20 – Zoonoses

Speaker: David M. Aronoff, MD

IDBR INFECTIOUS DISEASE BOARD REVIEW AUGUST 20-24 2022

Zoonoses

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Disclosures of Financial Relationships with Relevant Commercial Interests

- None

Zoonoses: major infection route from animals in USA

- Most recent epidemics & pandemics have been caused by zoonotic pathogens
- Emerging coronaviruses, haemorrhagic fever viruses, arboviruses, influenza A viruses & bacteria have caused recent major zoonotic epidemics

Judson SD & Rabinowitz PM. *Curr Opin Infect Dis* 2021, 34:385-392

Table 1. Zoonotic pathogens causing recent epidemics

Zoonotic pathogen	Reservoir host/Vector	Disease (key syndromes)	Major recent epidemics
SARS-CoV	Likely bats	SARS (pneumonia)	Global (2002–2003)
MERS-CoV	Dromedary camels	MERS (pneumonia)	Saudi Arabia, South Korea (2012–2019)
SARS-CoV-2	Unknown	COVID-19 (pneumonia)	Global (2020–present)
Ebola virus	Likely bats	Ebola virus disease (haemorrhagic fever)	West Africa (2013–2016) DRC (2018–2020)
Lassa virus	Multimammate rat	Lassa fever (haemorrhagic fever)	Nigeria (2018)
Rift valley fever virus	*Aedes* and *Culex* mosquitoes	Rift valley fever (haemorrhagic fever)	East Africa (2006–2007)
Zika virus	*Aedes* mosquitoes	Zika virus disease (arthralgia/myalgia, rash)	Brazil, Americas (2015–2016)
Chikungunya virus	*Aedes* mosquitoes	Chikungunya fever (arthralgia/myalgia, rash)	Indian Ocean Islands, India (2004–2007)
Dengue virus	*Aedes* mosquitoes	Dengue fever (arthralgia/myalgia, rash, haemorrhage)	Americas (2010)
West Nile virus	Birds/*Culex* mosquitoes	West Nile disease (meningitis/encephalitis, paralysis)	United States (2002)
Influenza A viruses	Waterfowl, Poultry, Pigs	Influenza (pneumonia)	Global (2009)
Yersinia pestis	Rats/Fleas	Plague (sepsis, pneumonia)	Madagascar (2017)
Brucella spp.	Cattle, sheep, goats	Brucellosis (undulant fever, endocarditis)	China (2020)
Coxiella burnetii	Cattle, sheep, goats	Q fever (pneumonia, hepatitis)	Netherlands (2007)

Judson SD & Rabinowitz PM. *Curr Opin Infect Dis* 2021, 34:385-392

THERE ARE MANY

TABLE 1. Bacterial zoonoses by transmission mechanism and causative agent(s)

	Causative agent(s)
Bacterial zoonoses transmitted by direct contact with animals or infected animal materials	
Anthrax	*Bacillus anthracis*
Brucellosis	*Brucella* spp.
Cat scratch disease	*Bartonella* spp.
Erysipelothrix infections	*Erysipelothrix rhusiopathiae*
Glanders and melioidosis	*Burkholderia mallei* and *Burkholderia pseudomallei*
Leptospirosis	*Leptospira interrogans* spp.
Mycobacterioses	*Mycobacteria* spp.
Q fever	*Coxiella burnetii*
Bacterial zoonoses transmitted principally by animal bites or scratches	
Pasteurellosis	*Pasteurella multocida* and other spp.
Capnocytophaga infections	*Capnocytophaga canimorsus*
Cat scratch disease	*Bartonella henselae*
Rat bite fever	*Spirillum minus* and *Streptobacillus moniliformis*
Vector-borne bacterial zoonoses	
Lyme borreliosis	*Borrelia burgdorferi sensu lato* (incl. *Borrelia garinii*, *Borrelia afzelii*)
Tick- and louse-borne relapsing fever borreliosis	*Borrelia recurrentis*, *Borrelia turicatae*, *Borrelia hermsii*, others
Plague	*Yersinia pestis*
Tularaemia	*Francisella tularensis*
Rickettsioses	Spotted fever and typhus group *Rickettsia* species
Ehrlichiosis and Anaplasmosis	*Ehrlichia chaffeensis*, *Anaplasma phagocytophilum*
Scrub typhus	*Orientia tsutsugamushi*
Foodborne bacterial zoonoses and intoxications	
Salmonellosis	*Salmonella enteritidis*
Campylobacteriosis	*Campylobacter* spp.
Listeriosis	*Listeria monocytogenes*
Escherichia coli O157:H7 infections	*Escherichia coli* STEC
Yersinia enterocolitica infections	*Yersinia enterocolitica*
Clostridium perfringens gastroenteritis	*Clostridium perfringens*
Botulism	*Clostridium botulinum*
Staphylococcal food poisoning	*Staphylococcus aureus*

