

Cattle, Pigs, Sheep

The following document describes common types of zoonotic illnesses encountered when working with the indicated species. This is not an exhaustive list and the possibility of zoonotic disease should be considered every time work is conducted with animals. Specific-pathogen-free status in laboratory animals tests only for the presence of particular pathogens and is NOT an assurance that the animal is pathogen-free or that it cannot transmit zoonotic diseases. PPE and experimental practices appropriate to the specific task should be followed when working with any animal species. EHS recommendations are made during review of your IACUC protocol –additional questions about the potential for zoonotic disease exposure should be directed to your EHS representative.

If you have had an exposure and/or are showing symptoms of illness, and need medical attention refer to the information in the [University of Michigan's Bite Scratch Protocol](#)

Bacterial

Disease:	BRUCELLOSIS (cattle, pigs, sheep)
Description of Disease:	In animals, this disease is also known as Bang's disease or contagious abortion. In humans, it is referred to as Mediterranean fever or undulant fever. Brucellosis is caused by infection with bacteria within the genus <i>Brucella</i> including <i>Brucella abortus</i> , <i>B. canis</i> , <i>B. melitensis</i> , <i>B. ovis</i> , and <i>B.suis</i> . Animals most frequently infected include cattle, sheep, goats, and pigs. It is unlikely that animals raised for use in research will harbor the disease.
Symptoms in Animals:	Symptoms in animals include abortion, infertility, testicular abnormalities, and joint inflammation. Infected animals may also not display any signs of illness.
Transmission and	Transmission to humans in a laboratory setting is by

Cattle/Pigs/Sheep Zoonotic Disease Risks

1

June 2020

Cattle, Pigs, Sheep

Symptoms in Humans:	the direct contact of broken skin or the mucous membranes (such as eyes or mouth) with infected animal birth products (aborted fetuses, fetal fluid and membranes, and secretions), blood, or urine. The bacteria can also be transmitted through inhalation of infectious aerosols. Symptoms usually develop in humans within 2 months of infection. Clinical signs in humans may include fever, headaches, nausea, appetite and weight loss, orchitis (inflammation of testicles), painful joints, and swollen lymph nodes. The chronic (undulant) form may present as acute and intermittent attacks of illness and fever that without treatment, can persist either continuously or intermittently for years.
Prevention:	Transmission of <i>Brucella</i> can be prevented through utilization of good personal hygiene and strict sanitization methods, and by wearing personal protective equipment especially when working with pregnant host species or their birth products. Birth products should be disposed of promptly and carefully. Contaminated surfaces should be appropriately disinfected.
Additional Information:	https://www.cdc.gov/brucellosis/index.html

Disease:	CAMPYLOBACTERIOSIS (pigs, sheep, cattle)
Description of Disease:	<i>Campylobacter spp.</i> bacteria can be found in numerous species of animals where the bacteria frequently colonizes the gastrointestinal tract. Infected sheep and pigs have been most frequently implicated in zoonotic disease transmissions.
Symptoms in Animals:	Infected pigs may display diarrhea abortion and fever whereas sheep may have abortions or stillbirth. Cattle are usually not affected clinically but can have diarrhea. An infected animal may not show any signs of illness and still shed this bacteria.

Cattle/Pigs/Sheep Zoonotic Disease Risks

2

June 2020

Cattle, Pigs, Sheep

Transmission and Symptoms in Humans:	In the laboratory environment, <i>Campylobacter spp</i> is transmitted to humans when a person ingests infected fecal material such as when a fecally contaminated glove or piece of equipment contacts a human's mucous membranes. Infected humans may either display no signs of illness or may develop abdominal pain, malaise, fever, nausea, vomiting, or diarrhea. Illness usually occurs within 2-5 days of exposure.
Prevention:	The practice of good personal hygiene, such as handwashing after handling animals and their environment, the use of personal protective equipment, and effective environmental sanitation are most important in preventing disease transmission to personnel.
Additional Information:	https://www.cdc.gov/campylobacter/index.html

Disease:	Chlamydia abortus (sheep)
Description of Disease:	<i>Chlamydia abortus</i> causes enzootic abortion of ewes and has been reported in most countries around the world.
Symptoms in Animals:	Abortion in the affected ewes typically occurs in the last few weeks of pregnancy. If the dam does carry to term, the surviving lamb may be weak, with a low birth weight or the lamb may be still born. Usually there are no clinical signs present in the ewe before the abortion. Reddish-brown vaginal secretions may be present for several days after the abortion, but otherwise the ewe is healthy.
Transmission and Symptoms in Humans:	Transmission can occur through ingestion, direct contact with mucous membranes, or inhalation of aerosols. Large amounts of the organism are present in the uterus and placenta of sheep and can be released into the environment during abortion and birthing. Shedding of the organism can occur up to 2-3 weeks after an abortion. Initial symptoms in humans tend to be non-specific. People can have flu-like symptoms including fever, headache, dizziness, vomiting, joint pains, and cough. In pregnant women, abortions can occur and if left untreated, infection can develop into septicemia and liver and renal problems.

