Occupational Health Program for Personnel with Laboratory Animal Contact at the Charles River Campus and Boston University Medical Campus

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PURPOSE

The purpose of the Occupational Health Program is to protect the health of both personnel and laboratory animals. The following information should be useful in assessing individual risk and avoiding potential health problems associated with exposure to laboratory animals. The requirements of this program are based on guidelines found in the NIH Guide for the Care and Use of Laboratory Animals. Health services related to this program are available at Boston University Student Health Services, Boston University Occupational Health Center, or Boston Medical Center Occupational and Environmental Medicine Department.

WHO IS INCLUDED IN THE PROGRAM

Personnel included are those involved in the direct care of animals and their living quarters as well as those individuals who have direct contact with animals (live or dead), their viable tissues, body fluids, or wastes. Participation in this program also includes all animal care staff, investigators, technical staff, students, volunteers, engineers, housekeepers, security officers, maintenance personnel, or anyone else who is exposed to animals, their tissues or fluids, or who may be exposed to them as a consequence of their job duties. In some cases, personnel involved with facilities management, housekeeping, and visitors to animal facilities may be required to follow protective procedures. The assessment of risk will be determined by frequency of contact, intensity of exposure, hazards associated with the animals being handled, hazardous properties of agents used in research, the susceptibility of individual, the hazard–control measures available, and the occupational health history of the individual.

SERVICES

Prior to working with animals, all persons with substantial laboratory animal contact should have a general health and exposure assessment by completing a questionnaire. The need for a physical examination is based on responses to the questionnaire and the risks inherent in the project. A tetanus vaccination will be provided if indicated. Students are required to be compliant with Massachusetts' regulations and Boston University's requirements in regard to immunizations. Rabies pre–exposure immunization is available, if indicated. Injury and illness assessment and management related to animal or laboratory research is available. Immunizations, medical clearance for respirator use, allergy assessments, and assistance in safety issues related to prevention of occupational injuries or illness from special research hazards is also available.

HOW TO CONTACT HEALTH SERVICES

In Case of Serious Emergency on the Boston University Charles River Campus

Call Boston University Police at (617) 353-2121

After hours, Holidays and Weekends or for Serious Emergency Contact: Boston Medical Center Emergency Department on the East Newton Campus at (**617) 638-6240.**

During Regular Business Hours (9:00 a.m. - 5:00 p.m.) Contact **Boston University Occupational Health at (617) 353-6630** or **Student Health Services at (617) 353-3575** immediately if you are bitten or scratched by an animal, if you cut or scratch yourself on animal caging, or if you are experiencing unusual disease symptoms or allergy symptoms. Always report incidents to your supervisor.

In Case of Serious Emergency on the Boston University Medical Campus

Call Control: (617) 638-4444

After hours, Holidays and Weekends or for Serious Emergency Contact: Boston Medical Center Emergency Department on the East Newton Campus at (**617) 638-6240.**

During Regular Business Hours (7:30 a.m. - 4:00 p.m.) Contact **Boston Medical Center Occupational & Environmental Medicine at (617) 638-8400** immediately if you are bitten or scratched by an animal, if you cut or scratched yourself on animal caging, or if you are experiencing unusual disease symptoms or allergy symptom. Always report incidents to your supervisor.

Appointments for Medical Services or Concerns

Boston University, Charles River Campus
Boston University Occupational Health Center, **cal**l (**617) 353-6630**
930 Commonwealth Avenue, West, Boston, (entrance on Pleasant Street)

Boston University Medical Campus
Boston Medical Center Occupational & Environmental Medicine, call (**617) 638-8400,** Preston Family Building (F5) 5th Floor, 732 Harrison Avenue, Boston, on the East Newton Campus.

Boston University Student Health Services, call (**617) 353-3575,** 881 Commonwealth Avenue (West Entrance), Boston.

INFECTION CONTROL IN THE LABORATORY AND ANIMAL FACILITY

Since zoonotic diseases can enter the body through a variety of routes including broken skin or through the eyes, mucus membranes, or the lungs, a combination of engineering controls, work practices, and personal protective devices are necessary to prevent laboratory–acquired infection.

