

Occupational Hazards Associated with the Care and Use of Laboratory Animals

University faculty, staff and students who work with research animals face a number of occupational risks, the extent of which vary widely. The diversity of hazards associated with animal research is tremendous. Animals bite, scratch, and kick; moving bulky animal cages can result in sprains and strains; and electricity, machinery, and noise can cause injury. Chemicals are ubiquitous in the laboratory and animal room environments; chemicals are used to disinfect and clean surfaces, anesthetize animals, and process tissue samples. Research protocols can introduce toxic chemicals, human pathogens, or radioactive materials into animals, and these agents can enter the waste stream of the animal facility.

The **UofL Hazard Training Program for Animal Handlers** is designed to acquaint you with the risks associated with animal experimentation. When used in conjunction with the Medical Surveillance Questionnaire, it gives you the opportunity for a thorough medical evaluation and risk assessment customized to your individual needs. Participation in the Hazard Training Program is mandatory. Please note that the Training Program alone does not supply you with all the information needed to completely assess the occupational risks associated with animal care and use. Rather, it is a brief summary of some of the hazards you may encounter along with some important health and safety tips. It is therefore important that you consult the Department of Environmental Health and Safety, the Offices of Research Services (Research Resources Facilities) and Health Services, as well as referenced documents, for a thorough discussion of the hazards found in your research plan along with a discussion of appropriate safety precautions and methods of hazard control.

Allergies

Animal Allergies. Allergic reactions to animals are among the most common and most important of the occupational hazards associated with the care and use of laboratory animals. Allergic symptoms (including respiratory and skin disorders; eye, nose and throat



irritation; and skin hives) are present in an estimated 10 – 40% of animal care workers. Up to 10% of laboratory workers will develop occupation-related asthma. If you already have hay fever or other allergies, chances are you will eventually develop an allergy to

laboratory animals. **Occupational asthma**, a much more serious condition, presents itself as coughing, wheezing, and shortness of breath. Occupational asthma can be severe, disabling, and persistent. It can lead to permanent disability and may require removal of all exposure sources or even a career change.

Preplacement screening can be helpful in identifying and alerting persons who might be at risk for developing laboratory-animal allergy or asthma and educating them to take protective measures. In persons who are chronically exposed, **annual screening** can help detect those who are developing allergic symptoms so that appropriate intervention can be taken to prevent long-term difficulties. A worker who has developed asthma symptoms often improves or recovers completely if he or she immediately stops being exposed to animal allergens. However, the longer the exposures continue, the more likely the illness will persist, even after all contact with animals has ceased. The Medical Surveillance Questionnaire has been designed to help

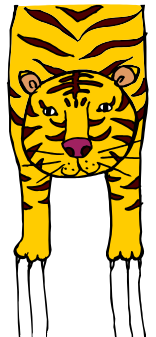
identify at-risk persons. Medical monitoring of exposed workers and remedial actions for workers with symptoms can reduce the risk of permanent adverse health effects. With timely and appropriate action, many cases of animal-related asthma can be prevented.

Latex Allergy. Latex gloves have proved effective in preventing transmission of many infectious diseases and are widely used in research. But for some workers, exposure to latex may result in allergic reactions. Latex allergy is a reaction to certain proteins in latex rubber. Symptoms may begin within minutes of exposure or can occur hours later. Mild reactions to latex involve skin redness, hives or itching. More severe reactions may involve respiratory symptoms such as runny nose, sneezing, itchy eyes, scratchy throat, and asthma. Detecting symptoms early, reducing exposure to latex, and obtaining medical advice are important to prevent long-term health effects. Once a worker becomes allergic to latex, special precautions are needed to prevent exposures.

Bites, Scratches, & Related Hazards

Bites, scratches, and kicks are ubiquitous hazards associated with laboratory animal contact. They are largely **preventable through proper training** in animal-handling techniques. People working with large animals such as calves or pigs should be especially careful as they can sustain crushing injuries when the animals kick, fall, or simply shift their body weight.

