Fantastic Beasts and the Infections they Transmit

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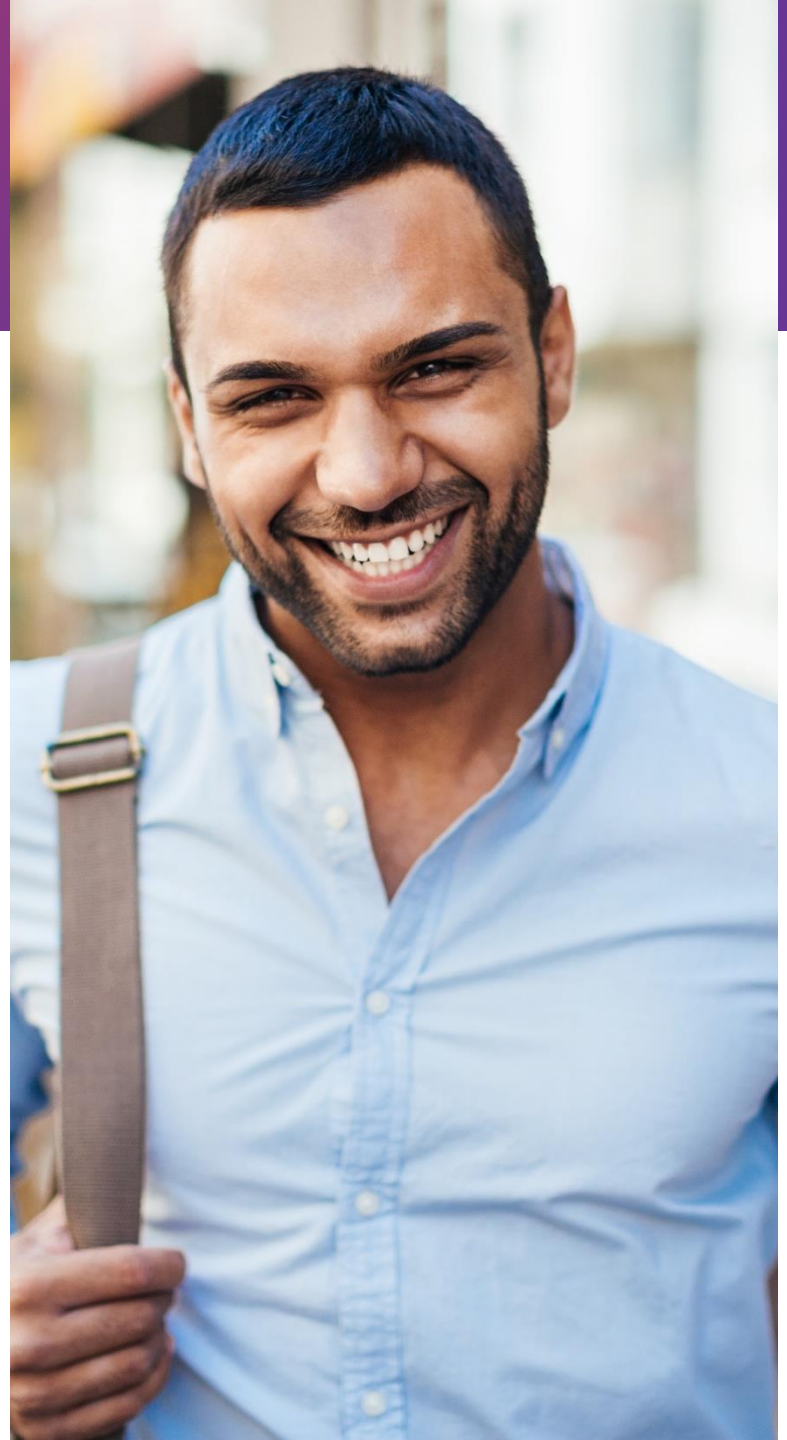
The Tale of Train-Wreck Tim

A Narrative Case-Based adventure

Trainwreck-Tim

- Tim lives in Salt Lake City, Utah
- Enjoys the outdoors and animals
- Generally good health, and a nice guy
- Prone to making poor decisions



Tim goes hiking in Utah

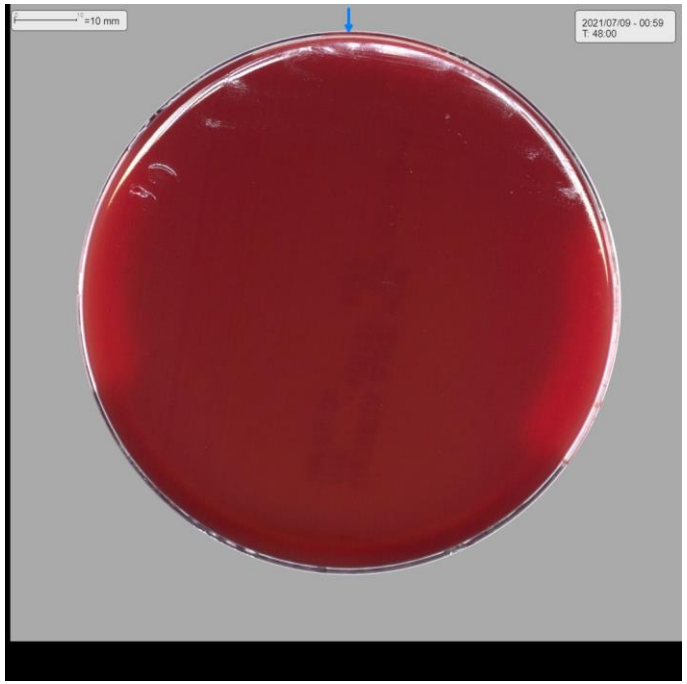
- He went hiking on the eastern slopes of the Wasatch Mountains
- Brought water and granola bars (his fave!)
- Avoided bug bites

Troubles on the Hike

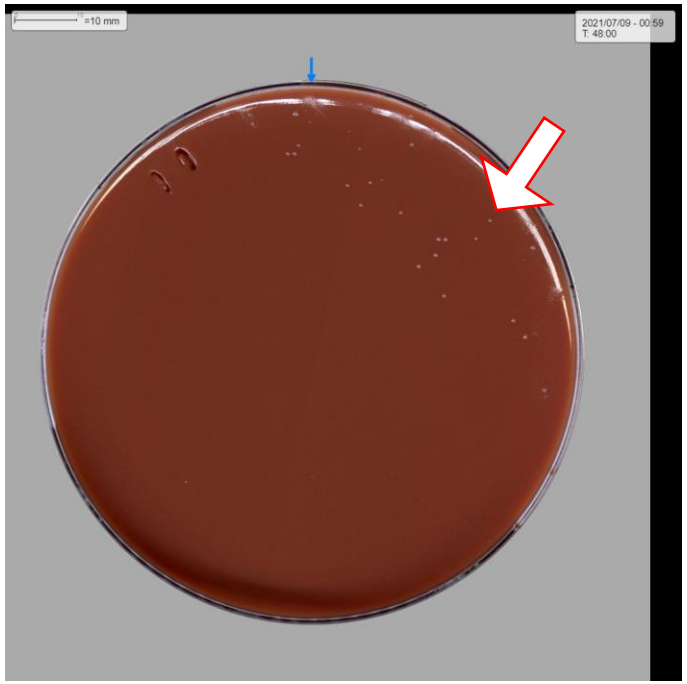
- Tim found a dead rabbit on the trail near the lake
- The coat was in excellent shape & Tim likes animal furs
- He skinned the rabbit & took the skin home, leaving the carcass
- Unfortunately…Tim cut his hand.

