WVU IACUC POLICY:
Q-FEVER

Objective

To protect West Virginia University faculty, staff, students, volunteers, and visitors from exposure to the Q fever agent (Coxiella burnetii), and other zoonotic diseases. The goal of this program is to reduce the potential for transmission of Q Fever to susceptible individuals. Although written specifically with sheep in mind, all aspects of this program apply also to goats.

Authority

Authority is delegated from the University Vice President for Research through the WVU Institutional Biosafety Committee (IBC) and Institutional Animal Care and Use Committee (IACUC); both are duly constituted standing committees of the University responsible for biological safety and the safe use of animals at all University facilities. Under this authority, all University programs are developed to provide a safe teaching, research, service, housing, and recreational environment. Occupational medicine is authorized to make a risk assessment and recommend procedures based on this assessment for the purpose of protecting members of the WVU community and the public where these risks intersect.

Background

Q fever is an infectious disease caused by the Coxiella burnetii, a bacteria with two forms, including a durable small cell variant (cyst-like) form. The cyst form is very environmentally resistant (e. g. to ultra-violet light, osmotic, high temperature, etc.) and can be distributed readily for years by aerosol or by the wind for some distance from livestock sources. Goats, sheep and cattle are the species most often infected, with sheep being the most common source for human disease. Q fever has long been considered an occupational disease associated with exposure to livestock by farmers, veterinarians, slaughter facility workers, and animal researchers who work with livestock, however risk of exposure is not restricted to these groups. The primary mode of transmission to humans is inhalation of pathogen-contaminated dust or aerosols. C. burnetii is extremely hardy and may become airborne, travelling on wind currents for up to 10 miles under ideal conditions. Thus, exposure to C. burnetii can occur without direct contact with infected animals. In fact, 63% of U.S. cases reported to CDC from 2000 to 2010 did not report contact with livestock. About 50% of human infections are asymptomatic, and many others have a flu-like illness. This infection can be severe or even life-threatening to persons who are pregnant, immune compromised, or have heart valve disease. Therefore, this program’s goal is to protect all workers, students, and other persons visiting University facilities from exposure to animals carrying the Q fever pathogen.

Fortunately, WVU is located in a state with an extremely low reported incidence of Q fever. Review of data from the CDC reveals that in 2010 there were no cases of Q fever in WV and very few cases in our surrounding states (PA, OH, MD, VA, and KY). Q fever is a reportable disease in WV, although in most years there have been no cases reported. However, despite this low overall regional risk, safeguards are needed to further decrease this risk as appropriate due to occasional sourcing of animals from outside West Virginia.
The cornerstone of the prevention program will be RT-PCR (PCR) testing, and the use and breeding of sheep or goats that are negative for *C. burnetii* mRNA. Utilization of PCR negative animals reduces the potential for human exposure to this pathogen. Repeated testing of animals, use of appropriate personal protective equipment (PPE), and risk based human serological monitoring will provide necessary protection for students, farm workers, researchers and faculty that may have contact with sheep and goats at any WVU farm.

**Reducing Exposure Risk – Animal Management**

All new sheep and goats coming to WVU for research, teaching, or other purposes must be PCR tested using blood samples collected approximately 1 week after arrival and found negative to be retained for ANY use. All newly arriving animals will be quarantined until the test results come back. If any sheep aborts a fetus or gives birth before test results are obtained, the biosafety officer should be contacted and full PPE, including respiratory protection and Tyvek coveralls, must be used. Even if an animal arrives with documentation of a negative test, they will still be required to have a Q fever negative PCR test before use. Animals euthanized or dying before testing is complete will be treated as infected for disposal and clean-up purposes.

**Newly acquired animals will be housed at a separate (non-nose to nose) quarantine site until tested and cleared.**

Animals testing PCR positive will be immediately euthanized and the original group segregated for retesting; these animals will be provided care last. No tissues may be collected from positive animals unless specifically approved by the IACUC and IBC or BSO. Personnel contact for handling or shipping is limited to personnel specifically approved by Occupational Medicine using prescribed PPE (i.e. Boots /boot covers or shoe covers (indoors); Gloves; Eye Protection / Safety glasses; N-95 masks or PAPR’s). PCR (+) animals will be euthanized for appropriate burial, 3 ft down in a compost manure pile, or incineration or disposal as biohazardous material. PCR (-) animals will be retained for teaching or research purposes.

A “positive” animal is defined as PCR (+); a “negative” animal is defined as PCR (-).

