MOREHEAD STATE UNIVERSITY

University Administrative Regulation (UAR) 118.04

OCCUPATIONAL HEALTH FOR ANIMAL CARE WORKERS

The Public Health Service of the U.S. Department of Health and Human Services has directed teaching/research institutions to develop programs to promote the health and safety of employees who have substantial animal contact. **All employees with animal contact are asked to read this material.** Verification from the principal investigator or supervisor that workers have been given this information is required in the Institutional Animal Care and Use Committee (IACUC) protocol application (Form P: Personnel (Principal Investigator/Co-Investigator) and Form AP: Associate Personnel (Undergraduate or Graduate Students, Technicians, Staff). The program at Morehead State University has two components:

1. **Health Care Program for Any Individual with Laboratory Animal Contact:** This program consists of an assessment of health history, physical examination (if required), and indicated diagnostic tests and immunizations (if required). **Complete Form P: Personnel (Principal Investigator/Co-Investigator) and Form AP: Associate Personnel (Undergraduate or Graduate Students, Technicians, Staff) of the Protocol APPLICATION FOR THE USE OF ANIMALS IN TEACHING, TESTING AND/OR RESEARCH, and attach a copy to all applications in which you will be a participant.**

2. **Education:** The attached pages contain informational material about several specific conditions or practices with which animal care workers should be familiar**. All employees with animal contact are required to read this material, complete Form P: Personnel (Principal Investigator/Co-Investigator) and Form AP: Associate Personnel (Undergraduate or Graduate Students, Technicians, Staff) of the Protocol APPLICATION FOR THE USE OF ANIMALS IN TEACHING, TESTING AND/OR RESEARCH, and attach a copy to all applications in which the employee will be a participant.** You should keep the rest of the material for future reference.

RISK FACTORS ASSOCIATED WITH ANIMAL CARE

Certain pre-existing medical conditions can place an individual at greater risk of injury or illness in the animal care setting. Consult with your physician if you think you have any of the following or other conditions. ***Disclosure is not required***; however, you may want to exclude yourself from working in an animal care environment if you believe you may be at risk.

1. Congenital immunodeficiency
2. Acquired immunodeficiency
3. Treatment for cancer
4. Pregnancy
5. Organ or tissue transplant recipient
6. Allergic condition
7. Immunosuppressive drug therapy

PHYSICAL EXAMINATIONS

All employees and new candidates for employment at Morehead State University who have significant contact with animals and/or in animal care facilities are encouraged to receive a complete history and annual physical examination. Included in such a physical examination may be urinalysis, hematology, chest X-rays, tuberculosis skin test, and necessary immunizations.

REPORTING INJURY OR ILLNESS

The Morehead State University policy for occupational injury or disease (MSU Administrative Regulation 309.01) is available from one's supervisor. The following is exerted from that policy:

> *"It shall be the responsibility of the faculty or staff member supervising any activity on Morehead State University property to complete the **MSU Accident Report** on any accident which results in personal injury."*

Beginning July 1, 2004, the following are the steps to be taken to report work-related incidents:

TO REPORT WORK-RELATED INCIDENTS…

Step 1: Contact your supervisor to report the incident

Step 2: Your supervisor will:
Help determine if you need medical care, and if so, call the 24-hour access line to report your incident and determine where you are to go to get medical care.
Or…
If your supervisor is unavailable, call the access number yourself, report your injury and find out which doctor is available.

Step 3: Proceed to a network doctor, authorized by Morehead State University, for evaluation and treatment.

Toll Free 24-Hour Access Line:
800-440-6285

Morehead State University participates in a managed care system for workers' compensation. To have your medical care paid for in a work-related injury, you MUST use an approved doctor, and only use an emergency department in a life threatening situation.

Only in the case of a life-threatening injury, go immediately to the approved hospital emergency department. Your supervisor will call the 24-hour access number to report the incident.

For any questions relative to your medical care, call toll free 800-440-6285 between 8:00 a.m. and 5:00 p.m., Monday – Friday.

Source: Handout provided by the Office of Human Resources.

Every person working with animals should be aware of the potential danger from animal bites and scratches. Tetanus, rabies, leptospirosis, ringworm, toxoplasmosis, Q fever, and hantavirus are just a sampling of diseases that can be transmitted from animals to humans. All animal bites and scratches, no matter how minor they appear to be, should be reported to one's supervisor so that proper measures may be taken.

PERSONAL HYGIENE

There are a number of personal hygiene issues that apply to all workers who are exposed to animals.

1. There must be no eating, drinking, use of tobacco products, or application of cosmetics in areas where animals are housed or used.

2. No animals should be kept overnight anywhere except in the designated animal rooms. There will be exceptions to this only where specific permission has been obtained from the IACUC for the retention of these animals.
3. At appropriate times, and/or if required by the protocol or the instructor, laboratory coats, gloves and protective eyewear should be worn at all times for the handling of animals. All contaminated or infected materials should be handled in such a way as to minimize aerosols. Protective clothing should be left in the lab and laundered or disposed of as appropriate.
4. There are numerous special requirements for the handling of large animals. Please contact the attending veterinarian for details.
5. Additional precautions are necessary for a number of specific hazardous agents. If infected material is being used in a laboratory, then specific guidelines should be followed for the handling of these biologically sensitive materials.
6. All work surfaces should be decontaminated daily and after any spill of animal-related material.
7. Hands must be washed thoroughly with anti-microbial soap before and after handling of animals and prior to leaving the laboratory for any reason.
8. Certain microbial pathogens are transmitted from animals to humans primarily by the animals' feces or urine entering the human body by mouth. Examples include *Salmonella*, *Shigella* and *Entamoeba*. It cannot be overemphasized that every precaution should be taken to avoid this mode of transmission by alertness and very careful personal hygiene.

