

Policies and Procedures

SECTION: Research Compliance	NUMBER: 7.0			
CHAPTER: Animal Occupational Health and Safety Program	ISSUED: 08/2010	REV. A: 8/2016	REV. B:	REV. C:
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7.0 Zoonotic Disease Descriptions (Diseases Transmitted to Humans from Animals)

A zoonotic disease is any disease that may be transmitted from an animal to a human under natural conditions. Zoonotic diseases pose risks to Creighton University personnel who work with or around animals. Some of these diseases pose significant health consequences. Familiar zoonotic diseases include rabies and ringworm.

The most common means of transmission of a zoonotic disease is by inhalation or animal contact. Transmission of zoonotic diseases can be prevented through a variety of means, including use of protective clothing, prevention of bites and scratches, proper sharps handling procedures, medical surveillance and vaccination programs and post-injury treatment.

This section focuses on zoonotic diseases associated with animals used at Creighton University, including general methods to prevent disease transfer from animals to humans, animal bite and scratch procedures, and specific diseases associated with animals commonly used at Creighton University. It is the responsibility of the Principal Investigator to educate their staff on zoonotic diseases of the animals that they are using in their research or teaching activities.

While most animals at Creighton University are free of zoonotic diseases, it is important to be aware of pathogenic organisms that may be carried by animals commonly used at Creighton University. Additional information about specific types of animals and their associated disease conditions may be obtained from the Attending Veterinarian.

7.1 BITES AND SCRATCHES

Using appropriate techniques when handling animals, their tissues, or their cages and the use of appropriate protective clothing can reduce the risk of animal bites or scratches.

Participants must report all animal bites or scratches (regardless of whether medical treatment is required) on the *Creighton University Incident Report Form (HR-24)* and file it with Risk Management. All injuries are to be reported even if medical treatment is not required. The Participant must also report any animal bite or scratch to his or her supervisor. If the injury is a dog or cat bite, the ARF Manager must be notified as soon as possible. For injuries from other

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species, the Attending Veterinarian will be contacted to determine if the treating physician should consider rabies prophylaxis.

Animal bites or scratches received by Creighton University personnel should immediately be washed with soap and water. All animals have bacteria in their mouths and under their claws, which can cause infection if a scratch or bite is not cleaned immediately.

If further medical attention is needed, follow the procedures outlined in section 10.0.

7.2 SPECIES-SPECIFIC ZOONOTIC DISEASES

7.2.1 Cats

Toxoplasma gondii is the causative agent of toxoplasmosis, a protozoal infection of cats. Oocysts are shed in the feces, and humans may become infected via ingestion or inhalation of the oocysts. In most instances, infection of humans induces a mild flu-like illness. Individuals who are immunocompromised or pregnant should not work with cats as the disease may become severe and affect the central nervous system and be fatal. In utero infections may result in birth defects.

7.2.2 Dogs

In the laboratory setting, people who work with dogs or tissues obtained from dogs should be vaccinated for rabies virus, even though the dogs may have a vaccination history for rabies prophylaxis. Rabies virus exposure is rare when working with laboratory dogs, but the high mortality from rabies warrants the precaution of pre-exposure immunization of staff.

Viruses:

Rabies virus Rabies virus causes encephalitis in all mammals, including humans, and the outcome is almost always fatal, once symptoms appear. Transmission of rabies virus occurs most often via a bite from an infected animal, as the virus is in the saliva. . Various other routes of transmission have been documented and include contamination of mucous membranes (i.e., eyes, nose, mouth), aerosol transmission, and corneal transplantations. It is also possible to transmit rabies if infectious material from a rabid animal, such as saliva, gets directly into an individual's or animal's eyes, nose, mouth, or a wound. The first symptoms of rabies are often flu-like in nature - malaise, fever, or headache.. There may be discomfort or paresthesia at the site of exposure (bite), progressing within days to symptoms of cerebral dysfunction, anxiety,

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confusion, agitation, progressing to delirium, abnormal behavior, hallucinations, and insomnia. The acute period of disease typically ends after 2 to 10 days. Disease prevention is entirely prophylactic and includes both passive antibody (immune globulin) and vaccine.