Chikeka & Dumler *Clin Microbiol Infect* 2015; 21: 404–415

CATS
- *Bartonella henselae*
- *Pasteurella multocida*

BIRDS
- *Chlamydia*
- *Chlamydophila psitacci*

FARM ANIMALS
(sheep, cows, goats, chicken, etc)
- *Bacillus anthracis*
- *Brucella*
- *Coxiella burnetii*
- *Campylobacter*
- *E. coli* (Shiga toxin+)
- *Erysipelothrix rhusiopathiae*
- *Hepatitis E*
- *Leptospira*
- *Salmonella*
- *Trichinella*

FISH
- *Erysipelothrix rhusiopathiae*
- *Mycobacterium marinum*
- *Streptococcus iniae*
- *Vibrio*

DOGS
- *Campylobacter*
- *Capnocytophaga canimorsus*
- *Leptospira*
- *Pasteurella multocida*
- *Staph intermedius/pseudintermedius*

Adapted from *Comprehensive Review of Infectious Diseases* (2020). Elsevier.

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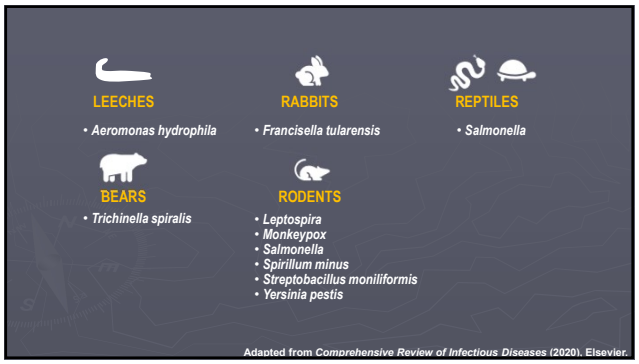


Zoonoses: major infection route from animals in USA

- **Direct contact with animal or animal tissue**
  - Cat scratch disease, anthrax, tularemia, monkeypox
- **Contact with insect vector**
  - Tularemia, plague
- **Intact skin contact with animal urine**
  - Leptospirosis
- **Ingestion of animal product**
  - Brucellosis
- **Inhalation of animal product**
  - Q Fever

Direct contact with animal or animal tissue

Question #1

19 yr woman presented with several days of headache, fever, chills, myalgias, cough & a rash

On exam she had generalized adenopathy & a vesiculopustular rash with focal areas of hemorrhage progressing in a uniform manner including the entire body, most prominently on the trunk, palms & soles

She reported her new pet prairie dog was also ill (lethargy, wasting, not eating)

Question #1

Sejvar JJ, *JID* 2004:190

Question #1

What is the most likely infection?

A. *Erysipelothrix rhusiopathiae*
B. Smallpox
C. Gambian cutaneous ulcerans
D. Monkeypox
E. Yaws (*Treponema pallidum pertenue*)

Answer #1

What is the most likely infection?

A. *Erysipelothrix rhusiopathiae*
B. Smallpox
C. Gambian cutaneous ulcerans
D. Monkeypox***
E. Yaws (*Treponema pallidum pertenue*)

A Brief on Monkeypox

- Imported animals (Gambian pouched rats cohoused with prairie dogs) & people can transmit
- Animals themselves are sick
- Constitutional symptoms & pox rash after animal contact (bite not necessary) or exposure to infected person
- Treatment: **tecovirimat** (ST-246), an inhibitor of the orthopoxvirus VP37 envelope wrapping protein (indicated for the treatment of human smallpox) might work for monkeypox (contact CDC), as might the antiviral **brincidofovir**
- Smallpox vaccines protect some against monkeypox & can be used as postexposure prophylaxis (contact CDC)

Guarner J, et al. JAMA 2022 doi: 10.1001/jama.2022.10802
Reynolds MG, et al. *Emerg Infect Dis.* 2007 Sep; 13(9): 1332–1339
https://www.accessdata.fda.gov/drugsatfda_docs/label/2018/208627s000lbl.pdf
https://www.fda.gov/news-events/press-announcements/fda-approves-first-live-non-replicating-vaccine-prevent-smallpox-and-monkeypox
https://www.cdc.gov/poxvirus/monkeypox/clinicians/treatment.html