POTENTIAL BIOLOGICAL HAZARDS

Animal Bites, Scratches and Kicks: Animal bites, scratches and kicks are hazards associated with animal contact. Such injuries can be avoided or minimized through proper training in animal handling methods. Larger animals can induce life-threatening injuries when they kick or fall upon an animal care worker.

Training and experience teaches an animal care worker to assess the mood and emotional state of animals, how they respond to human contact and stimuli, and fight or flight behavior. Knowledge of species-specific animal behavior is important in reducing risks.

Bites and scratches can not only produce tissue injury but also result in the transmission of zoonotic diseases such as rabies, tetanus, hantavirus infection, tularemia, rat-bite fever, cat-scratch fever, and B-virus infection. Even the normal oral flora of animals can cause serious infection of bite wounds. Important factors in reducing disease transmission to humans is knowledge of the health of the animals as assessed by a veterinarian, maintaining current tetanus and rabies vaccinations, and seeking medical treatment for any bite or scratch wound.

Sharps: The term "sharps" refers to needles, syringes, scalpel blades, lancets, disposable medical instruments, broken glass and similar devices or materials with the potential to cut or puncture an individual as it is sent through the waste stream. Sharps are ubiquitous in animal care. Needles, syringes, pipettes, scalpels -- all are commonly used in animal care facilities and laboratories. Puncture-resistant and leak-proof containers for sharps are to be available at critical locations in the facilities. Improper disposal of sharps with regular trash may expose animal care personnel and custodial staff to wounds, and, potentially to infectious agents and hazardous chemicals. State regulations are specific in the requirements for proper disposal of "sharps."

Basic rules to remember:

1. Never recap needles after use -- have a "sharps" container nearby.
2. Dispose of syringes, needles, glass, vials, and scalpels only in a "sharps" container.
3. If you cut yourself, perform first aid immediately. Report the incident to your supervisor. If you can safely identify the source of your injury, do so.

Human Allergies to Animals: Allergy to animals is common and, therefore, one of the most important occupational problems occurring in workers exposed to animals. Allergies can manifest in a number of ways including allergic rhinitis, allergic conjunctivitis, asthma, or atopic dermatitis. Allergy to animals is particularly common in workers exposed to cats, dogs, gerbils, guinea pigs, mice, rabbits, and rats. Recent studies suggest that exposure to animal urine, saliva and fecal matter, in addition to dander, skin debris and fur, provoke allergic reactions. These allergens are carried primarily on dust and exposure occurs through inhalation of contaminated dust. Various studies show that 10% to 44% of workers exposed to animals will develop symptoms of allergy. An estimated 10% of all laboratory workers eventually develop occupation-related asthma.

Most allergic reactions are manifested as allergic rhinitis (a condition characterized by runny nose and sneezing similar to hay fever), allergic conjunctivitis (irritation and tearing of the eyes), asthma, and contact urticaria ("hives," a skin condition which is caused by contact with a substance to which an individual is allergic). In rare instances, a person who has become sensitized to an animal protein in the saliva of the animal experiences a generalized allergic reaction (anaphylaxis) when bitten by an animal. Anaphylactic reactions vary from mild generalized urticarial reactions to profound life-threatening reactions. Because of the risk of allergy, all workers should exercise certain precautions to prevent animal allergy. Animals should be handled within well-ventilated areas to prevent build up of various particles in the air. Workers should always wear gloves and laboratory coats to prevent direct exposure to the animals. This applies to urine as well as animal dander. Frequent hand washing is important. In order to prevent inhaling contaminated materials, cages should be changed frequently and masks should be worn during the changing of cages.

Despite the best preventive techniques, some individuals will develop allergies after contact with laboratory animals. Rarely this will be so severe that a person is forced to change his/her line of work. More commonly this can be controlled with the use of personal protective equipment (laboratory coats, gloves, dust/surgical masks, and protective eyewear) while working with animals and/or in animal care facilities. Desensitization therapy has been done for some individuals but this is not as effective for animal allergies as it is for some other types of allergies. Certainly, any one with symptoms related to animal exposure should seek medical diagnosis and treatment.

Wild Animals

Research and teaching activities conducted "in the field" may expose workers to a number of hazards associated with the handling of vertebrate animals or injuries from other, non-target animals in the study area. Wild animals will frequently protect themselves by biting, kicking, or scratching. Injuries from these can range from minor to life-threatening. In addition, bites and scratches from wild animals may transfer pathogen-borne diseases, including tetanus and rabies to humans (see below for details about disease-causing pathogens). The risk of injury can be reduced by proper training in animal collection and handling methods and by wearing protective gear. In general, larger animals tend to be more aggressive and require more caution when handling. Specific risks associated with various wild animal groups are outlined below.

Fishes: Most fishes have teeth; larger ones may bite when handled. In addition, many fishes have sharp spines located on the fins or on the head. These spines are nonvenomous for most species, but a puncture from a large spine can be serious, and punctures from even small spines can be painful. A very few species (e.g., lionfishes, Pterois) are sufficiently venomous to be life-threatening. A group of local species, the madtom catfishes (Noturus), have mildly venomous spines; puncture by these can produce localized intense pain, similar to a bee sting. Avoidance of injuries from fishes usually can be achieved by careful handling.

Amphibians: Frogs and salamanders have teeth and some of the largest will bite when handled. Most amphibians secrete toxins from poison glands in the skin. A few, notably the poison frogs of Central and South America, produce a strong skin toxin that is life-threatening when ingested or otherwise introduced

internally. Most of these toxins are not readily absorbed through human skin, but may enter the body from open cuts or mucous membranes. When handling amphibians known to have toxic secretions, researchers should wear gloves, avoid touching mucous membranes, and/or wash hands afterwards.