Bacteria:

Brucella canis occurs commonly in dogs. Transmission to humans is greatest in dog breeding colonies, particularly for contact with aborting bitches and placental tissues. Contact with infected, non-breeding animals is associated with low transmission rates. *Brucella* spp. may also be spread by aerosol transmission from laboratory procedures. Major disease outbreaks by this route have been reported. Human infection with *Brucella* spp. is characterized by fever, headache, chills, myalgia, nausea, weight loss, lymphadenopathy, and splenomegaly. Animal Biosafety Level 3 practices, containment equipment and facilities are recommended for studies involving *Brucella* spp.

***Campylobacter jejuni* spp.** *Campylobacter* spp. commonly cause diarrhea in humans and animals. Transmission to humans is via the fecal-oral route. Young animals are more likely to be involved in transmission to humans, as they are most likely to be shedding the bacteria.

Campylobacter spp. produce an acute gastrointestinal illness, which is generally brief and self-limiting. The symptoms are a watery diarrhea (that may be bloody), abdominal cramps, fever, nausea, and vomiting

***Leptospira* spp.** Dogs may be a reservoir for *Leptospira* spp. bacteria, which are shed in the urine. Transmission occurs by contact with urine and tissues, or inhalation or ingestion of aerosol droplets. Humans with leptospirosis may have influenza-like symptoms, orchitis, rash, skin and mucosal hemorrhage, hemolytic anemia, hepatorenal failure, jaundice, encephalitis, and pneumonia. R

***Salmonella* spp.** Dogs may carry *Salmonella* spp. Up to 10% of random-source dogs are infected with these bacteria, which are transmitted to humans via the fecal-oral route. Humans infected with *Salmonella* may have inapparent clinical signs (and be carriers) or may have a febrile enterocolitis, septicemia or focal infections.

Fungi:

***Microsporum* spp. and *Trichophyton* spp.** *Mycosporum* spp., *Tricophytm* spp. Dermatophytic fungi grow in the skin and hair follicles and cause ringworm, a condition characterized by reddened skin and patchy hair loss ..These fungi are spread by direct contact. Infection may be

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inapparent in individual animalsFungal spores are long-lived and may become widely dispersed in the environment.

Protozoa:

***Cryptosporidium* spp.** *Cryptosporidium* spp. infect the intestinal tract of many species. Laboratory animal-associated infections have been reported and provide a direct source of infection for laboratory personnel who come in contact with feces of experimentally or naturally infected animals. Cryptosporidiosis is especially common in the young animals and humans. Symptoms include watery diarrhea, abdominal cramps, and fever. Infection may be asymptomatic. Individuals with weakened immune systems may be at risk for more severe disease and complications from infection. .

***Giardia* spp.** infect the gastrointestinal tract of humans and animals. The prevalence of *Giardia* spp. in dogs has been reported to range from 4 to 10%. Infection may be endemic in breeding kennels. Transmission of *Giardia* cysts occurs via the fecal-oral route. Symptoms include nausea, abdominal cramps, bloating, and diarrhea. While not as common, severe infections may involve bile and pancreatic ducts and may cause malabsorption syndromes due to small intestine pathology.

7.2.3 Gerbils

***Leptospira* spp.** Gerbils may be infected with *Leptospira* spp. bacteria which are shed in the urine. Transmission occurs by contact with urine and tissues, or inhalation or ingestion of aerosol droplets. Humans with leptospirosis may have influenza-like symptoms, orchitis, rash, skin and mucosal hemorrhage, hemolytic anemia, hepatorenal failure, jaundice, encephalitis, and pneumonia.

***Giardia* spp.** Gerbils may harbor the protozoan *Giardia*. Transmission occurs by the fecal-oral route of infective cysts. Humans may have an asymptomatic infection or may have overt clinical signs of anorexia, nausea, abdominal cramps, bloating, and diarrhea. Severe infections may involve bile and pancreatic ducts and may damage upper intestinal mucosa.

Hymenolepsis nana, a tapeworm, may infect gerbils. *H. nana* is transmissible to man via an oral-fecal route. Depending on the parasite burden, humans may have no apparent clinical signs or may have nausea, anorexia, vomiting, diarrhea, and central nervous involvement.

