edematous





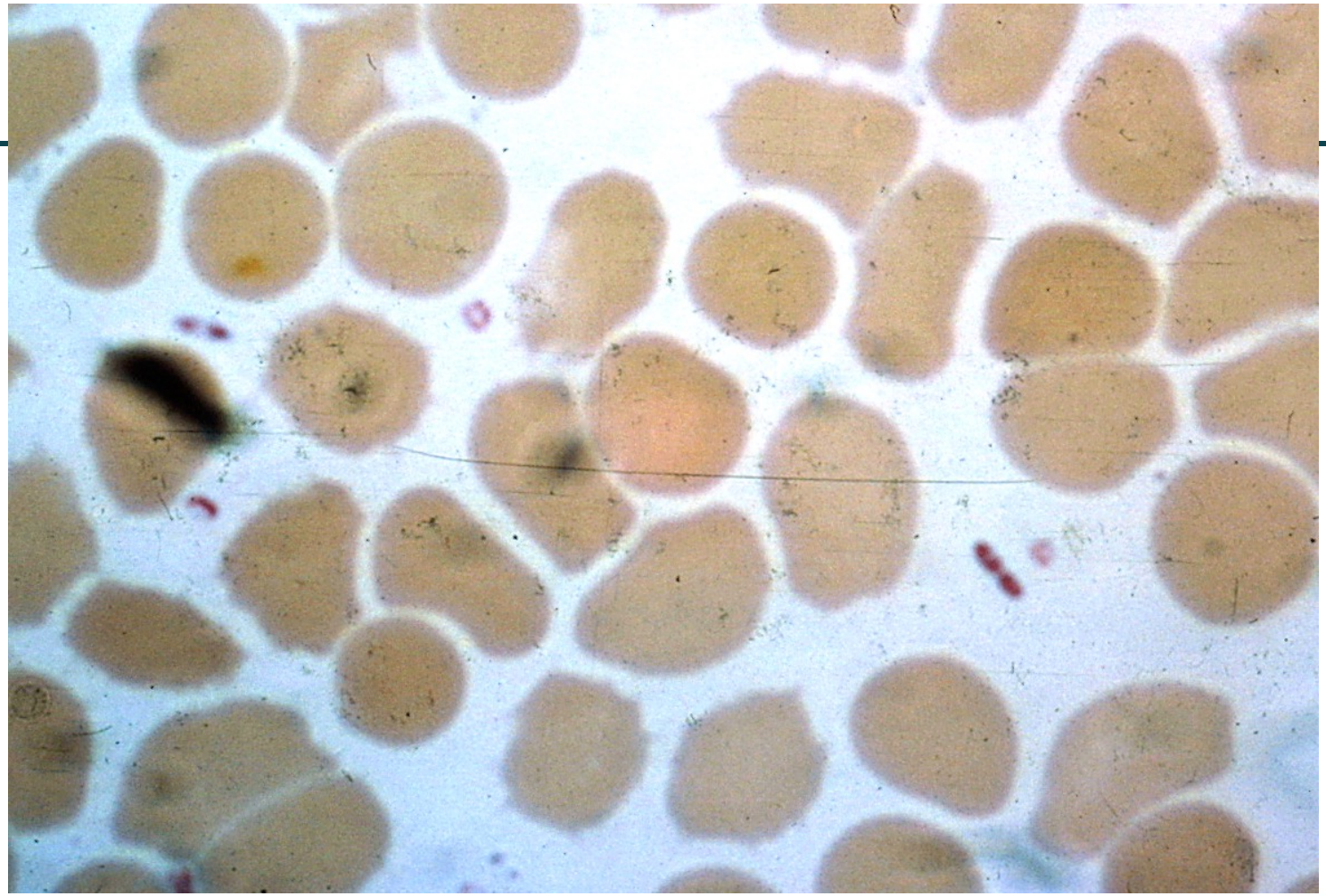
Plague

Clinical manifestations (continued)

- Septicemic Plague
  - fever, N + V, diarrhea, abdominal pain
  - blood cultures always positive
  - High mortality rate
- Pneumonic Plague
  - bilateral interstitial infiltrates
  - Secondary meningitis, ophthalmitis, arthritis seen

Plague Diagnosis

- Aspiration:
  - Inject 1 cc of saline into node and aspirate, inject, reaspirate, repeat until pink tinged
  - Gram stain shows GNR, Geimsa/Wright shows a safety pin-like rod
  - Fluorescent antibody stain done at CDC Fort Collins lab
  - Culture the aspirate and 2 blood cultures on routine media



Plague Therapy

- Streptomycin is the official drug of choice for bubonic plague (good luck getting it).
- Gentamicin 5 mg/kg/24h is the usual Rx available
  - Gent+/- Tetracycline equivalent to Strep (Boulanger, CID, 2004)
- Chloramphenicol is the drug of choice for meningitis, arthritis and shock 15 mg/kg q 6h
- Tetracycline 500 mg po q 6h or Doxycycline 100 mg po bid can be given after the patient responds to IV Rx.

EM Pearls to take home

- Look for exquisitely tender buboes in the axillae and groin for all patients in shock
- Think septicemic plague in patients with undiffentiated fever and shock
- Give gentamicin 5 mg/kg IV x 1 immediately if plague is suspected

References

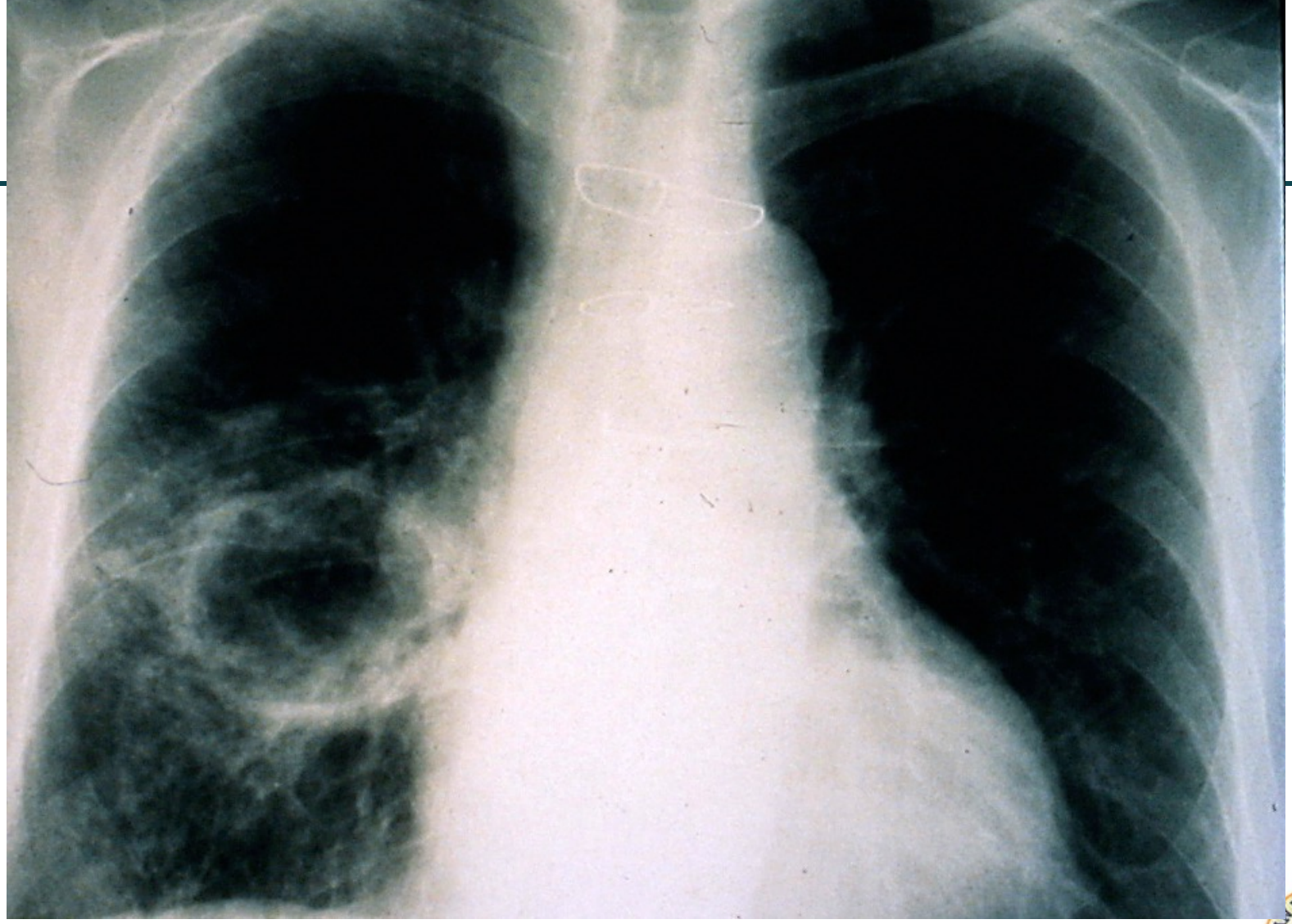
- Crook L, Tempest B; Plague: a clinical review of 27 cases; Arch Intern Med. 1992;152(6):1253-1256. doi:10.1001/archinte.1992.00400180107017