Troubles After the Hike

- Several days after his hike, wound began to ulcerate and lymph nodes swelled in armpit
- Wound cultures submitted to microbiology
- Growth seen after 2 days incubation



Blood agar plate (BAP)



Chocolate agar

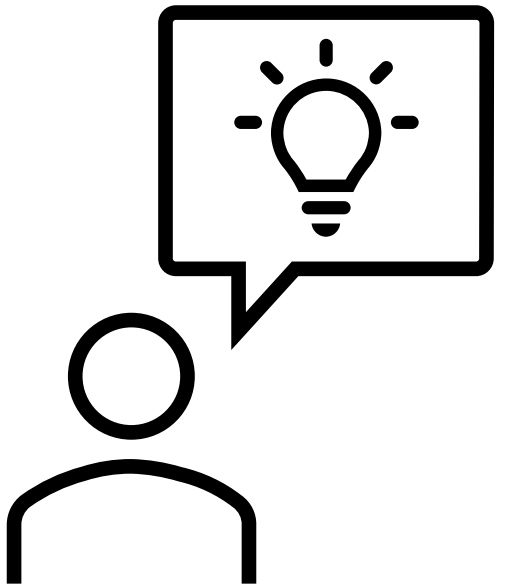
Troubles In Micro Lab

- Dead rodent exposure
- Ulcerative wound
- Slow growing
  - + Growth on Chocolate
  - - Growth on BAP

Image courtesy of Dr. Vanessa Wormser, Infectious Diseases, University of Utah

Q1: What is the Likely Diagnosis?

1. Cutaneous anthrax
2. Tularemia
3. rabbit pox virus
4. Q fever



Q1: What is the Likely Diagnosis?

1. Cutaneous anthrax (Not associated with rabbits, think livestock)
2. Tularemia (Correct)
3. rabbit pox virus (Does not infect humans)
4. Q fever (Not associated with rabbits)

Epidemiology

Ulceroglandual tularemia

- Follows bite of infected fly or tick
- OR handling dead infected animal
- Found in many parts of the world
  - US: common in NE, MW, SW
- Once weaponized during the Cold War

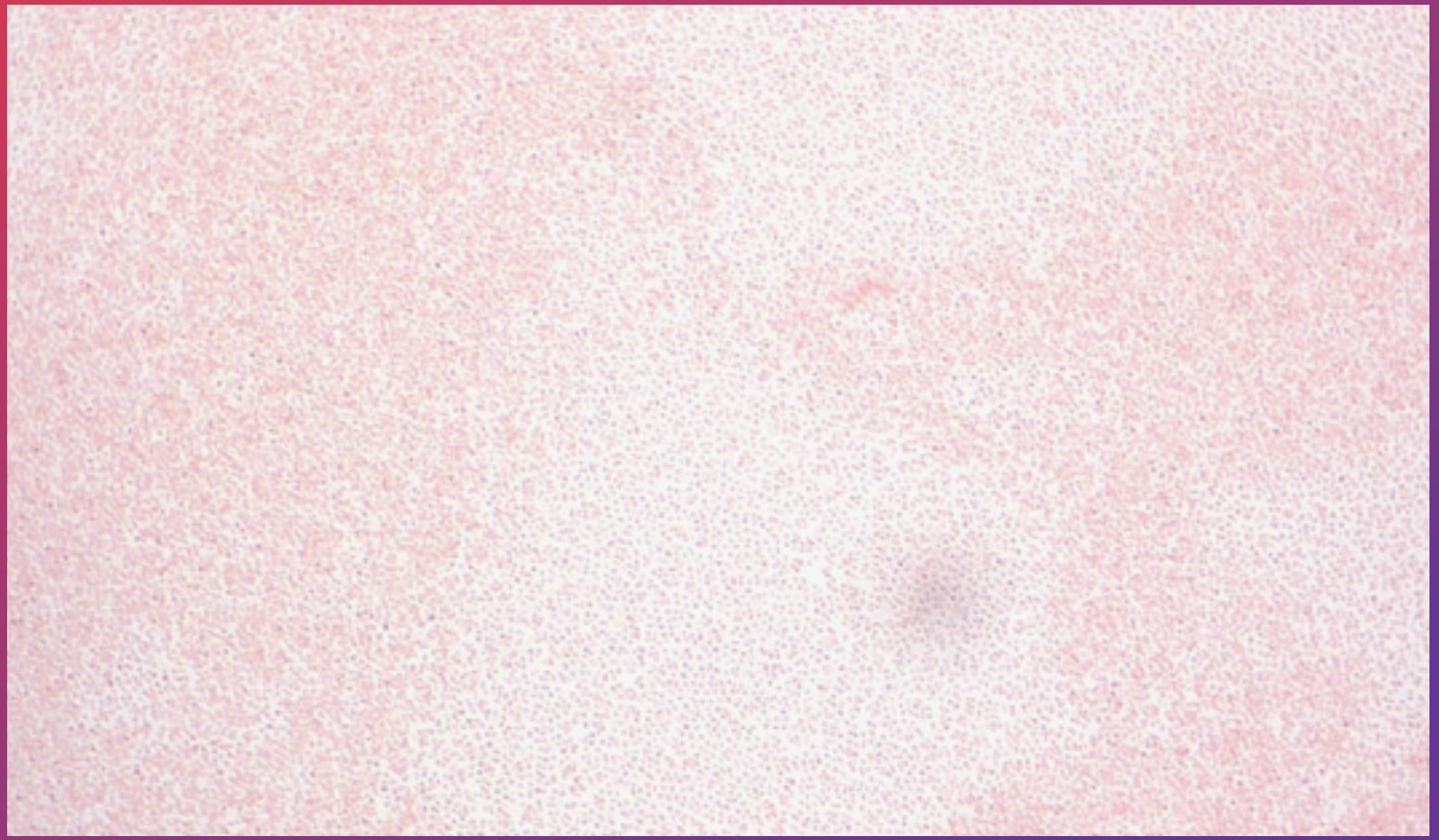
Images courtesy of the CDC's PHIL

Lab testing

Francisella tularensis

- Select agent…requires specific precautions for handling
- Slow to grow in culture (delayed growth on BAP)
  - May not grow at all
- IgG Serology also used for Cx-neg suspected cases
- Faint staining Gram-negative coccobacilli

Gram stain



Clinical

Tularemia

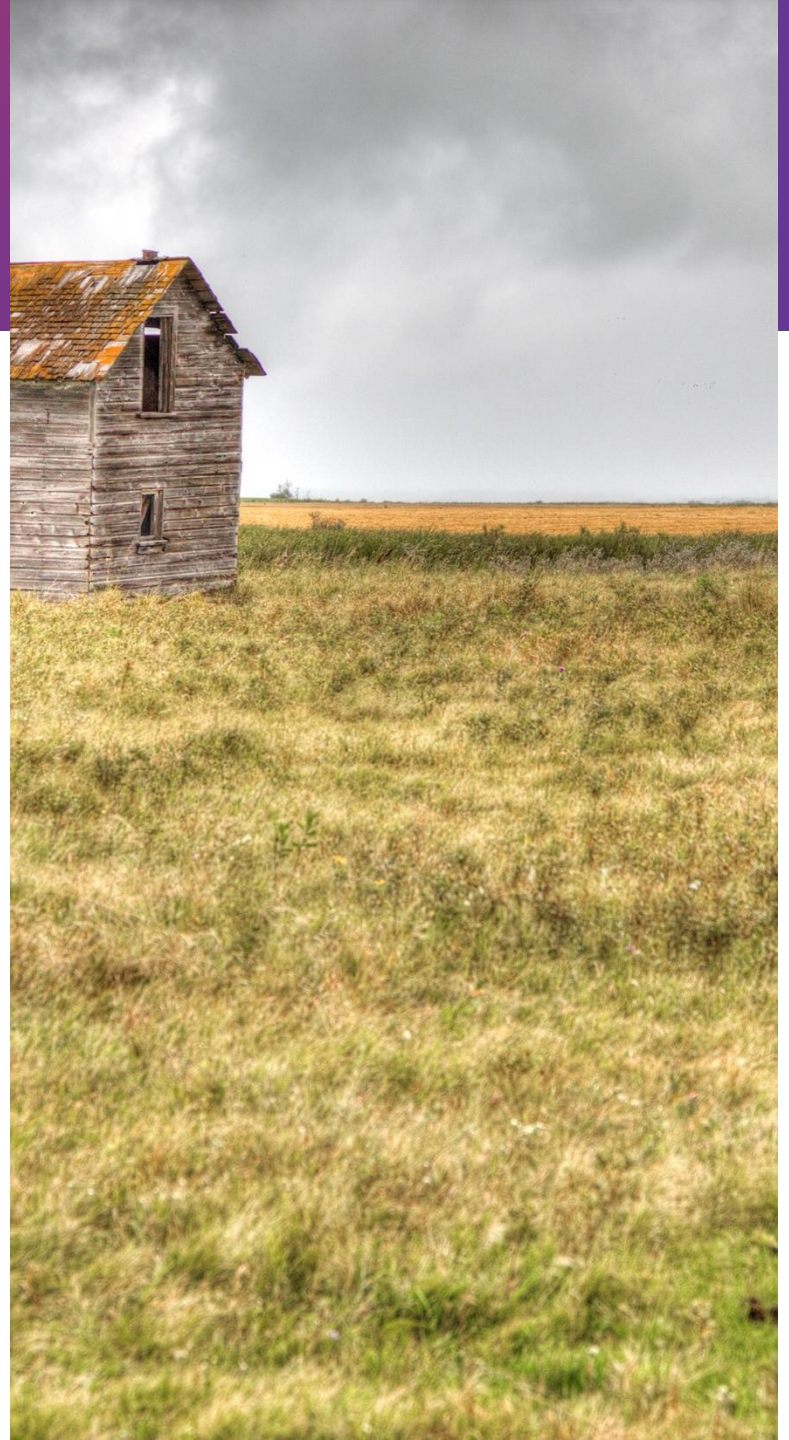
- Treated for 10-21 days with gentamycin, doxycycline, or ciprofloxacin
- Most patients recover quickly with treatment
- Can be fatal if left untreated