Update on Monkeypox

- Beginning in May, 2022 a large global outbreak >40,000 cases in > 90 countries
- Largely involving sexual contact among MSM communities
- Inoculation of the virus to skin & mucosal surfaces occurs by direct contact, sexual or skin to skin, & may include transmission via fomites such as towels, bedding, & sex toys
- Incubation period 5d-21d
- Fever, chills, fatigue, HA, muscle aches, sore throat, lymphadenopathy, skin lesions that evolve from macules & papules to vesicles & pustules that ulcerate & crust before healing over several weeks
- Mortality 1-11%
- Dx = PCR
- More to come. **UNLIKELY ON 2022 BOARDS** as this.

Guarner J, *et al. JAMA* 2022 doi: 10.1001/jama.2022.10802

Question #2

25 yr male presented in July with painful right inguinal mass of one week's duration. He is otherwise well. Married. Monogamous. No hx penile or skin lesion. Fishing last week in Northern Virginia creek, hiked through wooded area. Picked ticks off legs & neck. Has kitten & dog. Exam: T37°C, 5 cm tender red mass in right midinguinal area, fixed to skin. Genitalia normal. Aspiration of soft center: 5 cc yellow pus. Gm stain neg. cephalexin 250 mg qid. One week later: mass unchanged. Culture neg. Syphilis FTA & HIV neg.

Question #2

Most likely dx:

A. *Bartonella henselae*
B. *Treponema pallidum*
C. *Haemophilus ducreyi*
D. *Francisella tularensis*
E. *Klebsiella (Calymmatobacterium) granulomatis*

Answer #2

Most likely dx:

A. *Bartonella henselae****
B. *Treponema pallidum*
C. *Haemophilus ducreyi*
D. *Francisella tularensis*
E. *Klebsiella (Calymmatobacterium) granulomatis*

Purulent inguinal node

- *Bartonella henselae*: young cats
  - **Stellate abscess** on bx. **Warthin Starry** stain positive early
  - Dx: serology, PCR, or DFA on pus
- Tick borne tularemia ("glandular"): this case *could be* tularemia
  - Exposure to wild animals or their ticks
  - Gram stain, routine culture negative
  - But: he should be **systemically ill** (fevers, chills, malaise common)
  - **Uncommon**: 100-200 cases per year in the USA
- Chancroid: painful genital ulcer
- No suppurative lymph nodes in syphilis or granuloma inguinale (*Klebsiella granulomatis*) (painless ulcers)

Suppurative inguinal lymph nodes (continued)

- *Staphylococcus aureus*. Gram stain of pus & culture positive. Distal lesion may be present.
- Lymphogranuloma venereum (LGV)-
  - Sexually transmitted (no history in this case)
  - *Chlamydia trachomatis* L1-L3: genital lesion usually inapparent
  - Painful inguinal &/or femoral lymphadenopathy. "Groove sign"
  - Can form "Stellate abscesses" on bx
  - (+) Nucleic acid amplification test on urine or wound

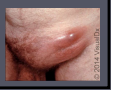


Image from https://www.skinsight.com/skin-conditions/adult/lymphogranuloma-venereum-lgv

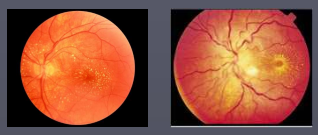
Cat Scratch Disease

- *B. henselae* causes most cases
- >13,000 cases in the USA per year[1]
- Clinical findings:
  - 80% <21 yrs old, acute suppurative lymphadenitis proximal to bite, scratch, lick of young cat
  - Cats have chronic bacteremia but seem healthy
- Cat fleas may transmit between cats & occasionally to humans

1. Nelson CA, *at al. Emerging Infectious Diseases* 22 (2016); Photo from http://www.catscratchmed.com

Cat Scratch Disease

- Papule or pustule often at inoculation site if sought
- Often self-limited
- Encephalitis, **stellate retinitis**, uveitis rare



Lipid exudates forming a macular star

Photos from http://www.catscratchmed.com, http://imagebank.asrs.org/file/1173/cat-scratch-retinitis-with-macular-lipid, http://www.nejm.org/doi/full/10.1056/ENEJMicm010038#t=article

Cat Scratch Disease

Rx: 10% drain spontaneously

If not, node aspiration improves pain & helps exclude *Staph. aureus*

Treatment = AZITHROMYCIN x 5 d

(TMP/SMX, clarithromycin, ciprofloxaxin or rifampin as alternatives)