Be aware of factors or situations that might precipitate a traumatic event in a



research animal. High pitched noises, quick movements, and inappropriate handling can frighten an animal and result in an unexpected response that injures the animal handler. **Knowledge of animal behavior** is important in reducing risks.

Dogs are the species most likely to bite, followed by cats and then rodents. Even though an animal bite may appear inconsequential, personnel should be aware of the host of diseases that can be spread by this mechanism. Complications can result from contamination of the wound by the normal oral flora of the animals involved. Rabies, cat-scratch fever, tularemia, rat-bite fever, brucellosis, and orf are among the specific diseases that can be transmitted by animal bites with profound consequences.

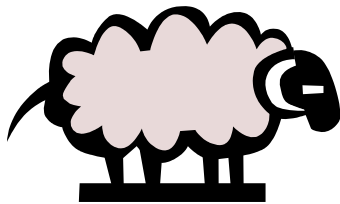
Personnel who have sustained an animal bite should report it to their immediate supervisor (so that appropriate paperwork can be started) and seek medical attention. **The HSC Health Services Office** (1st Floor, Ambulatory Care Building) is available, in the event of an animal bite or other occupational injury, to provide early intervention efforts. Early intervention can limit the progression of a localized infection and avert the more serious complications of wound infection, which could include cellulitis, abscess, septic arthritis, tenosynovitis, osteomyelitis, sepsis, endocarditis, and meningitis.

Animal bites are covered under worker's compensation and must be reported on the **First Report of Injury Form (IA-1)**. It is the responsibility of the Project Director and/or supervisor to complete the appropriate paperwork and submit it to Risk Management. Additional paperwork may be necessary depending on the extent of the injury, medical treatment, or down time as a result of the injury. For additional information regarding worker's compensation, *please contact the Office of Contract Administration and Risk Management at 852-6925.*

Zoonoses

The risk of acquiring infectious agents from contemporary laboratory animals is actually quite low. However, because many zoonotic agents can be quite serious or even life threatening, the hazard posed to personnel working with research animals should not be minimized.

One of the most frequently cited laboratory infections is **Q Fever**. In humans the illness is generally mild or even asymptomatic. Transmission of the causative agent, *Coxiella burnetti*, occurs by inhalation of infectious aerosols, by direct contact with infectious



tissues or fluids, or by contact with contaminated bedding. Although all ruminants can potentially spread Q-Fever, sheep during pregnancy and birth are by far the most frequent source of infection. Their birth tissues and fluids are considered highly infectious, requiring use of protective clothing and equipment where contact may occur.

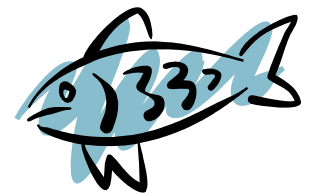
Another zoonotic disease of concern is **toxoplasmosis**. Although the actual risk of infection from exposure to cats is much less than that from consumption of undercooked meat, protective measures are still warranted, especially for at-risk persons. Of particular concern are immunodeficient individuals and females just prior to or during pregnancy, where infection is associated with spontaneous miscarriage and birth defects. At-risk persons should avoid contact with litter pans or cats with an unknown dietary history. Alternate assignment to duties that do not include contact with cats may also be considered.



While human **rabies** is now a rare disease in the U.S., it is almost invariably fatal and thus needs to be considered when working with animals. Transmission occurs when the virus is introduced into open cuts or wounds. Exposure may be from bites or, much less frequently, through scratches, abrasions, open wounds, or mucous membranes contaminated with saliva or other infectious material. Vaccination is the most valuable preventive measure.

Cat Scratch Disease (Cat-Scratch Fever) is a systemic infection that can occur following a cat scratch, cat bite, or abrasion from an object contaminated by cats. When it occurs it is seen as a lesion that develops 3-10 days after the initial injury, with a fever and other symptoms following 2 weeks later. Similarly, **Rat Bite Fever** is spread by rodent bites, most commonly from wild rodents, though, and rarely from laboratory-bred animals. Fever, chills and other symptoms usually occur about 10 days after the incident, followed shortly by a rash.