WVU shall maintain the following flocks of sheep:

**A. Flock A - Farm Flock for teaching and research –** All active breeding flock members are PCR tested for *C. burnetii*.

- ONLY this flock shall be used for undergraduate/graduate teaching and activities involving public contact.
- Lambs born to ewes in flock A shall be considered coxiellosis free, and will be tested for *C. burnetii* prior to first parity.
- If abortion occurs in this group, the placenta of the aborted fetus will be tested for *C. burnetii* via PCR.
- Any PCR-positive animal will be euthanized and the carcass will be properly disposed of as described above.
- The group of origin of a PCR (+) animal will be immediately quarantined and tested via PCR (serum or vaginal swabs) at a veterinary diagnostic laboratory.
B. Flock B – Quarantine Flock – Sheep with unknown status, including new arrivals (pregnant or non-pregnant), for use in teaching and research at the farm:

- Sheep will be quarantined separated from other sheep until PCR test results are available.
- All post-pubertal sheep will be sampled for PCR testing, approximately 1 week after arrival.
- If abortion occurs in this group, the placenta of the aborted fetus will be tested for \textit{C. burnetii} via PCR.
- PCR-positive animals will be euthanized and the carcass properly disposed of.
- PCR-negative animals will be transferred to Flocks A or C unless an animal in this group is PCR positive. In that case, they will be retested after the PCR-positive animal is euthanized.

C. Flock C – Biomedical Research Flock – Sheep with unknown status acquired from random sources, pregnant or non-pregnant, that have completed quarantine for use in research in the FARF:

- Sheep will be confirmed to be non-pregnant by monitoring progesterone and/or ultrasound scan of the uterus. Unless specifically approved in an IACUC protocol, no pregnant sheep are allowed in the FARF.

N.B. – this group of animals will be considered low-risk in the FARF based on negative \textit{C. burnetii} status, non-pregnant status, HVAC capacity and air handling in the facility (see below), medical monitoring of employees working in the facility and availability of PPE for those employees working with sheep in the facility.

\textbf{Independent Testing Sites}

CSUVDL, Colorado State University  
200 West Lake Street - 1644 Campus Delivery  
Fort Collins, CO 80523-1644  
970-297-1281 phone    970-297-0320 fax

CAHFS – Davis Laboratory, University of California  
620 West Health Sciences Drive  
Davis, CA 95616  
530-752-8700 phone    530-752-6253 fax  
cahfsdavis@cahfs.ucdavis.edu

USDA – APHIS – NVSL, Attn: Sample Processing Department  
1920 Dayton Ave.  
Ames, IA 50010  
Ph: (515) 337-7514  Fax: (515) 337-7568
FARF and Other Indoor Facilities Housing Sheep at WVU Operated Facilities

Indoor housing is defined as a space with 4 solid outside walls and a ceiling with no un-assisted movement of outside air through the space. All indoor housing, research, and/or procedure areas at the Food Animal Research Facility (FARF) or elsewhere for sheep and goats will be confined to areas having no recirculation of air to other rooms (i.e., surgery area, and connecting corridor). Rooms without this added protection will be posted with a sign saying “Storage Area.”

All air supply to surgery or procedure rooms or rooms in the FARF housing sheep or goats shall be HEPA filtered and if recirculated, will recirculate only to the place of origin.

Because of the significantly increased risk of transmitting C. burnetii during lambing, lambing is not permitted in the FARF or indoor housing unless the PI receives approval from IACUC and all animals in that group have received a negative PCR test. This applies to all university operated facilities. Ewes shall be screened for pregnancy prior to entering the FARF or other enclosed structures.

EH&S personnel shall perform semi-annual inspections of all sheep and goat facilities and practices. They will audit work practices, PPE, and engineering controls. These inspections shall be coordinated with the efforts of the University Biosafety Officer.

Reducing Susceptibility - Employees

Initial biosafety training is required for all individuals that will work with, and around, sheep and goats. The training will cover information about Q fever and methods to reduce exposure. Training will cover the Occupational Health Program and needed Personal Protective Equipment. Human health changes that would necessitate contacting Occupational Medicine such as the development of Q fever, pregnancy, heart valve surgery, and the use of immunosuppressive drugs will be reviewed. WVU Occupational Medicine will be involved in personnel monitoring and will assist with providing appropriate PPE for all personnel who work with sheep at the WVU farms.

The University Biosafety Officer or a Veterinarian will provide Q fever awareness training and instruction in techniques to decrease exposure risk.

