



ANIMAL CARE AND USE PROGRAM STANDARD OPERATING PROCEDURE NUMBER 03

Prevention of Zoonotic Diseases

PURPOSE

This standard operating procedure (SOP) provides information on zoonotic diseases, the transmission of diseases that are communicable to humans through the handling of laboratory animals; the University's policy on educating and training animal use and care staff; and the wearing of protective garments designed to aid in the prevention of zoonoses.

OCCUPATIONAL ANIMAL EXPOSURE

Both research and non-research animals have the potential to cause injury, transmit zoonotic disease, and/or cause allergic reaction to those who are exposed. These animal hazards can occur by either direct contact from handling an animal or just by being in close proximity, i.e., working or passing through an animal housing room or area where animal activities are taking place.

TRAINING OF LABORATORY ANIMAL CARE STAFF

Staff members and students who have occupational exposure to research and non-research animals need to be provided with appropriate education and training alerting them to potential risk. Understanding routes of disease transmission, disease or allergy signs and symptoms, personal protective equipment, waste handling, and emergency contacts is very important.

CLASSIFICATION OF ZONOSSES

Zoonoses are organized by symptomatology, that is, by the symptoms they might produce in man. Not all disease syndromes are reviewed, and not all may present as indicated below. A full list of zoonotic diseases may be obtained from the Centers for Disease Control in Atlanta. The CDC also has a very comprehensive occupational hazards website and can be found at: <http://www.cdc.gov/>.

As with other hazardous materials, exposure to these zoonotic diseases may occur primarily by getting infective material on skin, through cuts in skin, via the mouth, eyes, or by inhalation of aerosolized particles.

SUSCEPTABILITY

Certain conditions might predispose an individual to increased susceptibility to these diseases. That is, there is a chance that they might become infected more readily by the disease, or might develop a worse form of the disease. These include, but are not limited to:

- **immune suppressive conditions** (HIV, chemotherapy, corticosteroid treatments, concurrent diseases, etc.). Obviously, any condition that hampers a person's immune function also lowers their natural resistance to other disease.
- **pregnancy** Pregnant workers are also more susceptible to certain diseases. Because full development of some organ systems may be permanently affected, the growing fetus is especially vulnerable to some diseases, as well.
- **chronic smoking** Chronic smokers are at greater risk of inhaled disease because of lung damage, and a diminished mucociliary function. More information may be found at: <http://ajrccm.atsjournals.org/cgi/content/full/163/4/983>.
- **chronic alcoholism** Alcohol consumption, acute or chronic, can decrease a specific white blood cell called a 'monocyte'. The monocyte is responsible for fighting certain diseases. Chronic alcoholism further debilitates the immune system by decreasing several trace minerals and vitamins that are necessary for a normal immune function. More information is available at: <http://www.niaaa.nih.gov/ResearchInformation/ExtramuralResearch/NIAAAResearchAreas/contents.htm#biomedical>.

In the event any of these conditions are present, they should be discussed with a physician.

ANIMAL BITES AND SCRATCH EXPOSURE AND OTHER PUNCTURE WOUNDS

Bites, scratches, and puncture wounds from needles used in animal research are potentially dangerous not only from the physical damage but also for the potential of contracting zoonotic disease or allergic reactions. Animal bites can become infected with a variety of bacteria that might lead to a more serious problem. Wounds from animal bites or puncture of the skin with a needle that has been used on an animal, should be thoroughly cleaned with an

antibacterial soap solution (such as a surgical scrub) and supervisory personnel should be notified immediately.

BITE PREVENTION

Animal use and care staff must be trained in and knowledgeable of species-specific animal handling techniques.

ALLERGIES

Allergies might develop to any kind of protein, in any kind of workplace. Animal allergies can develop in pet owners, for example. Contact allergies are common in the laboratory animal industry and in the veterinary care industry, because of chronic exposure. Exposure to animal related allergens (fur, saliva, hair, dander, and protein from urine) may occur by inhaling contaminants or by direct contact.

- **Rodent contact allergy** Workers with ongoing exposure to rabbits and rodents, such as laboratory workers or pet owners, are at higher risk of developing allergies to them. The person is hyper-sensitized to the rodents mainly through exposure and inhalation of urine proteins that are aerosolized. Signs of allergies can vary tremendously, but include itching, hives, skin rash, flushing and inflammation; respiratory irritation and asthma; nasal, eye, or sinus symptoms; and in rare cases, shock. Wearing gloves and a NIOSH approved, N-95 (or better) respirator would diminish exposure to these antigens, and theoretically reduce the chance of developing these allergies.
- **Latex contact allergy** Workers with ongoing latex exposure, individuals with a tendency to have multiple allergic conditions, people with spina bifida and people with allergies to certain foods such as avocados, potatoes, bananas, tomatoes, chestnuts, kiwi fruit, and papaya are at increased risk of latex allergies. Acute reactions are most common, but they can also be delayed resulting in a variety of symptoms hours or days later. These include itching, hives, skin rash, flushing and inflammation; respiratory irritation and asthma; nasal, eye, or sinus symptoms; and in rare cases, shock. To reduce the chance of developing a latex allergy, use of creams, perfumes or cologne on hands while using latex gloves should be avoided since these substances cause the latex to deteriorate, exposing you to more antigens. Hand-washing after using latex gloves will remove any antigens on your skin. Wipe down areas contaminated with latex dust. This and more information is available at: <http://www.cdc.gov/niosh/topics/latex/>.