Turtles: Some larger turtles may deliver a painful bite and should be handled carefully.

Lizards: Local species of lizards present little danger to researchers, but some other, larger species (e.g., iguanas and monitors) can deliver painful bites prone to infection and deliver tail lashes. Two species, both in the desert southwest of North America, are venomous, but are not aggressive.

Snakes: Although small snakes, such as ringneck snakes (Diadophis), rarely bite, larger snakes, even those that are not venomous, such as watersnakes (Nerodia), often bite when handled. Although only two local snakes (copperhead and timber rattlesnake) are venomous, there are many venomous snakes worldwide. A venomous bite from most of these is life-threatening, or can cause severe injuries, including loss of a limb, if untreated.

Most venomous snakes are not aggressive and are not likely to be encountered in the field unless they are targeted for collection. However, field researchers should be cognizant of the venomous snakes that are found in their area and should avoid risky activities, such as sticking hands under rocks, and picking up or trying to kill snakes of uncertain identity. Researchers targeting collection of venomous snakes should take appropriate precautions including, but not limited to, use of snake tongs, gloves, and boots. If possible, these researchers should not work alone in the field, and should develop a plan in case of venomous snakebite that includes ability to contact emergency personnel (e.g., cell phone) and knowledge of locations of medical centers that carry the appropriate antivenom.

Crocodilians: Larger individuals of these can deliver severe injuries from bites or from tail-thrashing. Risks to researchers can be minimized by training in handling of these animals, including the use of techniques to immobilize them. For studies that take place in areas of high concentrations of crocodilians, precautions should be taken, including the development of a plan in case of attack.

Birds: Some birds may bite when handled. Birds of prey, including hawks, eagles, and owls, have sharp beaks and talons and may be quite aggressive. Protective gear and experience handling these animals are needed to avoid injury.

Mammals: In general, larger mammals are associated with more risk. Threats to researchers can be minimized by training in animal handling and when necessary, sedation of animals.

Insects: Many insects can bite or sting. Although most of these are only annoying or mildly painful, some individuals are sufficiently allergic to wasp and bee stings that even one sting is life-threatening. These individuals should carry with them appropriate medications (e.g., “epi-pen”) in case of a sting. Also, certain insects may transmit serious diseases such as sleeping sickness (tsetse fly), malaria, encephalitis, and yellow fever (mosquito), and Chagas disease (reduviid or “kissing” bugs). Risk from these may be reduced by appropriate use of immunizations and preventative medications, insect repellants, protective clothing, and avoidance of habitats and time periods where and when these insects are most abundant.

Other invertebrates: Various other invertebrates, including selected jellyfishes, spiders, and scorpions, can deliver bites or stings which range from painful to life-threatening. Caution and appropriate preventative measures should be used when field activities take place in areas where these animals are likely to occur. Also, ticks may carry certain pathogenic organisms, including those that cause spotted fever and Lyme disease. Use of repellants and protective clothing will reduce the risk of a tick bite. If a tick bite happens, monitoring of the bite for changes (including a “bulls-eye rash”) should be done and medical attention should be sought, if necessary.

More information about poisonous and venomous animals can be found in: Mebs, D. 2002. Venomous and poisonous animals: a handbook for biologists, and toxicologists and toxinologists, physicians and pharmacists.

VIRAL DISEASES

Hantavirus Infection: The hantaviruses, which can cause severe hemorrhagic disease, are widely distributed in nature among wild-rodent reservoirs. The severity of disease produced depends on the strain involved. Strains producing hemorrhagic fever with renal symptoms are prevalent in southeastern Asia and Japan, and focally throughout Europe. Outbreaks of hantavirus infection characterized by severe pulmonary syndrome resulting in numerous deaths have been recognized in the southwestern United States. Infections associated with laboratory rodents have occurred in Russia, Scandinavia, Japan, and Belgium.

Rodents in several genera have been implicated in the outbreaks of the disease in the United States. The transmission of hantavirus infection is through the inhalation of infectious aerosols. Extremely brief exposure times (five minutes) have resulted in human infection. Rodents develop persistent, asymptomatic infections, and shed the virus in their respiratory secretions, saliva, urine, and feces for many months. Transmission of the infection can also occur by animal bite, or when dried materials contaminated with rodent excreta are disturbed, allowing wound contamination, conjunctival exposure or ingestion to occur. Recent cases that have occurred in the laboratory animal environment have involved infected laboratory rats. Person-to-person transmission is apparently not a feature of hantavirus infection.

The form of the disease known as nephropathia endemica is characterized by fever, back pain, and nephritis that results in only moderate renal dysfunction. The infection is usually self-limiting with proper treatment. The form of the disease that has been noted after laboratory animal exposure fits the classical pattern of hemorrhagic fever with renal syndrome. The infection is characterized by fever, headache, myalgia, gastrointestinal bleeding, bloody urine, severe electrolyte abnormalities, and shock.

Human hantavirus infections associated with the care and use of laboratory animals can be prevented through the isolation or elimination of infected rodents and rodent tissues before they can be introduced into the resident laboratory animal populations.

Lymphocytic Choriomeningitis Virus Infection: Human infection with lymphocytic choriomeningitis (LCM) associated with laboratory animal and/or pet contact has been recorded on several occasions. LCM is widely distributed among wild mice throughout most of the world, and presents a zoonotic hazard. Many laboratory animal species are infected naturally, including mice, hamsters, guinea pigs, nonhuman primates, swine and dogs. The mouse has remained the primary concern in the consideration of this disease. Athymic, severe-combined-immunodeficiency (SCID), and other immunodeficient mice can pose a special risk by harboring silent, chronic infections, which present a hazard to personnel.