ENGINEERING CONTROLS

The aerosol route of exposure is the most difficult route of transmission to control. The facility (laboratory, procedure, or animal room) must operate with inward directional airflow; i.e., air must move from the corridor (area of least contamination) into the room where staff members manipulate the animal or animal by–products (area of greatest contamination). Air exhausted from these rooms cannot be recirculated to other rooms; the air must be discharged to the outside. When there is a very high potential for aerosol generation, additional facility related engineering controls such as sealed penetrations through the walls; double door access to the rooms, or installation of HEPA filters in the exhaust air system may be necessary. A facility can also apply engineering controls locally to reduce aerosol spread. Containment devices (e.g., bonnet tops for cages, ventilated racks) will help keep a potential zoonotic agent in the cage. Staff should use biological safety cabinets when opening the cages, conducting sampling or necropsy activities, or manipulating infectious materials. All biological safety cabinets and the high efficiency particulate air (HEPA) filters in ventilated cage racks need to be certified and leak tested annually. Staff should use special devices such as sealable centrifuge cups, blenders, or homogenizers whenever there is a high potential for creating aerosols of infectious microorganisms. Workers must also rely on personal protective devices, such as respirators, to minimize their exposure to infectious aerosols when containment devices offer insufficient protection.[1]

ANIMAL QUARANTINE AND STABILIZATION

Quarantine is the separation of newly received animals from those already in the facility until each new animal's health status has been evaluated. Effective quarantine minimizes the introduction of disease agents into established colonies. The quarantine period should be of sufficient duration to allow expression of diseases present in the incubation stages. Some or all of the following should be achieved during the quarantine and stabilization period: diagnosis, control, prevention and treatment of diseases; physiological and nutritional stabilization; and, grooming to include ectoparasite control.[1]

WORK PRACTICES AND PROCEDURES

Researchers should understand the hazards associated with the procedures they are performing, recognize the route through which they can be exposed to these hazards, select work practices that minimize exposures, and through training and experience acquire the discipline and skill necessary to sustain proficiency in the conduct of safe practices. Practices to be considered:

- **Practices to Reduce the Number of Employees at Risk of Exposure**

Restrict access to the work area.

Provide warning hazards and advice about special requirements

- **Practices to Reduce Exposures by Direct and Indirect Contact**

  Hand washing is an important means of preventing the spread of infectious contaminant. Workers should wash their hands when contaminated, after removing gloves and before leaving the laboratory, procedure room, or animal room. Liquid soap dispensers are preferable to soap bars to minimize cross contamination. After thorough washing, workers should dry their hands with disposable paper towels.

  Keep hands away from mouth, nose, eyes, and skin.

  Decontaminate work surfaces before and after work and after spilling a hazardous agent.

  Use appropriate methods to decontaminate equipment, surfaces, and wastes. Substitute less hazardous materials for hazardous materials when possible.

  Wear personal protective equipment (gloves, gowns, and eye protection).

  The person who generates infectious waste or contaminates equipment, work surfaces, or other areas is responsible for decontamination before the next person begins work. Chemical disinfection or, preferably, steam autoclaving, is recommended for decontaminating reusable materials before washing. When finished working, staff members must dispose contaminated waste materials, and package them according to local infectious waste regulations prior to disposal.

- **Practices to Reduce Percutaneous Exposures**

  Eliminate the use of sharp objects whenever possible.

  Use needles with self–storing sheaths or those designed to protect users.

  Keep sharp objects in view and limit use to one open needle at a time.

  Use appropriate gloves to prevent cuts and skin exposure.
  (Select products with puncture–resistant features whenever possible.)

  Use puncture resistant containers for the disposal of sharps.

  Handle animals with care and proper restraint to prevent scratches and bites.

- **Practices to Reduce Exposure by Ingestion**

Eating, drinking, smoking, handling contact lenses, and applying cosmetics should not be permitted in laboratories, nor should any other activities that might involve hand–to–mouth or hand–to–eye contact, such as mouth pipetting.

Keep hands and contaminated items away from mouth.

Protect mouth from splash and splatter hazards.

- **Practices to Reduce Exposure by Inhalation**

  Staff members should perform all manipulations of potentially infectious materials so as to minimize aerosol production.

  Handle fluids carefully to avoid spills, splashes and the generation of aerosols.

  Use in–line HEPA filters to protect the vacuum system.

PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment is the final measure for controlling exposure to potentially hazardous agents. Personal protective equipment provides a physical barrier to hazardous material to prevent contact with the staff members' skin eyes, mucous membranes, and clothing. The equipment should protect the part of the body that is reasonably expected to come in contact with hazardous agents. Selection is based on specific knowledge of the potential hazards, experience, and professional judgment.

Staff members can protect against splashes and splatters by adhering to careful work practices and rigorous use of personal protective devices. Face shields provide protection for eye and mucous membranes. Safety glasses should be considered to be the minimum eye protection worn to prevent injuries from projectiles, minor splashes or splatters of potentially hazardous agents or contact of contaminated hands with eyes. Goggles or a face shield are especially important when disinfectants and cleaning agents are used under pressure. Surgical masks provide some protection of the mouth from splashes.

