I was the laboratory-acquired infection: Coxiella burnetii (Q Fever) in the diagnostic laboratory

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Q Fever Facts - Coxiella burnetti

Cattle, sheep, and goats the primary reservoirs

Organisms are excreted in milk, urine, and feces

High numbers of organisms within amniotic fluid / placenta
Modes Of Transmission

Humans usually infected by inhalation of dust contaminated with dried placental material and/or excreta

Tick bites

Ingestion of unpasteurized milk

Human-to-human transmission (rare)
Diagnosis and Management of Q Fever —
United States, 2013
Recommendations from CDC and the Q Fever Working Group

General public
3.1% (adults)

Veterinarians
22.2%
Anderson et al. 2009
Whitney et al. 2009

Typical Diagnostic Lab Necropsy Area
Typical Diagnostic Lab Necropsy Area
Typical Diagnostic Necropsy Case
Diagnostic Necropsy Investigation
My Case...

- Sudden onset of severe fatigue
- Googled *zoonotic* and *chronic fatigue*
- Wanted to rule out:
  - Infectious diseases
  - Inflammatory conditions
  - Cancer/Leukemia/etc.
- Not be “stuck” with exclusion diagnosis of chronic fatigue - esp. given sudden onset

December 24, 2011
Zoonotic diseases associated with fatigue:

- **Q Fever** (serology)*
- **Brucellosis** (serology)
- **Other occupational possibilities:**
  - **West Nile Virus** (serology)
  - **Lyme Disease** (serology)
  - **TB** (skin test)

All tests results negative

*Q Fever serology not ordered by mistake
Blood Redrawn For Q-Fever Serology

February 7, 2012

- Titer 1:256 Phase II IgG = acute infection
  - Normal <1:16
- Told to see infectious disease specialist
- Filed a report of first injury at work and
- Notified lab director (administration)

**********

- No history of exposure to farm animals outside work for at least 9 months
- Tested other family members - all had negative titers to Q Fever
All veterinarians in meeting thought they would have positive titers too.
Most had attitude of “No big deal…”
No action taken
Blood Cultures

Chest Radiographs

Abdominal Cat Scan
  with IV/Intestinal Contrast Media

Serology: Q Fever, Toxoplasma, Cat Scratch Fever, Mycoplasmosis, Syphilis, EBV, HIV, CMV, fungi

CBC/Chem Panel

Except for Q Fever, all tests were negative/no significant findings
February 7, 2012

IgG > 1:256

March 26, 2012

IgG > 1:1024

Normal < 1:16
Doxycycline - 21 days

Trans-esophageal echocardiogram to look for signs of endocarditis

- No endocarditis observed
- Mild-to-moderate mitral regurgitation

First I knew that I was no longer a “typical healthy adult employee”
Treatment & Follow Up

- Titer checks to watch for signs of endocarditis (elevated phase I titer)
  - 1st yr - every month
  - 2nd yr - every 3 months
  - 3rd yr - every 6 months

March 26, 2012
State epidemiologist would get back to us with DOH questionnaires
- One for me and another for all lab employees
- University administrator
- Make no changes to necropsy protocol until after DOH investigates
- Wanted to use “outside authority figure” as source of expert information & investigation
- At that time our lab did not have robust safety committee
Laboratory director did not want to “cash in all his chips” against the expected push back to changes in protocol.

Wanted any changes to be recommended by “outside experts”.

April 20, 2012
1. **Recent Illness(es)**
   - In last 4 months have you experienced...
     - Survey had extensive list of symptoms associated with Q Fever—cough, fever, headache, hepatitis, flu-like symptoms, etc.

2. **List exposure to animals and/or animal products at work**
3. What procedures/manipulations were you doing when you had contact with animal products?

4. Where were these procedures performed?
   - i.e. bench top, fume hood, biosafety cabinet?

5. What PPE were you using?
Before All-Employee Meeting

I met with state epidemiologist, state public health veterinarian, lab director, & EHS personnel

Extensive discussion about

- Prevalence of Q Fever in SD (~2 human cases/yr)
- Likelihood that some employees would be positive already
- According to DOH the CDC does not recommend treatment if a person is asymptomatic…so why test asymptomatic individuals?

May 1, 2012
Decisions made during “pre-meeting”

- DOH would determine if/who should be tested based on likelihood of exposure
- DOH would not recommend testing asymptomatic employees
- DOH made it clear they would not make any recommendations regarding specific policy changes at the diagnostic laboratory - “not their call”
At All Employee Meeting

- I explained my own LAI
- Director told employees:
  - Department would pay for their testing if they wanted to be tested
  - Employees were told to see personal physician if they were sick or had questions about possible illness
- DOH handed out survey
  - Strictly voluntary / confidential
  - Left copies for employees not at meeting

May 1, 2012
After the All-Employee Meeting

Pregnant technician came to tell me that in microbiology section the placentas were washed in open sink before culturing (wash off grass/dirt)

Should she be concerned?