The LCM virus produces a pantropic infection under some circumstances, and can be present in blood, cerebrospinal fluid, urine, nasopharyngeal secretions, feces, and tissues of infected natural hosts. Bedding material and other fomites contaminated by LCM-infected animals are potential sources of infection, as are infected ectoparasites. In endemically infected mouse and hamster colonies, the virus is transmitted in utero, or early in the neonatal period, and produces a tolerant infection characterized by chronic viremia and viruria, without marked clinical disease. Humans can be infected by parental inoculation, inhalation, and contamination of mucous membranes or broken skin with infectious tissues or fluids from infected animals. Aerosol transmission is well documented.

Humans develop an influenza-like illness characterized by fever, myalgia, headache, and malaise after an incubation period of 1-3 weeks. In severe cases of the disease, patients might develop meningoencephalitis. Central nervous system involvement has resulted in several deaths.

Orf Disease: Orf disease is a parapoxvirus infection that is endemic in many sheep flocks and goat herds throughout the United States. The disease affects all age groups, although young animals are most often and most severely affected. Orf produces proliferative, pustular encrustations on the lips, nostrils, mucous membranes of the oral cavity, and urogenital orifices of infected animals.

Orf virus is transmitted to humans by direct contact with virus-laden lesion exudates. External lesions are not always apparent, so recognition may be difficult. Transmission of the agent by fomites or contaminated animals is possible because of its environmental persistence. Rare cases of person-to-person transmission have been recorded. The disease in humans is usually characterized by the development of a solitary lesion on the hand, arm, or face. The lesion is sometimes mistaken for an abscess. Occasionally, several nodular lesions are present, each measuring up to 3 cm. in diameter, persisting for 3-6 weeks, and regressing spontaneously. Progression to generalized disease is considered rare.

The characteristic appearance of the lesion, and a history of recent contact with sheep or goats are diagnostic of this condition in humans. Vaccination of susceptible sheep and goats is effective in preventing the disease. Personnel who handle sheep and goats should be cautioned to wear protective clothing and gloves and to practice good personal hygiene.

Rabies: Rabies is a relatively rare and devastating viral disease that can result in severe neurologic problems and death. Most cases of rabies occur in wild animals although any mammal can contract the disease. Rabies is virtually unheard of in common laboratory animals. The exception to this is with dogs and cats.

Rabies is an endemic disease in Kentucky, especially in skunks, foxes and bats. Sporadic cases have been well documented in other species of wildlife, as well as domestic animals. Animals and animal tissues field collected in Kentucky in research or teaching should be handled with care. Precautions should take into account the fact that infected animals may shed the virus in the saliva before visible signs of illness appear and that rabies virus can remain viable in frozen tissues for an extended period. Morehead State University accepts only those dogs and cats with documented rabies immunizations. **Every employee who handles dogs, cats, or wild mammals must be vaccinated against rabies, and must show proof of current immunization.**

BACTERIAL DISEASES

Brucellosis: Human brucellosis is caused by the bacteria *Brucella abortus* (cattle), *B.suis* (hogs), *B.melitensis* (sheep and goats), and *B.canis* (dogs). Brucellosis is transmitted by direct contact with secretions and excretions of infected animals, and by ingesting cow, sheep or goat milk or milk products containing viable *Brucella* organisms. The average incubation period is two weeks, although it can range from 5 days to several months. Onset may be rapid and acute, with chills and fever, headache, pains, malaise, and diarrhea. Fever rises in the evening. As the disease progresses, evening fever may rise to 105°F, then subsiding to near normal in the morning, when profuse sweating occurs. The intermittent fever lasts 1 to 5 weeks, followed by a 2- to 14-day remission. Fever may then recur. Patients with acute, uncomplicated brucellosis usually recover in 2 to 3 weeks. Chronic disease occurs occasionally, but it is unusual for it to result in long-term ill health. It is rarely fatal.

Brucellosis is treatable with an appropriate antibiotic therapy. The most important prophylactic measures are pasteurization of milk and milk products. Persons handling animals or carcasses likely to be infected should wear rubber gloves and protect breaks in the skin from bacterial invasion.

Campylobacteriosis: Organisms of the genus *Campylobacter* have been recognized as a leading cause of diarrhea in humans and animals in recent years. Numerous cases involving the zoonotic transmission of the organisms in pet and laboratory animals have been described. Results of prevalence studies on dogs, cats, nonhuman primates, and group-housed animals suggest that young animals readily acquire the

infection and shed the organism. Young animals are often implicated as the source of infection in zoonotic transmission. *Campylobacter* is transmitted by the fecal-oral route via contaminated food or water, or by direct contact with infected animals.

Campylobacter spp. produce an acute gastrointestinal illness, which, in most cases, is brief and self limiting. The clinical signs of *Campylobacter enteritis* include watery diarrhea, abdominal pain, fever, nausea, and vomiting. The infection generally resolves with specific anti-microbial therapy. Unusual complications of the disease include a typhoid-like syndrome, arthritis, hepatitis, febrile convulsions, and meningitis. Although the treatment of animals with *Campylobacter enteritis* is useful in the control of the infection, the attempt to eliminate the carrier state in asymptomatic animals might be less rewarding. Personnel should rely on the use of protective clothing, personal hygiene, and sanitation measures to prevent transmission of the disease. Biosafety Level 2 (**Attachment 1**) procedures are recommended for activities using naturally or experimentally infected animals.

Cat-Scratch Fever: *Bartonnella henselae*, a newly described rickettsial organism, has been directly associated with cat-scratch fever. This gram-negative, pleomorphic organism has been demonstrated to produce chronic, asymptomatic bacteremia, especially in younger cats, for at least 2 months, and possibly for as many as 17 months. The organism has been isolated on fleas that fed on infected cats, and fleas have been shown to be capable of transmitting the organism between cats. This finding suggests that fleas could serve as a vector in zoonotic transmission. A recent prevalence survey indicated that approximately 49% of pet and pound/shelter animals have blood cultures positive for this organism. Of patients with the disease, 75% report having been bitten or scratched by a cat, and over 90% report a history of exposure to a cat. Most cases of the disease appear between September and February, and the incidence peaks in December.