Treat to prevent serious complications, since up to 14% of patients will have dissemination, with potential infection of the liver, spleen, eye, or CNS

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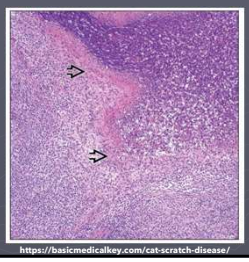
Cat Scratch Lymphadenopathy
Stellate abscesses, necrotizing granulomas
Necrotic area with neutrophils surrounded by **palisading histiocytes**

Lymph nodes showing central abscess formation surrounded by palisaded histiocytes



Major Syndromes due to *Bartonella* species

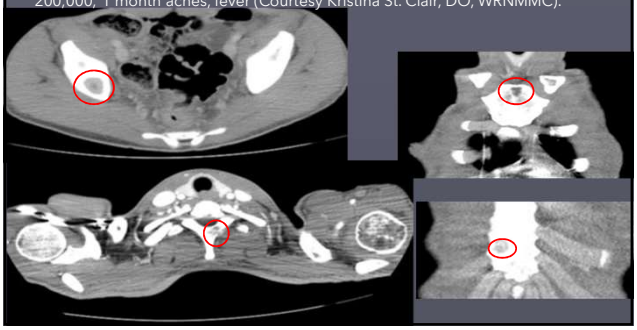
- *Bartonella*: **Slow growing** weakly Gram (-) rod
- *B. henselae*- cat scratch disease, peliosis
- *B. bacilliformis*- the **Andes, Peru, Equador, Columbia** & **sand fly** bite
  - Carrion's disease; biphasic illness
  - Oroya fever (acute phase: fever + anemia; high mortality) → verruga peruana (later; hemangioma-like nodules in the skin & mucous membranes); Treatment = ciprofloxacin (Oroya); azithromycin (vp)
- *B. quintana*
  - Human **body louse** *Pediculus humanus var. corporis* = vector
  - Bacteremia in persons experiencing **homelessness**, trench fever
  - **Endocarditis**

Major Syndromes due to *Bartonella* species

- HIV-associated (CD4<<100)
  - **Bacillary angiomatosis** (cutaneous)
    - Caused by either *B. henselae* or *B. quintana*
    - Lesions bleed easily
    - Biopsy: vascular proliferation, plump endothelial cells, bacilli
    - DDx = Kaposi sarcoma
  - Bacillary **peliosis** (*B. henselae*)
  - Osteomyelitis (lytic; *B. quintana*)
  - Chronic bacteremia/endocarditis

Images from http://mddk.com/bacillary-angiomatosis.html

Bartonella osteomyelitis: 30 yr old man with HIV, CD 4=3, viral load 200,000, 1 month aches, fever (Courtesy Kristina St. Clair, DO, WRNMMC).



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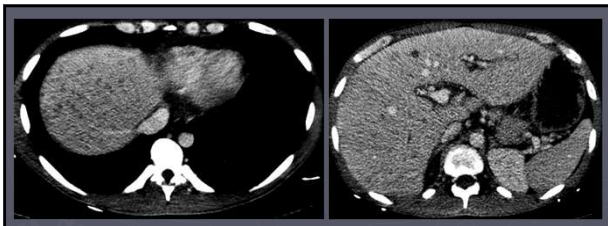
Bacillary peliosis

- *B. henselae*
- Hepatosplenic bacillary peliosis
- Fever, chills, hepatosplenomegaly
- CT: Hypodense dense center +/- contrast enhancing rim
- Ultrasound, MRI = masses
- Blood filled spaces. Numerous bacilli on Warthin Starry stain or immunostaining



29 year old male with longstanding HIV (CD4 < 10) with 3 months of fevers & weight loss. + hepatosplenomegaly & mild transaminitis, elevated Alk phos. CT showed innumerable hepatic & splenic hypodensities.
IgG (+) *Bartonella* 1:512 & serum *Bartonella henselae* PCR (+).
He had rescued a kitten 6 months prior & reported scratches & bites.