The number of additional zoonotic diseases to which animal workers may be exposed is potentially endless. They include mild illnesses such as the **ringworm** fungus from cats, rats, cattle and guinea pigs, and *Erysipelothrix* sp. ("fish rose") and *Mycobacterium* sp. from fish and aquarium environments. Severe and potentially fatal zoonotic diseases include Hantavirus from wild rodents and *Herpesvirus simiae* (Herpesvirus B, Monkey B virus) from non-human primates.



Toxic Chemicals

During the normal course of animal experimentation, animals may receive toxic chemicals or hazardous drugs. Sometimes the drugs themselves or their hazardous metabolites are excreted in urine or feces, contaminating the bedding and rendering it hazardous. When this possibility presents itself, researchers are responsible for developing a **Special Animal Safety Protocol (SASP)** that outlines safety practices and procedures to be taken in the animal facility. Currently there are several Special Animal Safety Protocols for cytotoxic drugs and carcinogens utilized in the animal facilities.



In the laboratory, hazardous agents are encountered as a matter of course. Use of **carcinogens**, **reproductive toxins**, and other highly **toxic agents** are part-and-parcel of modern research. During routine analyses and assays and in the administration of hazardous

agents to animals, hazardous agents tend to be present in very low concentrations, significantly lowering an individual's risk. It is during the preparation of **stock solutions**, however, where highly toxic chemicals are manipulated in their pure or concentrated state that the greatest potential for a significant exposure resides. Written Standard Operating Procedures delineating methods of hazard control are required for laboratory use of particularly hazardous chemicals.

Anesthetic agents are frequently used in animal experimentation. Based on the results of epidemiological studies of operating room personnel and other exposed persons, inhalation anesthetics as a class have been identified as reproductive toxins. An increased risk of spontaneous abortion and other reproductive effects have been observed in both exposed women and wives of exposed men. In addition to their assumed reproductive effects, individual anesthetics may be carcinogenic or toxic to major organ systems such as the liver or kidneys. **Proper ventilation**, whether by a scavenging device, use of a fume hood, or other local exhaust ventilation, is vital in maintaining ambient concentrations of anesthetic gases as low as possible.

The *Medical Surveillance Questionnaire* targets specific classes of highly hazardous chemicals and can be helpful in identifying persons who might have an increased susceptibility to their effects. For example, a person with pre-existing heart disease might want to take additional precautions before working with a cardiotoxic compound such as adriamycin. Persons who are pregnant, contemplating pregnancy, or even of full reproductive potential might wish for a confidential risk assessment from a medical professional before conducting experiments that involve inhalation anesthetics or other reproductive toxins.

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Infectious Agents & Biological Hazards

Biological hazards include pathogenic **microorganisms**; experimentally and naturally infected **animals**; tissues of infected animals; human **tissues**, blood and body **fluids**; human **cell lines** (including established cell lines); cell lines of non-human primates; and **recombinant DNA**. Infectious agents are classified on a scale of 1 to 4, in increasing risk. Research at the University of Louisville is currently limited to **Biosafety Levels 1 and 2**. **Biosafety Level 3** research facilities are in design and those experiments may be on-line in the near future. Biosafety Level 4 carries a high risk of life-threatening disease and cannot be conducted in current UofL facilities.

Because of their potential for direct contact with concentrated stocks of infectious agents, laboratory personnel are at the greatest risk for occupationally acquired infections. Researchers may be exposed during the care, propagation, and maintenance of infectious organisms; when injecting experimental animals with infectious agents; and during examination of infected tissues. Investigators wishing to conduct research activities involving experimentally or naturally infected animals should review the CDC/NIH publication *Biosafety in Microbiological and Biomedical Biological Laboratories, 4th edition*, for a thorough review of appropriate safety practices and procedures. The University of Louisville requires that investigators working with all biological agents, recombinant DNA molecules, or human blood, body fluids or tissues in any capacity, register their research with the **Institutional Biosafety Committee (IBC)** to ensure compliance with all regulatory requirements. Additionally, investigators



contemplating research involving recombinant DNA or human gene therapy must review the NIH Guidelines for Research Involving Recombinant DNA Molecules prior to submitting their proposal to the IBC for approval.