The disease begins with inoculation of the organism into the skin (bite or scratch) of an extremity, usually a hand or forearm. A small papule appears at the site of inoculation several days later, and is followed by vesicle and scab formation. The lesion resolves within a few days to a week. Several weeks later, regional lymph node swelling occurs, and can persist for months. Pus formation and rupture of the lymph node sometimes occurs. Cat-scratch fever can progress to a severe systemic or recurrent infection that is life-threatening in immunocompromised hosts.

The use of proper cat-handling techniques, protective clothing, and thorough cleansing of wounds should minimize the likelihood of personnel exposure to the organism of cat-scratch fever.

Enteric Yersiniosis: *Yersinia enterocolitica* and *Yersinia pseudotuberculosis* are present in a wide variety of wild and domestic animals, which are considered the natural reservoirs for the organisms. The host species for *Yersinia enterocolitica* include rodents, rabbits, swine, sheep, cattle, horses, dogs, and cats. Yersinia pseudotuberculosis has a similar host spectrum and also includes various avian species. Human infections often have been associated with household pets, particularly sick puppies and kittens. Occasional reports of *Yersinia* infections in animals housed in the laboratory, such as guinea pigs, rabbits, and nonhuman primates, suggest that zoonotic *Yersinia* infection should not be overlooked in this environment. *Yersinia* spp. are transmitted by direct contact with infected animals through the fecal-oral route.

Yersinia enterocolitica produces fever, diarrhea, and abdominal pain. In some cases, lesions may develop in the lower small intestine, resulting in a clinical presentation that mimics acute appendicitis. Laboratory animals with yersiniosis should be isolated and treated, or culled from the colony. Personnel should rely on the use of protective clothing, personal hygiene, and sanitation measures to prevent the transmission of the disease.

Leptospirosis: This is a contagious bacterial disease of animals and humans due to infection with *Leptospira interrogans* species. Rats, mice, field moles, hedgehogs, squirrels, gerbils, hamsters, rabbits, dogs, domestic livestock, other mammals, amphibians, and reptiles are among the animals that are

considered reservoir hosts. Leptospires are shed in the urine of reservoir animals, which often remain asymptomatic and carry the organism in their renal tubules for years. The usual mode of transmission occurs through abraded skin or mucous membranes, and is often related to direct contact with urine or tissues of infected animals. Inhalation of infectious droplet aerosols and ingestion of urine-contaminated food or water are also effective modes of transmission. Clinical symptoms may be severe, mild or absent, and may cause a wide variety of symptoms including fever, myalgia, headache, chills, icterus and conjunctival suffusion. The disease can usually be treated successfully with antibiotics.

Q Fever: Q fever is a rickettsial disease caused by *Coxiella burnetti*. It is very contagious and usually contracted by inhalation of infected aerosols. Q fever is maintained as an inapparent infection in domestic animals. Sheep, cattle, and goats are the principle reservoirs for human infection. Q fever can also be contracted by ingesting raw milk. The pathogen persists in feces, urine, milk and tissues (especially the placenta), so that infective aerosols form easily. The incubation period for the disease varies from 9 to 28 days. Onset is abrupt, with fever, severe headache, chilliness, severe malaise, myalgia, and, often, chest pains and cough. Fever may rise to 104°F and persist for 1 to >3 weeks. Pneumonia develops in half the patients as revealed by X-ray. About one third of patients develop hepatitis. Endocarditis occurs rarely, although it is serious, with aortic valve involvement. Immunocompromised patients are at risk of developing very severe disease, and should not work with sheep, cattle or goats. Q fever can be successfully treated with antibiotics, especially if diagnosed early. Workers who develop flu-like symptoms following exposure to sheep or goats must mention to the examining physician the possibility of Q fever.

In order to limit the spread of Q fever, there are a number of procedures that should be followed. Laboratories using sheep, cattle, and goats and animal care areas housing these animals should be strictly off limits to anyone who does not have a specific need to be there. Gloves should always be worn when handling these animals. It is important that animals be transported carefully to avoid infecting others. Potentially contaminated surfaces should be decontaminated with dilute solutions of chlorine bleach or dilute solutions of lysol. These organisms are quite resistant to destruction and many ordinary methods of disinfecting will not be adequate. It is extremely important that laboratory doors be kept closed when experiments are in progress. Employees working with potentially infected tissue need to wear protective clothing that is not to be worn outside the work area.

Rat-Bite Fever: Rat-bite fever is caused by either *Streptobacillus moniliformis* or *Spirillum minor*, two microorganisms that are present in the upper respiratory tracts and oral cavities of asymptomatic rodents, especially rats. These organisms are present worldwide in rodent populations, although efforts by commercial suppliers of laboratory rodents to eliminate *S. moniliformis* from their rodent colonies now appear to have been largely successful. The form of the disease caused by *Spirillum minor* can be clinically different from the disease produced by *S. moniliformis.* Most human cases result from a bite wound inoculated with nasopharyngeal secretions, but sporadic cases have occurred without a history of rat bite. Infection also has been transmitted via blood of an experimental animal. Persons working or living in rat infested areas have become infected even without direct contact with rats.

In *S. moniliformis* infections, patients develop chills, fever, malaise, headache, and muscle pain. A rash, most evident on the extremities, follows. Arthritis occurs in 50% of *S. moniliformis* cases, but is considered rare in *Spirillum minor* infections. Complications of untreated cases of the disease include abscesses, endocarditis, pneumonia, and hepatitis.