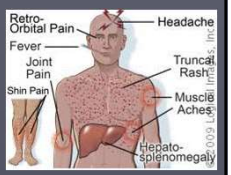
Case courtesy of Dr. Sam Bailin (Vanderbilt)

Solid Organ Transplantation

- SOT, like AIDS, can predispose to ALL the manifestations of bartonellosis
  - Lymphadenitis
  - Skin lesions (bacillary angiomatosis)
  - Bone lesions
  - Liver lesions

Bartonella quintana

- Transmitted by human body **lice**
- Crowded, unsanitary conditions: "trench fever" in WW1
- Splenomegaly, fever, arthropathy & arthritis, leg pains, rash, & severe weakness, thrombocytopenia
- Bacteremia, endocarditis in AIDS, **homelessness** +/- alcoholics



Brouqui P, *et al. NEJM* (1999)

Bartonella endocarditis

- <5% of all bacterial endocarditis
- Consider *B. quintana* or *B. henselae* in **homelessness** & with **culture negative** endocarditis
- Insidious or acute onset of fever, weight loss, anorexia.
- Serology: IgG>1:800 highly suggestive (not species specific)
- **PCR** of serum, valve tissue
- Lysis-centrifugation blood cult.
  - 35ºC, fresh chocolate agar, hold 2-4 weeks
- Rx: doxycycline x 6 weeks + initial 2 weeks gentamicin or 2 weeks rifampin if valve resected

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ANTHRAX

Images from https://www.dermnetnz.org/topics/anthrax

ANTHRAX

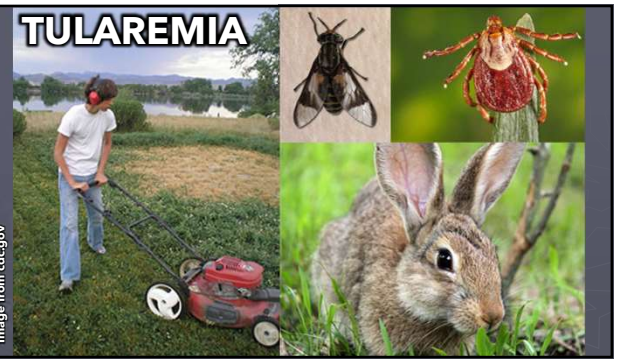
- Skin (95%): pruritic papule on skin exposed to goat hair, animal hides. Small **vesicles around an ulcer**. +/- pain. **Edema**. Mild systemic symptoms.
- DX: *Aerobic*, encapsulated, sporulating **Gram positive** bacillus seen on smear, culture of vesicle fluid (alert the lab!)
- RX: Penicillin but "weaponized" strains resistant to multiple antibiotics
- Inhalation (5%), ingestion (<1%)
- Anthrax rare in USA. Bioterrorism: see online lecture

http://www.pcds.org.uk/clinical-guidance/anthrax

Edema
Vesicles
Necrotic ulcer

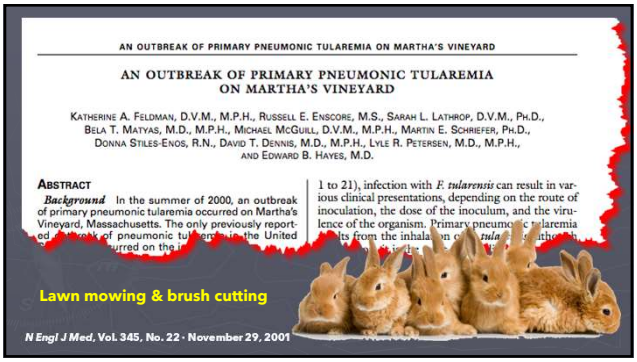
https://www.nejm.org/doi/full/10.1056/NEJMicm0802093

TULAREMIA



TULAREMIA

- Highly infectious gram-negative **coccobacillus** *Francisella tularensis*
- Vectors = **Ticks** (*Dermacentor variabilis* > *Amblyomma americanum*) & **Deerflies**
- Direct inoculation = rabbits, squirrels, muskrats, beavers, cats
- Hunters **skinning animals** (old days); farmers, veterinarians
- Red tender local lymph node inoculation site may form ulcer
- **Ulceroglandular >** glandular >> oculoglandular, pharyngeal, typhoidal, pneumonic = Bioterrorism, landscapers, mowers



TULAREMIA

- Incubation period: 3-5 days but up to 3 weeks
- DX: Serology; PCR
- Culture of *F. tularensis* is lab hazard. Notify the lab!
- Neg routine culture, needs chocolate agar or BCYE (like *Legionella*)
- RX: **gentamicin** (or streptomycin), **FQs**, **doxycycline**
- Prophylaxis (bioterrorism) doxycycline

Maurin & Gyuranecz. *Lancet* (2016); BCYE – buffered charcoal yeast extract

Glandular Tularemia

68-year-old with 1 wk fever then 2 mo progressive, painful swelling on R. side of neck

Exposure to a sick cat

Diagnosis made by + IgM (1:1280)

Improved with 4 wk doxycycline

Marks, Laura, & Spec. "Glandular Tularemia." *New England Journal of Medicine* 379.10 (2018): 967-967.