Biological safety cabinets provide near sterile work environments that offer protection to the worker, the materials they are manipulating, and the work area itself. Lab coats or work uniforms will help prevent contamination of street clothes and should be changed whenever visibly soiled. Protective clothing should be selected so that it provides an adequate barrier against the type and exposure anticipated. Staff members should place disposable lab coats into the waste receptacles for disposal. When working with an organism that presents a significant risk of exposure to a human pathogen disposal lab coats should be placed in red bag waste. Soiled lab coats should go to a professional laundry service only. Safety shoes might be advisable for employees moving cage carts. Uniforms, gowns or laboratory coats should not be worn outside the facility unless it is covered. The need to decontaminate and dispose of protective equipment is an important consideration in its selection.

Ensure that gloves provide an adequate barrier against the expected hazard. Powder free latex, nitrile gloves or other appropriate gloves should be worn for handling potentially

contaminated animals or their tissues. Nitrile or rubber gloves might be required to protect against some solvents, while thick leather gloves would offer better protection against animal bites and scratches. Staff must change gloves that are torn or visibly contaminated, and should dispose of them in a red biohazard bag. Gloves and other protective devices cannot prevent needle sticks or other unintentional injuries caused by sharp instruments, broken glass, etc.

Respiratory protection might be necessary to control occupational exposure to aerosols. Employees who require respirators must be enrolled in a respiratory program that is in compliance with OSHA standards.

TRAINING

All persons who work in a laboratory bear responsibility to minimize risk of infection by use of consistently safe microbiological practices and procedure. All at–risk persons working in a facility should receive appropriate training on that facility's particular biohazards, precautions, and biohazard evaluation procedures. Personnel should receive annual updates and additional training when procedures or policies change. This training is provided by supervisors, Environmental Health & Safety, and the Institutional Animal Care and Use Committees on both campuses depending on the type of change involved. Laboratory workers and animal care personnel should know how to recognize hazard warning signs, to protect themselves and their co–workers against each hazard, and to react properly in the event of emergencies, such as an unintentional biohazard material release. Training should be appropriate for the employee's education, experience, and language skills, and should be performance–based to ensure that employees master the skills before encountering a hazard. The facility should incorporate the syllabus of the training programs into its safety manual. Supervisors should assess each employee's biosafety knowledge during the formal training period and later through subsequent regular observation of routine activities.

HAZARDS WORKING WITH ANIMALS AND THEIR TISSUES

The hazards associated with handling animals can be placed in 3 categories: physical injuries, allergic reactions and zoonotic diseases.

I. PHYSICAL INJURIES:

Physical injuries occur from bites and scratches (rodents, rabbits, dogs, cats, swine, non–human primates, and others), and from injuries sustained from contaminated surfaces and equipment. The key to the prevention of these types of injuries is proper training of research personnel by the animal care staff or other qualified individuals.

ANIMAL BITES AND SCRATCHES

Every person working with animals should be aware of the potential dangers from animal bites. Animal scratches or bites should be reported to one’s supervisor or instructor so that proper measures may be taken. In addition, employees and students shall promptly report all suspected work–related injuries and illnesses.

A recent NIH study looked at the incidence of animal bites among researchers and animal handlers over time. Out of a total of 30 bites investigated, 24 of the incidents involved animals biting researchers in the labs rather than animal handlers working in animal care facilities. The difference can be explained by the fact that animals are more nervous and frightened in an experimental situation and because scientific researchers have many things on their minds while working.

ANIMAL INDUCED WOUNDS

Personnel receiving bites, wounds, or scratches from animals should immediately and vigorously scrub the wound with an antiseptic soap (e.g., betadine scrub) for 15 minutes. Although this will seem like a long time for a simple skin puncture, the rinsing can make a difference in the severity of the wound. Rinse the wound with warm water.

After the completion of scrubbing the wound, the involved employee will report the incident to the Director of the Laboratory Animal Care Facility Program (617–353–5415) and to the Boston University Veterinarian (617–638–4086). The early initiation of antimicrobial therapy for animal bites may be warranted. The injured personnel should seek immediate medical attention at Occupational Health or the Emergency Department.

VENOMOUS REPTILE INDUCED WOUNDS

Immediate first aid treatment includes remaining calm, removing any constricting items, such as jewelry, from the affected limb. When practical, immobilize the affected limb at approximately heart level. Seek medical help at the nearest hospital. Do not bring the snake to the health center because the snake may bite again; capture may delay transportation to professional care; and management will not be significantly different. Do not engage in strenuous physical activity. Do not apply oral suction to the bite. Do not cut into or incise bite marks with a blade. Do not apply either hot or cold packs. Do not apply a constrictive tourniquet.

