

## EASTERN ILLINOIS UNIVERSITY

### *OCCUPATIONAL HEALTH FOR ANIMAL WORKERS*

The Public Health Service of the U.S. Department of Health and Human Services has directed research/teaching institutions to develop programs to promote the health and safety of staff who have substantial contact with animals. The program at the Eastern Illinois University consists of informational material about several specific conditions or practices with which animal workers should be familiar. All faculty, staff, and research students whose duties involve significant contact with animals are asked to **read this material, complete the last page of this packet (entitled “Certification of Receipt and Understanding of *Occupational Health for Animal Workers*”), detach it, and return it to the Office of Research and Sponsored Programs.** You should keep the rest of the material for future reference.

#### References:

1. *Public Health Service Policy on Humane Care and Use of Laboratory Animals*, National Institutes of Health, Office for Protection from Research Risks, March 1996.
2. *Guide for the Care and Use of Laboratory Animals*, Institute of Laboratory Animal Resources, Commission on Life Sciences, National Research Council, 1996, National Academy Press, Washington, D.C.
3. *Occupational Health and Safety in the Care and Use of Research Animals*, Institute of Laboratory Animal Resources, Commission on Life Sciences, National Research Council, 1997, National Academy Press, Washington, D.C.

## **Reporting Injury or Illness**

Any injury or hazardous exposure arising out of and in the course of employment must be reported at once to the immediate supervisor for instructions on procedures for obtaining medical treatment. Reporting of all accidents to the supervisor is necessary and must be prompt and accurate in order to assure proper handling of claims...”

## **Personal Hygiene<sup>1</sup>**

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

1. There should be no eating, drinking, smoking or applying 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. Gloves should be worn at all times for the handling of animals, their fluids, tissues, or excreta. All contaminated or infected substances should be handled in such a way as to minimize aerosols.
4. There are numerous special requirements for the handling of large animals. Please contact the attending veterinarians for details.
5. Laboratory coats should be worn over street clothes when working with animals. This will decrease the contamination of street clothing. These laboratory clothes should not be worn during eating.
6. 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.
7. All work surfaces should be decontaminated daily and after any spill of animal-related material.
8. Careful hand washing should be done after handling of animals and prior to leaving the laboratory for any reason.
9. Certain infections are transmitted from animals to humans primarily by the animals' feces or urine entering a human's body by mouth. Examples of this usual means of transmission are *Salmonella*, *Shigella* and *Entamoeba*. It cannot be stressed too much that every precaution should be taken to avoid this mode of transmission by alertness and very careful personal hygiene.

<sup>1</sup>Adapted from *Biosafety in Microbiological & Biomedical Laboratories*, 4th edition, US Department of Health & Human Services, Center for Disease Control, National Institutes of Health, 4th edition, May 1999, U.S. Govt. Printing Office.

### **Animal Bites, Scratches, Kicks**

Bites, scratches, and kicks are potential hazards associated with research animal contact. They may be prevented or minimized through proper training in animal-handling technique. Personnel working with large domestic animals might sustain crushing injuries when the animals kick, fall, or simply shift their body weight.

Several factors need to be considered in work with animals. Animals respond to sounds and smells in the same manner as people. They also hear, smell, and react to things that people might not detect. These reactions can produce injury to an animal handler. Many animals have a “flight zone;” approaches by another animal or a person cause an attempt to escape. Being aware of an animal’s flight zone will help avoid injuries. Many animals are social and show visible signs of distress if isolated from others of their kind. Knowledge of species-specific animal behavior is important in reducing risks.

Animal bites, especially those by rodents that inflict little tissue damage, are sometimes considered inconsequential by personnel who are unfamiliar with the host of diseases that can spread by this mechanism. Serious complications can result from wound contamination by the normal oral flora of the animals involved. Personnel should maintain current tetanus immunizations, seek prompt medical review of wounds, and initiate veterinary evaluation of the animal involved, if warranted. Rabies, B-virus infection, hantavirus infection, cat-scratch fever, tularemia, rat-bite fever, and orf are among the specific diseases that can be transmitted by animal bites.