***Salmonella* spp.** Rats may carry *Salmonella* spp. These bacteria are transmitted to humans via the fecal-oral route. Humans infected with *Salmonella* may have inapparent clinical signs (and

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be carriers) or may have a febrile enterocolitis, septicemia or focal infections.. Individuals with immune system defects due to illness or age may have increased disease severity.

7.2.4 Guinea Pigs

Viruses:

Lymphocytic choriomeningitis virus (LCMV) Human infection with LCMV has been associated with laboratory animals and pets. House mice are also infected with LCMV. Guinea pig colonies may be endemically infected. In utero or early neonatal infection produces a subclinical infection in guinea pigs which is characterized by virus shedding (blood, urine). Tumor cell lines may be infected. Virus transmission occurs by direct contact with infected material as well as by inhalation. Pregnant women are at risk of transmission to the fetus which may result in spontaneous abortion, particularly early in pregnancy. Infections later in pregnancy (second or third trimester) may result in birth defects. Humans typically develop an influenza-like illness. Some individuals develop a second phase of the illness that may include meningitis, encephalitis, hydrocephalus, and myocarditis.

Bacteria:

Salmonella spp. Guinea pigs are highly susceptible to *Salmonella*. ***Salmonella* spp.** Rats may carry *Salmonella* spp. These bacteria are transmitted to humans via the fecal-oral route. Humans infected with *Salmonella* may have inapparent clinical signs (and be carriers) or may have a febrile enterocolitis, septicemia or focal infections.. Individuals with immune system defects due to illness or age may have increased disease severity.

Fungi:

Mycosporum spp., *Trichophyton* spp. Dermatophytic fungi grow in the skin and hair follicles and cause ringworm, a condition characterized by reddened skin and patchy hair loss ..These fungi are spread by direct contact. Infection may be inapparent in individual animalsFungal spores are long-lived and may become widely dispersed in the environment.

Arthropods:

Trixacarus caviae *Trixacarus caviae* is a highly pathogenic mite causing a debilitating mange in guinea pigs. Transmission to humans is by direct contact. *Trixacarus* causes hyperkeratosis and alopecia.

7.2.5 Hamsters

Virus:

Lymphocytic choriomeningitis virus (LCMV) Human infection with LCMV has been associated with laboratory animals and pets. House mice are also infected with LCMV. Guinea pig colonies may be endemically infected. In utero or early neonatal infection produces a

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subclinical infection in guinea pigs which is characterized by virus shedding (blood, urine). Tumor cell lines may be infected. Virus transmission occurs by direct contact with infected material as well as by inhalation. Pregnant women are at risk of transmission to the fetus which may result in spontaneous abortion, particularly early in pregnancy. Infections later in pregnancy (second or third trimester) may result in birth defects. Humans typically develop an influenza-like illness. Some individuals develop a second phase of the illness that may include meningitis, encephalitis, hydrocephalus, and myocarditis.

Bacteria:

***Leptospira* spp.** Hamsters may be infected with *Leptospira* spp. bacteria, which are shed in the urine. Transmission occurs by contact with urine and tissues, or inhalation or ingestion of aerosol droplets. Humans with leptospirosis may have influenza-like symptoms, orchitis, rash, skin and mucosal hemorrhage, hemolytic anemia, hepatorenal failure, jaundice, encephalitis, and pneumonia

Protozoa:

***Giardia* spp.** Hamsters may harbor the protozoan *Giardia*. Transmission occurs by the fecal-oral route of infective cysts. Humans may have an asymptomatic infection or develop clinical signs including anorexia, nausea, abdominal cramps, bloating, and diarrhea. Severe infections may involve bile and pancreatic ducts and damage upper to the intestinal mucosa.

Helminths:

Hymenolepis nana, a tapeworm, may infect gerbils. *H. nana* is transmissible to man via an oral-fecal route. Depending on the parasite burden, humans may have no apparent clinical signs or may have nausea, anorexia, vomiting, diarrhea, and central nervous involvement.