Participation in the Animal Handler Medical Monitoring Program is required for all individuals working with, or in close proximity to, sheep and goats or for those entering indoor housing, research, and/or procedure areas used for sheep or goats. See program details below. Students report to student health.

WVU Employees or other WVU affiliates, who develop a febrile illness while working with sheep and goats (or their feces, urine, tissues, or bodily fluids), will be directed to seek immediate medical care at WVU Occupational Medicine or the WVU Hospitals Emergency Department. Similarly, ill students shall contact WVU Student Heath or go directly to the WVU Hospitals Emergency Department.

Human Serology Monitoring

A positive Q Fever IgG titer suggests prior infection and present immunity from Q fever. This finding makes the use of Personal Protective Equipment (PPE) unnecessary for most contact with sheep and goats. This protection could be lost if there is interference with immune system function. Employees may opt to be tested by WVU Occupational Medicine. Human to human transmission of Q fever is extremely rare.
Non-compliance

Compliance with this program is the responsibility of the employee’s supervisor, faculty instructor, and veterinary oversight. Failure to comply with program requirements may result in the IACUC rescinding an investigator’s animal use or Institutional biosafety protocol approval and the ability to procure or have any contact with animals.

Responsibilities

Environmental Health & Safety

- Educational Program (in collaboration with OLAR)
- Routine Inspections/Audits
- Respirator user training for those requesting it (in collaboration with Occupational Medicine)

WVU Occupational Medicine

- Medical Monitoring Program design and operation
- Health Risk assessments for all WVU personnel
- Health screens for all WVU personnel and students with animal contact
- Respirator Fit Tests for those requesting it
- Support Respirator user training

Davis College of Agriculture and WVU Farm Management

- May assist with coordinating animal procurement for PIs
- May assist with routine animal care
- May assist with animal certification, testing risk assessment and quarantine
- Provide PPE for their animal care workers

IACUC

- Overseeing animal use and procurement
- Identifying protocol and animal care staff personnel, students, and faculty with likely contact with University livestock potentially carrying Q fever (especially sheep and goats)
- Ensuring completion of the annual animal user health questionnaire by all personnel, students and faculty.

WVU Student Health

- Health Assessments for non-employee students (in collaboration with WVU Occupational Medicine)

Principal Investigator or Similar Activity Leader

- Ensures that all persons with sheep or goat contact have been trained and are using personal protective equipment when expected, and that they complete the annual animal health questionnaire.
- OLAR will provide PPE for all activities in the FARF
Medical Monitoring Program for Q fever

Requirements
All those who work with, or in close proximity to, sheep and goats, or those entering sheep and goat indoor housing, or procedure areas, must be enrolled in the animal contact health program. Persons who will be working with any animals in flock B or C indoors or coming into contact with birth products from this group may if they desire complete respirator user medical assessment and have annual fit testing completed by WVU Occupational Medicine.

Generally, risk assessments for protocol activities are part of the protocol approval process. Risk assessment for non-protocol contact with animals (i.e. the animal care activities) will be done based upon the activities of the individual and the location, frequency, and type of work done with sheep and goats.

The Animal Contact Medical Monitoring Risk Assessment includes:
- Completion of an on-line medical history questionnaire
- If the answers on the annual questionnaire suggest increased risk or need for medical restrictions, those persons shall be evaluated in the Occupational Medicine clinic.
- Clinic evaluation for all persons whose activities require use of a respirator

This information is evaluated by WVU Occupational Medicine Physicians or Licensed Health Care Professionals to determine potential health risks to you and whether further clinical interaction or preventive steps may be necessary to protect your health. The above animal contact medical monitoring risk assessments are to be done prior to exposure or following a change of job status or change in the nature of animal contact, and annually.

Individuals identified as being at an increased risk for developing Q fever (see below) shall be scheduled for a medical consultation/assessment at WVU Occupational Medicine to discuss their risk of getting Q fever and of developing severe complications. Restrictions to manage that risk may be recommended and may include reassignment to another unit which does not require animal contact, as determined by Occ Med, the Davis College and WVU Human Resources. The reasons for this will be thoroughly explained during the health consultation.

Conditions with an increased risk for developing Q fever or complications from Q fever:
- Heart Valve Disease
- Pregnancy
- Prosthetic heart valves
- Liver disease
- Altered immune system

Respirator users must obtain medical clearance from WVU Occupational Medicine. Occupational Medicine will then provide a fit test for an appropriate respirator. Note that respirator user medical clearance and respirator fit testing is required on an annual basis. Failure to appear for annual medical evaluations or fit testing will result in notification of the supervisor and Human Resources, with potential for disciplinary action and/or activity suspension.