### **Sharps**

Sharps are ubiquitous in animal care. Needles, broken glass, syringes, pipette, scalpels --all are commonly used in animal facilities and laboratories. Puncture-resistant and leakproof containers for sharps should be available at critical locations in the facilities. Improper disposal of sharps with regular trash may expose humans to the risk of wounds and potentially infectious agents and hazardous chemicals. State and municipal regulations are specific in the requirements for proper disposal of “sharps.”

Basic rules to remember:

- Never recap needles after use - have a “sharps” container nearby.
- Dispose of syringes, needles, glass, vials, and scalpels in a “sharps” container only.
- 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**

Allergic reactions to animals are among the most common conditions that adversely affect the health of workers involved in the care and use of animals in research. One survey demonstrated that three-fourths of all institutions with laboratory animals had animal care workers with allergic symptoms. The estimated prevalence of allergic symptoms in the population of regularly exposed animal care workers ranges from 10% to 44%. An estimated 10% of laboratory workers eventually develop occupation-related asthma.

Allergies can be manifested in a number of ways, including 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. Allergy to animals is particularly common in workers exposed to animals such as cats, rabbits, mice, rats, gerbils and guinea pigs.

Most of the reactions are of the allergic rhinitis and allergic conjunctivitis type. Less than half of these will actually be asthma. People who have a prior personal history or family history of asthma, hay fever, or eczema will be more likely to develop asthma after contact with animals. But these people do not seem any more likely to develop rhinitis and conjunctivitis than do people without such personal or family history. Because of this, it is necessary that everyone exercise certain precautions to attempt to prevent animal allergy. These attempts should not be focused only on people with atopic history.

Symptoms can develop anywhere from months to years after a person begins working with animals. A majority of the individuals who are going to develop symptoms will do so within the first year. It is extremely unusual to develop symptoms after more than two years of animal contact.

Certain procedures should be routinely followed in order to prevent the development of animal allergy. Animals should be housed, as well as manipulated and/or handled, in extremely well ventilated areas to prevent build-up of animal allergens. Workers should always wear gloves and laboratory coats to prevent direct exposure to the animals, animal urine, and animal dander. Frequent handwashing is important. In order to prevent the inhalation of contaminated material, cages should be changed frequently, and masks should be worn during the changing of cages.

Despite adherence to preventive techniques, some individuals will develop allergies after contact with laboratory animals. Rarely will this be so severe that people are forced to change their line of work. More commonly, this can be controlled with the use of personal protective equipment (PPE) while working with animals. The use of gloves, laboratory coats, masks, eyewear, and other types of protective clothing that are worn only in animal rooms is encouraged. Once a person develops allergic symptoms, disposable surgical masks are usually ineffective. Some commercial dust respirators can exclude up to 98% of mouse urinary allergens. High-efficiency respirators are most likely to be of value, but they are cumbersome, and often are not used appropriately. Employees using effective respiratory protection (respirators) will need respiratory fit-testing and medical clearance. Certainly, any one with symptoms related to animal exposure should seek medical diagnosis and treatment.

## **Tetanus**

Tetanus (lockjaw) is an acute, often fatal disease caused by the toxin of the tetanus bacillus. The bacterium usually enters the body in spore form, often through a puncture wound contaminated with soil, street dust, or animal feces, or through lacerations, burns, and trivial or unnoticed wounds. 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 should have up-to-date tetanus immunizations. If you need a tetanus immunization or have questions regarding this issue, please contact your supervisor.

## **Viral Diseases**

### **B-Virus Infection**

***(Herpes B, Herpesvirus simiae, Cercopithecine Herpesvirus 1, or CHV1)***

B-virus produces a life-threatening disease of humans that has resulted in several deaths in the last decade. In macaques, B-virus produces a mild clinical disease similar to human herpes simplex. During primary infection, macaques can develop tongue or lip blisters or ulcers, which generally heal within two weeks. After acute infection, the virus becomes dormant in the nerves in the body region where it was first introduced. Reactivation of the virus from the resting state can result in viral shedding, and is often associated with physical or psychological stress. The infection is transmitted between macaques, via virus-laden secretions, through mucous membrane contact.