Tularemia Take Home Points

- Tularemia assoc. w/arthropod & animal carcass exposures
- Faint GN coccobacilli is a RED FLAG
- Growth on chocolate agar first +/- growth on BAP

Tim goes back to protect others

- Returned to scene of dead rabbit to bury carcass
- Hikes across ranch land, sees sheep delivering a breached lamb
- Helps deliver the lamb from the ewe
- Covered in by-products of delivery (Ewe!)



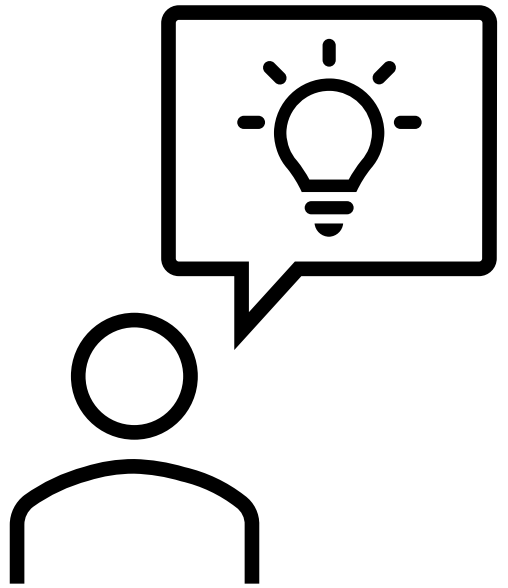
Tim is in trouble

- 1-week post-delivery of lamb, develops flu-like illness
- Fever, chills, fatigue, headache, muscle aches, non-productive cough
- Seen in urgent care & given Augmentin
- Symptoms worsened & admitted to ED with pneumonia 14 days later

  (21 day total duration of illness)

Q2: What is the Likely Diagnosis?

1. *Brucella abortus*
2. *Legionella pneumophila*
3. *Coxiella burnetti*
4. *Mycoplasma pneumoniae*

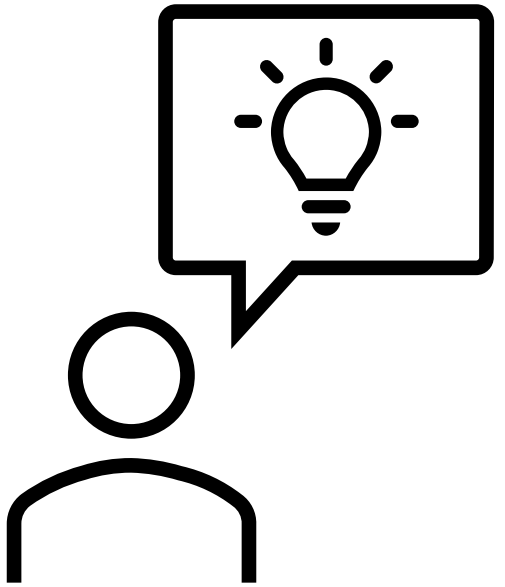


Laboratory findings

- BAL collected
  - Aerobic/anaerobic Cx = Negative
  - Gram-stain = Negative
  - *Mycoplasma pneumoniae* PCR = Negative
  - *L. pneumophila* urine antigen = Negative

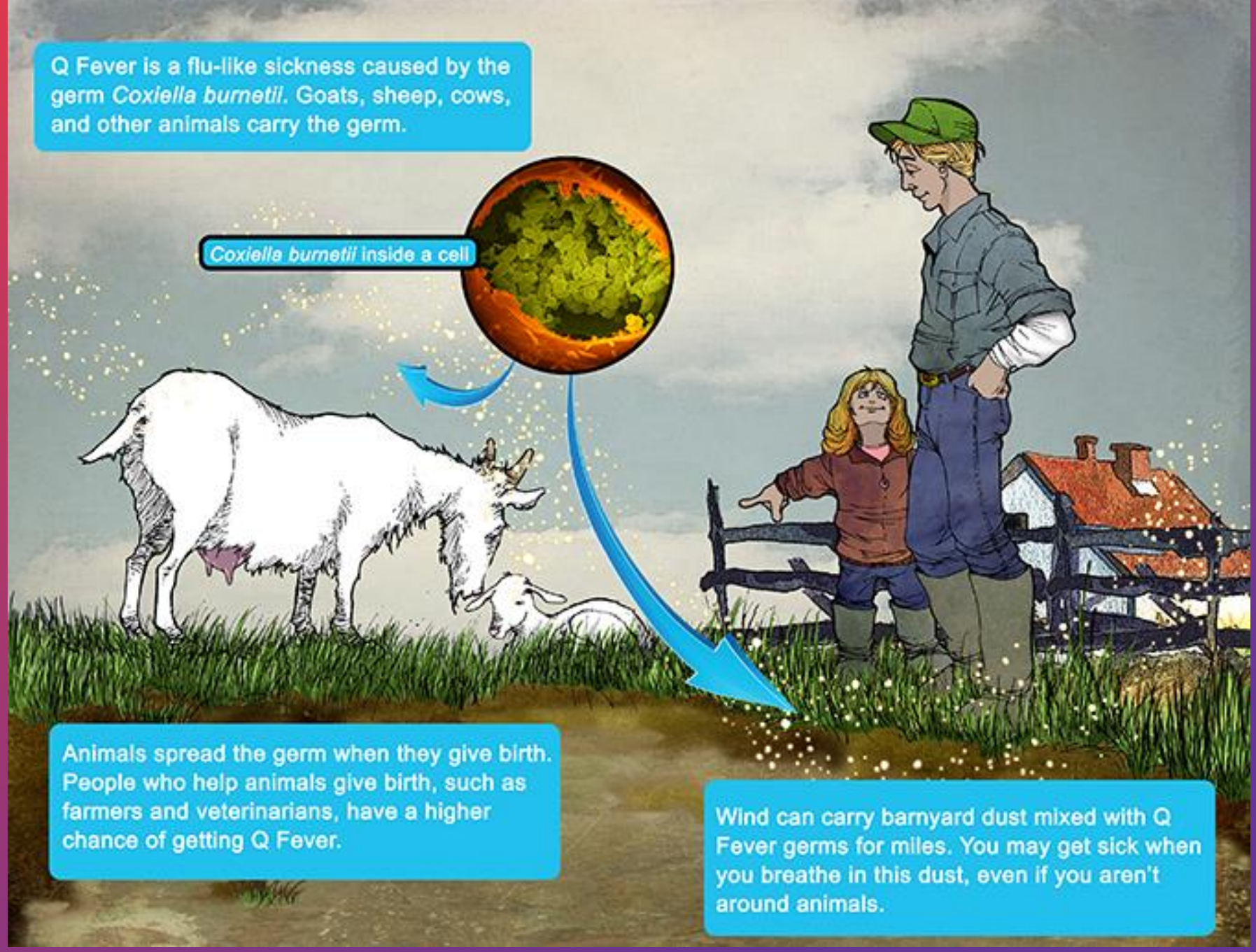
Q3: Which test should be used for acute Q-fever in Tim's case?