Animal care technicians face a much lower risk of occupational infection. Nonetheless, they may still be exposed through direct contact with infected animals, from animal bites or scratches, or through contact with contaminated bedding or its dust. Animals exposed to potentially infectious microorganisms are housed in a **biohazard containment facility**. Additional housing requirements, entry precautions, and signage are also needed. The *Special Animal Safety Protocol (SASP)*, a copy of which must be placed on the door of a room housing animals exposed to hazardous substances and designed specifically for the agent and host species, should be consulted for a review of appropriate safety

practices and procedures connected with experimentally infected animals.

Personnel who may be exposed to potentially infectious organisms, either through direct contact or through contact with infected animals, may benefit from a discussion of **risk factors** and **infection potential** with a health care professional. **Vaccinations** or other pre-exposure precautions may be appropriate for infectious agents like *Borrelia burgdorferi*, the causative agent for Lyme Disease. Personnel with reasonably anticipated exposure to bloodborne pathogens must either be vaccinated against hepatitis B or sign a vaccination declination form. This includes persons working with human blood, human tissues, human cell lines (including established cell lines), and certain body fluids. The *Medical Surveillance Questionnaire* can identify personnel in need of these services so that a confidential medical consultation can be arranged.

Physical Hazards

“**Sharps**” are ubiquitous in animal care. Needles, broken glass, syringes, pipettes, scalpels – all are commonly used in animal facilities and laboratories. **Avoid recapping used needles**; dispose of them in designated puncture proof containers. When disposing of sharps remember to segregate them away from regular trash so that custodial staff are not exposed to cuts, puncture wounds, infectious agents, or hazardous chemicals. Locate sharps disposal containers as near the point of use as possible. Traveling across a room to dispose of a scalpel, needle, or syringe is one of the most common causes of accidental needlestick/puncture.

Electrical hazards are found throughout animal and laboratory facilities. Pay particular attention to use of electrical equipment in wet areas such as the cagewash facility. Equipment that has frayed or damaged cords should not be used. Electrical cord splices and repairs made with electrical tape are not acceptable, as the tape does not check current flow. Substitute outlet strips for extension cords and octopus-type plug extenders. Follow lockout/tagout procedures during maintenance and repair of energized equipment.

Compressed gas cylinders are found routinely in laboratories and animal facilities. These cylinders are under high pressure and contain enormous amounts of energy. An uncontrolled release of energy from a typical five-foot compressed gas cylinder can easily propel the cylinder through a concrete block wall. Such an uncontrolled release can occur when a cylinder is knocked over. To protect against this potential, secure all compressed gas cylinders, even those marked “empty”, by a wall chain, bracket, or base. Replace the protective valve stem cap when the cylinder is not in use.



Radiation

Radiation is a diverse area that includes radioisotopes, x-rays, ultraviolet radiation (UV lights), and lasers. Radiation can present a hazard through inhalation, ingestion, skin contact, or proximity.

Ionizing Radiation. Experimentation involving animals and **radioisotopes** is common in molecular biology today. Use of radioisotopes in or with animals presents hazards that must be dealt with accordingly. For example, specific tissue that may concentrate a radioactive material might have to be handled or disposed of differently. Bedding from animals exposed to radioactive materials should be surveyed to determine its radioactivity and then disposed of accordingly. If an isotope could be released by exhalation, additional engineering controls might be required.



In addition to general laboratory safety precautions, basic radiation protection measures are required when administering radioisotopes to animals. **Class 1** work (administering low energy beta emitters such as ^3H , ^{14}C , and ^{35}S) requires contamination and waste control, proper labeling, and Geiger meter (GM) surveys of animal cages before returning them to Animal Care. **Class 2** work (administering high energy beta and gamma emitters such as ^{32}P , ^{125}I , ^{131}I , and ^{22}Na) requires additional safety precautions including the wearing of film badges and, sometimes, the shielding of animals. Animals containing microspheres are considered **Class 3**. These animals require special disposal practices that must be coordinated with the Radiation Safety Office. Investigators wishing to use radioactive materials in animals must be pre-authorized by both the UofL Radiation Safety Office and IACUC. You can begin the authorization process by contacting the Radiation Safety office at 852-5231.