B-virus should be considered endemic among Asian monkeys of the genus *Macaca* unless the animals have been obtained from specific breeding colonies confirmed to be free of the virus. Although several species of New World monkeys and Old World monkeys other than members of the genus *Macaca* are known to succumb to fatal B-virus infection, only macaques are known to harbor B-virus naturally.

B-virus is transmitted to humans primarily through exposure to contaminated saliva (in bites) and scratches. Transmission related to needlestick injury, injury obtained in handling contaminated cages, and exposure to infected nonhuman primate tissues have occurred. Human-to-human transmission has been documented. After exposure (via bite, scratch, other local trauma, etc.), humans might develop blister(s) at the site of inoculation. The disease usually terminates with ascending flaccid paralysis.

The Centers for Disease Control (CDC) have developed guidelines for prevention of this disease in humans. In brief, the recommendations emphasize the need for nonhuman primate handlers to use protective clothing and equipment, to include long-sleeved garments, face shields or masks, goggles, and gloves. Despite well published handling recommendations and heightened awareness of the B-virus hazard among personnel, exposure of personnel to monkey bites and scratches remains common, as evidenced by the numerous injuries reported to testing laboratories and to CDC. (7-2549).

### **Hantavirus Infection**

**(Hemorrhagic Fever with Renal Syndrome)**

### **(Nephropathia Endemica)**

The hantaviruses, which can cause severe hemorrhagic disease, are widely distributed in nature among wild-rodent reservoirs. The severity of the disease produced depends on the strain involved. Strains producing hemorrhagic fever with renal syndrome are prevalent in southeastern Asia and Japan, and focally throughout Eurasia. Outbreaks of hantavirus infection characterized by a severe pulmonary syndrome resulting in numerous deaths have been recognized in the southwestern U.S. Infections associated with laboratory rodents have occurred in Russia, Scandinavia, Japan, and Belgium (MMWR 37(6); 87-90, 2/19/98).

Rodents in several genera have been implicated in outbreaks of the disease in the U.S. 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 apparently is not a feature of hantavirus infection.

The form of the disease known as nephropathia endemica is characterized by fever, back pain, and nephritis that causes 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. But 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**  
**(Contagious Ecthyma/Contagious Pustular Dermatitis)**

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 which results in severe neurologic problems and death. Rabies virus infects all mammals, but the main reservoirs are wild and domestic canines, cats, skunks, raccoons, bats, and other biting animals. The disease is virtually unheard of in commonly-used laboratory animals. However, the incidence of rabies in wildlife in the U.S. has been rising in recent years, and the possibility of rabies transmission to dogs or cats with uncertain vaccination histories, and originating from an uncontrolled environment must be considered.

Rabies virus is most commonly transmitted by the bite of a rabid animal, or by the introduction of virus-laden saliva into a fresh skin wound or an intact mucous membrane. Airborne transmission can occur in caves where bats roost. Personnel who handle tissue specimens or other materials potentially laden with rabies virus during necropsy or other procedures should be regarded as "at-risk" for infection.

Rabies produces an almost invariably fatal encephalomyelitis. Patients experience a period of apprehension and develop headache, malaise, fever, and sensory changes at the site of a prior animal-bite wound. The disease progresses to paresis or paralysis, inability to swallow and the related hydrophobia, delirium, convulsions, and coma. Death is often due to respiratory paralysis.

Rabies is an endemic disease in Illinois, especially in skunks 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 Illinois in research or teaching should be handled with care. Precautions should take into account the facts 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. An excellent pre-exposure vaccine (human diploid cell vaccine) is available for those people at high risk of exposure.