1. Culture
2. Urine antigen
3. PCR from blood
4. Serology



Q3: Which test should be used for acute Q-fever in Tim's case?

1. Culture (Cannot be cultured in the routine microbiology lab)
2. Urine antigen (No such test exists)
3. PCR from blood (Not recommended after 1 week of symptoms)
4. Serology (Correct)



https://www.cdc.gov/qfever/transmission/index.html

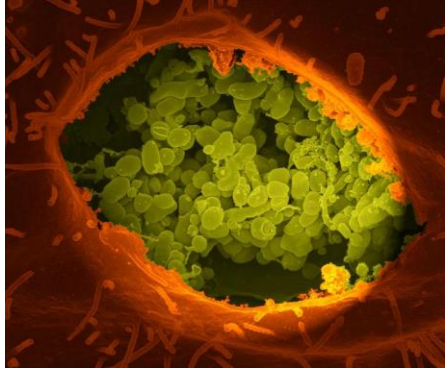
Epidemiology

Q Fever- *Coxiella burnetti*

- Exposure typically through dust & aerosols contaminated w/feces, milk, urine, & birth products from livestock (also cats!)
- ↑ risk = vets, ranchers, dairy farmers, meat processers
- Found in many parts of the world
  - Western Europe, Mediterranean, Middle East
  - US/Canada: common in mountains/west
- Once weaponized during the Cold War

Lab testing

Coxiella burnetti



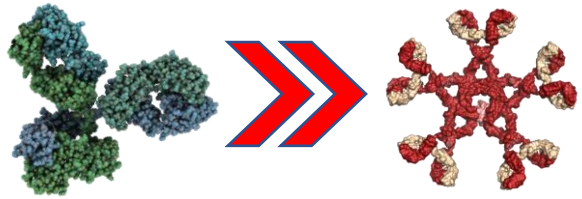
- Select agent…requires specific precautions for handling
- Does not grow in standard culture
- Serology is mainstay for diagnosis after 7-10 days
- PCR most useful in first week of illness

Image courtesy of the CDC's PHIL

Lab testing

Coxiella burnetti serology

- Phase I and Phase II antigen response by IFA
- IgG most useful, IgM only useful with IgG correlation



- Phase II >> Phase I titer = acute Q-fever
- Phase I >> Phase II titer = chronic Q-fever

  Cx- Endocarditis (Phase 1 titer > 1:800)

Clinical

Q-Fever

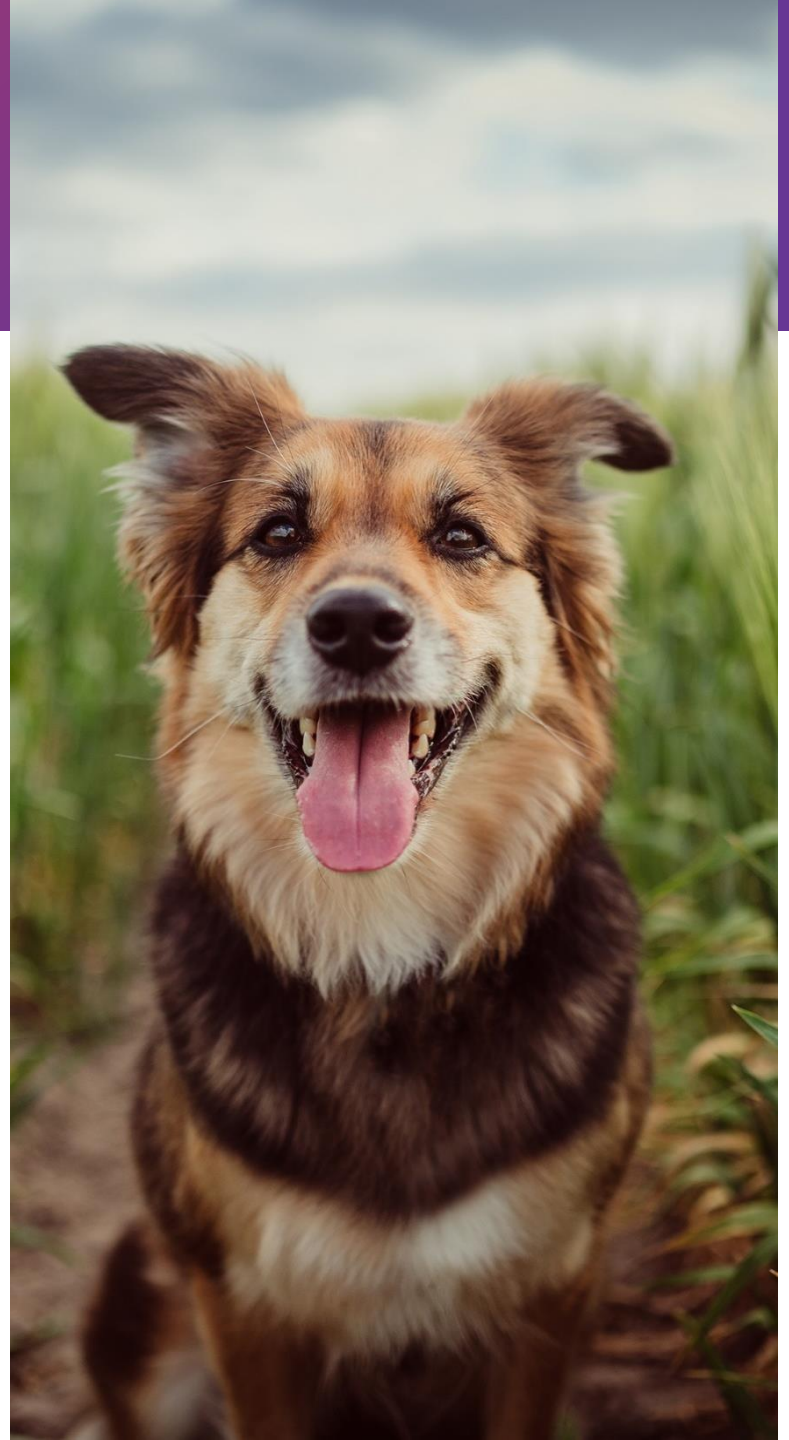
- Most acute Q-Fever patients recover without Abx
  - Acute symptomatic treated for 14 days with doxycycline
- Chronic = treated aggressively w/months of doxycycline +/- hydroxychloroquine
  - May require heart surgery for infected valves
  - Can be fatal if left untreated

Q-Fever Take Home Points

- Q- fever primarily assoc. w/livestock biproduct exposures
- Not able to culture in routine labs
  - Requires serology for most diagnoses (Phase I & II IgG)
- Acute and chronic are treated differently and have different serology patterns