II. ALLERGIC REACTIONS:

There are serious allergic hazards associated with breathing or contacting animal dander or urine allergens (among others). Wearing protective clothing (such as facemasks, gloves, a lab jacket, or respirator) can reduce exposure to allergens when handling animals.

Allergy to animal hair and dander is common and therefore one of the most important occupational problems occurring in workers exposed to animals. Allergies can be manifest in a number of ways, including: allergic rhinitis (a condition characterized by runny nose and sneezing similar to hay fever); by allergic conjunctivitis (irritation and tearing of the eyes); by asthma; or by atopic dermatitis (a skin condition which is caused by contact with a substance to which an individual is allergic). Allergy to animals is particularly common in workers exposed to animals such as cats, rabbits, mice, rats, rabbits, gerbils and guinea pigs.

There is still some controversy regarding exactly what substance causes the allergy in a certain individual. Previously it had been thought that most allergies were caused by

dander and debris from the skin and fur of an animal. More recent studies seem to suggest that exposure to animal urine, saliva, and fecal matter may be equally or more important. Exposure to animal urine may occur either through direct urine contact with skin or more commonly by inhaling dust from the bottom of a cage that has been contaminated with urine or fecal material.

Various studies show that 15 to 20% of workers exposed to animals will develop symptoms of allergy. This percentage may be even higher since some people are forced to leave their jobs because of the severity of the allergies that develop. Most of these reactions are of the allergic rhinitis and allergic conjunctivitis type. Less than half of these are 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. These people do not seem any more likely to develop rhinitis and conjunctivitis than do those without such personal or family history. Everyone should exercise certain precautions to attempt to prevent animal allergy. These attempts should not be focused only on people with an atopic or allergy history. Symptoms can develop on first contact or 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 worked with in well–ventilated areas to prevent build up of various particles in the air. Workers should wear gloves to prevent direct exposure to the animals – this applies to animal urine as well as to animal dander. In order to prevent inhaling contaminated material, cages should be changed frequently and masks should be worn during the changing of cages.

Despite the best preventive techniques some individuals will develop an allergy after contact with laboratory animals. Rarely, this will be so severe that a person is forced to change his line of work. More commonly, this can be controlled with the increased use of masks while working with animals and possibly medication. Desensitization therapy (allergy shots) has been successful for some individuals.

Employees at risk for developing work related allergies include those with a history of pre–existing allergies, asthma, seasonal rhinitis or eczema.

III. ZOONOTIC DISEASES:

Zoonotic diseases are those that can be transmitted from animals to humans or from humans to animals. Zoonotic diseases can be transmitted by animal tissues, as well as, the animals themselves. Although zoonotic diseases are **not** common, the prevention, detection, and eradication of zoonotic diseases from the animal facility are a primary concern of the entire animal care staff. The risk of acquiring a zoonotic disease has declined because research animals have a defined microbiological profile. Special ventilation systems in animal facilities, purchase of pathogen–free animals, quarantine of incoming animals to detect pathogens, intensive health monitoring routinely performed on laboratory rodents and rabbits, and treatment or removal of infected animal and their high risk contacts control exposure to zoonotic infections.

EXAMPLES OF ZOONOTIC DISEASES

Some of the animals that are housed at the LACF/LASC include: rats, mice, ferrets, rabbits, gerbils, hamsters, pigeons, frogs, turtles, salamanders, bats and fish. In addition to these animals on the BUSM Campus: goats, sheep, pigs, dogs, cats, and non–human primates may be houses.

Although humans usually are not susceptible to infectious diseases suffered by animals, there are some important exceptions. Infections of animals may, on some occasions, produce significant diseases in humans even when the animals themselves show little if any sign of illness. A bacterium in the normal flora of a healthy animal may cause a serious disorder in a person exposed to it because the animal has developed "resistance" to these microorganisms, whereas humans with no previous exposure to the agent lack this protective immunity. Therefore, staff should always be aware of possible consequences when working with each species of animals, and take precautions to minimize the risk of infection. In the event that you do become ill with a fever or some other sign of infection, it is important to let the physician caring for you know that you work with animals.

