

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



Continuing Education Examination available at <http://www.cdc.gov/mmwr/cme/conted.html>.



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Seroprevalence

➤ 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



December 24, 2011

- 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

Zoonotic Rule Outs For Chronic Fatigue

December 28, 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

Explained Diagnosis During Faculty Meeting

March 2, 2012

- All veterinarians in meeting thought they would have positive titers too
- Most had attitude of “No big deal...”
- No action taken

March 26, 2012

- 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

2nd Q Fever Serology – Classic 4X Rise In Titer

Feb 7, 2012

IgG > 1:256

Mar 26, 2012

IgG > 1:1024

□ Normal < 1:16

March 26, 2012

- ▶ 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”

March 26, 2012

- ▶ 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

Started Proactive Series Of Emails...

April 2, 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

Face-to-face Meeting w/ Administration

April 20, 2012

- ▶ 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”

Health Department's Survey For Employees

May 1, 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

May 1, 2012

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

May 1, 2012

- 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?

Before All-Employee Meeting

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

May 1, 2012

- 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

After the All-Employee Meeting

May 1, 2012

- 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

Survey Responses – Only 19/100+ Returned

- ▶ 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

May 29, 2012

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

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

DOH Recommendations

Please note: An erratum has been published for this issue. To view the erratum, please click [here](#).

Centers for Disease Control and Prevention
MMWR

Morbidity and Mortality Weekly Report
Supplement / Vol. 61 January 6, 2012

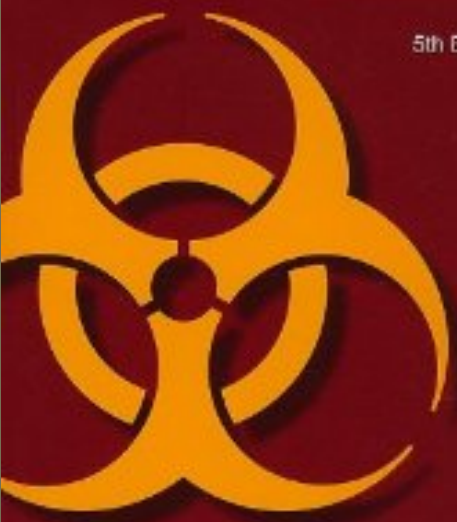
Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories

Recommendations of a CDC-convened,
Biosafety Blue Ribbon Panel

Biosafety in Microbiological and Biomedical Laboratories

5th Edition

Human Services
Director



Centers for Disease Control and Prevention
National Institutes of Health

4. Implement appropriate recommendations from these two documents “at the direction of the laboratory director to lower the risk of Q fever”

- Guidelines for Safe Work Practices in Human and Animal Medical diagnostic Laboratories (MMWR 61, January 2012)
- Biosafety in Microbiological and Biomedical Laboratories 5th Edition (2009)

DOH Conclusions

- “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.”

DOH Conclusions

- ▶ “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



May 24, 2013

- 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

SD	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Q Fever	0	0	2	2	1	1	9	4	1	2

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

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


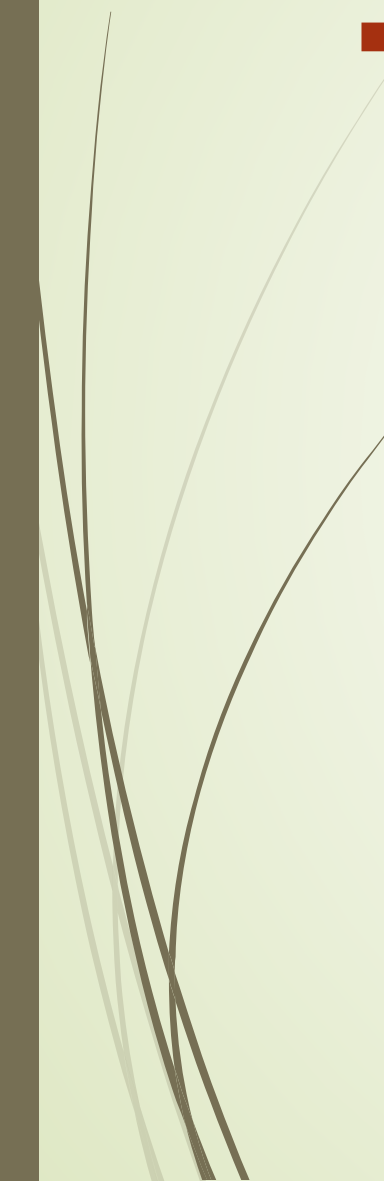
Lessons Learned – Know Where Animals Come From

- 
- 
- ▶ 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?