Suspected development of an allergy to something in the workplace should be immediately reported to a supervisor.

PERSONAL PROTECTIVE EQUIPMENT

The *Guide for the Care and Use of Laboratory Animals* suggests that animal-care personnel wear appropriate institution-issued protective clothing, shoes or shoe covers, and gloves. Protective clothing should not be worn beyond the boundary of the animal facility. Personnel working in areas where they might be exposed to contaminated airborne particulate material or vapors should be provided with suitable respiratory protection (CFR 1984c). Protective clothing and equipment will be issued to animal care staff consistent with the risk associated with the research activities, hazards, and animal species involved.

1. **Respirators** - The CDC recommends that workers protect themselves from diseases potentially spread through the air (such as viruses, tuberculosis, and psittacosis) by wearing a fit tested respirator *at least* as protective as a NIOSH-approved N-95 respirator. The "N" means it is not resistant to oils (used in other industries). And the "95" means that it will remove 95% of the particles in the air that you are breathing. If the mask does not have the letters "NIOSH" on it, it is not approved for these standards. This and more information is available at http://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/
2. **Gloves** - Gloves are recommended to prevent contact allergy to rodents and to prevent potentially infective material from getting on skin, cuts or breaks in the skin. There are two types of gloves in the healthcare industry: latex and vinyl. Only latex is an effective barrier against infectious materials.
3. **Surgical Scrub** - When washing hands, scratches or bites, use a surgical scrub or soap that contains a medical grade disinfectant. Follow label directions and use appropriate contact times.
4. **Eye Protection** - Protective glasses should be worn to prevent contaminated materials from making contact with the eyes.

ORGANISMS PRIMARILY CAUSING DIARRHEA

The following organisms may cause diarrhea and dehydration. While working with laboratory animals, most of these diseases can be prevented by good hygiene which includes wearing latex gloves, washing hands *before and after* using the bathroom, not eating and drinking in the lab, and hand-washing at the conclusion of work.

- **Campylobacter** a not very common (probably underreported) bacterium usually associated with sheep and cattle, but also could be

transmitted by many animals. In man, it may also cause hepatitis, meningitis, fever, and rarely, abortions, and premature delivery.

- **Salmonella** is a very common bacterium usually associated with birds and reptiles. However, many animals may be responsible for its transmission. Rodents have been reported to shed the disease. It usually presents with abdominal cramps, nausea and vomiting that may develop into diarrhea. May also be accompanied by fever, muscle aches, and malaise.
- **Shigella** is a rare bacterium (except in non-human primates). The resulting diarrhea might include blood and mucus. Shigella is probably very rare in other animals, but possible.
- **Escherichia coli** *E. coli* is a very common bacterium. Diarrhea would be the main sign of the disease and is more commonly associated with farm animals and chickens, but is possible in any species, because (ironically) man is the main shedder of this disease.
- **Rotavirus enteritis** usually occurs only in children, and is more common during winter. It is extremely common in man with 60% of children worldwide exposed by their first birthday. It may be associated with nursing mice and is usually self-limiting in man, but has been reported to cause death in children.
- **Cryptosporidium** is a protozoal disease that may produce profuse, watery, diarrhea. Sometimes abdominal cramping, nausea and fever may develop. It is primarily carried by cattle, chickens and turkeys, and man. So, it is possible that any animal associated with man could shed the disease.

ORGANISMS CAUSING PRIMARILY RESPIRATORY DISEASE

The following organisms may cause primary respiratory disease. Signs might include difficulty breathing, chest pain while inhaling, asthma-like signs, ocular redness or itching, and fever. While working with laboratory animals, most of these diseases can be prevented by good hygiene which includes wearing latex gloves, wearing a NIOSH approved N-95 (or better) respirator, and hand-washing at the conclusion of work.

- **Chlamydia psittissi** is a bacterium that causes the disease, psittacosis. It is associated with birds of all types and can cause respiratory and flu-like signs, as well as a chronic conjunctivitis.
- **Pasteurella** is a bacterium that rarely may cause respiratory disease in man. It mainly causes contaminated skin wounds. A more detailed description is given in the next section.
- **Mycobacterium avium** is a bacterium that is mostly associated with chickens and people that work with chicken manure. It can cause pneumonia and might be associated with any bird, however.

