

CHAPTER 12

SAFE HANDLING OF LABORATORY ANIMALS

Personnel involved in the care and use of research animals work in an environment that presents a number of unique hazards from several sources:

- Hazards related to the equipment, materials and practices used in performing routine animal husbandry;
- Hazards related directly or indirectly to animal contact, and;
- Hazards related to the techniques or materials (e.g., biohazardous substances) that may be used during the course of animal experimentation.

Regardless of the source of hazard, several basic measures should be taken to reduce the risk of personal exposure. These include understanding the hazards likely to be encountered during animal care and use, using properly designed and maintained facilities and equipment to minimize exposures, wearing appropriate personal protective equipment (PPE) and demonstrating the technical proficiency necessary to accomplish experimental manipulations or animal care procedures in safe and humane fashion. In compliance with federal regulations and institutional policy and procedures, health and safety issues pertaining to animal care and use are addressed at several levels in the institution. The Institutional Animal Care and Use Committee (IACUC) requires documentation of training or attendance at an orientation seminar held several times annually. The IACUC and the Department of Laboratory Animal Medicine (DLAM) work in collaboration with the UNC-CH Health and Safety Office and the University Employees Occupational Health Clinic (UEOHC) to ensure that appropriate expertise is involved in program guidance and the timely exploration and resolution of new problems.

Health questionnaires (Appendix 12-A) are submitted to the UEOHC which performs a risk assessment based upon relevant individual health history or concerns, the species of animals used, the extent of animal contact and the experimental agents or procedures that will be used in the animal studies. Based upon this assessment, additional vaccinations, modifications in the use of PPE, or possibly even work re-assignment to other types of duties might be recommended. In addition, the UEOHC serves as a primary care provider for workplace injuries and accidents involving laboratory animals or laboratory animal facilities, and urges prompt communication of health concerns associated with animal handling.

Common Injuries Associated with Animal Husbandry and Care

Injuries and accidents recorded in personnel working in laboratory animal facilities are provided below:

- Burn injuries due to working around cage washers, autoclaves or other sources of hot water or live steam

- Crush injuries or lacerations from moving caging equipment, operating sanitation equipment or working with intractable large animals
- Musculoskeletal injuries (sprains, strains or fractures) due to the use of improper technique in lifting or moving heavy equipment or improper restraint and handling of large animals
- Slip and fall injuries from walking on wet flooring
- Hearing impairment resulting from working around loud machinery or animals
- Visual impairment from direct trauma (equipment), splash exposure (detergents, disinfectants, or particulate matter) or exposure to ultraviolet light resulting in corneal damage
- Skin irritation or contact dermatitis from exposure to chemicals used in cleaning, latex or talc allergy, or in experimental procedures in the animal facility
- Respiratory exposure to irritating vapors, aerosols or particulates from working with disinfectants and bedding materials
- Needlestick exposures from attempts to recap hypodermic needles, improper injection technique or delay or improper disposal of used needles

Personal awareness of hazardous conditions or factors in the environment is critical to avoiding these types of injuries, and individuals should develop the habit of assessing the environments in which they work. Research staff are encouraged to consult with DLAM personnel about the hazards which have been identified in particular work areas and the work practices which have proven to be most effective in preventing incidents. DLAM facility supervisors can also provide a useful orientation about the available resources and use of the facility. MSDS information for all agents used in the animal care operation are available for review in each animal facility. DLAM provides PPE in all of its facilities consisting of masks, gloves, and in many sites, coveralls, booties, bonnets and hearing protection. For most activities conducted in animal rooms or procedure areas involving laboratory animals, research personnel are encouraged to wear a clean lab coat (or equivalent external cover), latex gloves, face (particle) mask and safety glasses. Shoes rather than sandals also should be worn for adequate foot protection.

Animal Related Hazards

Bites, Scratches and Other Injuries

Bites, scratches and other injuries represent a significant portion of the animal-associated hazards encountered by individuals with laboratory animal contact and are readily preventable through proper animal handling technique and the use of proper PPE. Unusual noises, defective equipment, slippery surfaces and conditions conducive to entrapment or distraction of the animal handler should be eliminated prior to animal handling. Inappropriate animal handling may induce discomfort, pain and distress in the animal provoking a fractious response, introducing undesirable experimental variables and providing the animal the opportunity to inflict injury upon the handler. DLAM can provide the opportunity for supervised instruction to individuals undertaking new animal handling procedures. Personnel should always wear a long sleeve lab coat or use other