Contact with insect vector

PLAGUE

- *Yersinia pestis*
- New Mexico, California, Arizona & Colorado
  - Rodent **flea bite**
  - **Prairie dogs**
- Fever, nausea & swollen, painful lymph nodes
- Sepsis, pneumonia-hematogenous or aerosol in crowded conditions


(Michael Smith, Getty Images)


(Eye of Science/Science Source)

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PLAGUE

- Gram negative coccobacillus
- **Bipolar-staining** bacilli
- **Safety pin** appearance
  - *Yersinia pestis*: lab hazard
- Treatment: **Streptomycin** >> doxy, cipro

Wikipedia image

Pneumonic form: Rapid Progression of Pneumonic Plague on CXR over 13 Hours

Image from Canyon, Deon V. "Environmental Change and Human Health Case Studies I." (2008).

Large Outbreak in Madagascar

Plague is an endemic disease in Madagascar

Each year there is a seasonal upsurge between September – April

In 2017, an unprecedented pneumonic plague outbreak hit the main island

Nearly 2,500 reported or suspected cases (78% pneumonic)

https://www.sciencedaily.com/releases/2019/04/190416132101.htm
Randremanana R, *et al. Lancet ID*, 19(5)(2019)
Majumder MS, *et al. PLoS Curr.* (2018)

Mongolian Couple Die of Plague after Eating Raw Marmot

2019

THE INCIDENT SPARKED A QUARANTINE, STRANDING TOURISTS FOR DAYS

May 17, 2019

By Jonny Lupsha, News Writer

A couple in Western Mongolia have died of bubonic plague after eating raw marmot, *The Guardian* reported. There are people who believe eating the innards of the rodent is good for their health. Although people ignore health warnings not to eat uncooked meat, raw marmot can carry the plague germ *Yersinia pestis*. Plague is known for causing the Black Death in the 14th century—but was it that simple?

Intact skin contact with animal urine

Question #3

- 28 yr old male presents with temp 39ºC, diffuse myalgia, headache, malaise. Returned 2 days ago from "Iron Man" race with running, biking, swimming in lake, climbing in Hawaii. Numerous mosquito bites. Exam: Conjunctival suffusion but no other localizing findings.
- WBC 14,500 with 80%PMN, no eos or bands. Platelets 210k.
- Bili 2.4, ALT 45, AST 52, Alk Phos 120, Cr 1.6. Hct 45%. BC neg. UA: normal

Question #3

Most likely diagnosis:

A. Malaria
B. Dengue
C. Ehrlichiosis
D. Leptospirosis
E. Zika

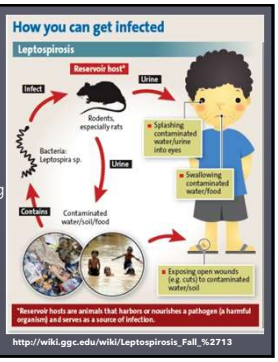
Answer #3

Most likely diagnosis:

A. Malaria
B. Dengue
C. Ehrlichiosis
D. Leptospirosis***
E. Zika

LEPTOSPIROSIS

- Spirochetes excreted in urine of infected host & able to survive in wet environment
- Exposed intact skin to animal urine in water: veterinarians, farmers, loggers, triathletes, white water rafting, trapping
- Urine from cows, pigs, dogs, raccoons, rats, mice.
  - Summer & early Fall



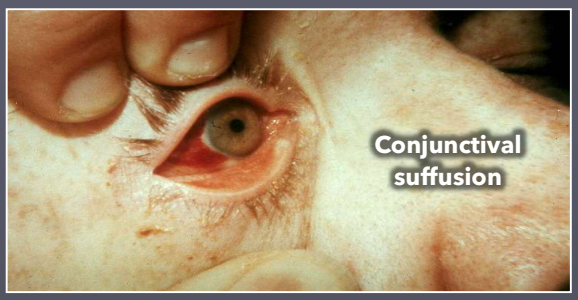
http://wiki.ggc.edu/wiki/Leptospirosis_Fall_%2713