Case History

- The patient is a 59-year-old man who presented to the ED with fever, cough with bloody phlegm. He has a history of alcohol use disorder and he works as a construction worker in southern Arizona.
- On physical exam you note R basilar rhonchi breath sounds, and tender red nodules on both shins
- Labs are notable for WBC 13K with 12% eosinophils

Case History continued…

- Physical Exam:
  - Temperature 1000 F
  - Dullness, rales and bronchial breath sounds in the mid right lung field
  - no lymphadenopathy
- Labs:
  - WBC 19,000 (62P,14L,6M,18Eosinophils)



Differential Diagnosis

- Tuberculosis
- Anerobic lung abscess
- Coccidioidomycosis
- Sporotrichosis
- Paragonamiasis

Coccidioidomycosis: Epidemiology

- Lower Sonoran Life Zone
  - San Joaquin Valley
  - Southern Arizona and New Mexico
  - Western Texas
  - Northern Mexico
  - South America (especially Venezuela)

Coccidioidomycosis: Epidemiology

- Blacks and Filipinos are at increased risk for dissemination (ten-fold increase)
- Pregnancy is a risk factor for dissemination (third trimester

  – https://pdfs.semanticscholar.org/20ea/b99944709cee5f8b5145da9a1d7750845748.pdf

Open Forum Infectious Diseases

MAJOR ARTICLE

Coccidioidomycosis Among American Indians and Alaska Natives, 2001–2014

Orion McCotter,[1] Jordan Kennedy,[2] Jeffrey McCollum,[3] Michael Bartholomew,[3] Jonathan Iralu,[3] Brendan R. Jackson,[1] Dana Haberling,[2] and Kaitlin Benedict[1]

[1]Mycotic Diseases Branch and [2]Division of High-Consequence Pathogens and Pathology, Centers for Disease Control and Prevention, Atlanta, Georgia; [3]Indian Health Service, Rockville, Maryland

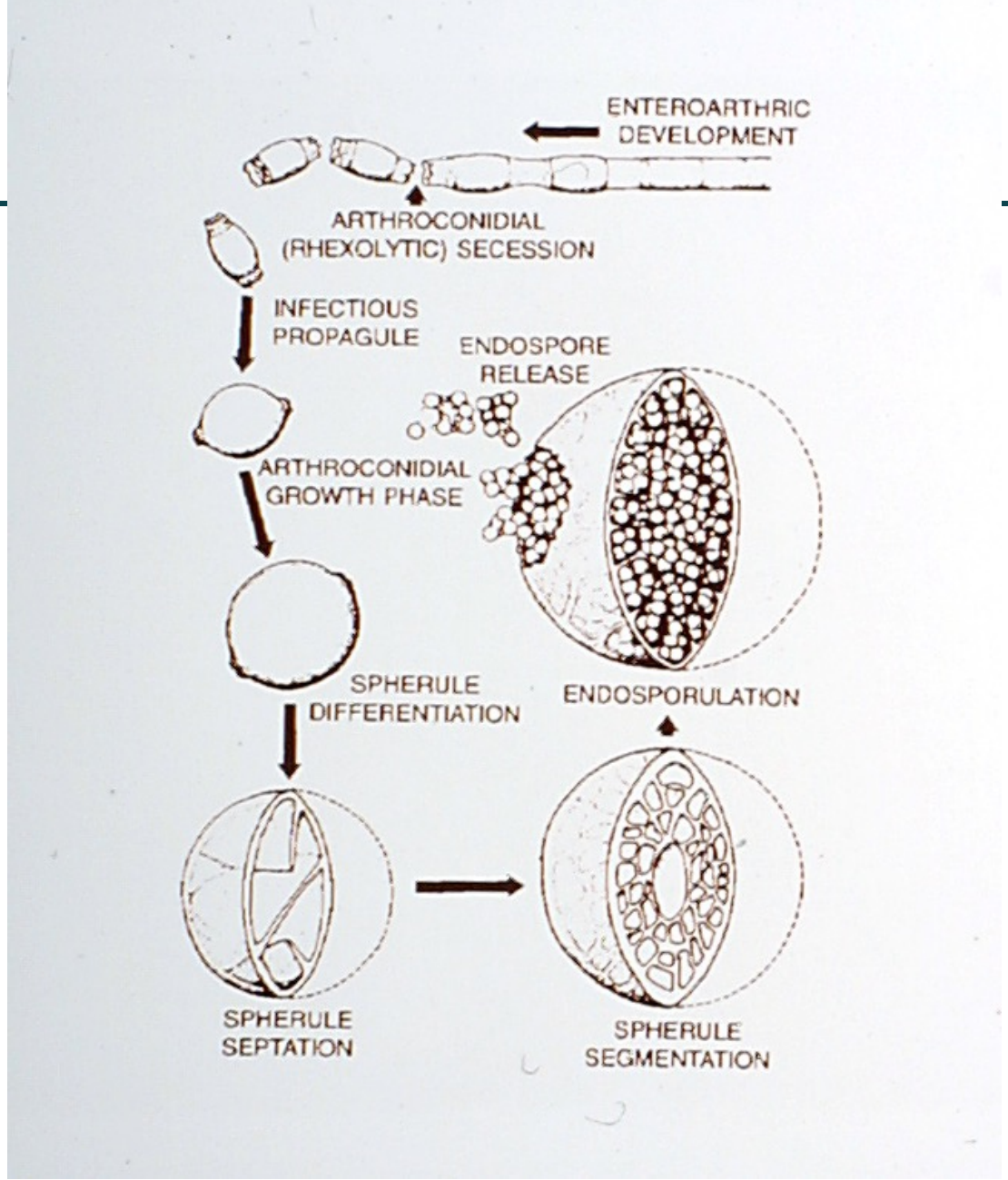
- AI/AN compared with Non-Hispanic Whites are at increased risk for hospitalization: 58 % vs 13.4%
- Age > 65, Diabetes and extrapulmonary/progressive cocci were risk factors for admission
  - https://pdfs.semanticscholar.org/20ea/b99944709cee5f8b5145da9a1d7750845748.pdf