## **Bacterial Diseases**

### **Brucellosis**

The incidence of brucellosis, which is caused by *Brucella* spp., in agricultural species in the United States is low because eradication of the disease is emphasized. Recent human cases have been associated with consumption of raw (unpasteurized) dairy products. Foci of infection persist in cattle, swine, and ruminant populations. Although zoonotic transmission of the disease from those species is not considered important in the laboratory, *Brucella suis* of swine might achieve importance as the use of swine in the laboratory increases. *Brucella canis* in dogs remains a zoonotic hazard in the laboratory animal facility. Canine brucellosis has been identified in dog-production colonies and in 6% of dog populations.

Most of the reported human cases of *Brucella canis* infection have resulted from contact with aborting bitches. Placental tissues from infected dogs are typically rich in organisms. *Brucella canis* also produces prolonged bacteremia and can be present in the urine of infected animals. Direct contact with the skin or mucous membranes during specimen handling or preparation in the laboratory has resulted in transmission. Aerosol transmission also has resulted in large outbreaks of the disease in the laboratory setting. Human infection with *Brucella canis* is characterized by fever, headache, chills, myalgia, nausea, and weight loss. Subclinical and inapparent infection can occur.

Preventive measures should be aimed at excluding infected animals from the facility. Serological tests are available for diagnosis. Animal handlers should wear appropriate protective clothing and practice good personal hygiene to prevent transmission. Animal Biosafety Level 3 practices, as well as containment equipment and facilities are recommended for animal studies involving *Brucella canis*, *Brucella abortus*, *Brucella melitensis*, or *Brucella suis*.

### **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 antimicrobial 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. Animal Biosafety Level 2 is recommended for activities using naturally or experimentally infected animals.



## 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. Leptospire 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 transmissions. 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.

## Plague

Plague, caused by *Yersinia pestis*, has not been identified as an important disease entity in the laboratory animal setting. However, focal outbreaks of this once devastating disease continue to be recognized worldwide, including the United States, where the disease exists in wild rodents in the western one-third of the country. In the United States, most human cases are related to wild rodents, but cats, dogs, coyotes, rabbits, and goats have also been associated with human infection.

Most cases are the result of bites by infected fleas, or contact with infected rodents. In human plague associated with nonrodent species, infection has resulted from bites or scratches, handling of infected animals (especially cats with pneumonic disease), ingestion of infected tissues, and contact with infected tissues. Nonrodent species can serve as transporters of fleas from infected rodents into the laboratory.

Human plague has a localized (bubonic) form and a septicemic form. In bubonic plague, patients have fever and large, swollen, inflamed, and tender lymph nodes, which can suppurate. The bubonic form can progress to septicemic plague, with spread of the organism to diverse parts of the body, including lungs and meninges. The development of secondary pneumonic plague is of special importance

because aerosol droplets can serve as a source of primary pneumonic or pharyngeal plague, creating a potential for epidemic disease.

Preventive measures in a laboratory animal facility should encompass the control of wild rodents and the quarantine, examination, and ectoparasite treatment of incoming animals with potential infection. Those measures need to be applied continuously for animals that are housed outdoors, and therefore have an opportunity for contact with plague-infected animals or their fleas. Vaccines are available for personnel in high-risk categories, but confer only brief immunity. Animal Biosafety Level 2 practices, as well as containment equipment and facilities, are recommended for personnel working with naturally or experimentally infected animals.

### **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 *Strep. 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 *Strep. 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 *Strep. moniliformis* infections, patients develop chills, fever, malaise, headache, and muscle pain. A rash, most evident on the extremities, follows. Arthritis occurs in 50% of *Strep. 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* continue 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. Animal Biosafety Level 2 is recommended for activities using naturally or experimentally infected animals.

### **Tuberculosis**

Tuberculosis of animals and humans is caused by acid-fast bacilli of the genus *Mycobacterium*. Cattle, birds, and humans serve as the main reservoirs for these mycobacteria. Many laboratory animal species, to include nonhuman primates, swine, sheep, goats, rabbits, cats, dogs, and ferrets, are susceptible to infection, and contribute to the spread of the disease.