If a Q fever positive animal is identified at the University, all potentially exposed individuals shall undergo further medical evaluation through WVU Occupational Medicine, which may include Q fever titer testing.
Personal Protective Equipment

Appropriate personal protective equipment (PPE) will be available for all WVU persons interacting with sheep that are not known to be Q Fever-free and all personnel performing high-risk activities, such as working with pregnant or delivering animals of unknown Q fever status on the WVU farms.

Suggested PPE for personnel working in indoor housing, procedure, and research areas:

- Disposable or onsite-laundered coveralls, jumpsuits, or scrubs
- Boots, booties, or dedicated footwear
- Gloves
- Eye Protection / Safety glasses
- Surgical Mask or N-95 respirator*
- Hair cover

* Surgical Masks may be used by most persons for work with flock A or B animals. All individuals may choose to voluntarily wear an N-95 respirator. Individuals with increased risk may be required to use an N-95 or N-100 respirator to work with these animals.

Suggested PPE for personnel conducting obstetrical procedures or surgery/necropsy of pregnant animals conducted indoors:

- Disposable or onsite-laundered coveralls, jumpsuits, or scrubs
- Boots, booties, or dedicated footwear
- Gloves
- Eye Protection / Safety glasses
- N-95 or N-100 respirator (filtering facepiece, elastomeric, or PAPR)
- Hair cover

PPE required for all personnel contacting placental tissue or amniotic fluid (i.e. at parturition or abortion) OR any close contact or feces/urine exposure with animal of unknown Q fever status:

- Disposable or onsite-laundered coveralls, jumpsuits, or scrubs
- Boots, booties, or dedicated footwear
- Gloves
- Eye Protection / Safety glasses
- N-95 or N-100 respirator (filtering facepiece, elastomeric, or PAPR)
- Hair cover

NOTES FOR PERSONAL PROTECTIVE EQUIPMENT:

- Surgical Masks may be used by most persons for work with flock A or C animals. Individuals with increased risk may be required to use a respirator to work with these animals. Work with sheep in flock B involving contact with placental tissue or amniotic fluid, feces and/or urine requires use of an N-95 or N-100 respirator.
• All persons using a respirator require respirator safety education (from EH&S) plus respirator medical assessment and annual fit testing provided by WVU Occupational Medicine. Failure to keep the certifications up to date will lead to protocol suspensions or removal from an active protocol.

• All persons using a respirator require respirator safety education, respirator medical assessment and annual fit testing provided by WVU Occupational Medicine. N-100 respirators provide the same protection as HEPA filtration.

• All disposable PPE shall be left onsite in biohazard bags. All reusable PPE shall be appropriately disinfected. Surgical scrubs and gowns shall be autoclaved prior to laundering. All animal contact clothing should be laundered on site.

**Disinfectants Appropriate for Sheep and Goat Work**

**Surfaces in Surgical and Laboratory Areas**
- Fresh-made 10% solution of household bleach
- 10% solution of H₂O₂ (Hydrogen Peroxide)
- 5-10% solution of Lysol concentrate (phenol-based)

**Large Contaminated Items that cannot be Autoclaved**
- Detergent to remove excessive organic debris, then Fresh-made (expiration dated) 10% solution of bleach

**Indoor Housing Facilities**
- Fresh-made 10% solution of household bleach
- 10% solution of H₂O₂
- 5-10% solution of Lysol concentrate (phenol-based)
- Large scale decontamination (gassing or fogging) of facilities with Paraformaldehyde, Chlorine Dioxide, or vaporized hydrogen peroxide may be performed by a trained professional, after approval from EH&S, the Biosafety Officer, or the attending veterinarian.

**Outdoor Pastures and Sheds**
- Lime

**Inappropriate Disinfectants**
- Ethanol
- 1% phenol
- 1% formalin
- Quaternary ammonium compounds
- Wexcide®
- Broadcide®
- Cavicide®

**Education for those working with Sheep and Goats**
The following pages consist of a handout providing a succinct overview of the key health risks related to working with sheep and goats.
Information about Q Fever

- What is Q fever?
Q fever is an infectious disease caused by the Coxiella burnetii bacteria for which sheep and goats are carriers and humans can be infected. Although about 50% of human infections are asymptomatic, this infection can be severe or even life threatening in persons who are pregnant, immune compromised, or have heart valve disease. About 75% of people diagnosed with Q fever are sick enough to be hospitalized, and less than 2% of persons who get acute Q fever die.

