

**NORTHERN ARIZONA UNIVERSITY INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE
POLICIES AND PROCEDURES MANUAL**

TABLE OF CONTENTS

INTRODUCTION

THE BIOLOGICAL SCIENCES ANNEX (BSA)

- **General Information**
 - **Location and Hours of Operation**
 - **Facilities Management Personnel and Contact Information**
 - **Facility Resources**
 - **Veterinary Services**
 - **Emergency Response**
 - **Facility Maintenance**
- **Animal Care Policies and Procedures**
 - **Standard Operating Procedures (SOPs)**
 - **Personal Protective Equipment (PPE)**
 - **Common Hazards in the Research Setting**
 - **Chemical Use/ Storage and MSDS**
 - **Zoonoses**
 - **Animal Bite and Scratch Procedures**
 - **Animal Allergies**
 - **Animal Bio-Safety Practices/ Training**
 - **General Animal Husbandry**
 - **Animal Health/Sickness**
 - **Animal Care**
 - **Animal Care in the Event of an Emergency**
 - **Animal Housing**
 - **Environmental Enrichment**
 - **Daily Records**
 - **Suspension of Animal Care Privileges**
 - **Food, Bedding and Water**
 - **Soiled Bedding**
 - **Temperature and Humidity**
 - **Heating, Ventilation and Air Conditioning**
 - **Lighting**
 - **Noise**
 - **Surgical Areas**
 - **Animal Identification**
 - **Animal Handling / Restraint**
 - **Maintenance of Pathogen Free Animals (SPF)**
 - **Sentinel Program**
 - **In House Breeding**
 - **Animal Transportation**

THE INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE (IACUC)

- **THE ROLE OF THE IACUC**
 - IACUC Member Composition
 - IACUC Member Training
 - Requirements to be a Principal Investigator
 - Duplicate Review
 - Scientific Justification
 - The IACUC Protocol Form
 - Protocol Modifications
 - Annual Reports
 - Triennial and Final Reports
 - Semi-Annual Evaluation Of Laboratory Animal Programs And Facilities
 - Post Approval Monitoring and Grant to Protocol Congruency Review
 - Recommendations to the Institutional Official
 - Suspension of Animal Research Activities
 - Reporting Animal Welfare Concerns- “Whistle Blowing”
- **Personnel Training and Tutorial Services**
- **Occupational Health and Safety**
- **Responsible Conduct of Research**
- **Conflict of Interest**
- **Tissue Transfer Policy**
- **Field Studies**
- **LD50 Experiments / Alternative Endpoints**
- **Surgical Procedures**
- **Anesthesia/Analgesia**
- **Euthanasia**
- **Neuromuscular Blocking Agents**
- **Prolonged Animal Restraint**
- **Food and Water Restriction/Deprivation**
- **Chronic Implants**
- **Screening of Biological Materials**
- **Lethal Dose 50 Testing**
- **Determination of Alternative Endpoints**
- **Blood Collection**
- **Expired Pharmaceuticals**
- **Controlled Substances**
- **Adoption/Disposition of Excess Live Animals**

INTRODUCTION

Biomedical and scientific research using animals have made tremendous advances in scientific knowledge and the treatment of human and animal medical conditions, including a significant reduction in deaths in humans and animals. Additionally, animal research has contributed to a growing understanding of cancer, heart disease, mental illness, and the development of less invasive surgical methods for advanced treatment and therapies for trauma, congenital, acquired and malignant diseases.

These advances are due to many different kinds of research, from the laboratory bench, to computers, to animals. As scientists we recognize the importance of healthy animals for experimental research and

that working with animals is a privilege. The Northern Arizona University animal research program is committed to providing excellence in animal care.

It is the goal of the Institutional Animal Care and Use Committee (IACUC) and the Biological Sciences Annex (BSA), within accepted National Institutes of Health (NIH) and federal, state and local guidelines, to provide the best possible service to enable Principal Investigators (PI) and research personnel to perform the highest quality research. Conducting animal research is a privilege and animal use programs are highly regulated by federal and public service organizations. NAU ascribes to the highest standards in meeting and exceeding regulatory requirements. The NAU animal research program is accredited by the American Association for the Assessment and Accreditation of Laboratory Animal Care (AAALAC), the gold standard for commitment to excellence in animal research. To learn more about the regulatory oversight process, consult the agency websites below.