sleeve protection when handling rabbits or larger animals to avoid scratch injury, and in some cases special gloves (e.g., stainless steel mesh or heavy leather gauntlets) should be worn to prevent bites. Special attention should be given to the training of personnel involved in the handling and restraint of large animals, especially nonhuman primates. In addition to posing a bite and scratch hazard, nonhuman primates can be challenging and difficult to handle safely because of their remarkable strength, dexterity, intelligence and tenacity. Unsuspecting personnel have been injured when nonhuman primates have grabbed and pulled neckties, loose-fitting lab coats or long hair. When it is compatible with the experimental conditions of animal use and/or the clinical condition of the animal, consideration should be given to chemical immobilization of many nonhuman primate species to enable safe animal handling and to reduce the risk of injury for personnel. Specific PPE requirements are in effect for personnel working with monkeys and are posted in the housing areas for these species.

Animal bites continue to be a relatively common occurrence among research personnel and should be regarded seriously even when they have been inflicted by small rodents causing little tissue damage. Personnel who have been bitten should seek prompt medical review of the wound and their tetanus immunization status by UEOHC, and initiate the veterinary evaluation of the animal involved if warranted. Animal bites also prompt a veterinary review of the animal handling circumstances to ensure that proper animal handling techniques were used. A specific, detailed protocol is in effect for bites, scratches or mucous membrane exposures involving some monkey species due to the Herpes B virus, an agent which can cause fatal infection. The list of other specific viral agents that can be involved as wound contaminants includes rabies virus (all mammals), hantavirus (rodents), lymphocytic choriomeningitis virus (rodents) and orf virus (sheep and goats). Numerous bacterial agents and at least one fungal agent have also been recorded as wound contaminants resulting in serious localized or systemic infections.

Animal Associated Allergy

An estimated 10 to 30 percent of individuals who work with laboratory animals may eventually develop allergy to laboratory animals manifested by reddened, itchy eyes, nasal symptoms and skin rashes. Individuals with pre-existing allergy to other agents have a predisposition to develop an additional sensitivity to animal allergens. Asthma, which is characterized by cough, wheezing, chest tightness and shortness of breath, develops as a further complication in approximately 10 percent of individuals with animal-associated allergy. Also, anaphylaxis, a generalized allergic reaction presenting as diffuse itching, hives and facial and oral swelling can develop and produce life-threatening consequences from laryngeal edema, airway obstruction and shock in certain individuals with massive allergen exposure, often through saliva.

Although rodents, rabbits and cats are most often incriminated in cases of laboratory animal-associated allergy, other mammals and birds also can be involved. Work practices which minimize contact with animal proteins reduce risk for development of allergy. For example, various levels of PPE are available for personnel working with laboratory animals to reduce exposure to allergen. Allergy history is an important element of the health review conducted by UEOHC for personnel involved with laboratory animal care and use, and individuals who have or suspect that they are developing animal-associated allergy should consult with the UEOHC to determine the optimal allergy management strategy.

Zoonoses

Zoonoses are diseases that are transmissible from animals to humans. Laboratory animal species potentially harbor numerous zoonotic agents, including viruses, bacteria, fungi, protozoa and internal and external parasites, but the reported cases of zoonotic transmission to individuals with laboratory animal contact have been infrequent and sporadic. However, because many of the zoonotic disease episodes likely have remained unreported and because those which have been reported involved serious disease and even fatalities, individuals with laboratory animal contact should be aware of these diseases and take appropriate precautionary measures. The likelihood of encountering a zoonoses varies with the species of laboratory animal used, its source and history of veterinary care. Individuals who become ill and/or feel they have contracted a disease from a laboratory animal, should consult with the UEOHC staff. The major zoonoses are summarized below.

Rodents and Rabbits. The modern conditions of production and care for most laboratory rodents and rabbits have led to the eradication of zoonoses in most of these species. However, these animals rarely can become contaminated through environmental sources, contact with wild rodents or other infected animals or through tumors, cell lines or other biologics used experimentally. In most circumstances, only wild-caught, laboratory maintained rodents would be regarded as a high risk for the transmission of zoonotic diseases. Personnel should be familiar with several zoonoses associated with rodents and rabbits. Two serious systemic viral zoonoses have been associated with the use of laboratory rodents. Lymphocytic choriomeningitis virus causes a flu-like disease with neurological complications, and hantavirus infection produces a disease marked by renal failure and respiratory complications. Other than the bite-associated bacterial infections from rodents (i.e., rat-bite fever) there are few bacterial zoonoses in these species. The rabbit is a potential source for human bacterial pathogens especially those which cause human diarrheal disease such as salmonellosis. Rodents and rabbits also can be source for human ringworm infection usually recognized as a reddened, annular lesion of the skin of the affected individual. A similar focal dermatitis can be caused by infestation with the rabbit fur mite and, rarely, other mite species of rodents. The dwarf tapeworm infestation of rodents also is capable of infecting man. The complete absence or extremely low incidence of these agents in our laboratory animal populations has obviated our need to adopt intensive health surveillance measures for individuals who work with these species. However, all personnel should use appropriate PPE when working with these species and are encouraged to report unusual illnesses or conditions possibly related to animal contact.