Policy changed in microbiology section a few days later:

All manipulations involving placentas (regardless of species) be performed inside biosafety cabinet

May 1, 2012
56% of respondents (11/19) had contact with animals/animal products

50% of those 11 individuals had animal contact both at work and at home (pets/livestock)
Survey Results

- Employees' animal contact at work:
  - Cattle 77%
  - Sheep 77%
  - Goats 46%
  - Pigs 54%
  - Dogs 38%
  - Horses 31%
  - Cats 23%
  - Birds 23%
  - Rodents 15%
  - Bison 8%
Survey Results

- 80% of those in contact with animals also in contact with birthing products
- 0% (none of respondents) consumed unpasteurized milk/milk products
- 32% of respondents had traveled outside the local area in the past 4 months
  - No common travel destinations
1. DOH recommended 2 individuals be tested, based on the symptoms they listed on their survey

- These individuals were technicians in microbiology section
- Both tested negative for Q Fever
DOH Recommendations

2. Mass sero-screening not recommended
   - “Once employee gets results it will be difficult to know what to do with those results.”
   - “Why test asymptomatic employees?”

3. Inform current and future employees of the risk of Q Fever, its association with birth products and advise employees to see personal physician if ill
   - When I left university 13 months later this was still not occurring.
4. Implement appropriate recommendations from these two documents “at the direction of the laboratory director to lower the risk of Q fever”

- Biosafety in Microbiological and Biomedical Laboratories 5th Edition (2009)
Based on the questionnaire results we do not find increased illness suggestive of Q Fever among workers at the facility.

Workers at the facility have a high rate of exposure to [sheep/goat/cattle] birth products which would place them at potentially higher risk than the general public.
“Personal and facility protective equipment are available and should be used as recommended [see previous references].”

- No mention of need for training/fit testing PPE
- No mention of regular drills using PPE
One Year Later
One Year Later

- No SOP’s or written policies in place for dealing with potential Q Fever cases
- No training for use of PPE
- Lack of understanding of risk of airborne disease by employees and administration
- Recent leadership changes at facility may cause further delays in changing policy

May 24, 2013
Another round of possible exposures - employees on necropsy floor without respiratory protection when goat fetus containing Coxiella burnetti was processed by the “expert”

I encouraged safety committee to try again to get respiratory policy established

I gave up and left the university
Lessons Learned - Verify Information From Experts

- Laboratory “expert” had been telling me since 2009 that we did not have Q-Fever in South Dakota
- 2007: Laboratory necropsied 5 goats infected with Coxiella burnetti
- 2011: Suspected Q Fever case (species unknown) resulting in my LAI
- 2013: Laboratory necropsied 1 goat infected with Coxiella burnetti
### Actual Incidence (in Humans) in South Dakota

- **Average 2 human cases / year**
- **90% of cases male**
- **95% Caucasian**
- **53 years - median age**
  - **Range 37-71 years**

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Lessons Learned - Is Administration On Board?

- Administration MUST be on board
- May have to “skip” individuals in chain of command to make changes
  - ALWAYS let everyone in chain of command know you are doing so - no blind-siding anyone
Lessons Learned - Don’t Forget About The People

- As the employee with the LAI...
  - I was frustrated, angry, & disappointed
  - Did not understand the continued resistance to change
  - Felt I had failed my colleagues because I couldn’t implement needed changes by myself
  - I waited too long to push for revitalization of safety committee
Lessons Learned - Is Workers Comp Ready?

- Workers comp personnel completely unfamiliar with infectious disease injury
- Even after claim was “approved” there were problems with workers comp payments to clinics
- I was receiving 6 separate bill collection letters with each monthly blood draw
- Phase I (chronic) and II (acute) IgG, IgA, IgM
Many universities purchase animals from local/regional farms

Specific-pathogen free doesn’t mean all pathogen free, especially if bought from farm setting
Lessons Learned - What Animals Are At Home?

- Besides knowing which species of animals employees work with...
  - Know which biosafety-related precautions are taken when dealing with animals prior to / during / after specific research protocol
  - Know which biosafety-related precautions are taken during clean up of animal and procedure rooms
  - Know which animals employees keep at home as pets/ livestock
Lessons Learned - Anticipate Potential Problems

- Consider the wide variety of diseases employees could conceivably “catch” either at work or at home...
  
- Should your facility have any rules on pet/livestock ownership?
  
- Should employees be going to farm shows/petting zoos/etc. while working on specific project/case?
  
- Should your facility require pre-employment serology collection and/or testing?
“New safety regulations won’t allow us to think outside of the box anymore because boxes have sharp corners.”
Be Prepared For LAI Before It Occurs

➤ We don’t have to think outside the box

➤ We do have to think beyond the end of the project (or diagnostic case)
  ➤ What do you want to happen if
    ➤ LAI is suspected?
    ➤ LAI is confirmed?

➤ Have “LAI Response Plan” ready!
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“...found no evidence to link the illness to work conducted in the laboratory....

Agricultural Select Agent Program has no further questions regarding this event and has closed this file.”