Some of the specific diseases and the animals associated with those disorders are described in this document. There are some common sense steps that can be taken to lessen the risk of infection in general. These include not eating, drinking, or applying cosmetics or contact lenses around animals or animal care areas, wearing gloves when handling animals or their tissues, taking care not to accidentally rub your face with contaminated hands or gloves, and hand washing after each animal contact. Research personnel can protect themselves against accidental self–inoculation by adhering strictly to proper procedures. Do not recap the needles! Instead, activate any safety device incorporated into the syringes and discard them promptly in a biohazard "sharps" container. For procedures such as necropsies, bedding changes, and tissue and fluid samplings, physical containment devices such as biological safety cabinets, full–face respirators or other personal safety gear should be used as indicated.

The scope of possible zoonotic infections is quite large, and only a few examples will be described here. However, all personnel should be aware that laboratory animals are sources of potent allergens to sensitized persons.

SMALL ANIMALS

TURTLES or AMPHIBIANS

Salmonella: Salmonella is a bacterial disease causing the sudden onset of diarrhea. Salmonella is caused by the ingestion of food contaminated by animal feces. Fecal–oral transmission can also occur from person–to–person. Hand washing is important in the avoidance of this infection in the animal laboratory. Salmonella is usually asymptomatic in reptiles. Salmonella is frequently harbored in turtles, other reptiles and amphibians. Transmission **can** be avoided by the use of protective clothing and good hygiene.

Trypanosomiasis: Trypanosomiasis is caused by a protozoan parasite that causes fever malaise, lymphadenopathy, hepatosplenomegaly, myocarditis, and meningitis.

RABBITS or RODENTS

Limiting exposure to soiled animal bedding and the use of gloves and mask may protect against rodent transmitted disease. The potential for zoonotic disease is greatly reduced in modern times due to the high quality of animals available through suppliers today (this does not include wild rodents). Some of the potential zoonoses include salmonellosis, tapeworms, Lymphocytic Choriomeningitis virus (LCM), Hantavirus, plague, leptospirosis, ringworm, tropical rat mites, and rat bite fever. The occurrence of laboratory rodent transmitted diseases is rare but, nevertheless, it is recommended that gloves be worn.

Leptosporosis: Leptosporosis is a contagious disease of animals and humans due to infection with pathogenic leptospires belonging to the species Leptospirosis interrogans. The usual mode of transmission is contact with infected urine through the ingestion of urine–contaminated food or water or through a skin break. Clinical symptoms may be severe, mild or absent and may include a wide variety such as fever, jaundice and general discomfort. The disease can usually be treated successfully with antibiotics. Dogs, domestic livestock and wild rats are commonly infected.

Rat-bite Fever: There is a history of a rat bite that healed within 10 days prior to onset of symptoms of chills, fever headache, muscle pain, followed by rash, mostly on the extremities, joint swelling, and possible endocarditis (an inflammation of the heart). Blood from experimental laboratory animals has been known to infect man. Antibiotics are used to prevent and treat infection.

Rotavirus: (Group B, C, D) causes watery diarrhea associated with fever and vomiting.

Ringworm (Dermatomycoses): 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, 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. In humans, the disease usually consists of small, scaly, semibald, grayish patches with broken, lusterless hairs, with itching. Transmission of the disease is by direct contact with an infected animal. Personal hygiene is the best method of prevention and one should obtain medical assistance if the lesions are noted.

PIGEONS

Psittacosis: Psittacosis causes fever, headache, and mild chest symptoms with pneumonia on X–ray. Infection is acquired by inhaling dried droppings and secretions of infected birds. Transmission from person–to–person is rare. Quarantine and antibiotics can eliminate infections in birds.

WILD CAUGHT ANIMALS

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. The disease is virtually unheard of in common laboratory animals. All bites of any type should be reported immediately to one's supervisor.

Rabies is an endemic disease in most of the United States, especially in skunks, foxes, raccoons and bats. Sporadic cases have been well documented in other species of wildlife, as well as domestic animals. Animals and animal tissue field–collected should be handled with care. Infected animals may shed the virus in saliva before visible signs of illness appear, and a bite is not required to contract rabies. Contact with saliva may be sufficient to cause rabies and the rabies virus can remain viable in frozen tissues for an extended period.

There is a human vaccine that offers protection for those persons working with unvaccinated animals. Based on the current Advisory Committee on Immunization Practices (ACIP) (MMWR, Recommendations and Reports, January 8, 1999, http://www.cdc.gov/mmwr/preview/mmwrhtml/00056176.htm), rabies pre–exposure prophylaxis with human diploid cell rabies vaccine (HDCV) is indicated and provided to the following employee categories: those working directly with the rabies virus, those having random source dog and cat contact, those having direct contact with animals in quarantine, those having exposure to potentially infected animal body organs or performing post mortem examinations on animals with a history of poorly defined neurological disorders, those having responsibility for capturing or destroying wild animals (excluding birds and rodents), wildlife mammalogists and students engaged in the handling and/or capture of susceptible species. Serologic testing is indicated following immunization. Booster doses are administered to employees with inadequate titers (<1:5 by rapid fluorescent focus inhibition test.).