Tim goes back to warn the rancher

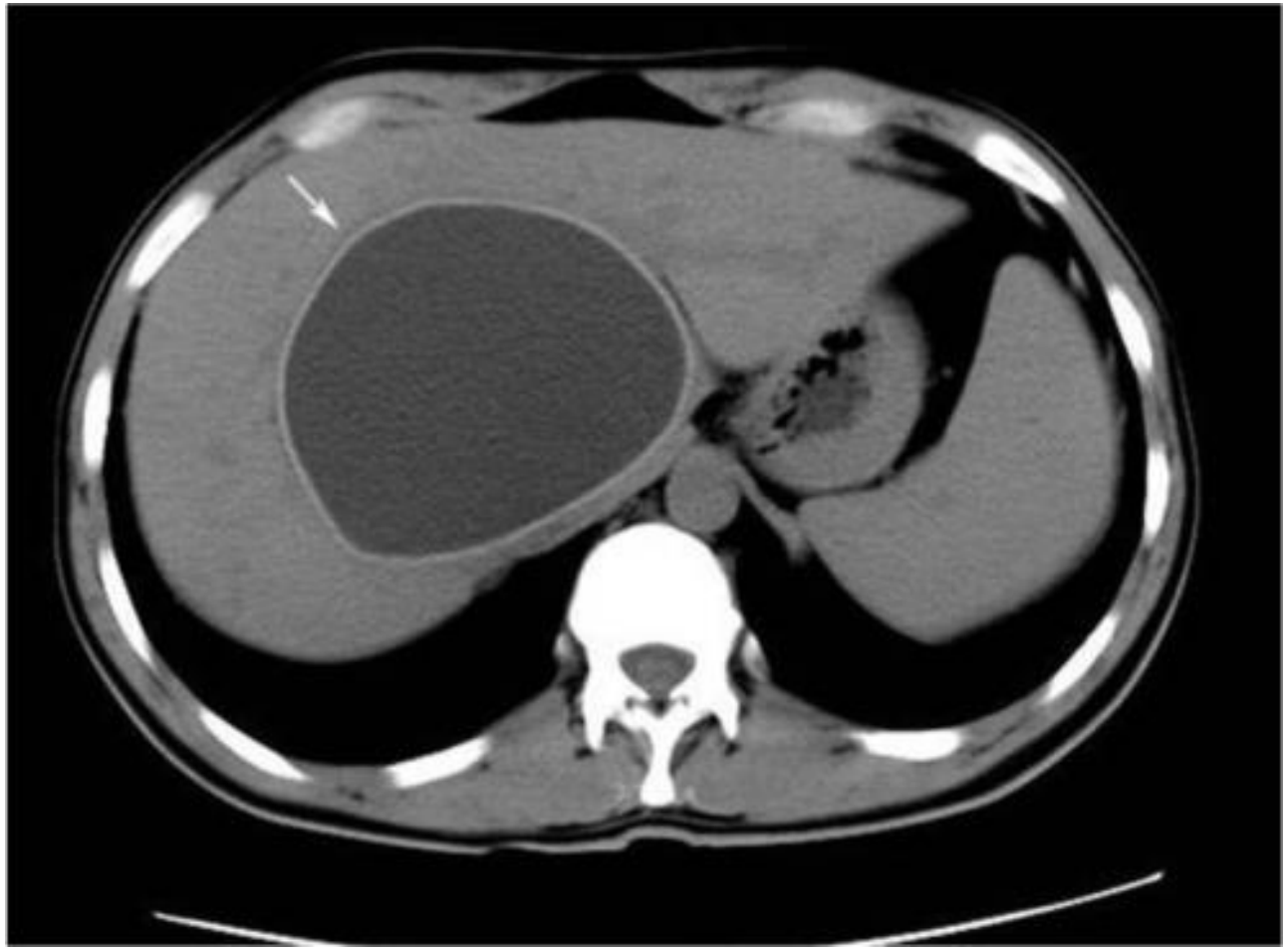
- Returned to inform about herd infection
- Encounters a sheep dog in its pen that licks his face and mouth
- Plays with the dog for a while in pen
- Waiting, playing with dog, has a snack, drops his granola bar in the dirt. Blows it off and eats it



Tim is good for a while

- 2 years after his ranch debacle with Q-Fever, Tim begins to develop persistent RUQ discomfort
- He experiences nausea and vomiting intermittently
- Eventually is seen by internal medicine
- Order a chest X-ray & CT

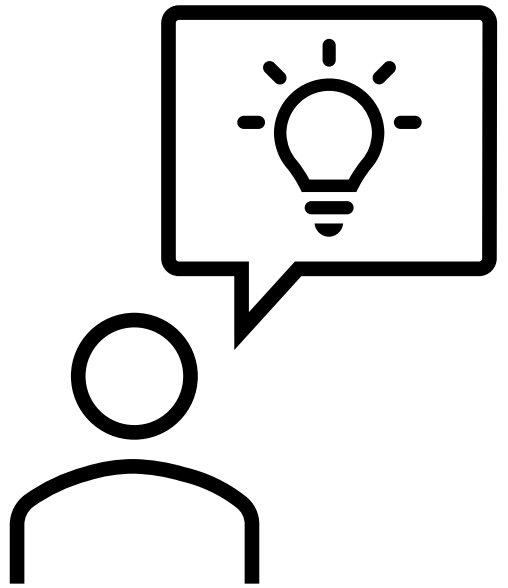
Concerning CT



Korean J Radiol. 2007 Nov-Dec; 8(6): 531–540.

Q4: What is the Likely Diagnosis?

1. *Mycobacterium tuberculosis*
2. *Entamoeba histolytica*
3. *Echinococcus granulosus*
4. *Fasciola hepatica*

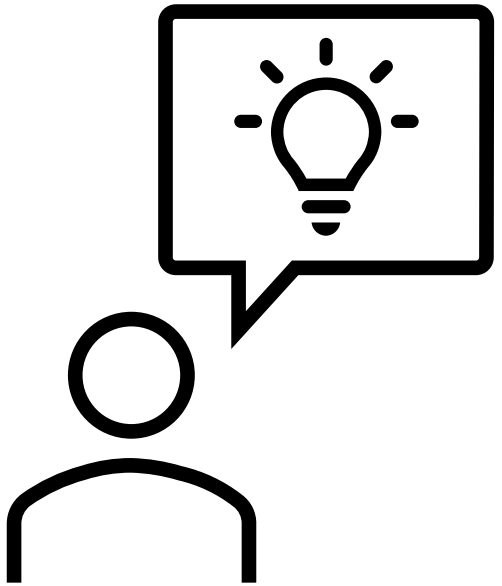


Q4: What is the Likely Diagnosis?

1. *Mycobacterium tuberculosis*
   (Low risk and radiology is inconsistent)
2. *Entamoeba histolytica* (Possibly, though risk factors are low)
3. *Echinococcus granulosus* (Most likely)
4. *Fasciola hepatica* (No risk and imaging would be unhelpful)

Q5: What test(s) would aid in diagnosis?

1. *Entamoeba histolytica* IgG
2. *Echinococcus granulosus* IgG
3. *Faciola hepatica IgG*
4. Fine Needle aspirate



Q5: What test(s) would aid in diagnosis?

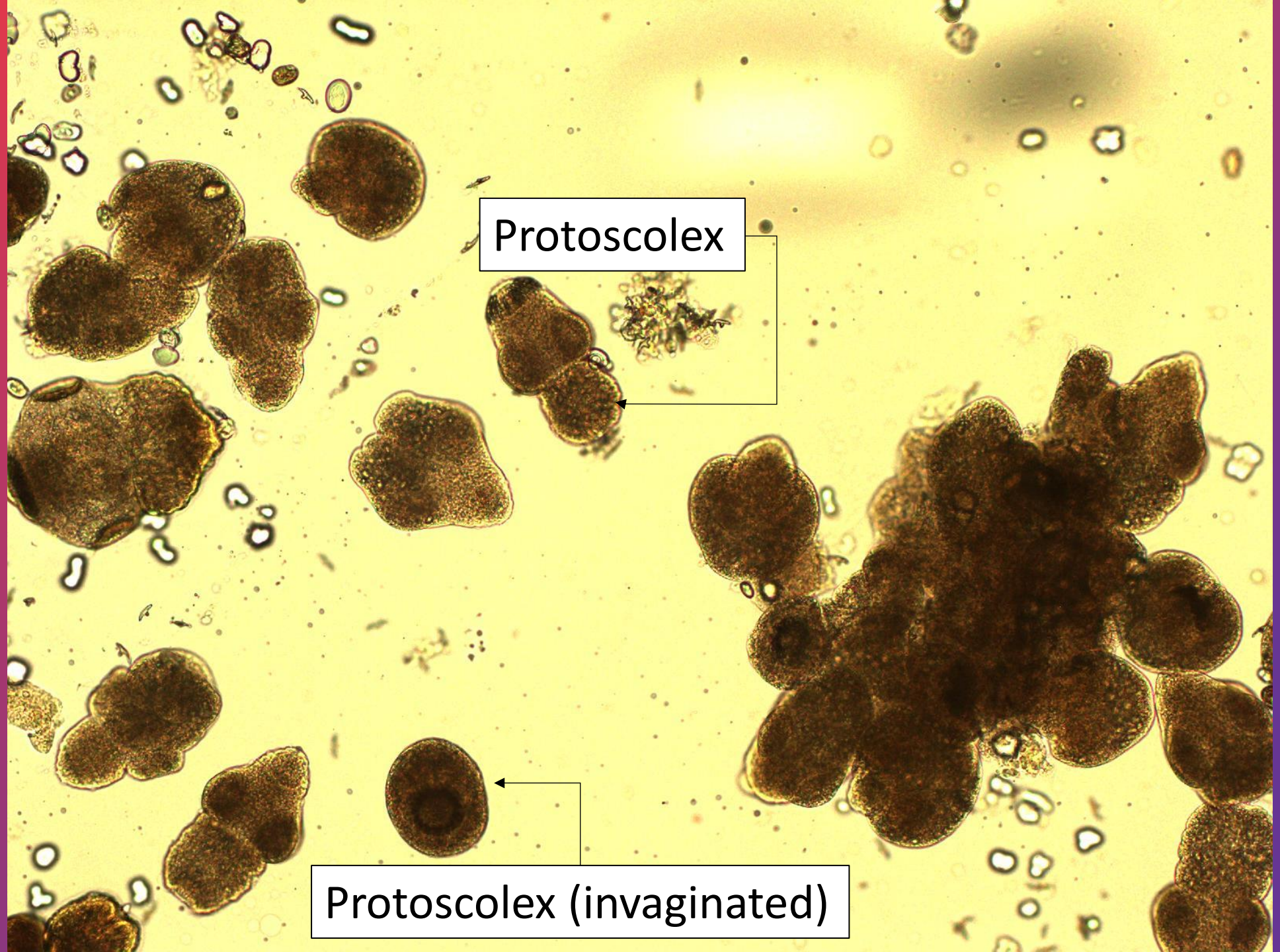
1. *Entamoeba histolytica* IgG (Correct)
2. *Echinococcus granulosus* IgG (Correct)
3. *Faciola hepatica IgG* (No clinical indications)
4. Fine Needle aspirate (NO! If *Echinococcus*, risk anaphylactic shock)