Cattle/Pigs/Sheep Zoonotic Disease Risks

3

June 2020

Cattle, Pigs, Sheep

Prevention:	Lab workers should practice good hygiene including hand washing and disinfecting foot wear, and wear appropriate PPE. Pregnant women are susceptible to <i>C. abortus</i> at all stages of pregnancy and should therefore avoid handling pregnant or aborting sheep whenever possible.
Additional Information:	http://www.cfsph.iastate.edu/Factsheets/pdfs/chlamydiosis.pdf

Disease:	ERYSIPELAS (pigs and sheep)
Description of Disease:	Erysipelas is a disease caused by the bacteria <i>Erysipelothrix rhusiopathiae</i> . In the laboratory, it is most frequently a disease of pigs and less frequently of sheep.
Symptoms in Animals:	Infected pigs may show signs of fever, lethargy, loss of appetite, painful joints, stiff gait, and sudden death. Diamond-shaped skin discoloration and necrosis of the ear and tail tips can also be seen. In growing lambs, infection can lead to sudden moderate to severe joint swelling and lameness.
Transmission and Symptoms in Humans:	Erysipelas is transmitted to humans by direct contact with infected animals, tissues, or feces. Infected humans most frequently exhibit well-defined skin lesions such as redness or swelling but may also exhibit fever, endocarditis (inflammation of the inner lining of the heart), encephalitis (inflammation of the brain), and septic arthritis within 1-3 days of exposure.
Prevention:	The practice of good personal hygiene, such as hand washing after contacting animals and their environment, the use of personal protective equipment, and effective environmental sanitation are most important in preventing disease transmission to personnel.
Additional Information:	https://dermnetnz.org/topics/erysipeloid/

Disease:	LEPTOSPIROSIS (sheep)
Description of Disease:	<i>Leptospira interrogans</i> , a spirochete bacteria, can infect a wide range of laboratory animal species including pigs,

Cattle/Pigs/Sheep Zoonotic Disease Risks

4

June 2020

Cattle, Pigs, Sheep

	sheep, and cattle.
Symptoms in Animals:	Infection can result in varying symptoms across species. Cattle and sheep can be asymptomatic or may experience fever, loss of appetite, yellowing of skin and mucous membranes, and dark urine with acute infections or reproductive failure such as abortion and stillbirth with chronic infections. Pigs also exhibit reproductive failure with infection.
Transmission and Symptoms in Humans:	Transmission to humans may occur if the individual's abraded skin or mucous membranes come in contact with urine or tissues of infected animals or equipment contaminated with these substances. It is also possible for humans to contract the disease through inhalation of fine particles of contaminated fluids that may be generated during high-power washing of contaminated equipment. Infected humans may be asymptomatic or have fever, chills, weakness, pain, and headache. The severe form of the disease results in impaired kidney and liver function, as well as mental status changes, and possible death.
Prevention:	The best methods of control are good sanitation with appropriate animal waste control and appropriate use of personal protective equipment when handling animals.
Additional Information:	https://www.cdc.gov/leptospirosis/index.html

Disease:	Q FEVER (sheep and cattle)
Description of Disease:	Q fever is a disease caused by the bacteria <i>Coxiella burnetii</i> . Sheep, goats, and cattle (ruminants) are the laboratory species most frequently infected.
Symptoms in Animals:	Infected animals are usually asymptomatic but may have loss of appetite or undergo late abortion.
Transmission and Symptoms in Humans:	The bacteria is shed in the milk, feces, and urine of infected animals; a high number of bacteria can be shed when an infected female is pregnant or has recently given birth. Humans can become infected by exposure to environments or equipment contaminated with the excretions of infected animals or to placental membranes and fetuses of infected

Cattle/Pigs/Sheep Zoonotic Disease Risks

Cattle, Pigs, Sheep

	<p>animals. Infectious material often dries up leading to transmission primarily by aerosol. The organism is highly infectious, with less than 10 organisms resulting in infection, and it can be very resistant to cleaning and survive for long periods in the environment. In most infected humans develop an acute illness that could be mistaken for the flu. Symptoms vary in severity and duration with some infected humans being asymptomatic whereas others develop a flu-like illness with fever, headache, chest pain, a nonproductive cough, and pneumonia. Such symptoms generally resolve in 2 weeks but serious systemic inflammation can occur in the liver, kidney, and heart. Q fever can cause miscarriage or other problems with the human fetus.</p>
Prevention:	<p>Individuals who have heart conditions, who are immunocompromised, or who are pregnant or thinking about becoming pregnant, are at particular risk for complicated infections and should consult with their physician prior to working with or near ruminants. Enhanced personal protective equipment including N95-type respirators or face shields should be used when handling pregnant ruminants.</p>
Additional Information:	<p>https://www.cdc.gov/qfever/index.html</p>

