Zoonotic Diseases of Concern

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Objective

To describe a variety of zoonotic disease of concern for individuals handling research animals and the procedure for reporting and seeking treatment for suspected zoonotic disease exposures or illnesses. Zoonotic diseases have been almost completely eradicated from purpose bred research animal colonies, however, at UK extensive amounts of fieldwork and collection of animal specimens for surveillance often place researchers in contact with wild animal populations. This document seeks to provide awareness and biosafety tips for UK personnel with potential for zoonotic disease exposure.

Definitions and Acronyms

Personal Protective Equipment (PPE): Clothing or equipment utilized to reduce exposure to hazards in the event that the risk associated with exposure to the hazard cannot be effectively mitigated through engineering (biological safety cabinets, fume hoods) or administrative (work practices) controls.

Zoonotic Disease: An infectious disease that can be transmitted from animals to humans. Many times transmission occurs through an insect vector. “Approximately 75% of recently emerging infectious diseases affecting humans are diseases of animal origin; approximately 60% of all human pathogens are zoonotic” (http://www.cdc.gov/ncezid/).

Background Information

The majority of known human pathogens are zoonotic. Additionally, it should be noted that the vast majority of emerging infectious diseases identified in the recent past, including West Nile Virus and SARS-Coronavirus, are zoonotic diseases. Individuals whose research or employment places them in close contact with live animals or unfixed animal specimens should be familiar with the particular zoonotic diseases associated with the animal species in use. This may vary depending on the type of activity involved with the animal species, the area of the world in which the animal or specimen was collected and even the season in which collection or fieldwork occurs. For example, transmission of Q-fever from sheep to humans is most likely to be associated with exposure to biological materials present in the birthing process. Raccoons which are wild caught in Kentucky are likely to have raccoon roundworm, Baylisascaris procyonis, infections. Lyme disease is more likely to be transmitted to humans in the early spring and summer as transmission is typically via the bite of an immature tick or nymph rather than an adult.

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Infectious Agent and Reference Link	Resultant Disease or Common Name	Natural Host or Reservoir	Route of Transmission	Signs and Symptoms
Arboviruses https://www.cdc.gov/westnile/index.html http://www.cdc.gov/Dengue/ http://www.cdc.gov/yellowfever/	West Nile Virus, Dengue Fever, Yellow Fever	Birds, Horses, Wide range of mammals	Insect Vector, tick or mosquito bite	Early symptoms are generally fever and flu- like illness
Bacillus Anthracis https://www.cdc.gov/anthrax/index.html	Anthrax	Cattle, Sheep, Goats, Horses, Pigs	Handling products from infected animals or by breathing in anthrax spores from infected animal products (wool or hides). Eating undercooked meat from infected animals	•Cutaneous: small blister that develops into a painless skin ulcer with a black area in the center •Gastrointestinal: nausea, loss of appetite, bloody diarrhea, fever, bad stomach pain •Inhalation: flu-like symptoms, cough, chest discomfort, shortness of breath, tiredness and muscle aches
Bartonella henselae https://www.cdc.gov/bartonella/symptoms/index.html	Cat Scratch Disease	Cats, Dogs	Direct inoculation through scratch or bite	Lesion at inoculation site, more serious disease may result in fever, lymphadenopathy and progression to meningitis or encephalitis
Baylisascaris procyonis https://www.cdc.gov/parasites/baylisascaris/index.html	Raccoon Roundworm	Raccoons	Ingestion of contaminated material	Nausea, Tiredness, Liver enlargement, Loss of coordination, Loss of muscle control, Blindness, Coma
Borrelia burgdorferi http://www.cdc.gov/lyme/	Lyme Disease	Deer, Wild Rodents	Insect Vector, tick bite	"Bulls-eye" rash, fatigue, chills, fever, headache, muscle and joint aches
Brucella species https://www.cdc.gov/brucellosis/index.html	Brucellosis	cattle, swine, goats, sheep, deer, caribou, elk, dogs, coyotes	Ingestion, Inhalation, Direct Contact	Fever, headache, weakness, sweating, chills, arthralgia
Coxiella burnetii http://www.cdc.gov/qfever/	Q Fever	Cattle, Sheep, Goats, Dogs, Cats, Other Mammals	Ingestion, Inhalation, Direct Contact	Acute disease: self-limited flu-like illness, atypical pneumonia and hepatitis, Chronic disease: endocarditis
Cryptosporidium species http://www.cdc.gov/parasites/crypto/	"Crypto"	Large Vertebrate Host Range	Fecal-oral Transmission	Profuse, watery diarrhea, cramping, abdominal pain, weight loss, flatulence and malaise