Laboratory findings

- IgG for *E. histolytica* = Negative
- IgG for Echinococcus = Positive

Cyst is complicated and metastasized to spleen. Surgery recommended to remove.

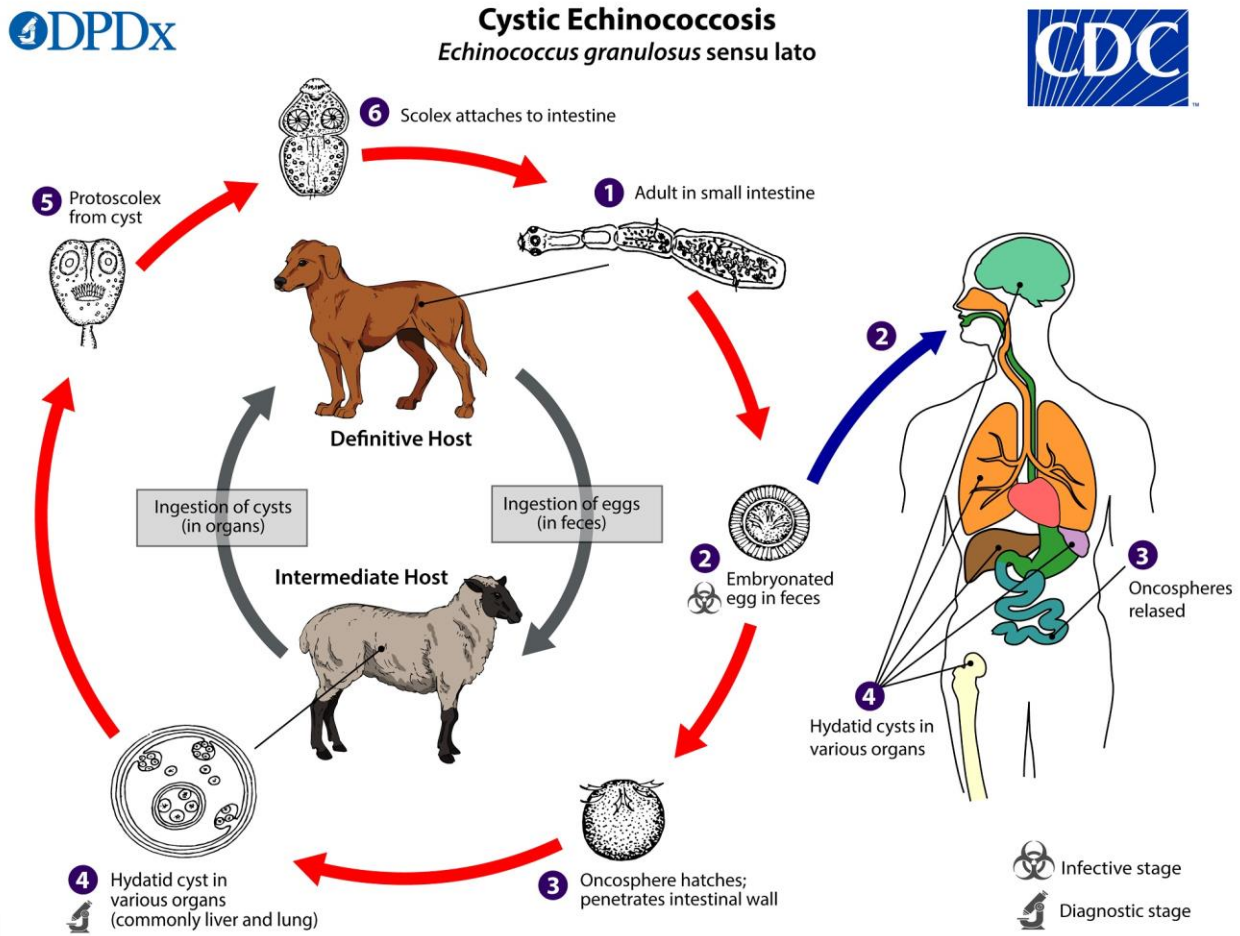
- Liver cyst removed easily
- Spleen too complicated & splenectomy required
- Cyst fluid submitted to lab…


Protoscolex
Protoscolex (invaginated)

Epidemiology Risks

Cystic echinococcosis

- Common where sheep, goat, & pigs are raised
  - Mediterranean, Middle East, Western US/Canada, Mexico



https://www.cdc.gov/dpdx/echinococcosis/index.html

Complicated Clinical Management

Echinococcus

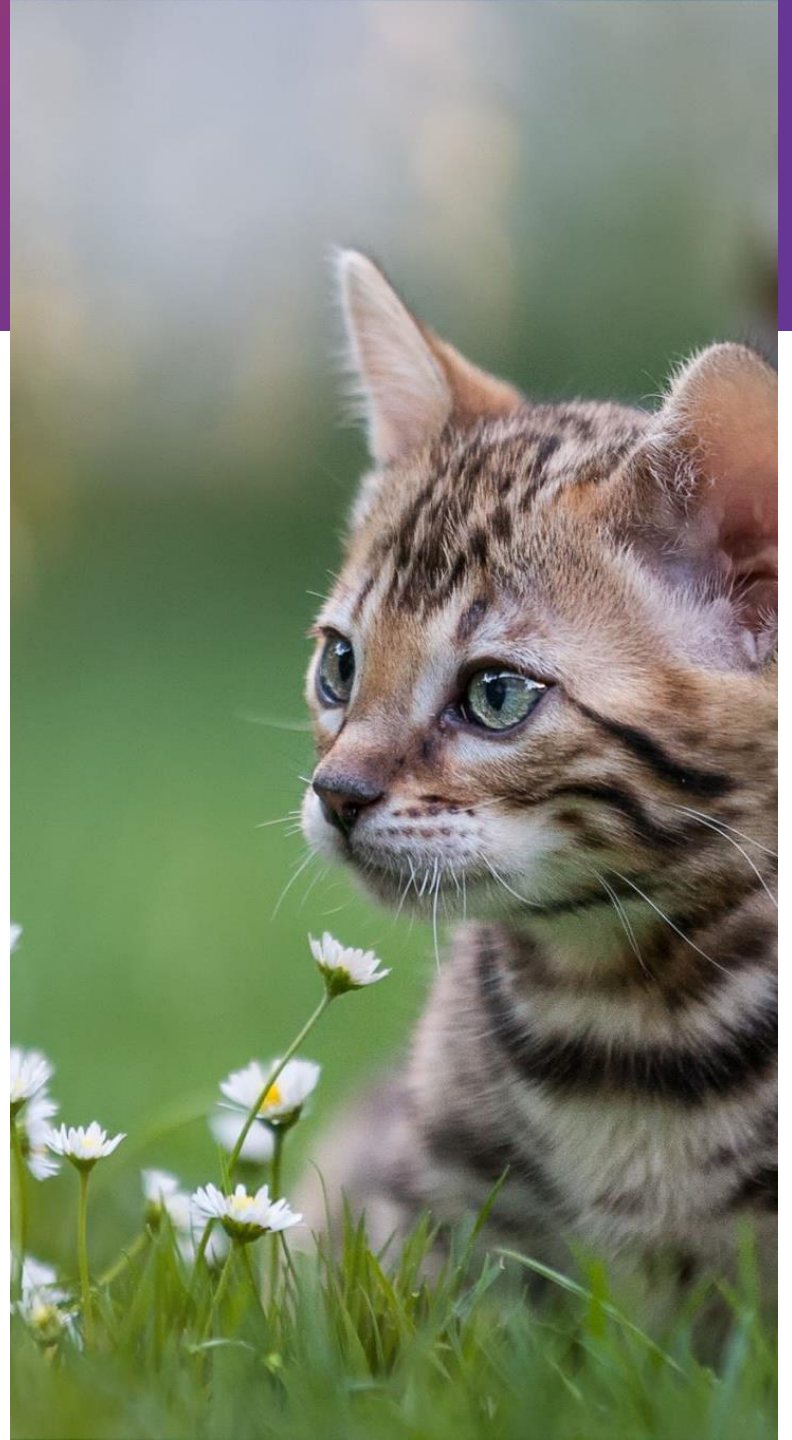
- 1st = Imaging
- 2nd = IgG Serology
- 3rd = Cyst intervention*
  - Surgery
  - Treatment with albendazole…watch & wait
  - Percutaneous aspiration, injection, re-aspiration (PAIR)
  - *Or Nothing at all if calcified and uncomplicated