Proper animal handling techniques are critical to the prevention of rat-bite fever.

Salmonellosis: Enteric infection with *Salmonella* spp. has a worldwide distribution among humans and animals. Among the laboratory animal species, rodents from many sources are now free from salmonella infection, due to successful programs of cesarean rederivation, accompanied by rigorous management practices to exclude the recontamination of animal colonies. The pasteurization of feeds has also contributed to the control of salmonellosis in laboratory animal populations. However, despite the efforts

to eliminate the organism in laboratory animal populations, carriers continue to occur, as a result of infection by contaminated food, or other environmental sources of contamination. These carriers represent a source of infection for other animals and for personnel who work with animals.

Results of recent surveys in dogs and cats have indicated that the prevalence of infection remains approximately 10% among random-source animals. *Salmonella* continues to be recorded frequently among recently imported nonhuman primates. Infection with *Salmonella* is nearly ubiquitous among reptiles. Avian sources are often implicated in foodborne cases of human salmonellosis. Birds in a laboratory animal facility should be considered likely sources for zoonotic transmission. The organism is transmitted by the fecal-oral route, via food derived from infected animals, or from food contaminated during preparation, contaminated water, or direct contact with infected animals. Salmonella infection produces an acute, febrile enterocolitis. Septicemia and focal infections occur as secondary complications. Focal infections can be localized in any tissue of the body, so the disease has diverse manifestations.

Whenever possible, animals known to be *Salmonella* free should be used in laboratory animal facilities. The use of antibiotic treatment of Salmonella-infected animals as a means of controlling the organism in a laboratory animal facility may be unrewarding, because antibiotic treatment can prolong the period of communicability. Personnel should rely on the use of protective clothing, personal hygiene, and sanitation measures to prevent the transmission of the disease. Biosafety Level 2 (**Attachment 1**) procedures are recommended for activities using naturally or experimentally infected animals.

Tetanus: Tetanus is caused by tetanospasmin, a toxin produced by the bacterium *Clostridium tetani*. Spores produced by the bacterium can remain viable for years and can be found in soil and animal feces. Tetanus may follow a contaminated puncture wound or animal bite. The incubation period ranges from 2 to 50 (usually 5 to 10) days. The most common symptom is stiffness of the jaw. Other symptoms include difficulty in swallowing; restlessness; irritability; stiff neck, arms, or legs; headache; fever; sore throat; chilliness; and convulsions. The prognosis is poorer if the incubation period is short and symptoms progress rapidly, or treatment is delayed. Treatment involves early and adequate use of human immune serum to neutralize the toxin; wound debridement to control the bacterial infection; and other therapies to treat the symptoms.

The Public Health Service Advisory Committee on Immunization Practices recommends immunization against tetanus every 10 years. An immunization is also recommended if a particularly tetanus-prone injury occurs in an employee where more than five years has elapsed since the last immunization. **Every employee must have up-to-date tetanus immunizations, and must show proof of current tetanus vaccinations**.

Tuberculosis: Tuberculosis (TB) is an acute or chronic infection caused by the bacterium *Mycobacterium tuberculosis*, and rarely by *M.bovis*. Infection occurs primarily by inhalation. Infectious droplets, which are aerosolized by coughing and dry while suspended in air, may contaminate the air in closed spaces for long periods. In areas where bovine TB has not been eliminated, transmission may occur by ingestion of contaminated milk. Direct inoculation sometimes occurs in laboratory workers.

Most cases of TB in the United States are pulmonary. Pulmonary TB is initially asymptomatic; signs become apparent when a lung lesion is large enough to be visible on chest x-ray. Other symptoms of fever, malaise and weight loss are often so gradual as to be unnoticed. In the nonsensitized host, infection typically begins in the lower of middle lungs. The pathogen multiplies, and may spread. After a few weeks, an immune response is mounted which arrests the bacterium. In 90% of patients, the infection remains dormant but viable. Disease reactivation can occur at any time during the life of the host. Active disease results in the formation of tubercles in the lungs, with a tendency for fibrosis and caseation (non-liquifying necrosis) of the lungs. Once diagnosed, most cases of TB can be effectively treated with an appropriate antibiotic regimen. In recent years, a multi-drug resistant strain of *M.tuberculosis* has emerged, which is very difficult to treat.

FUNGAL DISEASES

Dermatomycoses (Ringworm): Many species of animals are susceptible to fungi that cause the condition known as ringworm. The skin lesion usually spreads in a circular manner from the original point of infection, thus, the name "ringworm." Cats and rabbits may be asymptomatic carriers of the fungal pathogens, which can cause dermatomycosis in humans. In humans, the disease usually consists of small, scaly, semibald, grayish patches with broken, lusterless hairs, and itching. Most lesions are successfully treated with topical anti-fungal medications. Transmission of the disease is by direct contact with an infected animal. Personal hygiene is the best method of prevention.

PARASITIC PROTOZOAN DISEASES

Cryptosporidiosis: *Cryptosporidium* spp. have a cosmopolitan distribution and have been found in many animal species, including mammals, birds, reptiles, and fishes. Cross-infectivity studies have shown a lack of host specificity for many of the organisms. Among the laboratory animals, lambs, calves, pigs, rabbits, guinea pigs, mice, dogs, cats, and nonhuman primates can be infected with the organisms. Cryptosporidiosis is common in young animals, particularly ruminants and piglets.

Cryptosporidiosis is transmitted by the fecal-oral route and can involve contaminated water, food, and possibly air. Many human cases involve human-to-human transmission or possibly the reactivation of subclinical infections. Several outbreaks of the disease have been associated with surface water contaminants. A 1993 waterborne epidemic in Milwaukee, Wisconsin, was believed to involve more than 370,000 people. Zoonotic transmission of the disease to animal handlers has been recorded, including a recent report of cryptosporidiosis among handlers of infected infant nonhuman primates.