Non-ionizing Radiation. Exposure to **ultraviolet (UV) radiation** can occur during the use of **UV germicidal lamps** and **transilluminators**. UV light is very damaging to the skin and eyes. Exposures can cause hyperpigmentation, burns, cataracts, photokeratitis, and skin cancer. Protect skin and eyes when using UV generating equipment. Latex gloves should cover hands; protect arms with long sleeves from a labcoat or other garment; a face shield will protect eyes, face, and neck.



Lasers emit concentrated beams of optical radiation in the UV, visible, and infrared regions. Depending on wavelength, power level, and duration of exposure, the

beams can present eye hazards (corneal and retinal burns, cataracts, or retinal injury) and skin hazards (burns and skin cancer). The most hazardous laser systems, **Class IV** lasers, produce hazards from direct viewing of the beam, specular reflection and diffuse reflection, as well as skin hazards and fire hazards. There may be significant non-beam hazards associated with laser systems, most notably electric shock and hazardous aerosols generated by laser/substrate reactions. In animal research, lasers may be used to perform surgery or to provide medical treatment. Personnel who work with or around lasers should be trained in the hazards and the means to protect themselves, including proper selection of eye protection. Laser surgery can also produce substantial aerosols, fumes, and toxic gases that should be controlled by the use of local exhaust ventilation.

Hazards in the Animal Facility

Working with heavy animals and equipment can stress muscles and joints. **Cumulative trauma injuries** including carpal-tunnel syndrome, tennis elbow, and bursitis are possible from repetitive motions associated with animal husbandry. **Wet floors** in animal rooms and cage wash areas increases the risk of slips and falls. The risk of **back injury** is real in animal care; proper lifting technique is imperative. Animal care technicians are provided back safety training to help them avoid back injury.



Conveyer belts, sanders, floor polishers, cage washers, room washing equipment, and other **machinery** have potential to cause injury. The most common types of hazards presented by machinery occur where there are exposed moving parts. Machine guarding is important even when workers know that they are not to place their hands in a dangerous area. When possible, install guards over exposed moving parts. Do not operate machinery that has had its guarding removed.

Exposure to excessive **noise** over several years may result in permanent hearing loss. This is hardly an issue in rodent facilities. Animal rooms housing dogs or pigs are another situation entirely. These animals in particular are known for their persistent and loud vocalizations that can reach intense levels inside the confines of the holding facility. Equipment such as cage washers, high-

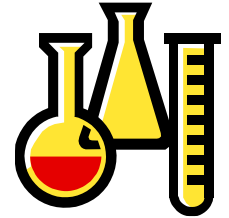


pressure air cleaning equipment, and wet vacuum systems may also produce excessive sound levels. A useful way of assessing whether a noise exposure might be excessive is to try to carry on a conversation in the area. The noise may be excessive if normal speech or talking is difficult or impossible. Animal care staff who work in areas where excessive noise levels have been

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identified (i.e., cage wash areas) are enrolled in a **hearing conservation program** that includes hearing protection, training, and annual hearing tests. Proper use of hearing protectors when working in these areas is essential to avoid hearing loss over a working lifetime.

Ethylene oxide is a carcinogen that is used in the animal facility as a sterilant gas for items that cannot be autoclaved. The use of sealed bag systems inside a properly functioning fume hood makes it possible to use ethylene oxide for its intended purpose with no detectable exposure to personnel.



Research Resources personnel use other potentially hazardous chemicals on a daily basis. Burns and skin irritation are the most common chemical injuries associated with animal care and use. Chemical exposures can occur during procedures that involve the use of disinfectants and detergents, pesticides, anesthetic gases, and chemicals for preserving tissues. Exposure sources can include animals that have been intentionally exposed to highly toxic chemicals, contaminated bedding, and other waste materials from experimental procedures. By following standard operating procedures for use of these materials, with special attention to *Special Animal Safety Protocols* in place for cytotoxic drugs and carcinogens, the risk of an injurious chemical exposure can be nearly eliminated.