Coccidioidomycosis: Epidemiology

- Seen with outdoor activity
  - Construction
  - Archeological digs
- Heavy rains in Feb & March lead to an increase in Autumn cases
- ***Infectious but not contagious***

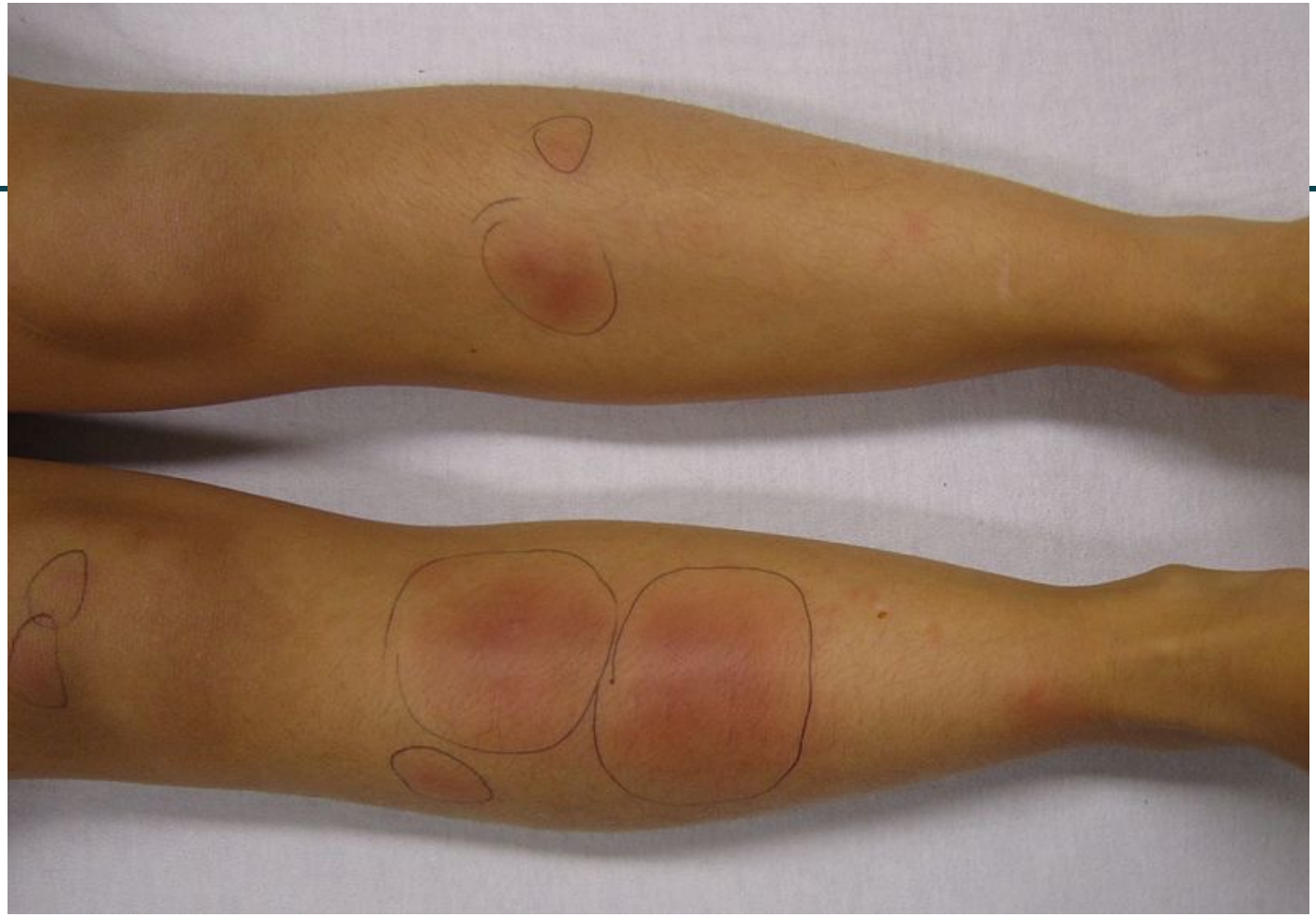
Coccidioidomycosis
Biology

- Mycelia grow in soil, every other cell becomes an arthroconidium
- Arthroconidia establish new mycelia in soil or convert to spherules in humans
- Spherules in tissue septate to form endospores


ENTEROARTHRIC
DEVELOPMENT
ARTHROCONIDIAL
(RHEXOLYTIC) SECESSION
INFECTIOUS
PROPAGULE
ENDOSPORE
RELEASE
ARTHROCONIDIAL
GROWTH PHASE
SPHERULE
DIFFERENTIATION
ENDOSPORULATION
SPHERULE
SEPTATION
SPHERULE
SEGMENTATION

Coccidioidomycosis
Acute Infection

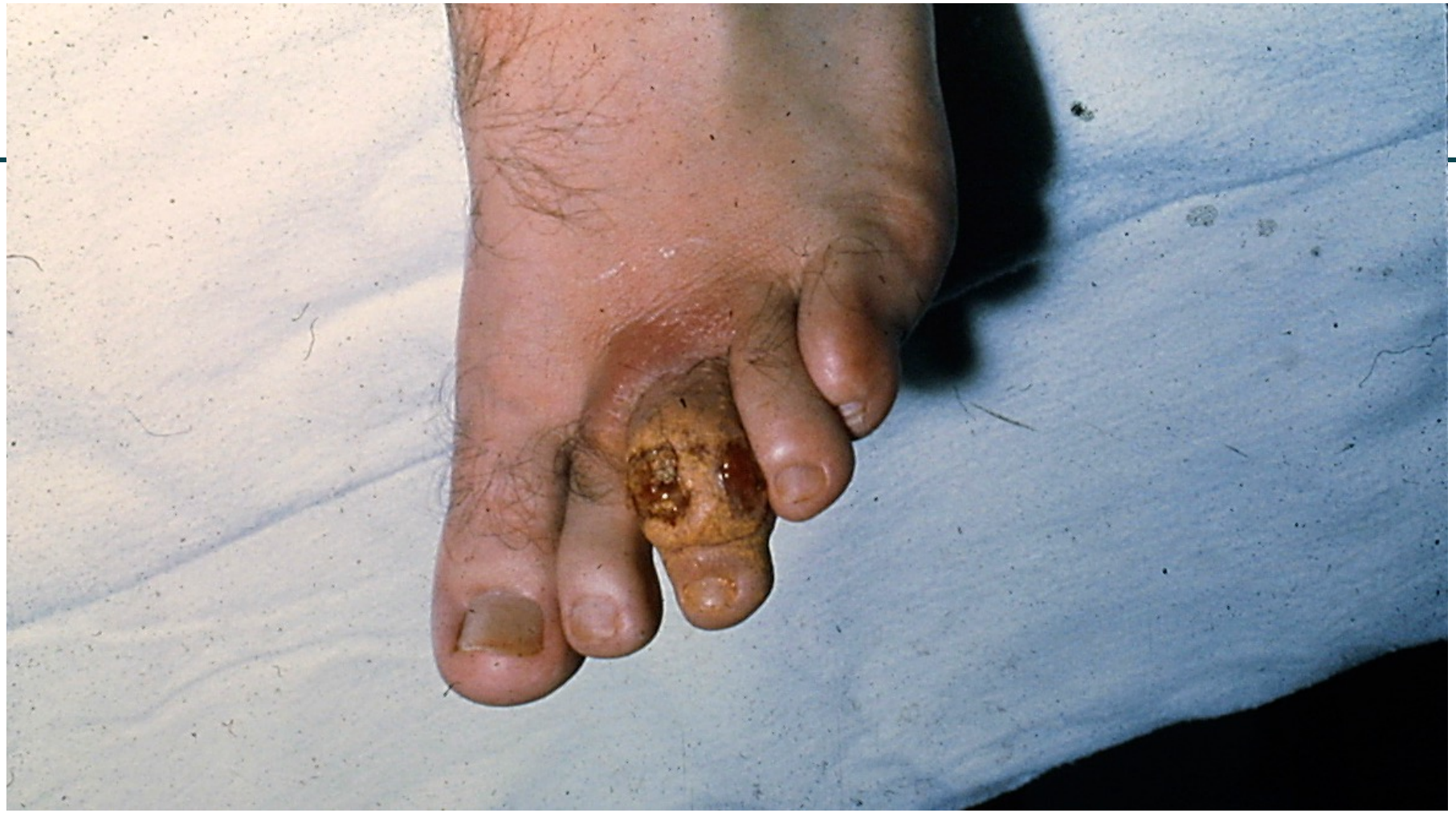
- 60% asymptomatic or mild illness
- 35% develop self-limited pneumonia
  - Symptoms: fever, sweats, anorexia, cough, chest pain
  - Exam: erythema nodosum
  - Labs: Peripheral eosinophilia
  - CXR: infiltrates, hilar lymphadenopathy, effusions, thin-walled cavities
- 1/200 get dissemination causing extrapulmonary