- **Hantavirus** a virus that has been associated only with the deer mouse, cotton rat and rice rat in the Southeastern United States and the white footed mouse, elsewhere. However, it has been theorized that it is possible for any rodent to carry it. It can cause 'hantavirus pulmonary syndrome' and symptoms of fever, deep muscle aches, and severe shortness of breath.

ORGANISMS CAUSING PRIMARILY SKIN DISEASE

Persistently red lesions, itchy skin or bumps, or non-healing wounds might indicate exposure to one of the following zoonoses. While working with laboratory animals, most of these diseases can be prevented by good hygiene which includes wearing latex gloves, washing any bite wounds immediately with an antibacterial soap (such as a surgical scrub solution), and hand-washing after completing work.

- **Pasteurella** is a bacterium that can cause infected wounds resulting from bites and scratches mainly from cats and dogs, but also rabbits and rarely rodents. Man may also carry the disease. The first signs of pasteurellosis usually occur within 2 to 12 hours of the bite and include pain, reddening, and swelling of the area around the site of the bite. Pasteurellosis can progress quickly, spreading through the body from the bitten area. Untreated, this infection can lead to severe complications. Bites to the hand need special attention; if pasteurellosis develops in the tissues of the hand, the bacteria can infect tendons or even bones and sometimes cause permanent damage if appropriate medical care is not administered promptly. Red streaks and enlarged lymph nodes may indicate a very serious septicemia is developing.
- **Visceral larval migrans** may be caused by nematodes that penetrate the skin and become 'lost' as they try to complete their life cycle in an unfamiliar host. The lesions tend to be small, 'sigmoid' (curvilinear) and might be itchy.
- **Dermatophytes**- are a variety of fungi that cause 'ringworm'. The resultant lesions might be shaped in a red ring, but could be itchy, tingly or burning red bumps or lines, as well.
- **Mycobacterium** is a bacterium that is associated with fish. It can be difficult to cure and is manifested by puffy, red, persistent, non-healing wounds.
- **Sarcoptic mange** is caused by a mite that may be present on any domesticated animal. It is usually self limiting and may cause itchy red bumps or lines.

ORGANISMS CAUSING OTHER DISEASES

- **Rabies** is a viral disease that is transmitted primarily from saliva to blood (as in the case of bite wounds) from an infected animal. Without treatment, it is nearly always causes a fatal encephalitis in man. The vast majority of rabies cases reported to the CDC each year occur in wild animals like raccoons, skunks, bats, and foxes. Domestic animals account for less than 10% of the reported rabies cases, with cats, cattle, and dogs most often reported rabid. Any mammal could theoretically carry the virus, but it is primarily a disease of carnivorous mammals, and exposure would be highly unlikely in the rodent lab environment.
- **Leptospira** is a bacterium found in a variety of animals, but rodents seem to be well adapted to it, and show no signs of disease. In other animals, including man, symptoms may be quite varied. In man, fever, flu-like signs, muscle aches, nausea, a stiff neck, conjunctivitis, bruising and bleeding, and jaundice might occur. The disease is spread primarily through the urine of infected animals and is most commonly associated with farm animals, urine contaminated water, soil and foods. Hygiene, and personal protective equipment, as outlined in other sections, should provide protection.
- **Rocky Mountain Spotted Fever, Toxoplasma, and Brucella** are other zoonotic diseases of interest that are more likely be encountered in the veterinary field because of close contact with ticks, dogs, cats, and cattle. These are less likely to be encountered in a laboratory environment, but are listed here for edification.
- **Rat-Bite Fever** is caused by *Streptobacillus moniliformis* or *Spirillum mino*; these organisms are in the respiratory tracts and mouths of rodents, especially rats. Most human infections are the result of a bite wound. Symptoms include chills, fever, malaise, headache and muscle pain. A rash can develop along with painful joints, abscesses, endocarditis, pneumonia, hepatitis pyelonephritis, and enteritis.

DEFINITIONS

Allergen - A substance, usually a protein that can cause the immune system to react as if infected with a cold virus. Cats, rabbits, mice, rats, birds, and guinea pigs are the most frequently implicated allergy causing species.

Animal - Any live non-human vertebrate animal used or intended for use in research, training, experimentation, testing, propagation, or related purpose, with the exclusion of embryos, tissue, and other biological samples.

- For embryos, the point in development at which oviparous, ovoviparous, and viviparous species become regulated animals is specified by the Animal Welfare Act (AWA) and the Office of

Laboratory Animal Welfare (OLAW). Viviparous and ovoviviparous species become regulated at parturition from the maternal organism. Oviparous species become regulated when they hatch from the egg. For fish, the UMass Boston IACUC has determined a similar stage in development as the “buttoned-up” stage (when the embryo has fully absorbed the yolk sac and must forage on its own).