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7.2.6 Mice

Viruses:

Hantavirus is carried by wild mouse species. The virus is transmitted to man by excretions and aerosols from the lungs, saliva, and urine of infected animals. Humans are at risk for Hantavirus infection primarily from wild caught rodents (e.g., the deer mouse, *Peromyscus*). Hantavirus occurring in the southwestern U.S. causes a severe pulmonary syndrome. Strains originating in Asia produce a hemorrhagic fever and nephropathy. Strains originating in northern Europe produce renal symptoms of less severity. Individuals involved in field studies should take precautions to prevent infection.

Lymphocytic choriomeningitis virus (LCMV) Human infection with LCMV has been associated with laboratory animals and pets. House mice are also infected with LCMV. Guinea pig colonies may be endemically infected. In utero or early neonatal infection produces a subclinical infection in guinea pigs which is characterized by virus shedding (blood, urine). Tumor cell lines may be infected. Virus transmission occurs by direct contact with infected material as well as by inhalation. Pregnant women are at risk of transmission to the fetus which may result in spontaneous abortion, particularly early in pregnancy. Infections later in pregnancy (second or third trimester) may result in birth defects. Humans typically develop an influenza-like illness. Some individuals develop a second phase of the illness that may include meningitis, encephalitis, hydrocephalus, and myocarditis.

Bacteria:

***Leptospira* spp.** Mice may be a reservoir for *Leptospira* spp. bacteria, which are shed in the urine. Transmission occurs by contact with urine and tissues, or inhalation or ingestion of aerosol droplets. Humans with leptospirosis may have influenza-like symptoms, orchitis, rash, skin and mucosal hemorrhage, hemolytic anemia, hepatorenal failure, jaundice, encephalitis, and pneumonia.

***Salmonella* spp.** Mice may carry *Salmonella* spp. These bacteria are transmitted to humans via the fecal-oral route. Humans infected with *Salmonella* may have inapparent clinical signs (and be carriers) or may have a febrile enterocolitis, septicemia or focal infections.. Individuals with immune system defects due to illness or age may have increased disease severity.

Fungi:

***Mycosporum* spp., *Trichophyton* spp.** Dermatophytic fungi grow in the skin and hair follicles and cause ringworm, a condition characterized by reddened skin and patchy hair loss ..These fungi

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are spread by direct contact. Infection may be inapparent in individual animalsFungal spores are long-lived and may become widely dispersed in the environment.

Parasites:

Hymenolepsis nana, a tapeworm, may infect mice. *H. nana* is transmissible to man via an oral-fecal route. Depending on the parasite burden, humans may have no apparent clinical signs or may have nausea, anorexia, vomiting, diarrhea, and central nervous involvement.

7.2.7 Rabbits

Bacteria:

Francisella tularensis (tularemia) typically causes sudden death in rabbits. Tularemia is transmitted by ticks and the disease occurs mainly in wild rabbits. Humans become infected by contact with infected tissues or blood, as well as via bites from infected ticks. Tularemia is potentially fatal in humans as the disease can result in meningitis and septicemia. Individuals involved in field studies should take precautions to prevent infection.

Leptospira interrogans Rabbits may be a reservoir for *Leptospira* spp. bacteria, which are shed in the urine. Transmission occurs by contact with urine and tissues, or inhalation or ingestion of aerosol droplets. Humans with leptospirosis may have influenza-like symptoms, orchitis, rash, skin and mucosal hemorrhage, hemolytic anemia, hepatorenal failure, jaundice, encephalitis, and pneumonia.

Yersinia spp. infect wild rabbits and are transmitted by direct contact with the bacteria and the fecal-oral route. Humans infected with *Yersinia* spp. experience gastroenterocolitis characterized by fever, diarrhea, and abdominal pain. *Yersinia* can cause ulcerative mucosal lesions in the terminal ileum, mesenteric lymphadenitis, hepatosplenic abscesses, iritis, skin ulceration, osteomyelitis, septicemia, and postinfectious arthritis. Individuals involved in field studies should take precautions to prevent infection.

Fungi:

Mycosporum spp., *Trichophyton* spp. Dermatophytic fungi grow in the skin and hair follicles and cause ringworm, a condition characterized by reddened skin and patchy hair loss ..These fungi are spread by direct contact. Infection may be inapparent in individual animalsFungal spores are long-lived and may become widely dispersed in the environment.