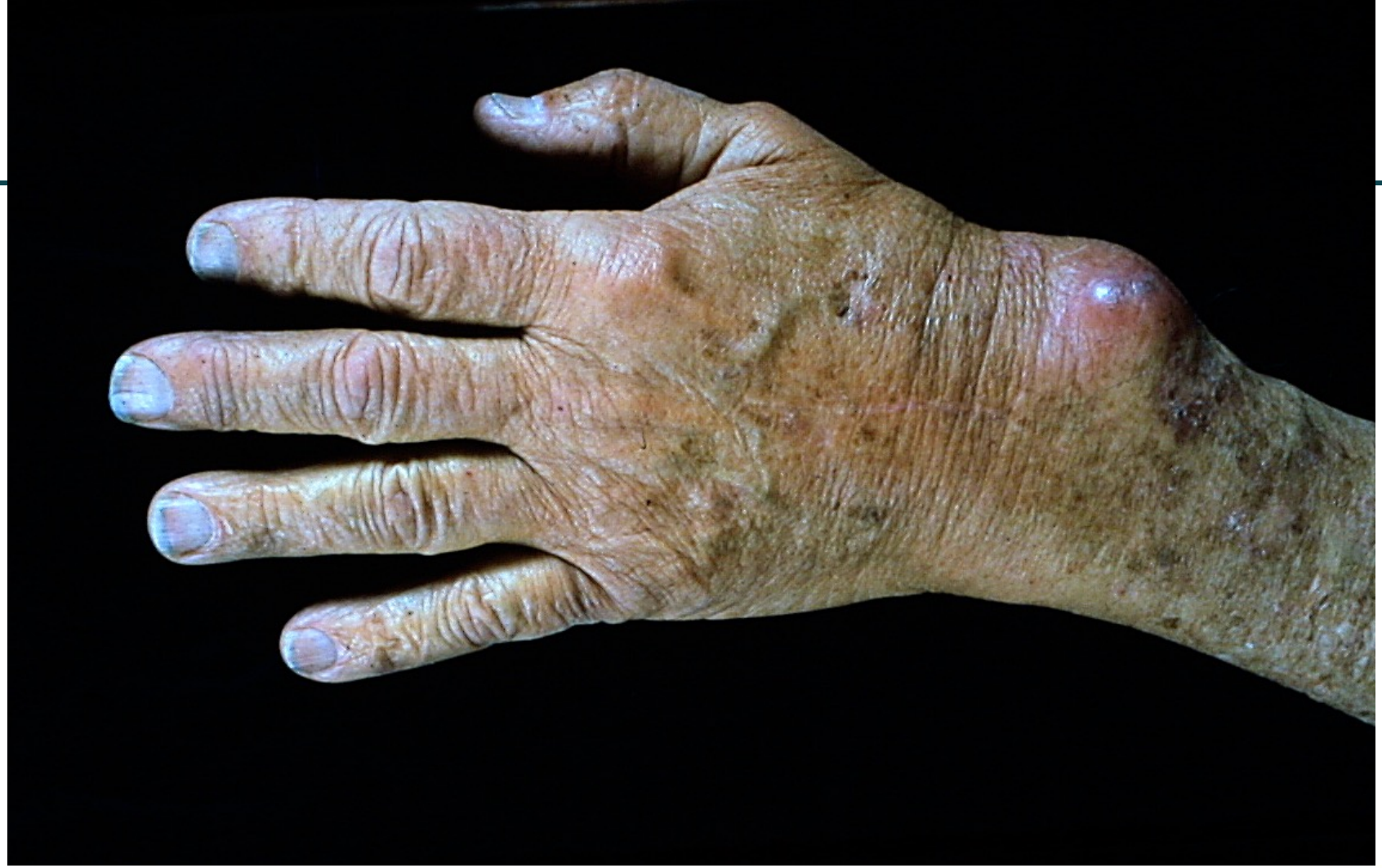


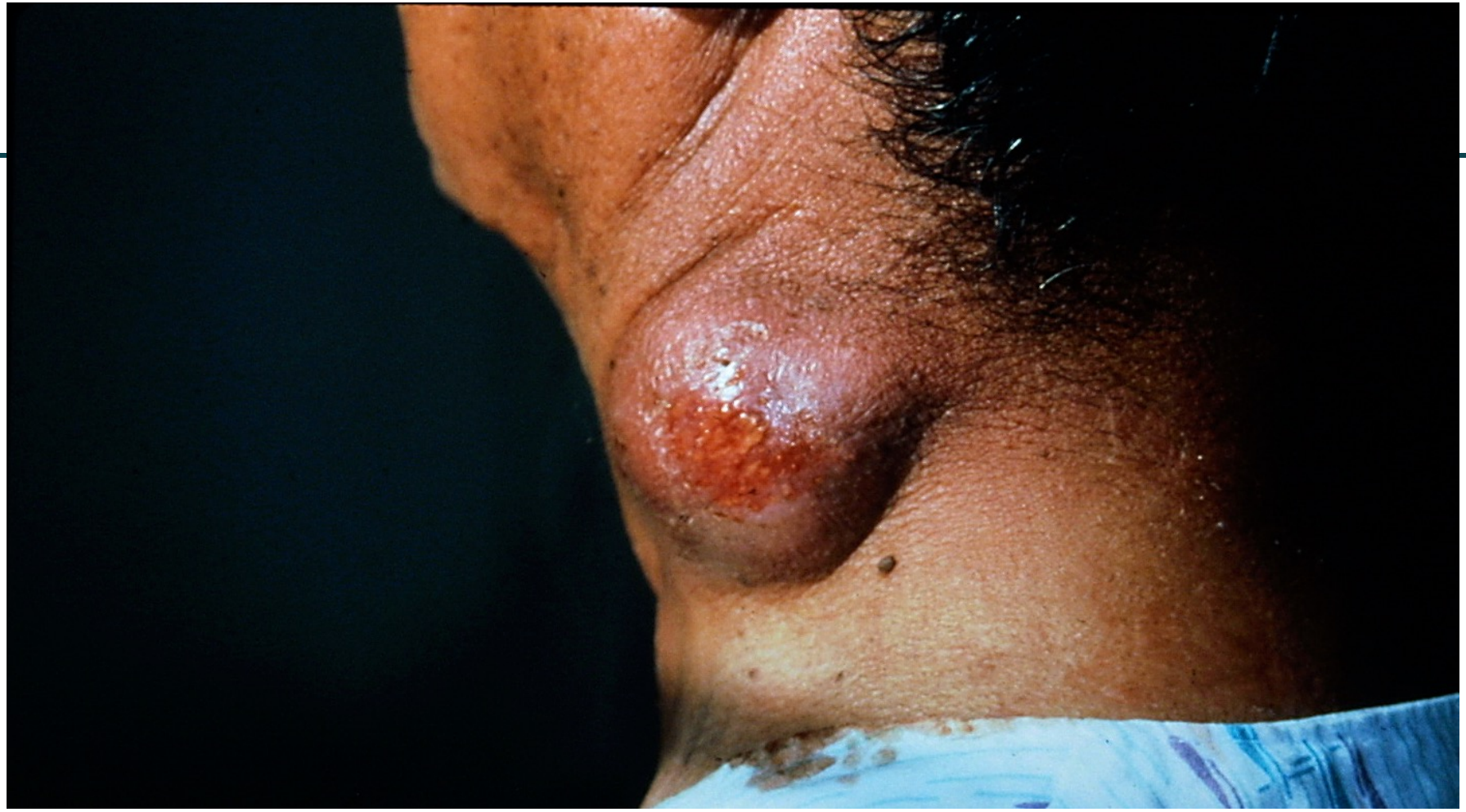
Creative Commons: Dr Daniel J Bell, Radiopaedia.org, rID: 87934

Coccidioidomycosis
Chronic Disease

- Seen in diabetics and other immuno-compromised hosts:
  - cavitary pneumonia, empyema, BP fistulas
  - Osteomyelitis
  - Unifocal septic arthritis
  - Wartlike skin lesions
  - Chronic basilar meningitis/hydrocephalus

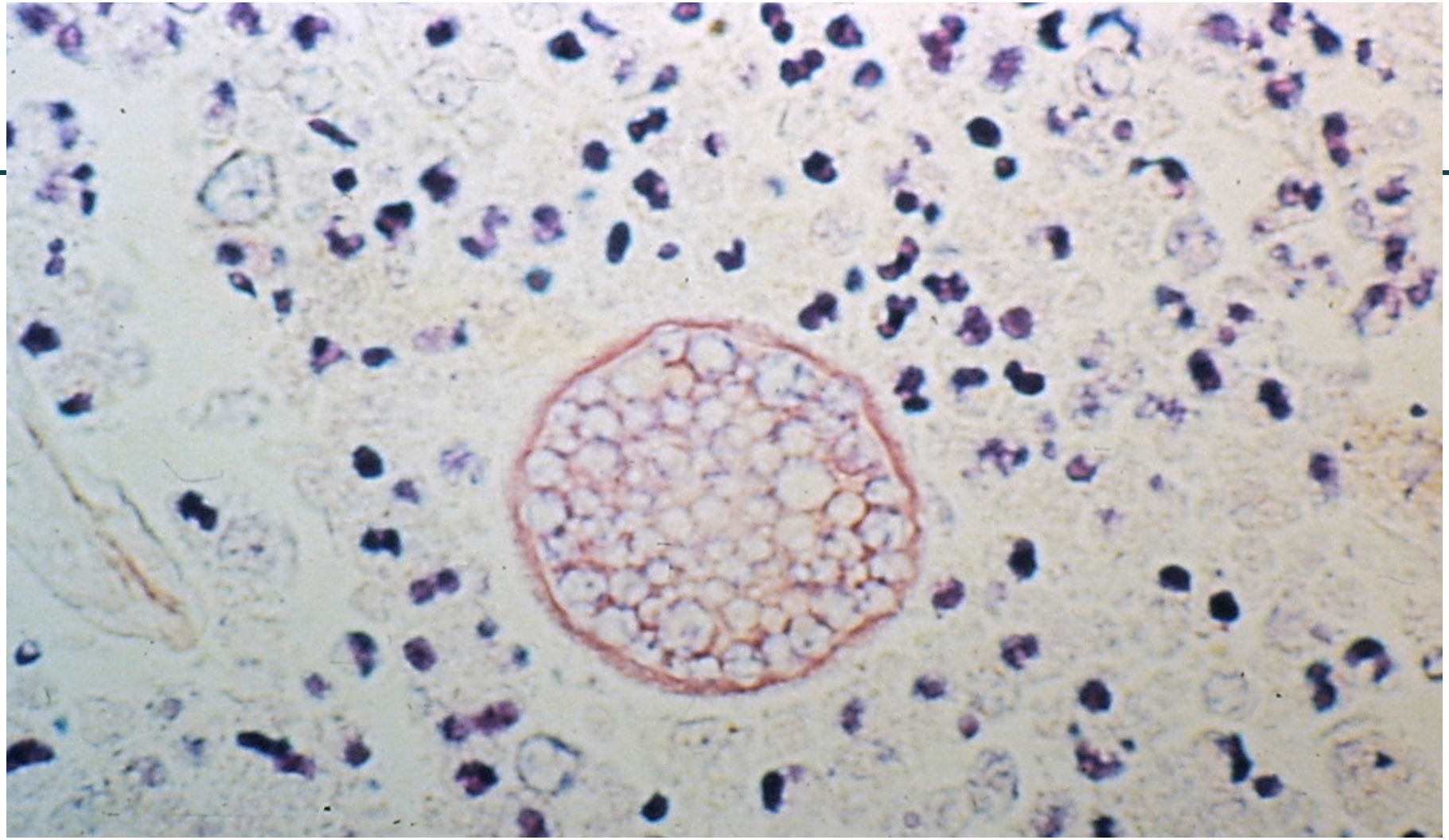






Coccidioidomycosis
Diagnosis

- Culture on fungal medium, confirm with PCR and specialized culture techniques
- Serum and CSF antibody (EIA, ID, CF)
- Spherusol skin test is the Cocci PPD



Coccidioidomycosis Therapy

- Antifungal therapy is indicated only for
  - severe acute disease
  - acute disease in compromised hosts
  - disseminated disease
- Amphoterecin was the gold standard
  - Intra-articular
  - CSF Barbotage
  - Still used for severe disease in the immunocomopromised

Coccidioidomycosis Therapy (continued)

- Oral Azoles are the treatment of choice
  - Fluconazole 400 mg po daily for pulmonary cocci (BID for meningitis)
  - Itraconazole 200 mg po bid is the back up drug
- Duration of Therapy
  - 3-6 months for acute valley fever
  - 12 months for more severe disease or dissemination
  - Life-long therapy is required for CNS disease

EM Pearls to take home

- Look for
  - Thin-walled cavities
  - Erythema nodosum
  - Peripheral Eosinophilia
- Send Cocci EIA IgG and IgM as screening tests
- Consult ID about azole therapy