LEPTOSPIROSIS

- Fever, myalgia, headache (aseptic meningitis late in course)
- **Conjunctival suffusion**, +/- rash
- In severe cases: jaundice (Weil syndrome), azotemia, pulm. hemorrhage
- Lab: serology by agglutination test, culture urine in Fletcher's medium
  - PCR & sequencing emerging
- Rx: **doxycycline** for outpatients, IV penicillin for inpatients
  - Jarisch-Herxheimer in first 2 hr

LEPTOSPIROSIS

- From David Thomas:
- Biphasic illness
- Exposure to fresh water (Hawaii Costa Rico or triathlon) or rats, Baltimore (David Thomas)
- Bilirubin is high out of proportion to transaminase elevation
- Jaundice out of proportion to ALT/AST



Ingestion of animal products

Question #4

A 41 year old car salesperson from Baltimore was admitted for a febrile illness & found to have *Brucella melitensis* in their blood culture. They had attended a dinner a month prior where some family members from Greece had brought food from home.

About two weeks prior to onset of fever, they had bought some lamb & beef at a farmer's market outside Baltimore.

Question #4

The most likely source of the brucellosis was which of the following:

A. Home made sausage from Greece
B. Home made goat cheese from Greece
C. Cole slaw from a Baltimore delicatessen
D. Beef tartar, meat from the farmer's market
E. Lamb kabobs, meat from the farmer's market

Answer #4

The most likely source of the brucellosis was which of the following:

A. Home made sausage from Greece
B. Home made goat cheese from Greece***
C. Cole slaw from a Baltimore delicatessen
D. Beef tartar, meat from the farmer's market
E. Lamb kabobs, meat from the farmer's market

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Speaker: David M. Aronoff, MD

BRUCELLOSIS

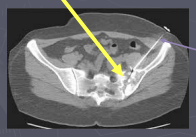
- Exposure to non-USA dairy or meat, **unpasteurized** cheese, uncooked meat,
- Slaughterhouse worker, meat packer, veterinarian
- An illness characterized by acute or insidious onset of fever & one or more of the following: fever, night sweats, arthralgia, headache, fatigue, anorexia, myalgia, weight loss, arthritis/spondylitis, meningitis, or focal organ involvement (endocarditis, orchitis/epididymitis, hepatomegaly, splenomegaly).
- Nodes, liver, spleen may be enlarged
- Rare in the US, with 80-120 cases reported annually; most of these are associated with *Brucella* exposures abroad

BRUCELLOSIS

Later onset lesions in <u>bone</u>, liver

Epididymo-orchitis[1], endocarditis

sacroiliitis, tenosynovitis, meningitis



Biopsy needle

Malodorous perspiration (uncommon) "pathognomonic"[2]

1. Ip CCK, *et al. BMJ Case Rep* 2019;12:e230007. doi:10.1136/bcr-2019-230007
2. 2. Pappas G, *et al. NEJM* (2005)

BRUCELLOSIS (con't)

- WBC normal or low, anemia, plt can be low
- DX: Bone marrow/blood/tissue culture, serology, PCR
  - ***LET THE LAB KNOW YOU ARE WORRIED ABOUT BRUCELLA*** *(lab safety issue!)*
- RX: Doxy plus rifampin or strep/gent
  - TMP-SMX in pregnant or young children

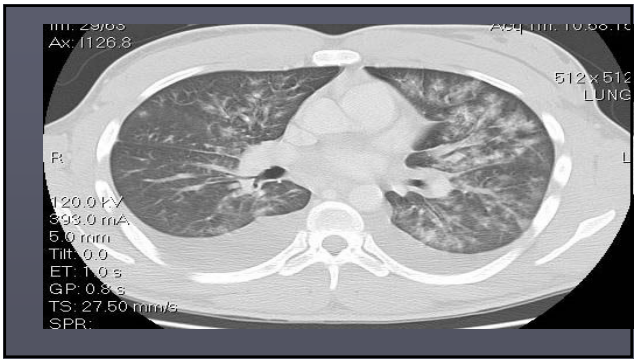
Inhalation of animal products

Case

- A 22 year old previously healthy male contractor returned from Afghanistan one week prior to presentation. He had a three day history of fever, myalgia, arthralgia, mild headache & cough. He had vomited once & had mild midepigastric, nonradiating pain.
- The facility he was hired to guard was adjacent to the path that the local sheep & goat herders used on their way to market & he had purchased a wool rug from one of the locals. He remembers shaking it hard to get rid of the dust.
- He reported that some members of his guard unit also had flu-like illness from which they recovered without treatment.