LARGE ANIMALS

FERRETS

The rabies risk with ferrets depends on their source and vaccination status. Rabies vaccination is not indicated at the LACF/LASC for work with ferrets. Ferret–to–human transmission of **influenza** has been documented. Ferrets are susceptible to **Tuberculosis.**

CATS

Cat feces should be avoided and gloves should be worn when working in areas potentially contaminated with cat feces. Thorough hand washing after handling any potential source of infection is also necessary. Working with hazardous agents in general and toxic chemicals in particular is discouraged during the first trimester of pregnancy.

Toxoplasmosis: Toxoplasmosis is a disease that is caused by an organism called Toxoplasma gondii. Approximately 500 million humans have 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, tiredness and mild headaches. Rarely, a more serious illness can occur that involves the lungs, heart, brain or liver.

People acquire this disease by eating meat that is raw or has not been cooked properly or by contact with feces of an infected cat – 1% of cats shed the toxoplasma oocyst in their feces. There are two situations in which toxoplasmosis can be extremely serious. A person whose **immune system** is not working properly can contract a very severe form of the disease. Persons at risk include those with HIV infection or a positive blood test for the HIV virus, people on medications that suppress their immune systems, and people who have some other serious illness that affects their immune system in the same way. In addition, an infection with toxoplasma can severely damage an unborn child if the mother is infected during pregnancy. Miscarriages, stillbirths and congenital defects can occur. The disease is more serious if passed on to the fetus early in pregnancy, though it is more common for the illness to be acquired later in pregnancy.

Certain simple precautions will prevent a person from acquiring toxoplasmosis. Meat fed to animals should be thoroughly cooked before it is eaten, therefore preventing this form of transmission. Cats acquire the toxoplasma organism by eating raw meat or wild animals that have been infected with the organism. The cat then excretes an egg form in its feces. These do not become infective for approximately two days but after this they can persist for quite some time in the soil. Because of this, it is important that cats be fed only commercial cat food or well–cooked meat. In addition, the litter box of a cat should be changed daily. When a woman is **pregnant**, she should avoid **any** contact with cat litter and should avoid **any** close contact with any cats that have been allowed to roam outdoors.

Since the toxoplasmosis agent is found primarily in cat feces, pregnant women should be cautioned about working with cats in the laboratory setting. Toxoplasmosis can infect the unborn baby in women exposed during **pregnancy** who do not already have immunity to the agent. Asymptomatic toxoplasmosis infection is common before childbearing years, and many women have elevated antibody levels indicative of immunity. To help assess the level of immunity against this agent, serum samples can be tested prior to pregnancy.

Pregnant animal technicians who have been assigned to cat husbandry duties should be reassigned to other jobs during pregnancy unless titers are sufficient to demonstrate immunity. Pregnant women who are exposed to cats in other ways would be best advised to avoid this exposure. There is no vaccine to protect humans. Toxoplasmosis antibody titers should be determined on any female employee of childbearing capacity who is occupationally exposed to cats or their feces. A negative IgM test and an IgG antibody of 6–200 IU/ML indicates immunity is present.

Females of childbearing capacity who lack immunity and plan to work with cats are informed of their susceptibility and provided additional educational information on toxoplasmosis. Her supervisor will be advised (if requested by the employee) to consider arranging a temporary job reassignment while a susceptible employee is pregnant. When this is not possible, consultation with the Environmental Health & Safety will be encouraged to identify alternative methods of employee protection.

CATTLE, SHEEP and GOATS

Q fever, a potentially serious human disease caused by the rickettsia Coxiella burnetii, was formerly quite common in those drinking unpasteurized milk and in slaughterhouse workers exposed to freshly slaughtered ruminants (cattle, sheep, and goats). It is now known that the organism is shed abundantly from the placental membranes of sheep. This route of exposure has been the cause of recent cases of Q fever pneumonia and other associated symptoms in laboratory workers. Personnel working where exposure is possible should take extra precautions. Gloves, masks, and protective clothing are recommended for individuals working with pregnant sheep and goats. Infected persons can be effectively treated.

Contagious ecthyma ("orf") from the mouth of an infected sheep or goat can be transmitted to humans causing focal skin lesions on the hands.