Echinococcosis Take Home Points

- Ingestion of food/soil/water contaminated w/canine/wolf feces
- Cysts develop in large organ tissue
- Diagnosis by imaging & serology
- Treatment depends on cyst location and severity

Tim takes the path east

- Decided he is done with the west
- Moves to the greater Boston area
- While still recovering from his surgeries and newly found lonesomeness…adopts a kitten (because the dog almost killed him)

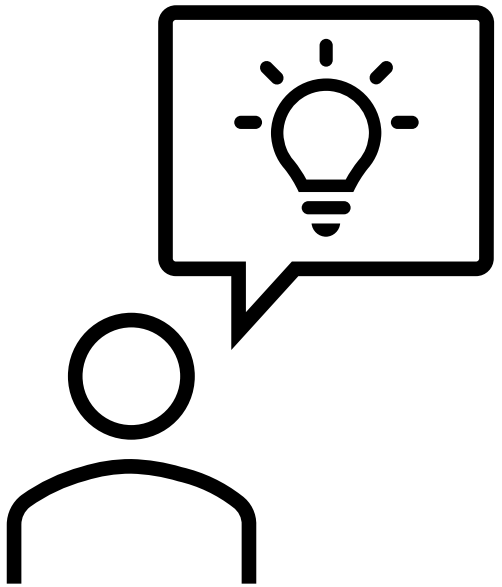


Tim plays rough

- The kitten is very energetic & playful
- Tim lets him attack his hand while playing
- Tim gets a small scratch and minor bites

Q6: What infections could Tim be at risk for?

1. *Pasteurella multocida*
2. *Bartonella henselae*
3. *Capnocytophaga canimorsus*
4. All of the above



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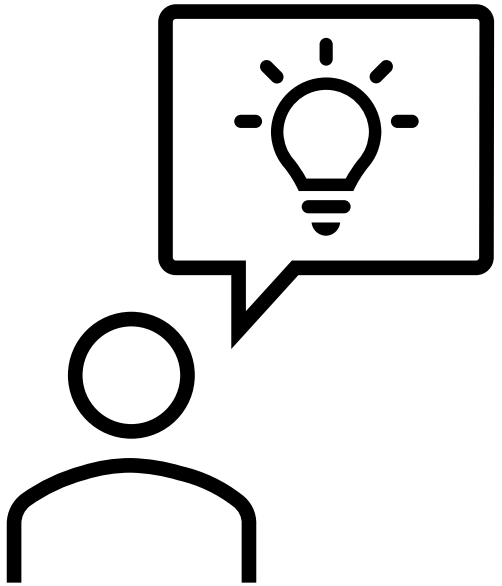
Q7: What makes Tim at higher risk?

1. Male gender
2. History of splenectomy
3. Age
4. Prior antibiotic exposure



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Pasteurella multocida

- Clinical & Laboratory

- Major cause of hand (wound) infections in cat owners
- Rapidly developing cellulitis at puncture site
- Gram-negative coccobacilli/short rods
  - Encapsulated
  - Oxidase+, catalase +, indole +
  - Growth on routine media (BAP, MAC, CHOC)
- Treated w/penicillin

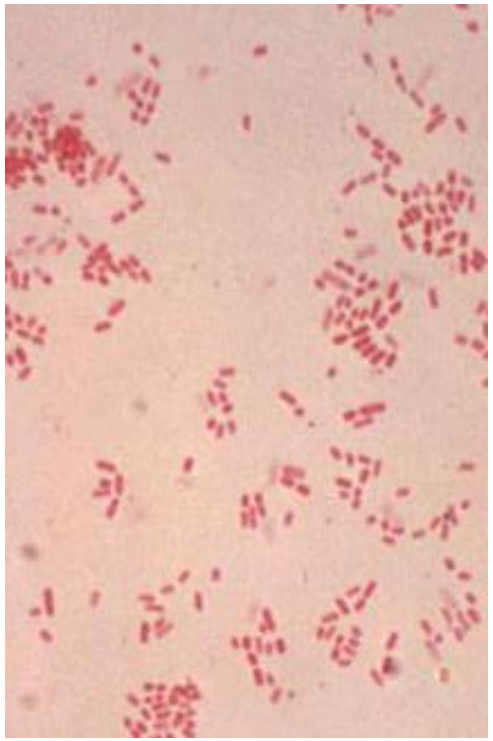


Image courtesy of the CDC's PHIL

Bartonella henselae

- Epidemiology & Clinical

- "Cat scratch disease"
  - Scratch or bite wound, or lick preexisting wound
- Axillary lymphadenopathy + healing wound on extremity
- Most common in kittens (colonization wanes in adult cats)
  - 40% of cats are infected at some time in USA
- Treatment = azithromycin
  - Not necessary in healthy patients

Image courtesy of the CDC's PHIL

Bartonella henselae

- Testing

- Obligate intracellular Gram-negative bacterium
  - Non-culturable in routine lab
- Detected by serology (+/- tissue/fluid PCR)
  - *Bartonella* serology (IgM, IgG) cross-reactive in genus
  - Many healthy volunteers have low level IgG titers
- Testing not necessary for uncomplicated cases

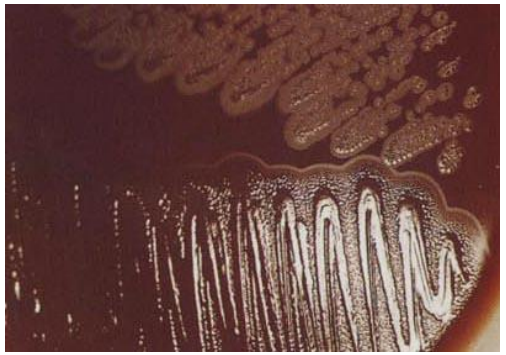
Capnocytophaga canimorsus

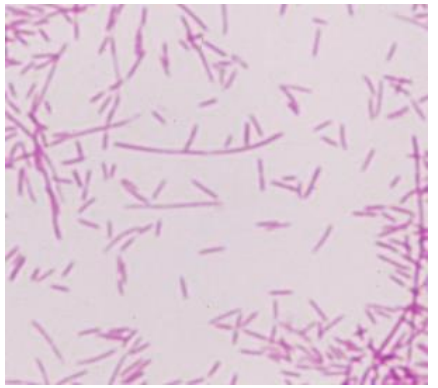
- Epidemiology & Clinical

- Normal flora in canine & feline oral cavity
- Opportunistic pathogen
  - Alcoholics, asplenia, HIV/transplant/cancer
- Sepsis, abscesses, DIC, endocarditis
- Treatment: IV for severe infections, many drug class options