Case Presentation

- A 31-year-old man presents to the ED with diarrhea, abdominal cramps and back pain. On exam he has a fever of 1020 F, HR 120 bpm, BP 87/64, and a toxic appearance with a diffusely tender abdomen.
- Laboratory data : WBC 12K, Hct 50%, Platelets 93, ALT 56, Alk Phos 121, Bili 1.3, Glucose 147, UA WN.
- A CXR shows some patchy infiltrates

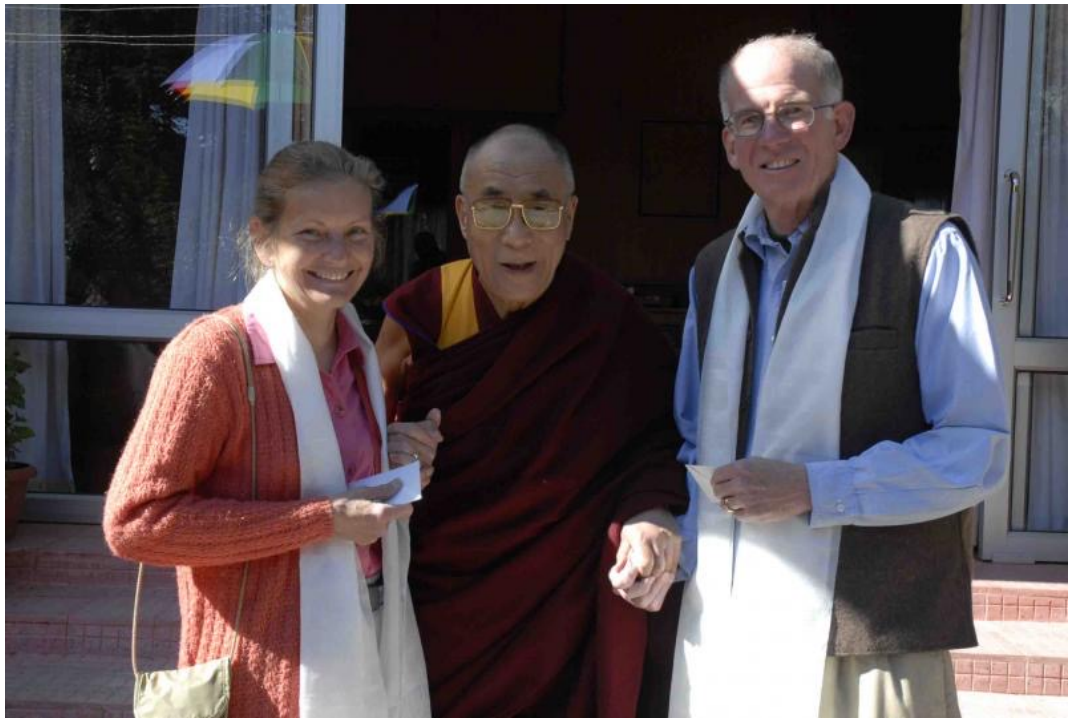
Differential Diagnosis

- COVID-19
- Septicemic plague
- Rocky Mountain spotted fever
- Pneumococcal pneumonia
- Group A Strep Toxic shock syndrome
- Hantavirus pulmonary syndrome prodrome

Hantavirus Pulmonary Syndrome

- **History**
  - First recognized at Gallup Indian Medical Center by Bruce Tempest and Larry Crook in April 1993.
  - Earliest American case retrospectively diagnosed by serology was July 1959
  - Confirmed by immuno-histochemical staining of post-mortem tissue from a case from 1978

Bruce Tempest

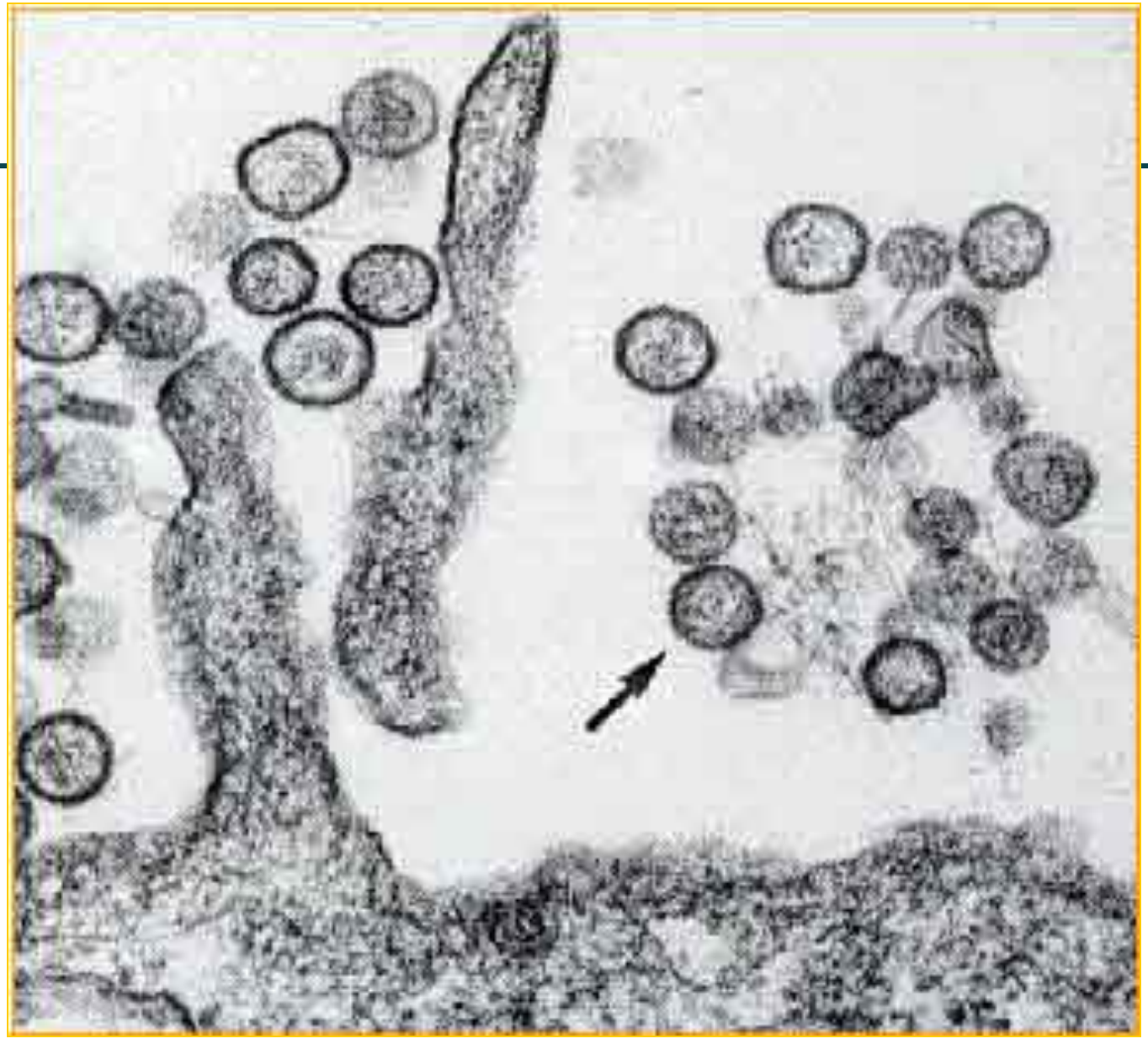


Hantavirus Pulmonary Syndrome Ecology

- US Vectors
  - Sin Nombre Virus:
    - Deer Mouse (Peromyscus maniculatus)
  - Black Creek Canal Virus (Dade Co., FL)
    - Cotton rat (Sigmodon Hispidus)
  - New York-1
    - White Footed Mouse (Peromyscus leucopus)