*M. tuberculosis* is transmitted via aerosols from infected animals or tissues. This mode of transmission also applies to most of the other mycobacterial species that might be encountered in laboratory animal contact. Humans can contract the disease in the laboratory through exposure of infectious aerosols generated by the handling of dirty bedding, the use of high-pressure water sanitizers, or the coughing of animals with respiratory involvement. The bacteria may also be shed in droppings, or from skin exudates resulting from infected, ruptured lymph nodes.

The most common form of tuberculosis reflects the involvement of the pulmonary system, and is characterized by soft cough, which progresses to the coughing of blood or blood stained sputum. Other forms of the disease can involve any tissue or organ system, due to the spread via the blood stream. General symptoms as the disease progresses include weight loss, fatigue, lassitude, fever and chills.

The diagnosis of tuberculosis in humans and animals relies primarily on the use of the intradermal tuberculin skin test. The prevention and control of tuberculosis in a biomedical research facility require personnel education, periodic surveillance for infection in nonhuman primates and their handlers, and isolation and quarantine of any suspect animal. Animals confirmed positive will normally be euthanatized.

### **Fungal Diseases**

#### **Ringworm** (Dermatomycosis)

Many species of animals are susceptible to fungi (dermatophyte) that cause the condition known as ringworm. Dogs, cats, and domestic livestock are the most commonly affected animals. The skin lesion usually spreads in a circular manner from the original point of infection, giving rise to the term "ringworm." The complicating factor is that cats and rabbits may be asymptomatic carriers of the pathogens which can cause the condition in humans. Dermatophyte spores can become widely disseminated and persistent in the environment, contaminating bedding, equipment, dust, surfaces, and air, resulting in the infection of personnel who have no direct animal contact.

In humans, the disease usually consists of small, scaly, semibald, grayish skin patches with broken, lusterless hairs, with itching. Lesions often are on the hands, arms or other exposed areas, but invasive and systemic infections have been reported in immunocompromised people. The use of protective clothing, disposable gloves, and other appropriate personal hygiene measures are essential for the control of this zoonosis in a laboratory animal facility.

## **Protozoal 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.

Giardiasis is transmitted by the fecal-oral route chiefly 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 a disease caused by an organism called *Toxoplasma gondii*. Wild and domestic cats are the only definitive hosts of this organism. Approximately 30% of the United States human population has had this disease at some time. Usually this disease is quite mild and may be mistaken for a simple cold or viral infection. Swollen lymph nodes are common. In addition, it is common to have a mild fever, general washed-out feeling, and mild headaches. Rarely, more serious illness can occur, with involvement of the lungs, heart, brain or liver.

People acquire this disease by eating infected beef or pork which is uncooked or undercooked, or by ingestion of food, water, or other material that has been contaminated by feces of an infected cat. At any one time, about 1% of all cats will be shedding toxoplasma oocysts in their feces. Toxoplasmosis can have severe consequences in pregnant women and immunologically impaired people. In pregnant women with a primary infection, a transplacental infection of the fetus may occur. In early pregnancy, the fetal infection can result in death of the fetus or chorioretinitis, brain damage, fever, jaundice, hepatosplenomegaly, and convulsions at birth, or shortly thereafter. Fetal infection during late gestation can result in mild or subclinical disease. Primary infection in immunosuppressed people can be characterized by pneumonia, myocarditis, brain involvement, and death.

To prevent infection of human beings by *T. gondii*, people should wash their hands thoroughly with soap and water after handling meat. All cutting boards, sink tops, knives, and other utensils that come in contact with uncooked meat should be washed with soap and water. Meat should be cooked until a temperature of 151° F (66° C) has been reached before consumption by human beings or other animals. Tasting while cooking meat, or while seasoning homemade sausages should be avoided.

Pregnant women should avoid contact with cat feces, soil, or uncooked meat. Cat litter and cat feces should be disposed of promptly before sporocysts become infectious, and gloves should be worn in the handling of potentially infective material.