- For tissues and other biological samples, only those that have been collected from a live animal by a UMass Boston investigator are regulated.

Animal Bite or Exposure - A piercing, puncture or abrasion of skin by animal teeth or claws, or by coming in contact with animal saliva or tissue on abraded skin, eyes, or mucus membranes.

Bacteria - ubiquitous, prokaryotic organisms occurring at amazingly high densities in water and soil (and milk left out over night!). Bacteria are often maligned as the causes of human and animal disease.

Centers for Disease Control and Prevention (CDC) - The CDC is one of the 13 major operating components of the Department of Health and Human Services (HHS), which is the principal agency in the United States government for protecting the health and safety of all Americans. The CDC has remained at the forefront of public health efforts to prevent and control infectious and chronic diseases, injuries, workplace hazards, disabilities, and environmental health threats. The CDC applies research and findings to improve people’s daily lives and responds to health emergencies.

Conjunctivitis - Commonly known as pinkeye, conjunctivitis is an inflammation of the conjunctiva, the clear membrane that covers the white part of the eye and lines the inner surface of the eyelids. It is a fairly common condition and usually causes no danger to the eye or vision. The inflammation can have many causes, the most common of which are infectious, allergic, and irritant. Infectious conjunctivitis is usually caused by either bacteria or viruses. Many different bacteria can cause conjunctivitis but the most common are *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Staphylococcus aureus*.

Encephalitis - Encephalitis literally means an inflammation of the brain, but it usually refers to brain inflammation caused by a virus.

Fungi - Fungi are eukaryotic organisms that include moulds, yeasts and higher fungi. Fungal infections or mycoses are classified depending on the degree of tissue involvement and mode of entry into the host. These are

- Superficial - localized to the skin, the hair, and the nails.
- Subcutaneous - infection confined to the dermis, subcutaneous tissue or adjacent structures.
- Systemic - deep infections of the internal organs.
- Opportunistic - cause infection only in the immunocompromised.

Human fungal infections are uncommon in normally healthy persons, being confined to conditions such as candidiasis (thrush) and dermatophyte skin infections such as athlete's foot. However, in the immunocompromised host, a variety of normally mild or nonpathogenic fungi can cause potentially fatal infections.

Hepatitis - An inflammation of the liver caused either by viral transmission or chemical toxins in the body. Untreated cases of hepatitis can lead to liver failure and even death.

- Hepatitis A - seen in epidemics and transmitted through fecal contaminated food and water.
- Hepatitis B - transmitted by infected blood or blood products, or sexually.
- Hepatitis C - transmitted by blood from asymptomatic donors and may result in chronic disease.
- Hepatitis D - occurs in conjunction with Hepatitis B and results in either acute or chronic disease.
- Hepatitis E - often transmitted by fecal contaminated food in the tropics.

Hepatitis disease is either acute (starts and ends quickly) or chronic (long-term progression).

Immune Suppressive Condition - A condition that results in a decrease in the normal response of the human immune system to invading viruses, bacteria, parasites, and tumors. (The immune system is the body's primary line of defense against disease agents, so weakening its response could increase the toll of disease).

Malaise - An indefinite feeling of lack of health often indicative of or accompanying the onset of an illness.

Meningitis - An inflammation of the meninges, the membranes that cover the brain and spinal cord. The inflammation is usually caused by bacteria or viruses (viral meningitis is also called aseptic meningitis). Less common causes include fungi, protozoa, and other parasites.

Mucociliary function – The ability of the cilia of the respiratory tract to function optimally. Alterations of mucociliary defense are most commonly the result of viral upper respiratory infection. Viral infection has been shown to alter ciliary function with a decrease in beat frequency and subsequent stasis of secretions.

Nematodes – Nematodes are simple roundworms. Colorless, unsegmented, and lacking appendages, nematodes may be free-living, predaceous, or parasitic. Many of the parasitic species cause important diseases of plants, animals, and humans.

The National Institute for Occupational Safety and Health (NIOSH) - The federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. NIOSH is part of the CDC in the Department of Health and Human Services.

Protozoa - There are over 50,000 species of protozoa, of which a fifth are parasitic, some 10,000 species. They infect vertebrates and invertebrates and some are even parasitic in plants. Parasitic protozoa are, in general, small, have short generation times, high rates of reproduction and a tendency to induce immunity to reinfection in those hosts that survive. Structurally a protozoan is equivalent to a single eukaryotic cell.

Psittacosis - an acute chlamydial (intracellular bacteria) disease that causes fever, headache, myalgia, and pneumonia-like respiratory illness. Associated with inhaling feather dust and dried bird droppings.

Zoonotic diseases (zoonoses) - Diseases that are communicable from animals to people under natural conditions.