Personal Medical Conditions That May Increase Risk

Every employee or student who works with animals at the University of Louisville is required to participate in the *Medical Surveillance Program*. When an individual receives animal care training they are given an initial medical evaluation form to complete, the *Periodic Animal Contact Health Survey*. The purpose of the medical evaluation is to identify any pre-existing conditions that might increase their risk of an occupationally acquired illness or injury. This **individual risk assessment** is an extremely important component of a successful environmental health and safety program.

An example is a technician who is planning on becoming pregnant. As noted previously, cats may carry an organism called *Toxoplasma* that can infect the mother and harm the baby. In this instance it would be appropriate to educate the employee who wanted to become pregnant about the dangers of toxoplasmosis and also make reasonable accommodations for the employee by reassigning them to an area



without cats until the baby is delivered.

Some medical conditions may increase an individual's risk of developing an occupationally acquired infection. These include chemotherapy, immunosuppressive drugs such as prednisone, chemotherapy agents and immune system modifying drugs such as methotrexate used to treat rheumatoid arthritis. Any given individual's risk will depend on a **combination of factors** including the individual's health history, type of research animals, and type of chemical agents and biological agents used. Individuals who are immunocompromised, such as patients receiving chemotherapy or radiation for a cancer, are at greater risk of acquiring an occupational illness. A patient with HIV, leukemia, organ transplants, kidney failure or certain medications that make their immune systems weak should work closely with the occupational health service and their supervisor to find reasonable accommodation. The Health Service can educate the employee and their supervisor regarding the individual's risk and actions that would reduce that risk.

Employees should also be aware that some conditions such as animal allergies develop over long periods of time. Employees should be educated to recognize the symptoms and seek medical advice should they develop.

Medical Surveillance Questionnaire

Completion of the attached *Periodic Animal Contact Health Survey* ensures your relevant medical history is on file in the Staff Health Services Office in case of

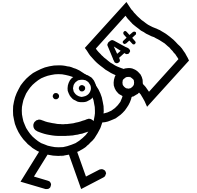


occupational injury or illness. The survey also provides the opportunity for a health risk assessment based on your potential exposures and personal health history. After a confidential review of your health survey by a physician you will receive a written health risk assessment based on your type of exposure.

Confirming What You Have Learned from this Training Document

A simple multiple choice test is attached and must be completed to confirm that you have read and understood the most important facts presented in this

training document. Once you have completed the test, please follow the instructions for returning both the test and the periodic health survey. **Be sure to fill in your full name and other identifying information on both the health survey and the test.**



To maintain confidentiality the periodic health survey must be sealed in the appropriate envelope and returned along with the test to the Research Services Office in the second envelope. Research Services will record receipt of the health survey and forward it unopened to the Staff Health Services Office.

For More Information, Contact:

Office of Research Services, Research Resources Facilities, Veterinary Care Staff. **852-5268.**

Department of Environmental Health and Safety. **852-6670.**

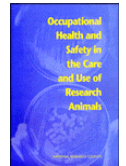
Office of Health Services. **852-6446.**

Bibliography:

National Research Council. 1997.

Occupational Health and Safety in the Care and Use of Research Animals. National Academy Press, Washington, D.C.

[<http://www.nap.edu/books/0309052998/html/index.html>]

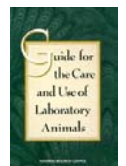


Centers for Disease Control. 1999. *Biosafety in Microbiological and Biomedical Laboratories*. U.S. Government Printing Office, Washington, D.C.

[<http://www.cdc.gov/od/ohs/biosfty/bmb14/bmb14toc.htm>]

National Research Council. 1996. *The Guide for the Care and Use of Laboratory Animals* (a.k.a. "the Guide"). National Academy Press, Washington, D.C.

[<http://www.nap.edu/readingroom/books/labrats/>]



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