Although cryptosporidiosis has become identified widely with immunosuppressed people, the ability of the organism to infect immunocompetent people also has been recognized. In humans, the disease is characterized by cramping, abdominal pain, profuse watery diarrhea, anorexia, weight loss, and malaise. Symptoms can wax and wane for up to 30 days, with eventual resolution. However, in immunocompromised persons, the disease can have a prolonged course that contributes to death. Appropriate personal-hygiene practices should be effective in preventing the spread of infection. No pharmacological treatment is effective for this infection.

Giardiasis: Many wild and laboratory animals serve as a reservoir for *Giardia* spp., although cysts from human sources are regarded as more infectious for humans than are those from animal sources. Dogs, cats, and nonhuman primates are most likely to be involved in zoonotic transmission. According to recent surveys of endoparasites in dogs, the prevalence of *Giardia* generally ranges from 4 to 10%, and approaches 100% in some breeding kennels.

Giardia is transmitted by the fecal-oral route, primarily via cysts from an infected person or animal. The organism resides in the upper gastrointestinal tract where trophozoites feed and develop into infective cysts. Humans and animals have similar patterns of infection. Infection can be asymptomatic, but anorexia, nausea, abdominal cramps, bloating, and chronic, intermittent diarrhea are often seen. Although the organism is rarely invasive, severe infections can produce inflammation in the bile and pancreatic ducts, and damage the duodenal and jejunal mucosa, resulting in the malabsorption of fat and fat-soluble vitamins. Identification and treatment of giardiasis in a laboratory animal host, in combination with effective personal-hygiene measures should reduce the potential for zoonotic transmission in a laboratory animal facility.

Toxoplasmosis: Toxoplasmosis is caused by the parasitic protozoan *Toxoplasma gondii*. This parasite is ubiquitous; as many as 30% of the United States population has had the disease at some time. Most infections are asymptomatic. Some patients may experience swollen lymph nodes, mild fever, headaches, and malaise. Serious disease develops in immunocompromised individuals, with involvement of the lungs, heart, brain, or liver. The pathogen is acquired by eating raw or poorly cooked meat, or by contact with

oocyst-contaminated cat feces. At any given time, approximately 1% of domestic cats are shedding *Toxoplasma* oocysts in their feces. *Toxoplasma* infection can severely damage an unborn child. This can only occur if the mother acquires an acute infection during pregnancy. The result may be miscarriages, still births, or various congenital defects.

To prevent *Toxoplasma* infections, meat should be thoroughly cooked before eating. Cats should be fed only well cooked meat or commercial cat food. Oocysts require two days in the external environment before they become infective. Changing the litter box on a daily basis significantly reduces the risk of transmission. **Pregnant women <u>must</u> not be allowed to work with cats in the laboratory setting**. Animal care workers who have been assigned to cleaning cat cages must be reassigned to other jobs during pregnancy. Workers who are exposed to cats in other ways would do best to avoid this exposure.

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5. *Public Health Service Policy on Humane Care and Use of Laboratory Animals*, National Institutes of Health, Office of Laboratory Animal Science, March 1996.
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ATTACHMENT 1

Biosafety Level 2 Procedures

The following standard and special practices, safety equipment, and facilities apply to agents assigned to Biosafety Level 2 as described by the Centers for Disease Control and Prevention:

A. Standard Microbiological Practices

1. Access to the laboratory is limited or restricted at the discretion of the laboratory director (PI/faculty member) when experiments are in progress.
2. Persons wash their hands after they handle viable materials, after removing gloves, and before leaving the laboratory.
3. Eating, drinking, smoking, handling contact lenses, and applying cosmetics are not permitted in the work areas. Food is stored outside the work area in cabinets or refrigerators designated for this purpose only.
4. Mouth pipetting is prohibited; mechanical pipetting devices are used.
5. Policies for the safe handling of sharps are instituted.
6. All procedures are performed carefully to minimize the creation of splashes or aerosols.
7. Work surfaces are decontaminated on completion of work or at the end of the day and after any spill or splash of viable material with disinfectants that are effective against the agents of concern.
8. All cultures, stocks, and other regulated wastes are decontaminated before disposal by an approved decontamination method such as autoclaving. Materials to be decontaminated outside of the immediate laboratory are placed in a durable, leakproof container and closed for transport from the laboratory. Materials to be decontaminated off-site from the facility are packaged in accordance with applicable local, state, and federal regulations before removal from the facility.
9. An insect and rodent control program is in effect.

B. Special Practices

1. Access to the laboratory is limited or restricted by the laboratory director (PI/faculty member) when work with infectious agents is in progress. In general, persons who are at increased risk of acquiring infection, or for whom infection may have serious consequences, are not allowed in the laboratory or animal rooms. For example, persons who are immunocompromised or immunosuppressed may be at increased risk of acquiring infections. The laboratory director (PI/faculty member) has the final responsibility for assessing each circumstance and determining who may enter or work in the laboratory or animal room.
2. The laboratory director (PI/faculty member) establishes policies and procedures whereby only persons who have been advised of the potential hazards and meet specific entry requirements (e.g., immunization) may enter the laboratory.
3. A biohazard sign must be posted on the entrance to the laboratory when etiologic agents are in use. Appropriate information to be posted includes the agent(s) in use, the biosafety level, the required immunizations, the investigator's name and telephone number, any personal protective equipment that must be worn in the laboratory, and any procedures required for exiting the laboratory.
4. Laboratory personnel receive appropriate immunizations or tests for the agents handled or potentially present in the laboratory (e.g., Hepatitis B vaccine or tuberculosis (TB) skin testing).
5. When appropriate, considering the agent(s) handled, baseline serum samples for laboratory and other at-risk personnel are collected and stored. Additional serum specimens may be collected periodically depending on the agents handled or the function of the facility.