NON-HUMAN PRIMATES

Primate colonies pose special zoonotic risks. Nonhuman primate diseases are often transmissible to humans and can be a serious health hazard. The tuberculosis bacterium may be transmitted from animals to humans and from humans to animals. In all primate colonies, regularly scheduled TB testing of both the primates and the personnel must be done. Shigella, Campylobacter, and Salmonella cause bacterial dysentery in primate species, and can cause similar problems in humans exposed to primate excrement. Parasites such as Entamoeba histolytica can also be transferred to humans and provide further reason for careful hand washing after exposure to primates. Precautions should be taken to prevent either human or primate cross–contamination.

Although there are a number of primate viruses that can cause disease in humans, Herpesvirus simiae (or Herpes B virus), is the primate virus of most concern to people who are exposed to these animals. B virus is frequently asymptomatic in rhesus, cynomolgus, and other members of the genus Macaca. It causes fatal encephalitis in humans. Wounds by these species, or wounds caused by objects contaminated with body fluids from these species require immediate medical attention. First aid for exposure to B virus should be readily available to all with primate contact. Anyone with potential exposure to B virus should have an immediate evaluation at Occupational Health or the Emergency Department after performing first aid. Personnel with potential exposure are required to be trained at Occupational Health regarding the hazards of exposure to macaques or other non-human primates. Those working with macaques should be familiar with the NIH B virus web–site and latest guidelines for the Prevention of Herpes Simiae (b–virus) in Monkey Handlers. [NIH B virus Laboratory Website: http://www.gsu.edu/~wwwvir/.]

PHYSICAL & CHEMICAL HAZARDS IN ANIMAL FACILITIES

Animal care and use is inevitably associated with situations that require safe practices to protect workers from physical and chemical hazards. This section outlines safety procedures for physical and chemical hazards likely to be encountered by animal users and caretakers.

Animal Bites and Scratches. Bites and scratches when in contact with laboratory or wild animals are largely preventable through proper training in animal–handling techniques. Anyone working with animals at Boston University who incurs a job–related injury due to a bite and/or scratch from any animals must report it to his or her supervisor and seek medical attention immediately.

Sharps. Sharp objects such as glass, syringes, plastic pipettes, and pipette tips contaminated with biological waste or pathogenic material should be placed in a separate rigid, leak–proof, puncture resistant container which is then placed in a red or orange bag labeled and secured for removal by the hazardous waste personnel. Self–sheathing needles or other types of safety needles are mandated by OSHA to be used when feasible, as are other engineered safety devices. Needles must not be bent, cut, or recapped: they must be discarded directly into puncture resistant and leak proof containers.

Flammable Materials. Flammable/explosive materials are to be stored in flammable storage cabinets and Material Safety Data Sheets must be readily available to employees for each hazardous chemical used in the work area.

Pressure Vessels. Compressed–gas cylinders, high–pressure washing equipment, steam generators and autoclaves contain steam and contents under high pressure. Compressed–gas cylinders are to be capped when not in use. Cylinders must be stored away from ignition sources, excess foot traffic, or where they may be damaged. Also, cylinders must remain chained at two–thirds height to a permanent structural component of the building to avoid falling. Employees must be trained and demonstrate competency prior to using high-pressure washing equipment, steam generators and/or autoclaves.

Lighting and Electricity. In animal facilities light cycles can vary and most animals receive only artificial light. Animals can be kept on light dark cycles that do not match the natural daily cycles or may be kept in rooms with single–color or very low light. For humans, poor lighting can cause visual fatigue or create safety hazards that cause trips or falls. You will need an adjustment period for their eyes to become accustomed to the color or light levels in the room. Waiting for this adjustment period will make work easier and safer.

Ultraviolet Radiation. Exposure to ultraviolet (UV) radiation can occur in animal facilities. UV germicidal lamps are used to sterilize clean surfaces and UV radiation is used in sterilizing water in the diagnosis of some fungal diseases. Chlorinated solvents should not be used in the presence of UV–B or UV–C radiation because they can react and form phosgene, a potent lung irritant.

Lasers. Personnel who work with or around lasers should be trained in the hazard and safe operating procedures and use laser specific eyewear if indicated. The beam can

cause burns, eye damage, lacerations or fires, depending on its power. Laser surgery can produce aerosols, fumes, and toxic gases. Electric shock is also a risk.

Ionizing Radiation. Use of gamma or beta radiation, irradiator, and/or diagnostic x–ray machines requires appropriate training of personnel and use of personal protection. Special disposal procedures may be required for radioactive tissues or bedding.