65


Sin Nombre
Peromyscus maniculatus
Muleshoe
Sigmodon hispidus
Isla Vista
Microtus californicus
El Moro Canyon
Reithrodontomys megalotis
Calabazo
Zygodontomys brevicauda
Choclo
Oligoryzomys fulvescens
New York
Peromyscus leucopus
Prospect Hill
Microtus pennsylvanicus
Bloodland Lake
Microtus ochrogaster
Bayou
Oryzomys palustris
Black Creek Canal
Sigmodon hispidus
Rio Segundo
Reithrodontomys mexicanus
Juquitiba
Unknown Host
Laguna Negra
Calomys laucha
Caño Delgadito
Sigmodon alstoni
Rio Mamore
Oligoryzomys microtis
Orán
Oligoryzomys longicaudatus
Bermejo
Oligoryzomys chacoensis
Andes
Oligoryzomys longicaudatus
Maciel
Necromys benefactus
Hu39694
Unknown Host
Lechiguanas
Oligoryzomys flavescens
Pergamino
Akodon azarae



HPS Clinical Presentation

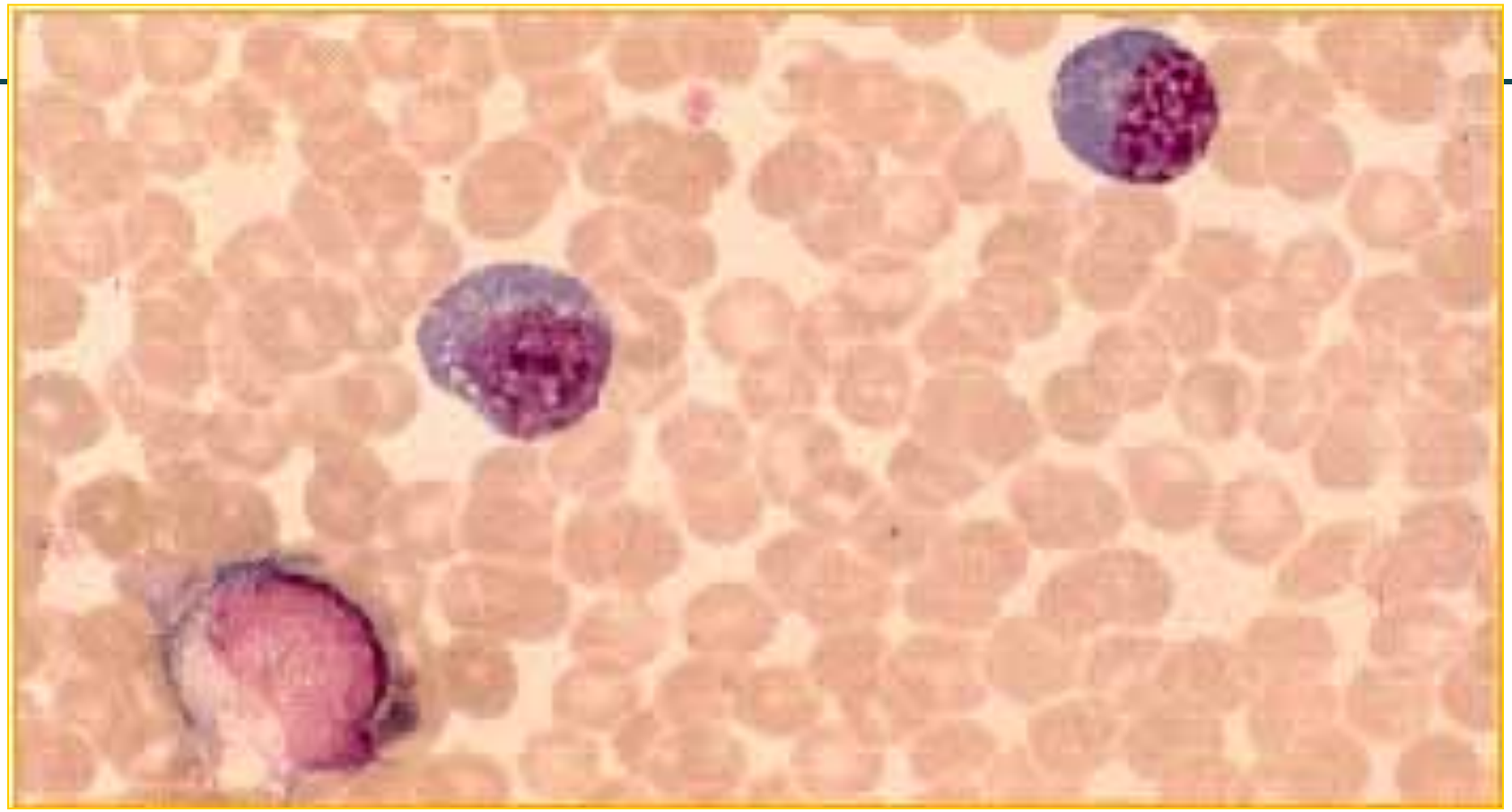
- **Febrile Prodrome Phase**
  - Most Frequent:
    - fever, chills, myalgia
  - Frequent:
    - headache, nausea & vomiting, abdominal pain, diarrhea, cough, malaise
  - Other:
    - SOB, dizziness, arthralgia, back/chest pain, sweats

HPS Clinical Presentation

- **Not likely to be Hantavirus Prodrome if:**
  - rash
  - conjunctival or other hemorrhage
  - throat or conjunctival erythema
  - petechiae
  - peripheral or periorbital edema