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7.2.8 Rats

Bacteria:

***Leptospira* spp.** Rats may be a reservoir for *Leptospira* spp. bacteria, which are shed in the urine. Transmission occurs by contact with urine and tissues, or inhalation or ingestion of aerosol droplets. Humans with leptospirosis may have influenza-like symptoms, orchitis, rash, skin and mucosal hemorrhage, hemolytic anemia, hepatorenal failure, jaundice, encephalitis, and pneumonia.

Rat Bite Fever – This is caused by bacteria found in the mouths of rats. Fever and inflammation at the site of injury and the lymph nodes are typical. Some individuals may develop arthritis, pneumonia, hepatitis, enteritis and/or endocarditis.

***Salmonella* spp.** Rats may carry *Salmonella* spp. These bacteria are transmitted to humans via the fecal-oral route. Humans infected with *Salmonella* may have inapparent clinical signs (and be carriers) or may have a febrile enterocolitis, septicemia or focal infections.. Individuals with immune system defects due to illness or age may have increased disease severity.

Streptobacillus moniliformis* and *Spirillum minus are the causative agents of rat bite fever. Rats may carry *Streptobacillus moniliformis* and *Spirillum minus* as commensal organisms living in the nasopharynx. Transmission to humans occurs by rat bite. Symptoms may include wound inflammation, lymphadenopathy, fever, headache, malaise, myalgia, joint pain, and arthritis.

Fungi:

Sporothrix schenckii is a fungus associated with multiple species, including rats. Humans acquire *Sporothrix schenckii* via bites or direct contact. Disease manifests as a nodule on the hand or arm, which may progress with additional nodules forming along the path of lymphatic vessels. Deep visceral infections may also occur.

***Trichophyton* spp.** Dermatophytic fungi grow in the skin and hair follicles and cause a condition of reddened skin and patchy hair loss known as **ringworm**. The symptoms are the same in animals and humans. Infection may be inapparent in individual animals. Dermatophytes are spread by direct contact. Fungal spores are long-lived and may become widely dispersed in the environment. Infections are treatable, but an extended period of therapy is often required to eliminate infection.

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7.2.9 Sheep and Goats

Q-Fever – This is a rickettsial disease of wild and domestic animals. Goats and sheep are the species most likely to be infected. Transmission may occur by inhalation, ingestion, or by contact with infected tissues. As there is no definitive diagnostic test available, all sheep and goats should be considered positive. Q-Fever causes a serious, possibly fatal, disease in humans. Individuals who are pregnant, immunocompromised, or have endocarditis should not work with sheep or goats. Individuals involved in field studies should take precautions to prevent infection.

7.2.10 Swine

Bacteria:

Erysipelothrix rhusiopathiae causes *erysipelas* in swine and *erysipeloid* in humans. The disease is transmitted by contact with infected animals or their excrement. The disease in humans may be localized and cause a progressive, erythematous swelling, burning pain and/or itching. The generalized form of the disease causes fever, headache, and myalgia.

Brucella suis causes a systemic disease in humans that is characterized by undulating fever, chills, sweating, myalgia. The bacteria is transmitted by contamination of the mucous membranes or entry via abraded skin. Humans may also become infection by ingesting the organisms. There are typically spontaneous relapses, and it may be complicated by arthritis or cardiac involvement.

Campylobacter jejuni, *Escherichia coli*, and *Salmonella* spp. are all causes of gastroenteric infections that may be asymptomatic or cause severe diarrhea, vomiting and occasionally sepsis. Transmission is by oral/fecal exposure.

Bacillus anthracis is the causative agent of anthrax. Transmission is via direct contact with infected tissues or inhalation of spores. The organism affects domestic and wild ruminants and swine. It causes cutaneous, intestinal and pulmonary syndromes in humans which may result in death.

Protozoa:

Balantidium coli is a ciliate that may be carried asymptotically in swine or it may be associated with diarrhea. It is transmitted by oral/fecal exposure. Humans are generally resistant except when immunosuppressed. In these cases, individuals may develop mucoid or bloody diarrhea, dysentery, or hepatic abscessation. Deaths have been reported.