Disease:	SALMONELLOSIS (pigs, sheep, cattle)
Description of Disease:	<p>Many species are susceptible to infection with bacteria within the genus <i>Salmonella</i> including pigs, sheep, and cattle.</p>
Symptoms in Animals:	<p>Infected animals may display no signs of infection or be severely affected with fever, diarrhea, with or without blood, or straining.</p>
Transmission and Symptoms in Humans:	<p>In the laboratory environment, <i>Salmonella spp</i> may be transmitted to humans when a person ingests infected fecal material such as when a fecally contaminated glove or piece of equipment contacts a human's mucous membranes. Infected humans may have</p>

Cattle/Pigs/Sheep Zoonotic Disease Risks

6

June 2020

Cattle, Pigs, Sheep

	diarrhea, with or without blood, fever, nausea, and stomach cramps or pain. More severe signs and symptoms may develop especially in individuals with compromised immune systems. Onset of signs will usually occur 7-72 hours after infection and last for 4-7 days.
Prevention:	The practice of good personal hygiene, such as hand washing after handling animals and their environment, the use of personal protective equipment, and effective environmental sanitation are most important in preventing disease transmission to personnel.
Additional Information:	https://www.cdc.gov/salmonella/

Viral

Disease:	ORF DISEASE (sheep)
Description of Disease:	Orf disease is a parapoxvirus infection that is common in many sheep flocks and goat herds throughout the United States. Infection in animals is commonly known as sore mouth or scabby mouth.
Symptoms in Animals:	The disease affects all age groups, although young or immunocompromised animals are most often and most severely affected. Orf produces crusty, proliferative, pus-filled blisters on the lips, nostrils, mucous membranes of the oral cavity, and urogenital orifices of infected animals.
Transmission and Symptoms in Humans:	Orf virus is transmitted to humans by direct contact with virus-filled matter originating from a lesion. The virus is very hardy and can contaminate equipment, supplies, or even the skin and wool of uninfected sheep. Humans can become infected from these sources as well as directly from infected animals. Onset of disease in humans occurs when the virus is introduced into a break in the skin resulting in the

Cattle, Pigs, Sheep

	development of a single lesion on the hand, arm, or face. The lesion is sometimes mistaken for an abscess. Progression to generalized disease is considered rare.
Prevention:	Personnel who handle sheep are urged to wear protective clothing and gloves and to practice good personal hygiene.
Additional information:	https://www.cdc.gov/poxvirus/orf-virus/index.html

Fungal

Disease:	RINGWORM (DERMATOPHYTOSIS)
Description of Disease:	Ringworm can be common in livestock. The causative organism is a fungus, not a worm, that may infect fur/hair, skin, and nails.
Symptoms in Animals:	Infected animals may not exhibit any signs of infection. If clinically affected, pigs can have raised red lesions arranged in a circular pattern and cattle and sheep may have distinct areas of hair loss with overlying scale or crust.
Transmission and Symptoms in Humans:	Ringworm can be transmitted to humans by direct contact with infected areas of skin or through contact with an infected animal or contaminated equipment or environment. The organism can persist in the environment for extended periods of time. Lesions in humans may appear as flat, scaly, ring-shaped lesions in the skin. These lesions can increase in diameter and the center of the lesion often returns to a normal appearance. Some lesions can be more inflamed with redness and itchiness. Clinical signs often appear within 4-14 days of the exposure.
Prevention:	Transmission of an infection can be prevented through use of appropriate personal protective equipment including gloves and protective clothing and through appropriate environmental sanitation.
Additional information:	https://www.cdc.gov/fungal/diseases/ringworm/index.html

Cattle/Pigs/Sheep Zoonotic Disease Risks

8

June 2020

Cattle, Pigs, Sheep

Parasites/Protozoa/Prions

Disease:	BALANTIDIASIS
Description of Disease:	Balantidiasis is caused by the large protozoan <i>Balantidium coli</i> with pigs as the primary reservoir and the most common animal source of infection in humans.
Symptoms in Animals:	Affected animals may not display any signs of illness or may have diarrhea with or without blood or mucus.
Transmission and Symptoms in Humans:	The disease is transmitted by the fecal-oral route. Humans may be asymptomatic or have diarrhea, abdominal pain, nausea, vomiting, or stools containing blood or mucus. If the infection is left untreated, the colon can become perforated.
Prevention:	Transmission of the protozoan can be prevented through use of appropriate personal protective equipment (including gloves and protective clothing), strict hygiene, and appropriate environmental sanitation.
Additional information:	https://www.cdc.gov/parasites/balantidium/