HPS Clinical Presentation

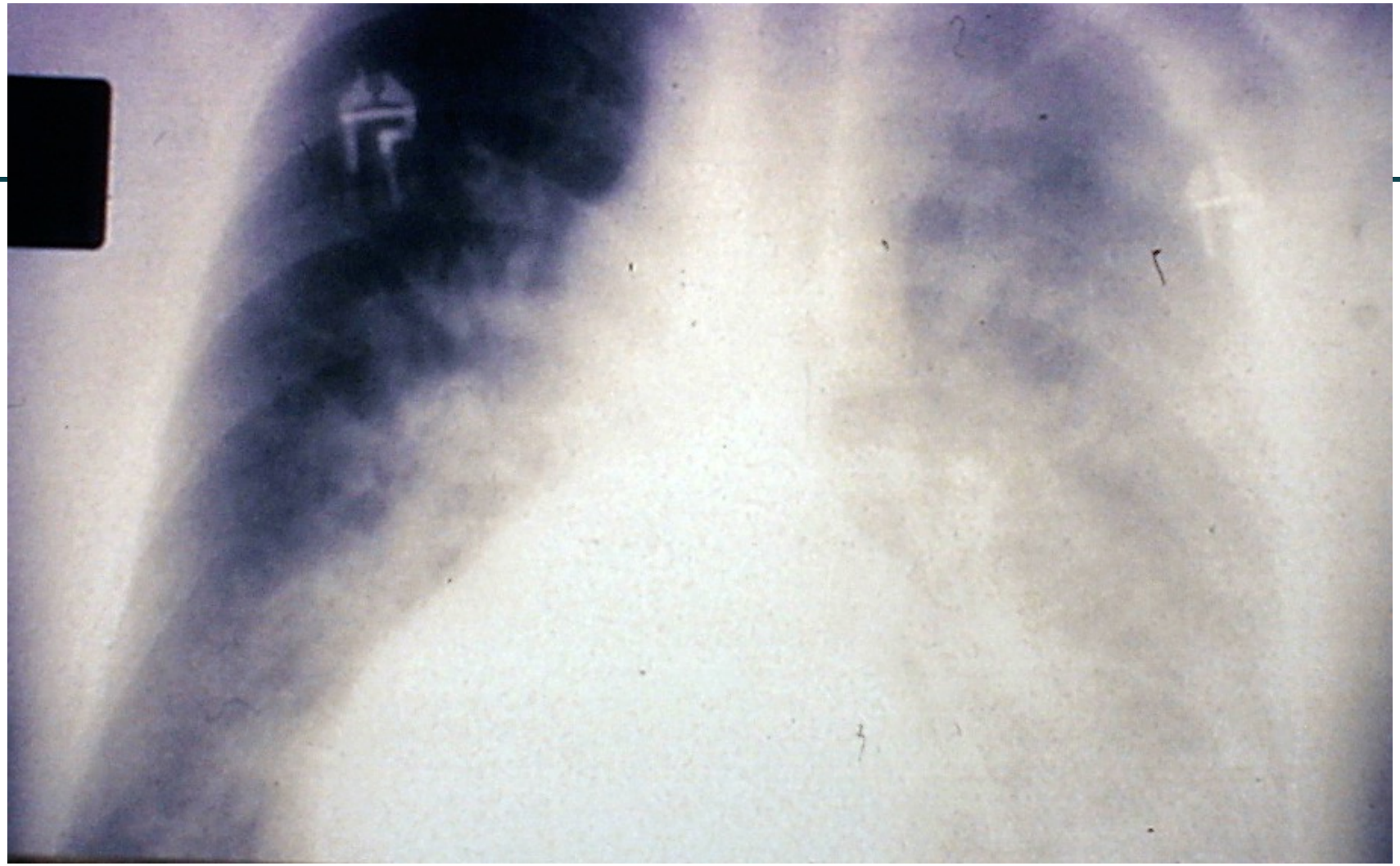
- **Laboratory Evaluation**
  - **Thrombocytopenia is the most important marker for HPS**
  - Falling albumin and rising hematocrit mark fluid shifts from endovascular space to lung
  - Bands, atypical lymphocytes and immunoblasts are seen as the disease progresses.



Koster-Foucar Smear Criteria

- Hemoconcentration (> 50% HCT males, 48% females)
- Thrombocytopenia < 150K
- Leukocytosis with left shift
- Absence of toxic granules
- Immunoblasts make up > 10% of lymphocytes

4 out of 5 met: 96% Sensitive, 99% Specific



HPS Clinical Presentation

- **Pulmonary Syndrome Phase**
  - Hypotension and pulmonary edema and effusion
  - Severe pump failure is the terminal event
    - *(low cardiac output with high SVR)*
    - *lactate > 4mmol/L or CI, 2.2 L/min/mm2 portend a poor prognosis*

HPS Clinical Presentation

- **Recovery Phase**
  - Polyuric diuresis
  - Rapid improvement is seen
  - Chronic asthenia, myalgia, pulmonary function abnormalities are seen in the survivors.

HPS Clinical Presentation

- **Diagnosis**
  - ELISA for SNV IgM available at CDC
  - IgG ELISA also available for acute and convalescent sera
  - Immunoblot Assay formerly available at UNM Virology Laboratory

HPS Treatment

- ICU Care is critical!
  - PA Catheterization (at UNM, not Navajoland)
  - NO IV FLUID !!!!!!!!!!
  - Don't intubate in the field (if you can help it) !!!!!!!
  - Pressors: Norepinephrine is the best pressor
  - Antibiotics until diagnosis is confirmed HPS (Ceftriaxone/Gent/Doxy)
  - ECMO saves lives
  - There are no good antivirals
  - NO IV FLUID!!

EM Pearls to take home

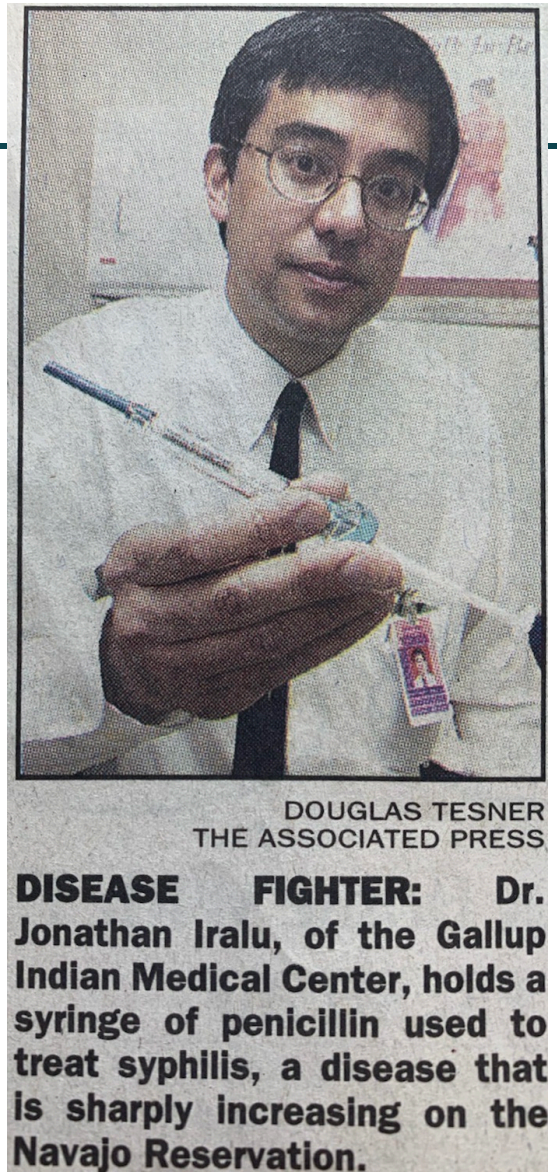
- Don’t miss the prodrome of gastrointestinal symptoms and myalgias at the first visit
- Send a CBC with differential to look for
  - Thrombocytopenia
  - Hemoconcentration
  - Immunoblasts
- Avoid IV hydration and intubation

References

- Duchin et al; N Engl J Med 1994; 330:949-95
  DOI: 10.1056/NEJM199404073301401

- Moore and Griffen; Hantavirus: NLM STAT PEARLS:
  https://www.ncbi.nlm.nih.gov/books/NBK513243/

Don’t Forget about Syphilis!



DOUGLAS TESNER
THE ASSOCIATED PRESS

DISEASE FIGHTER: Dr. Jonathan Iralu, of the Gallup Indian Medical Center, holds a syringe of penicillin used to treat syphilis, a disease that is sharply increasing on the Navajo Reservation.

Syphilis Pearls for the ED in 2022

- Assume every rash/oro-ano-genital lesion is syphilis
- Test every Substance Use Disorder, trauma and pregnant patient you see for syphilis
- Do a brief skin, oral, & anogenital exam if test positive
- You don't have to order a pregnancy test on male patients
- Get a fresh RPR and HCG on the day of treatment
- When in doubt treat for syphilis
  - https://www.mdcalc.com/calc/10422/penicillin-allergy-decision-rule-pen-fast#use-cases

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End of Presentation

Questions?

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