6. Biosafety procedures are incorporated into standard operating procedures or in a biosafety manual adopted or prepared specifically for the laboratory by the laboratory director (PI/faculty member). Personnel are advised of special hazards and are required to read and follow instructions on practices and procedures.
7. The laboratory director (PI/faculty member) ensures that laboratory and support personnel receive appropriate training on the potential hazards associated with the work involved, the necessary precautions to prevent exposures, and the exposure evaluation procedures. Personnel receive annual updates or additional training as necessary for procedural or policy changes.
8. A high degree of precaution must always be taken with any contaminated sharp items, including needles and syringes, slides, pipettes, capillary tubes, and scalpels.
    a. Needles and syringes or other sharp instruments should be restricted in the laboratory for use only when there is no alternative, such as parenteral injection, phlebotomy, or aspiration of fluids from laboratory animals and diaphragm bottles. Plasticware should be substituted for glassware whenever possible.
    b. Only needle-locking syringes or disposable syringe-needle units (i.e., needle is integral to the syringe) are used for injection or aspiration of infectious materials. Used disposable needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal; rather, they must be carefully placed in conveniently located puncture-resistant containers used for sharps disposal. Non-disposable sharps must be placed in a hard-walled container for transport to a processing area for decontamination, preferably by autoclaving.
    c. Syringes which re-sheathe the needle, needleless systems, and other safety devices are used when appropriate.
    d. Broken glassware must not be handled directly by hand but must be removed by mechanical means such as a brush and dustpan, tongs, or forceps. Containers of contaminated needles, sharp equipment, and broken glass are decontaminated before disposal, according to any local, state, or federal regulations.
9. Cultures, tissues, specimens of body fluids, or potentially infectious wastes are placed in a container with a cover that prevents leakage during collection, handling, processing, storage, transport, or shipping.
10. Laboratory equipment and work surfaces should be decontaminated with an effective disinfectant on a routine basis, after work with infectious materials is finished, and especially after overt spills, splashes, or other contamination by infectious materials. Contaminated equipment must be decontaminated according to any local, state, or federal regulations before it is sent for repair or maintenance or packaged for transport in accordance with applicable local, state, or federal regulations, before removal from the facility.
11. Spills and accidents that result in overt exposures to infectious materials are immediately reported to the laboratory director (PI/faculty member). Medical evaluation, surveillance, and treatment are provided as appropriate and written records are maintained.
12. Animals not involved in the work being performed are not permitted in the lab.

C. Safety Equipment (Primary Barriers)

1. Properly maintained biological safety cabinets, preferably Class II, or other appropriate personal protective equipment or physical containment devices are used whenever:
    a. Procedures with a potential for creating infectious aerosols or splashes are conducted. These may include centrifuging, grinding, blending, vigorous shaking or mixing, sonic disruption, opening containers of infectious materials whose internal pressures may be different from ambient pressures, inoculating animals intranasally, and harvesting infected tissues from animals or embryonate eggs.

b. High concentrations or large volumes of infectious agents are used. Such materials may be centrifuged in the open laboratory if sealed rotor heads or centrifuge safety cups are used, and if these rotors or safety cups are opened only in a biological safety cabinet.

2. Face protection (goggles, mask, face shield or other splatter guard) is used for anticipated splashes or sprays of infectious or other hazardous materials to the face when the microorganisms must be manipulated outside the Biological Safety Cabinet (BSC).
3. Protective laboratory coats, gowns, smocks, or uniforms designated for lab use are worn while in the laboratory. This protective clothing is removed and left in the laboratory before leaving for non-laboratory areas (e.g., cafeteria, library, administrative offices). All protective clothing is either disposed of in the laboratory or laundered by the institution; it should never be taken home by personnel.
4. Gloves are worn when hands may contact potentially infectious materials, contaminated surfaces or equipment. Wearing two pairs of gloves may be appropriate. Gloves are disposed of when overtly contaminated, and removed when work with infectious materials is completed or when the integrity of the glove is compromised. Disposable gloves are not washed, reused, or used for touching "clean" surfaces (keyboards, telephones, etc.), and they should not be worn outside the lab. Alternatives to powdered latex gloves should be available. Hands are washed following removal of gloves.

D. Laboratory Facilities (Secondary Barriers)

1. Provide lockable doors for facilities that house restricted agents (as defined in 42 CFR 72.6).
2. Consider locating new laboratories away from public areas.
3. Each laboratory contains a sink for hand washing.
4. The laboratory is designed so that it can be easily cleaned. Carpets and rugs in laboratories are inappropriate.
5. Bench tops are impervious to water and are resistant to moderate heat and the organic solvents, acids, alkalis, and chemicals used to decontaminate the work surfaces and equipment.
6. Laboratory furniture is capable of supporting anticipated loading and uses. Spaces between benches, cabinets, and equipment are accessible for cleaning. Chairs and other furniture used in laboratory work should be covered with a non-fabric material that can be easily decontaminated.
7. Install biological safety cabinets in such a manner that fluctuations of the room supply and exhaust air do not cause the biological safety cabinets to operate outside their parameters for containment. Locate biological safety cabinets away from doors, from windows that can be opened, from heavily traveled laboratory areas, and from other potentially disruptive equipment so as to maintain the biological safety cabinets' air flow parameters for containment.
8. An eyewash station is readily available.
9. Illumination is adequate for all activities, avoiding reflections and glare that could impede vision.
10. There are no specific ventilation requirements. However, planning of new facilities should consider mechanical ventilation systems that provide an inward flow of air without recirculation to spaces outside of the laboratory. If the laboratory has windows that open to the exterior, they are fitted with fly screens.