Disease:	CRYPTOSPORIDIOSIS
Description of Disease:	Cryptosporidiosis is a protozoal infection that affects many mammals including ruminants and pigs.
Symptoms in Animals:	Clinical disease in animals is most frequently diagnosed in young livestock who have not developed a sufficient level of immunity to the organism. Calves and lambs may be subclinical or have severe watery diarrhea.
Transmission and Symptoms in Humans:	The organism is most frequently transmitted by ingestion of contaminated materials. The organism can survive in the environment for extended periods. If infected, humans may not have any signs of illness or have severe watery diarrhea, abdominal cramps,

Cattle, Pigs, Sheep

	dehydration, fever, nausea, vomiting, or weight loss. These symptoms usually occur within 1 to 2 weeks of exposure. In otherwise healthy individuals, the illness is usually self-limiting (1 to 2 weeks) and only supportive care is required. However, a more severe and chronic disease may develop in immunocompromised patients.
Prevention:	Transmission of the disease can be prevented through utilization of good personal hygiene and by wearing personal protective equipment, especially when working with young animals with diarrhea.
Additional information:	https://www.cdc.gov/parasites/crypto/index.html

Disease:	GIARDIASIS
Description of Disease:	Numerous mammals including pigs, sheep, and goats, can be natural hosts for the protozoa giardia.
Symptoms in Animals:	Infected animals may not show any signs of illness or may exhibit diarrhea, weight loss, vomiting, or anorexia. Management of infected animals includes sanitation of the environment, prompt removal of feces, and treatment with antiparasitic agents.
Transmission and Symptoms in Humans:	Giardia is transmitted to humans when a person ingests infected fecal material such as when a fecally contaminated glove or piece of equipment contacts a human's mucous membranes. Infected humans may be asymptomatic or can develop chronic or intermittent diarrhea, a loss of appetite, abdominal cramps, vomiting, fever, and weight loss.
Prevention:	The practice of good personal hygiene, such as hand washing after handling animals and their environment, the use of personal protective equipment, and effective environmental sanitation are most important in preventing disease transmission to personnel.
Additional information:	https://www.cdc.gov/parasites/giardia/index.html

Cattle/Pigs/Sheep Zoonotic Disease Risks

10

June 2020

Cattle, Pigs, Sheep

Disease:	Variant Creutzfeldt-Jakob Disease (vCJD)
Description of Disease:	Variant Creutzfeldt-Jakob disease (vCJD) is a rapidly progressive neurodegenerative disease caused by an infectious prion which is an abnormal, misfolded protein. Unlike vCJD, classic CJD is caused by spontaneous transformation of normal prion proteins into abnormal prion proteins and is not linked to any animal disease.
Symptoms in Animals:	Bovine spongiform encephalopathy (BSE), also known as mad cow disease, is a progressive neurological disorder of cattle is caused by infectious prions thought to be related to the causative prions in vCJD. It is transmitted to cattle by contaminated feed. Affected animals may display changes in temperament, such as aggression, incoordination and difficulty walking and standing, decreased milk production, and weight loss.
Transmission and Symptoms in Humans:	vCJD in humans is thought to be linked to consumption of meat from cattle suspected of having BSE. The primary concern of vCJD transmission in laboratory workers is by accidental parenteral inoculation or ingestion when working with bovine neuronal tissues, such as brain and spinal cord. The median duration of the illness for vCJD is 14 months, and the median age at death is 28 years. Symptoms include early psychiatric symptoms such as anxiety, apathy, delusions, depression, persistent painful sensations, incoordination when walking progressing to muscle jerks, dementia, and death. To date, there have been no confirmed cases of laboratory workers acquiring vCJD from neural tissue. However, vCJD is a serious and fatal disease in humans, and it is extremely important to take the appropriate precautions when handling bovine brain matter and spinal cord.
Prevention:	BSE agents are highly resistant to heat, radiation, and chemical inactivation. Follow EHS guidelines regarding instrument and environmental sterilization. All lab workers handling bovine brain matter and spinal tissue must wear appropriate PPE at all times and

Cattle/Pigs/Sheep Zoonotic Disease Risks

11

June 2020

Cattle, Pigs, Sheep

	tissues must be handled at designated biosafety levels.
Additional information:	https://www.cdc.gov/prions/vcjd/index.html https://ehs.msu.edu/lab-clinic/bio/handling-prions.html

References

Merck Veterinary Manual 2020 https://www.merckvetmanual.com/
Fox JG, Otto GM, Colby LA. 2015. Selected Zoonoses, p 1313-1370. In: Fox JG, Anderson LC, Otto GM, Pritchett-Corning KR, Whary MT editors. Laboratory Animal Medicine, 3 rd edition. New York (NY). Academic Press.