Dogs and Cats. Source control and sound programs of veterinary care at the vendors' facilities and at UNC-CH ensure that the majority of zoonotic infections are eradicated in these animal species prior to their experimental utilization. Due to financial limitations, it is not practical to rule out all potential zoonoses however. In some cases, subclinical infections, may go undetected and untreated posing a risk for the personnel who work with these animals. Such infections would include intestinal bacterial infections (salmonellosis, yersiniosis, and campylobacteriosis), systemic bacterial infections (brucellosis, cat-scratch fever, leptospirosis and Q-fever) and intestinal parasitic infections (giardiasis and toxoplasmosis). Also, the dog and cat can also harbor the dermatophytes causing human ringworm and other external parasites capable of infesting humans.

Proper use of PPE is essential to minimize exposure to these zoonotic hazards. Personnel involved in the use of laboratory cats that have not been specifically breed for research purposes should give consideration to participation in the rabies vaccination program available through

UEOHC.

Non-human Primates. The list of zoonotic diseases in nonhuman primates is long and includes numerous viral (e.g., B virus, hepatitis A and B, measles and SIV), bacterial (e.g., tuberculosis, salmonellosis and shigellosis) and protozoal (e.g., giardiasis and amebiasis) diseases, and there are many documented cases of zoonotic transmission. Consequently, non-human primates must undergo an extensive quarantine period to preclude the presence of many of these zoonoses before experimental work with these animals can be started. Even after release from quarantine, rigorous disease surveillance continues for some agents such as tuberculosis. Personnel also must participate in periodic tuberculin testing through UEOHC if they have any nonhuman primate contact. Personnel who work with macaques must undergo special training concerning the prevention and management of potential exposure to B virus, an agent which has caused many fatalities among laboratory personnel. Strict adherence in the use of PPE is expected of all personnel with nonhuman primate contact.

Birds and Livestock. Q fever has proven to be the most important zoonosis associated with livestock in the laboratory animal facility. Although all ruminants and many other animals are potential carriers, infection of laboratory personnel has most often been associated with pregnant sheep that copiously shed the organisms. The disease causes a flu-like illness which can progress to a serious systemic infection with heart involvement. Orf, a pox viral disease of sheep and goats, can also infect humans through contaminated wounds producing firm, nodular lesions. Livestock and birds can harbor bacterial zoonoses causing diarrhea in humans. Birds also can shed the agent of psittacosis (*Chlamydia psittaci*), a serious respiratory and systemic disease of humans. Proper use of PPE is essential to minimize exposure to these potential zoonotic hazards.

Use of Hazardous Agents in Animal Experimentation

Many studies involve the use of hazardous agents in laboratory animals. Often the use of a hazardous substance is incidental to the research, whereas in other circumstances it is an integral component of the study intended to produce a particular experimental effect. Examples of the former include inhalant anesthetic agents (e.g., ether, methoxyflurane, halothane or isoflurane), injectable anesthetic agents (urethane), and adjuvants (particularly Freund's Complete Adjuvant). Examples of the latter include carcinogens, teratogens, mutagens, toxicants, microbial pathogens, radioisotopes, and organisms modified through recombinant DNA techniques. In either case, the use of hazardous agents is noted during the IACUC review of the animal protocol and is referred to the Health and Safety Office or the appropriate UNC-CH campus committee to verify or establish the conditions under which the hazardous materials can be used safely. The conditions for safe use of the agent are then summarized on a Use of Hazardous Materials in Laboratory Animals form (found in Appendix 2-A) which is transferred to DLAM for space assignment and additional planning necessary for the safe conduct of the study. In some cases it may be necessary for the institution to engage outside expert consultants and work with the investigator to develop a more elaborate safety protocol and ensure appropriate personnel training before the animal studies can be initiated.