Because most cats become infected by eating cyst-contaminated tissues, pet cats should be fed only dry, canned, or cooked food. Cats should never be fed uncooked meat, viscera, or bones, and efforts should be made to keep pet cats indoors to prevent hunting. Because cats cannot use plant sources of vitamin A, some owners feed their cats uncooked liver to improve their fur. This practice should be discouraged, because *T. gondii* cysts frequently are found in livers of food animals, and commercially available cat foods contain most essential nutrients.

It is University policy that pregnant women should not be allowed to work with cats in the laboratory setting. During pregnancy, animal care workers who have been assigned to cleaning cat cages should be reassigned to other jobs.

## **Rickettsial Diseases**

### **Cat-Scratch Fever**

*Bartonella 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.

### **Q Fever**

Q fever is caused by the rickettsial agent *Coxiella burnetii*. This disease has a worldwide distribution, and infection is most common in sheep, goats, and cattle. Cats, dogs, and domestic fowl can also be infected. The prevalence of infection among sheep is high throughout the United States, and sheep have been the primary species associated with outbreaks of the disease in laboratory animal facilities. Other documented sources of laboratory environment associated disease include the cat and the rabbit.

Humans usually acquire this infection via inhalation of infectious aerosols, although transmission by ingestion has been recorded. The organism is shed in urine, feces, milk, and especially birth products of domestic ungulates. The placenta of an infected ewe can contain up to  $10^9$  organisms per gram of tissue, and milk can contain  $10^5$  organisms per ml. The organism is resistant to drying, and persists in the environment for long periods, contributing to the widespread dissemination of infectious aerosols. The risk of infection is high because the infectious dose by inhalation is fewer than 10 microorganisms. The importance of those factors was evident in outbreaks of the disease associated with the use of pregnant sheep in research facilities in the U.S. when personnel became infected along the routes of sheep transport, and in the vicinity of sheep surgery (contact with soiled linens).

Recommendations for the control of Q fever in a research facility include the separation of sheep research activities from other areas. Physical barriers, appropriate air-handling systems, the proper use and disposal of protective clothing, and the use of disinfectants in the sanitation and waste management programs minimize the risk of exposure. Whenever possible, male or nonpregnant female sheep should be used in research programs. However, many research studies require the use of pregnant sheep. Neither antimicrobial therapy nor serological testing, in combination with the culling of infected animals, has led to the reliable development of disease-free flocks for use in biomedical research programs.

The disease in humans varies widely in duration and severity, and asymptomatic infection is possible. The disease often has a sudden onset with fever, chills, retrobulbar headache, weakness, malaise and profuse sweating. In some cases, pneumonitis occurs with a nonproductive cough, chest pain, and few other signs. Endocarditis can occur on native or prosthetic cardiac valves and often extends over a period of months or years, and results in relapsing systemic infection. Most cases of Q fever resolve within two weeks. Persons with valvular heart disease should not work with *C. burnetii*.



**Certification of Receipt and Understanding of  
*Occupational Health for Animal Workers***

I have read and understood the Eastern Illinois University *Occupational Health for Animal Worker* document, including the articles on “Reporting Injury or Illness,” “Personal Hygiene,” “Animal Bites, Scratches, Kicks,” “Sharps,” “Human Allergies to Animals,” “Tetanus,” and the discussions of the various zoonoses which are important to laboratory animal personnel.

Federal policy requires Eastern Illinois University to document that this information has been provided to you.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name Typed or Printed

\_\_\_\_\_  
Animal Care & Use Protocol #(s)

\_\_\_\_\_  
Department

**Note:** If you are the principal investigator, please check here (  ). If not, please name the principal investigator(s) of the “Animal Care and Use Protocol(s)”:

\_\_\_\_\_  
\_\_\_\_\_

**PLEASE DETACH THIS PAGE AND RETURN TO:**

IACUC Administrator  
Office of Research and Sponsored Programs