- How can I get Q fever?
Almost any contact with an infected sheep or goat can pass the bacteria to you. The highest risk is during lambing, since the bacteria can grow especially well in the amniotic fluid, however even non-pregnant animals can cause infections.

- Is there anything I can do to decrease my risk?
  - Be certain that animals have completed testing before you have any contact.
  - Use personal protective equipment when working with sheep or goats, as outlined in the program. Check with your supervisor, the veterinarian, or WVU Occupational Medicine if you are uncertain what protective equipment is required for a specific activity.
  - If your personal health changes (especially pregnancy, heart valve disease, or immune status changes), contact WVU Occupational Medicine at 304-293-3693 to discuss your risk of acquiring the disease.

- How will West Virginia University help protect me from this risk?
The University tests animals at the University farms. The flocks used for teaching and community outreach are closed flocks tested annually to minimize the risks to students and the community. Other animals are tested upon arrival at the farm before they are used for research activities. Any animals that test positive are removed from the farm.

- All persons working with animals are required to have completed the Animal Contact Medical Monitoring Risk Assessment Program requirements through WVU Occupational Medicine. If you report any health conditions that could increase your risk, you will be evaluated in the WVU Occupational Medicine clinic, and additional personal protection equipment may be required to continue animal contact.

- In the unlikely event that an animal is identified with Q fever after WVU personnel had been working with it, testing and any needed medications will be provided by WVU Occupational Medicine.

- What are the symptoms of Q fever?
After an incubation period of 2–3 weeks, acute Q fever causes a nonspecific febrile illness, perhaps accompanied by pneumonia or hepatitis. The most frequently reported symptoms include fever, fatigue, chills, and muscle aches. Severe, debilitating headaches are common, with pain behind the eyes and increased by light. It is common for these symptoms to be mistaken initially for other diseases.

Pneumonia can occur, ranging from mild to severe, and patients may have accompanying severe headache, muscle aches, and joint pain. An unproductive cough is often present in 50% of patients. Sore throat is uncommon. Fever usually lasts approximately 10 days in untreated patients (fever may range from 5 - 57 days), and may last longer in immune compromised or older patients.
- Is there any treatment for Q fever?
Coxiella burnetii is a bacterium that is responsive to several antibiotics. The majority of cases improve within 72 hours of starting antibiotics. About 70% of those who get acute Q fever are hospitalized, but outpatient treatment with oral antibiotics is quite effective once the diagnosis is made.

- Are there any health conditions that could put me at increased risk of getting Q fever or having severe consequences from Q fever?
There are several medical conditions that will put you at increased risk for developing Q fever or having the severe consequences of the disease. These include:
  - Heart Valve Disease
  - Pregnancy
  - Prosthetic (Artificial) Heart Valves
  - Liver Disease
  - Altered Immune System (HIV, Use of Steroids, Chemotherapy, and Immune Modulator Drugs used for Rheumatologic and Gastrointestinal diseases)

- What should I do if I have symptoms that could be caused by Q fever?
If you develop symptoms that could be related to Q fever exposure, contact WVU Occupational Medicine (304-293-3693) or go to the WVU Hospital Emergency Room. Make sure to explain to any healthcare professional evaluating you that you work with sheep or goats and Q fever could be a possibility. Tell them that WVU Occupational Medicine is available to assist them.

- Are there any other diseases I could get from sheep or goats?
Orf: This viral disease causes papules and pustules (small blisters) in the animals, mostly often on or near the hairline or on the lips and muzzle. This virus can also infect people, causing blisters on infected body parts. It does not usually cause systemic disease, and lesions usually resolves without treatment. However, people with impaired immune function can get a progressive and even life-threatening infection. Serious damage to the eye can occur if the eye is infected by Orf, even in healthy individuals. Prevention is through monitoring animals for disease and using gloves during animal contact.

Anthrax: This bacterial infection comes from exposure to wool or skin of infected animals. Animals are generally vaccinated, which decreases the frequency of disease. Infected animals typically live only a few hours from the onset of symptoms. Humans may be infected through skin or respiratory exposure to infected animals. Prevention is through the use of protective equipment including respirators when handling dead animals of unknown cause.

References:

CDC Web Page on Q Fever:  [http://www.cdc.gov/qfever/](http://www.cdc.gov/qfever/)
CDC MMWR from March 2013: [http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6203a1.htm](http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6203a1.htm)