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Dermatophytes, including *Microsporum canis* https://www.cdc.gov/fungal/diseases/ringworm/index.html	Ringworm, Tinea	Dogs, Cats, other Mammals	Direct contact	Skin, hair or nail infections characterized by redness, scaling and cracking of skin, Hair loss
Francisella tularensis http://www.cdc.gov/Tularemia/	Tularemia, Rabbit Fever	Rabbits, Birds, Wild Animals	Ingestion, Inhalation, Inoculation, Insect Bite	Ulcer at infection site, lymph node swelling, pain, fever
Hantaviruses http://www.cdc.gov/hantavirus/	Hantavirus Pulmonary Syndrome, Hemorrhagic Fever with Renal Syndrome	Rodent Species	Inhalation of aerosolized secretions, waste or other contaminated material	Early symptoms: Flu-like Illness, Later symptoms are dependent on causative virus
Hepatitis E Virus http://www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/hepe-eng.php	Hepatitis	Rabbits and other animal species	Fecal-oral Transmission	Symptoms identical to acute viral hepatitis. Jaundice, malaise, anorexia, abdominal pain, nausea, fever, diarrhea, discolored stool and/or urine, and hepatomegaly
Influenza Virus http://www.cdc.gov/flu/avianflu/ http://www.cdc.gov/flu/swineflu/	Avian Flu, Swine Flu	Swine, Domestic and wild avian species	Direct animal to human transmission is rare, respiration of aerosols or droplets, contact with contaminated surfaces	fever, headache, myalgia, malaise, sore throat, non-productive cough, sneezing and nasal discharge
Leptospira interrogans http://www.cdc.gov/leptospirosis/	Leptospirosis	Domesticated animal including dogs, horses, cattle	Direct or indirect contact with urine or tissue of infected animals	Fever, headache, chills, severe malaise, vomiting, myalgia and conjunctival suffusion
Lymphocytic Choriomeningitis Virus https://www.cdc.gov/vhf/lcm/	LCMV	Rodents, particularly Mus. musculus and Syrian hamsters	Contact with contaminated rodent waste or secretions	Flu-like illness, aseptic meningitis, encephalitis or meningoencephalitis
Macacine herpesvirus 1 (formerly Cercopithecine herpesvirus 1 [CHV-1]) http://www.cdc.gov/herpesbvirus/ind ex.html	Herpes B Virus, Monkey B Virus, Herpesvirus Simiae	Macaques	Direct mucous membrane or wound contact with bodily fluids from infected macaques or contaminated surfaces	Fever, headache, and vesicular skin lesions at exposure site

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Monkeypox Virus http://www.cdc.gov/ncidod/monkeyp ox/index.htm	Monkeypox	Arboreal squirrels, rodents	Direct mucous membrane or wound contact with bodily fluids from infected animals or contaminated surfaces	Initial flu-like illness followed by rash development
Mycobacterium tuberculosis http://www.cdc.gov/tb/	Tuberculosis, TB	Non-human primates	Inhalation of infectious aerosols, Direct contact with infected animals/tissues	Fatigue, fever, cough, chest pain
Orf Virus https://www.cdc.gov/poxvirus/orf-virus/index.html	Sore Mouth, Contagious Ecthyma	Sheep, Goats	Direct skin contact with infected animal or contaminated surfaces	Painful sores at inoculation point
Rabies Virus http://www.cdc.gov/rabies/	Rabies	Wide mammalian host range, Dogs, Skunks, Raccoons, Bats	Bite of infected animal, Contact of infectious material (saliva) with mucous membrane or wound	Acute infection, progressive encephalomyelitis, typically fatal, initial symptoms resemble flu-like illness
Salmonella species http://www.cdc.gov/salmonella/	Salmonellosis	Domestic and wild animals, Birds, Pets - especially reptiles and turtles	Ingestion of contaminated food, Direct contact with infected animals, Fecal- oral	Acute gastroenteritis, abdominal pain, diarrhea, nausea, vomiting
Strongyloides species https://www.cdc.gov/parasites/strongyloides/gen_info/faqs.html	Strongyloidiasis	Humans are typically infected with Strongyloides stercoralis	Contact with soil contaminated with free- living helminths	Generally asymptomatic, some have non- specific or generalized complaints
Toxocara canis, Toxocara cati https://www.cdc.gov/parasites/toxocariasis/index.html	Toxocariasis, Roundworm	Dogs, cats serve as reservoirs	Ingestion of embryonated eggs from soil, dirty hands, raw vegetables, contact with infected animals	Generally asymptomatic, symptoms will depend and vary greatly depending on organ system affected

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Toxoplasma gondii https://www.cdc.gov/parasites/toxoplasmosis/index.html	Toxoplasmosis	Cats, Warm- blooded animals, Birds	Ingestion, inhalation, contact with infective oocysts, typically present in cat feces	Generally asymptomatic; Abortion, stillbirth and severe central nervous system involvement may be seen in congenital cases

Procedure

- Know the signs and symptoms of the likely zoonotic diseases present in the animal species with which you will be working.
- Know who to contact in the event of a suspected exposure or illness.
    - Follow the same procedure you would for other occupational injuries or exposures, http://ehs.uky.edu/docs/pdf/ohs_lab_exposure_protocol_0001.pdf.
- Take precautions to prevent biting or physical injury when handling live animals.
    - These may include chemical or physical restraints or personal protective equipment such as bite-resistant gloves.
- Depending on the route of transmission and likelihood of zoonotic disease presence determine the appropriate personal protective equipment.
    - Consultations with knowledgeable veterinarians and/or biosafety professionals can be helpful in determining this information.
    - Examples of appropriate PPE may be:
        - Gloves when handling animals with suspected Salmonella infections.
        - Face shields and respiratory protection when handling non-human primates with suspected Herpes B virus infections.
- Receive appropriate vaccinations based on animal species being handled.
    - An example of appropriate vaccination would be receipt of rabies vaccine prior to handling of field collected raccoon specimens.
- Utilize appropriate transport containers and storage methods for potentially infectious specimens collected in the field or animal research facilities.
- Decontaminate reusable equipment and properly dispose of materials which may have been in contact with infectious animals or specimens.

References

Biosafety in Microbiological and Biomedical Laboratories (BMBL), 5th Edition, http://www.cdc.gov/od/ohs/biosfty/bmbl5/bmbl5toc.htm

Methods for Trapping & Sampling Small Mammals for Virologic Testing, http://www.cdc.gov/hantavirus/pdf/rodent_manual.pdf

Pathogen Safety Data Sheets, Public Health Agency of Canada, http://www.phacaspc.gc.ca/lab-bio/res/psds-ftss/index-eng.php

Centers for Disease Control and Prevention, A-Z Index,
http://www.cdc.gov/

National Center for Emerging and Zoonotic Infectious Disease,
http://www.cdc.gov/ncezid/

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