Case

- Examination was normal except for a variable temperature up to 102°F
- WBC **3.3**K, platelets **121**K, creatinine 1.2, AST **144**, ALT **154**, alk phos 88, total bilirubin 0.6
- Admission chest Xray was normal
- Ceftriaxone was begun but the patient remained febrile & had the chest CT shown on the next slide



Question #5

Which of the following is the most likely diagnosis?

A. Brucellosis
B. Anthrax
C. Leptospirosis
D. Q fever
E. Visceral leishmaniasis

Answer #5

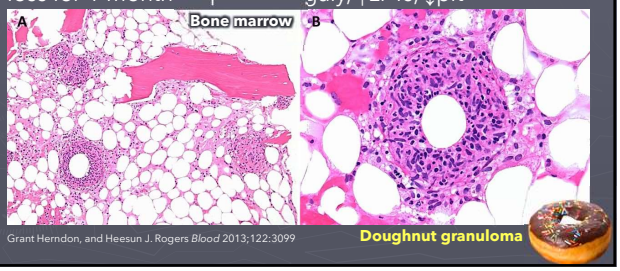
Which of the following is the most likely diagnosis?

A. Brucellosis
B. Anthrax
C. Leptospirosis
D. Q fever***
E. Visceral leishmaniasis

Q FEVER

- *Coxiella burnetii*: tiny cocco baccilus
  - Infects cows, sheep, goats, cats, etc.
- Spores survive in straw, manure, meat, *parturient tissue* for months.
  - Aerosol, ingest raw milk
- Acute pneumonia (in half cases), fever, headache, hepatosplenomegaly
- **Chronic endocarditis** on native or prosthetic valves
- **Granulomatous hepatitis**
  - **Doughnut granulomas**
- DX: serology, valve PCR; specific tissue stain; hard to culture
- RX: acute: Doxycycline or levofloxacin or azithromycin
- Chronic: doxycycline plus hydroxychloroquine

A 54-year-old man with a history of multiple myeloma presented with intermittent fevers, chills, fatigue, & weight loss for 1 month. +splenomegaly, ↑LFTs, ↓plt



Grant Herndon, and Heesun J. Rogers *Blood* 2013;122:3099

Rat Bite Fever

- Rat-bite fever (RBF): infection caused by 2 different bacteria:
  - *Streptobacillus moniliformis*, the only reported bacteria that causes RBF in North America (streptobacillary RBF): fever, chills, myalgia, headache, & vomiting; rash
    - Gram negative facultative anaerobe; can culture
    - "Haverhill fever"
  - *Spirillum minus*, common in Asia: fever, ulceration at the bite site, lymphangitis, lymphadenopathy, distinct rash of purple or red plaques
    - Darkfield needed to diagnose; culture negative
- Most infected after contact with rodents carrying the bacteria
  - Consumption of food or water contaminated with the urine & droppings of rodents carrying the bacteria.
- **Penicillin** treatment

https://www.cdc.gov/rat-bite-fever/index.html

20 – Zoonoses

Speaker: David M. Aronoff, MD

QUICK SUMMARIES

Summary of Key Exposures

- Flea bites from rodents or outdoor cats in contact with wild rodents:
  - *Yersina pestis* PLAGUE (New Mexico, Colorado, Arizona)
- Wild game or their ticks: handling, cleaning muskrats, beavers, rabbits, squirrels
  - TULAREMIA

Summary of Key Exposures

- Eating unpasteurized cheese from overseas, including goat cheese:
  - BRUCELLOSIS
  - Unpasteurized queso *could suggest* ***Listeria***
    - Stem likely to include pregnant patient

Summary of Key Exposures

- Animal **urine** on intact skin: hiker, farmer, forestry, veterinarian, swimming, falling in water or rafting in contaminated water
  - **Leptospirosis**
- Handling overseas animal **hair**, **hides**
  - **Anthrax**
- Slaughterhouses, veterinarians, parturient cat exposure, sheep handlers, living downwind of sheep/cattle farms
  - **Q Fever**

Key Clinical Syndromes

Culture negative endocarditis
- Homelessness: *Bartonella quintana*
- Animal exposure: *Coxiella burnetii*

Kaposi-like skin lesions: *Bartonella henselae*
Tender lymph node: bartonellosis, tularemia, plague
Fever + jaundice: leptospirosis
Sacroiliitis or chronic illness w/ stinky sweat: brucellosis
Rat bite in US: *Streptobacillus moniliformis*
Rat bite in Asia: *Spirillum minus*

Other Zoonoses

- There are many zoonoses
- Be sure to review them before the boards

Chikeka & Dumler *Clin Microbiol Infect* 2015; 21: 404-415

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