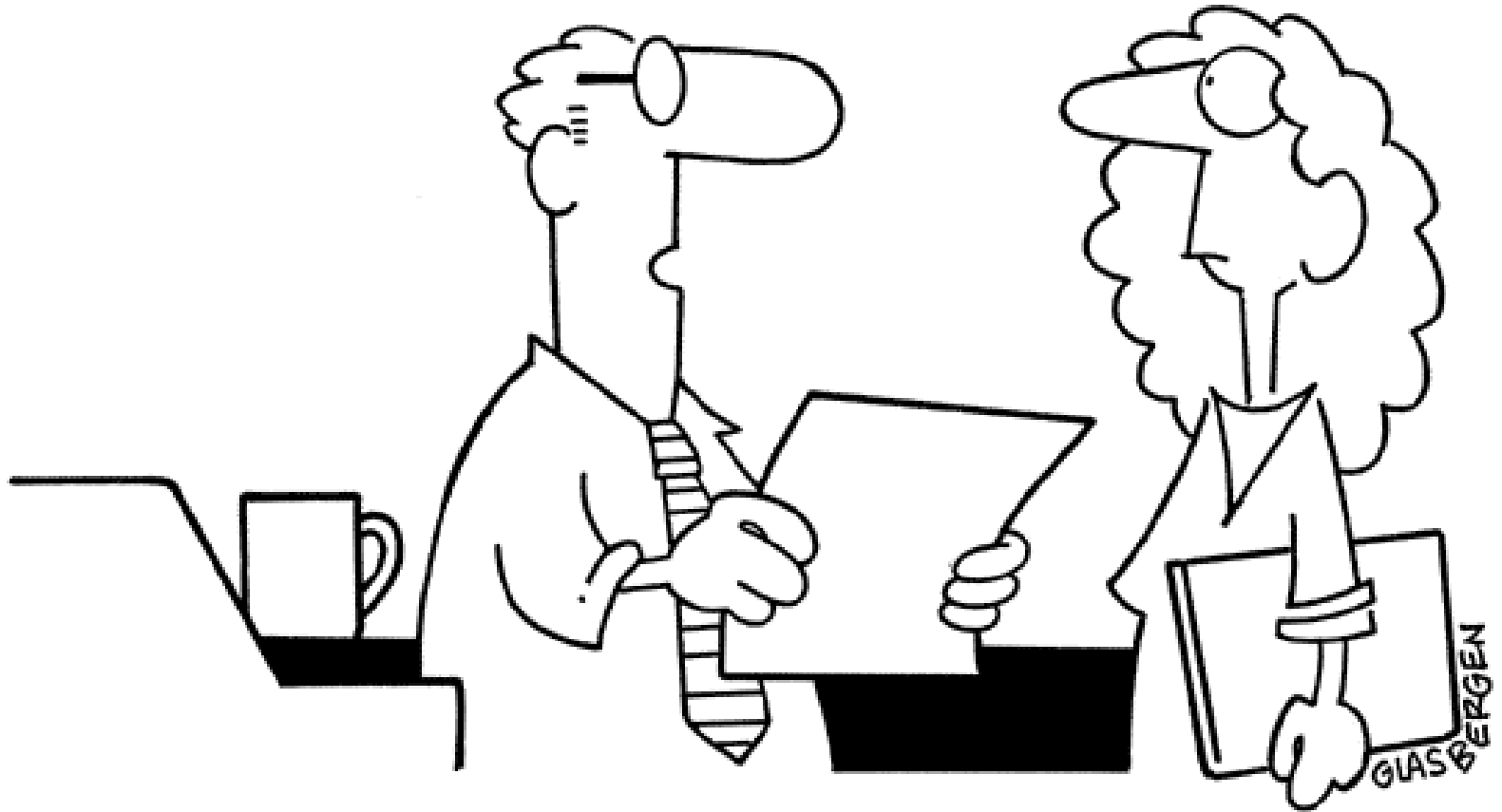
- ▶ Besides knowing which species of animals employees work with...
 - ▶ Know which biosafety-related precautions are taken when dealing with animals prior to / during / after specific research protocol
 - ▶ Know which biosafety-related precautions are taken during clean up of animal and procedure rooms
- ▶ **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?
- 