Housekeeping. Good housekeeping keeps work surfaces clean and clear of obstruction, wastes and other materials. Housekeeping can pose a risk of slipping on wet floors, and high temperature steam can pose a burn risk. Sweeping bedding, hair, and dander from floors, rather than using a vacuum with a filtered exhaust can result in high concentrations of airborne allergens throughout the facility.

Ergonomic Hazards. Physical trauma resulting from lifting heavy loads and small repetitive stresses can be minimized with proper education and engineering controls. Animal care operations that involve a potential for physical stress include moving and restraining large animals, lifting and moving cages, large feedbags, and high pressure wet vacuum systems.

Noise. In an animal facility noise exposure can result from animals (pigs and dogs), from equipment, such as cage washers, high–pressure air cleaning equipment, and wet vacuum systems operated in confined space. If noise is considered problematic Environmental Health & Safety is contacted to evaluate noise exposure and noise control.

Chemical Hazards. Typical sources of chemical exposure in the care and use of research animals include the use of disinfectants, anesthetic gases, and chemicals for preserving tissues. Burns and skin irritation are the most common chemical injuries associated with animal care and use. If a female worker is pregnant or planning to become pregnant, she should confer with the Student Health or/and Occupational Health Physician prior to exposure to the possible inhalation of toxic chemicals.

HAZARDOUS AGENTS

Protective devices should be used when possible, and other safety practices consistent with current guidelines should be adopted. Hands should be washed after handling chemicals, infectious materials, or animals, and before leaving the laboratory. A biological safety cabinet should be used when handling infectious materials and a fume hood when handling toxic materials. All contaminated work surfaces should be decontaminated daily by chemical disinfectant. Contaminated materials should be decontaminated before washing, or discarded. Reusable materials should then be sterilized by autoclaving. For further information on working with hazardous agents, contact the Environmental Health & Safety Office concerning chemical agents or radioactive materials.

Biohazards. Biohazardous materials include blood and other potentially infectious materials such as blood products, semen, vaginal secretions, cerebral spinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, concentrated HIV (AIDS) and HBV (Hepatitis B) viruses, and saliva in dental settings.

Biohazardous Waste. Biological waste derived from human sources such as blood, body fluids, tissues, tumors, human cell lines, etc., and materials used in processing biohazardous material including vacutainers, syringes, plastic pipets and pipet tips must be put into a red or orange bag labeled and secured for disposal by Environmental Health and Safety. Sharps and sharp objects that are contaminated with biohazardous waste should be placed in a rigid leakproof, puncture–resistant container labeled and secured for disposal by hazardous waste personnel.

REFERENCES

GENERAL REFERENCE

[1] Text Modified from Document Created by Michael S. Rand, DVM, ACLAM

Occupational Health in the Care and Use of Research Animals,
Institute of Laboratory Research (ILAR): National Academy Press, 1997.
http://www.nap.edu/books/0309052998/html/index.html

LAB ANIMAL ALLERGY AND ASTHMA

NIOSH Alert: Preventing Asthma in Animal Handlers
http://www.phppo.cdc.gov/cdcrecommends/showarticle.asp?a_artid=P0001002&TopNum=50&CallPg=Adv

BIOSAFETY

Biosafety+ in Microbiological and Biomedical Laboratories (BMBL) 4th Edition
http://www.cdc.gov/od/ohs/biosfty/biosfty.htm
http://www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm

ZOONOTIC DISEASE REFERENCES

Disease links by listed by Animal Reservoir
http://research.ucsb.edu/connect/acc/policy.html#Reservoir

Disease links Listed by Disease
http://research.ucsb.edu/connect/acc/policy.html#Disease

Zoonosis of Wildlife Table
http://phps.dhs.co.la.ca.us/vet/guides/vetzooman.htm#Wildlife%20Zoonoses%20Table

Zoonosis of Domestic Animal Table
http://phps.dhs.co.la.ca.us/vet/guides/vetzooman.htm#Domestic%20Animal%20Zoonoses%20Table

CDC, NIOSH AND OTHER CHEMICAL SAFETY RESOURCES

http://www.cdc.gov/niosh/topics/chemical-safety/

More Toxicology and Chemistry Resource Links

- http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB
- http://chemfinder.cambridgesoft.com/
- http://extoxnet.orst.edu/ghindex.html
- http://www.atsdr.cdc.gov/toxfaq.html#bookmark05
- http://www.atsdr.cdc.gov/toxfaq.html
- http://www.osha-slc.gov/SLTC/carcinogens
- **NIOSH Pocket Guide to Chemical Hazards**
  http://www.cdc.gov/niosh/npg/npg.html
- **NIOSH Emergency Response Resource**
  http://www.cdc.gov/niosh/topics/emres/default.html