Capnocytophaga canimorsus

- Laboratory





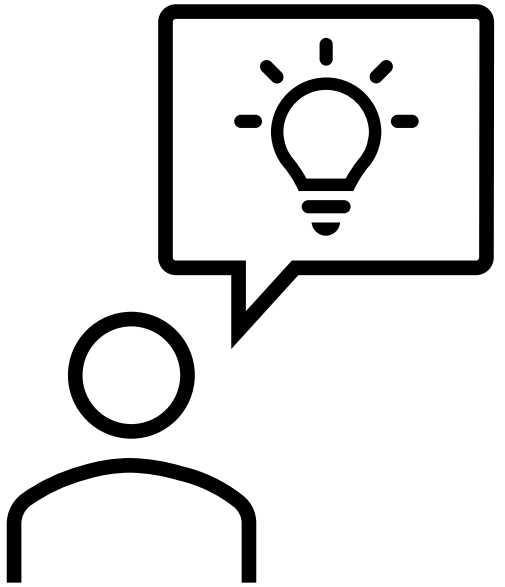
- Encapsulated Gram-negative rods (fusiform, long)
  - Slow growing, fastidious
- Full AST may guide therapy
  - Screen for beta-lactamases especially

Tim takes a walk in the woods

- Tim dodged a bullet and did not get sick
- Decided to take a small hike in the woods
- 2 days later discovered a tick attached to his leg.
  - Lab identified as *Ixodes*

Q8: What infections is Tim at risk for?

Let’s build a list!



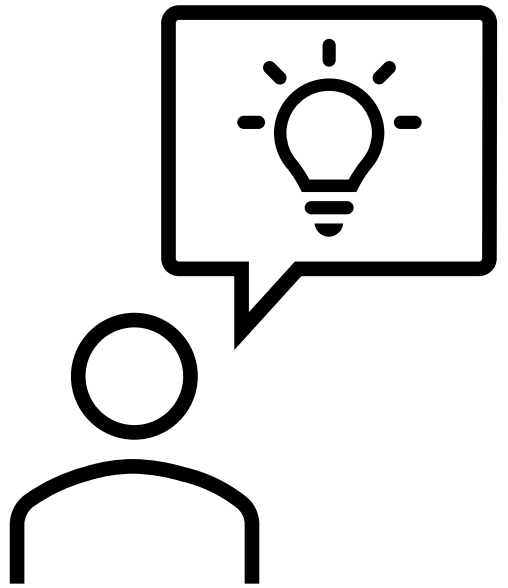
Q8: What infections is Tim at risk for?

1. *Babesia*
2. *Borrelia burgdorferi*
3. deer tick virus
4. *Anaplasma phagocytophilum*
5. *Borrelia miyamotoi*

(*Erhlichia muris* euclairensis – upper MW not Mass.)

Q9: Which infection is highest risk for asplenics?

1. *Babesia*
2. *Borrelia burgdorferi*
3. deer tick virus
4. *Anaplasma phagocytophilum*
5. *Borrelia miyamotoi*



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5. *Borrelia miyamotoi*

Babesia

- Clinical

- Intraerythrocytic parasite
  - *Ixodes* tick vectored
  - Blood transfusions
- Fever, chills, sweats, malaise, fatigue
  - Many cases asymptomatic
- Severe cases: thrombocytopenia, hemodynamic instability, renal failure, liver damage, AMS, or death
- Treatment: atovaquone & azithromycin

Babesia

- Epidemiology

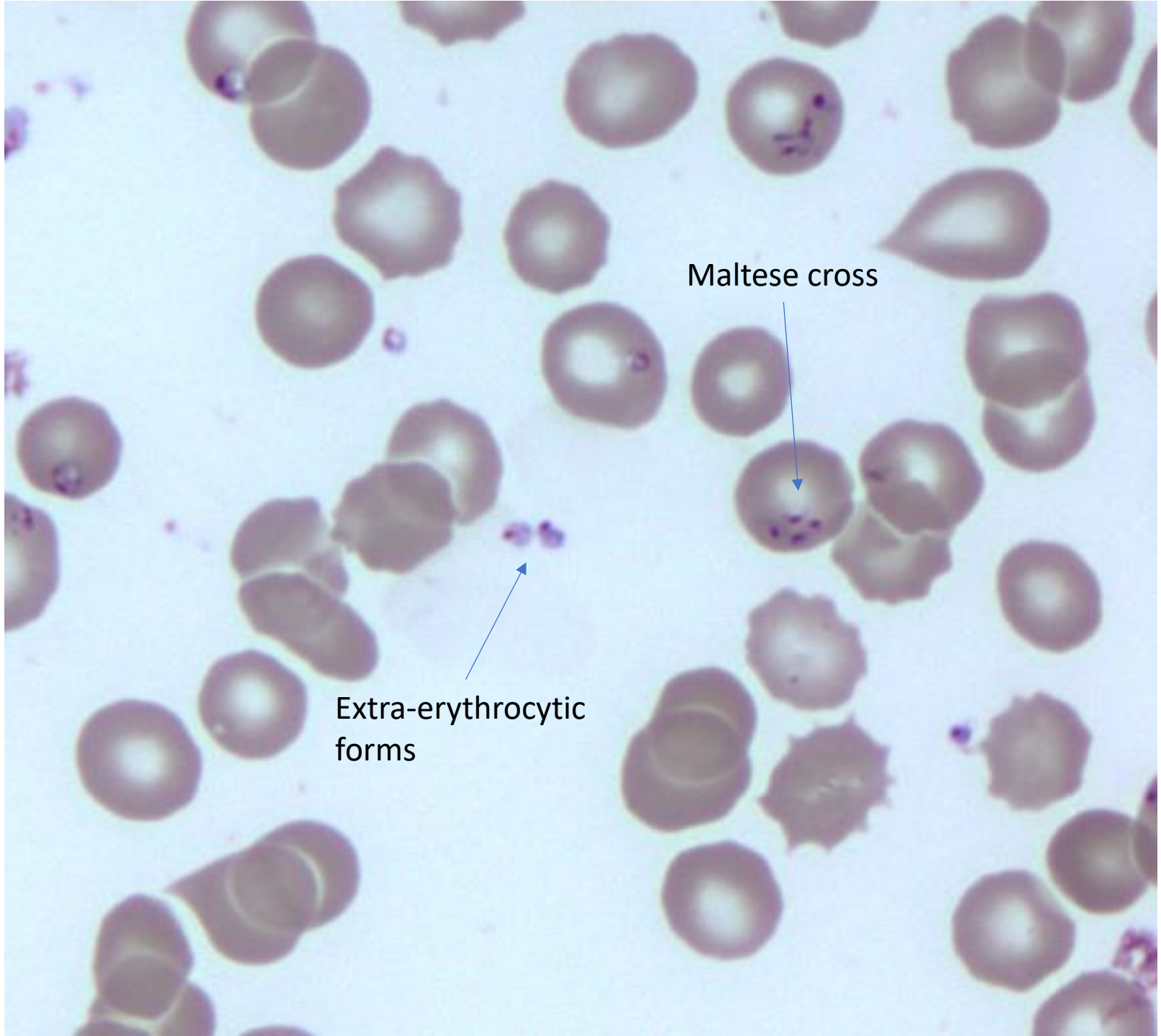
Babesia

- Laboratory

- Microscopic identification in blood smear (Giemsa)
- PCR detection: blood
- IgG antibody for retrospective evidence

Babesia

- Laboratory



Babesia Take Home Points

- *Ixodes* tick vectored
- Erythrocytic parasite (can be found extra-erythrocytic)
- Diagnosed by blood smear or PCR in acute phase
- Very dangerous for asplenics

Take home points

- Animals can vector many infections
- Lab testing for many zoonoses is not *via* traditional cultures
- Immune-perturbance is a major risk factor for many zoonoses
- Tim is not the luckiest guy around

Thank you

Questions?

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