#1 Lesson Learned – Plan In Advance For LAI

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“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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Name	Q Fever Phase I IgA < 1:16 titer	Q Fever Phase I IgG < 1:16 titer	Q Fever Phase I IgM < 1:16 titer	Q Fever Phase II IgA < 1:16 titer	Q Fever Phase II IgG < 1:16 titer	Q Fever Phase II IgM < 1:16 titer
2/7/12	<1:16	<1:16	<1:16	<1:16	1:256 H	<1:16
3/26/12	<1:16	<1:16	<1:16	<1:16	>=1:1024 H	<1:16
5/14/12	<1:16	1:16 H	<1:16	<1:16	1:256 H	<1:16
6/18/12	<1:16	1:16 H	<1:16	<1:16	>=1:1024 H	<1:16
7/16/12	<1:16	<1:16	<1:16	<1:16	1:256 H	<1:16
8/15/12	<1:16	1:16 H	<1:16	<1:16	1:256 H	<1:16
9/17/12	<1:16	<1:16	<1:16	<1:16	1:256 H	<1:16
10/26/12	<1:16	1:16 H	<1:16	<1:16	1:256 H	<1:16
11/26/12	<1:16	<1:16	<1:16	<1:16	1:256 H	<1:16
1/2/13	<1:16	1:16 H	<1:16	<1:16	1:256 H	<1:16
2/6/13	<1:16	1:16 H	<1:16	<1:16	1:256 H	<1:16
3/6/13	<1:16	<1:16	<1:16	<1:16	1:256 H	<1:16
6/21/13	<1:16	1:64	<1:16	<1:16	1:256	<1:16

Form 3 (Select Agents) – November 29, 2012



November 29, 2012

United States
Department of
Agriculture

Animal and Plant
Health Inspection
Service

Veterinary Services

National Center for
Import and Export

Agricultural Select
Agent Program

4700 River Road,
Marstop 22, Unit 2,
Room 1A-07
Riverdale, MD 20737

(301) 851-3300, ext. 1
FAX (301) 734-3652
www.selectagents.gov

Dr. Gary Yarrow, Responsible Official
South Dakota State University (A20100115-0991)
North Campus Drive, SAR 2175
Brookings, SD 57007

Dear Dr. Yarrow:

On May 4, 2012, the United States Department of Agriculture received an APHIS/CDC Form 3 (Report of Theft Loss or Release of select agents) for an incident that occurred on May 7, 2012. This involved a potential laboratory acquired infection of a staff veterinarian which became ill with reported symptoms consistent with Q-fever involving the HHS- only select agent *Coxiella burnetii*. The Center for Disease Control and Prevention Division of Select Agents and Toxins conducted a site visit on June 26-27, 2012 and found no evidence to link the illness to work conducted in the laboratory. Please note that the Agricultural Select Agent Program (ASAP) thanks you for your cooperation and timely follow-up of the employees' health status.

ASAP has no further questions regarding this event and has closed this file. If you have any further comments or questions, please do not hesitate to contact Lidia Carrera at Lidia.Carrera@aphis.usda.gov or 301-851-2163.

Sincerely,

Lidia M. Carrera, Ph.D.
Compliance Manager
Agricultural Select Agent Program
USDA, APHIS
4700 River Road, Unit 2
Riverdale, MD 20737-1231

Cc:

: Thomas Miller, Safety & Occupational Health, CDC
: Wendy Kendrick, DVM
: AGR030121

- "...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."

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