Regulatory Resources

- United States Department of Agriculture (USDA)
 - <http://www.aphis.usda.gov/>
- Animal Welfare Act Regulations
 - http://www.aphis.usda.gov/animal_welfare/downloads/awa/awa.pdf
- The Guide for the Care and Use of Laboratory Animals 8th Edition
 - <http://oacu.od.nih.gov/regs/guide/guide.pdf>
- The Office of Laboratory Animal Welfare (OLAW) Public Health Service Policy on Humane Care and Use of Laboratory Animals.
 - <http://grants.nih.gov/grants/olaw/olaw.htm>
- Institutional Animal Care and Use Committee Guidebook 2nd Edition
 - <ftp://ftp.grants.nih.gov/IACUC/GuideBook.pdf>
- The American Veterinary Medical Association (AVMA) 2007 Guidelines on Euthanasia
 - http://www.avma.org/issues/animal_welfare/euthanasia.pdf

This policies and procedures manual describes many of the considerations associated with humane treatment, maintenance and usage of experimental animals and is to serve as a reference for researchers to find answers to common questions regarding standard BSA and IACUC policies and procedures. For topics not covered in this manual and for guidance with your specific research projects, please contact BSA personnel.

THE BIOLOGICAL SCIENCES ANNEX (BSA)

GENERAL INFORMATION

LOCATION AND HOURS OF OPERATION

The BSA is located in Building 21B at the south end of the Biological Sciences Building (21). The BSA serves as the central animal research facility. A smaller satellite facility on south campus, the Avian Cognition Laboratory (ACL) is dedicated for housing birds and other animals brought to NAU from the wild.

The BSA is open during normal working hours Monday through Friday. The BSA has an alarm system which is activated outside of normal working hours. Should you need access to the BSA outside of normal working hours, you must request authorization and access from the Animal Care Manager (ACM) in advance. If appropriate, you will be granted after-hours access.

FACILITIES MANAGEMENT PERSONNEL AND CONTACT INFORMATION

BSA personnel can be reached during normal business hours at the email and phone numbers below. Emergency and after hours contact information is posted in the BSA and in PI laboratories. If the AV is unavailable to physically respond to an animal emergency, NAU has contracted with local veterinarians to provide emergency veterinary care.

Thomas M. Greene BS, RLATG, CPIA (Animal Care Manager)

Thomas.Greene@NAU.edu

928-523-1330 (office)

Scott D. Nichols MS, DVM (Attending Veterinarian)

Scott.Nichols@NAU.edu

928-523-7318 (office)

928-607-1561 (cell)

FACILITY RESOURCES

The BSA provides animal housing, husbandry and support services to the research community at NAU. The BSA contains 11 animal holding rooms, dedicated animal treatment and surgical suites, a necropsy area, a steam autoclave and a large flex room that can be adapted for your needs including tissue collection, histology, behavioral testing and x-ray evaluation. The surgical suite offers gas anesthesia, dry bead sterilizer and technique and training services.

VETERINARY SERVICES

Dr. Scott Nichols is the Attending veterinarian (AV) for NAU. He is employed by the institution on a part time basis. He is responsible for the health and welfare of your research colonies including pre-, peri and post operative assessment and treatment. In addition, The AV is available for assistance with animal model development, technical and procedural development, personnel training and pre-IACUC submission review of animal research protocols. The AV must be consulted for all procedures that include surgery and/ or procedures that may produce pain, stress or discomfort in laboratory animals. The AV can provide species specific surgical, anesthesia, analgesia and euthanasia assistance.

EMERGENCY RESPONSE

Description: Emergencies, accidents and disasters can occur at any time, without warning. The ability to respond to an emergency is the responsibility of each individual as well as the BSA. An emergency response document is in place for the BSA. This document is designed to assist you in the event of an emergency while you are working in the BSA. Information is provided to;

- Help prepare for an emergency and react swiftly when called upon.
- Guide you through an emergency as it is happening.
- Help you avoid and anticipate dangerous situations.
- Create a plan to ensure animal welfare during an emergency and provide details for evacuation and/or euthanasia of animals should it be warranted.

Policy: Personnel are to be familiar with facility guidelines for emergency response. Primary BSA personnel are notified by campus response systems that disaster/emergency involves the BSA. The ACM and AV are the primary responders. They will address immediate BSA needs and integrate into to the campus wide response system if necessary.

Primary Emergency Responders

- Tom Greene BS, RLATG, CPIA- Animal Care Manager 523-1330 (office), 928-607-9153 (cell)
- Scott Nichols MS, DVM- Attending Veterinarian 523-7318 (office), 928-607-1561 (cell)

Procedures:

General Guidelines

- Always be aware of your surroundings and what is taking place around you
- Be familiar with building's floor plan and evacuation route
- Be competent in the use of a fire extinguisher, and
- Know what to do, where to go and how to get in touch with emergency responders

Preparedness Actions: Personnel should know the location of the following;

- Emergency contact information and nearest telephone
- Stairs, emergency exits and evacuation routes
- Fire alarms and fire extinguishers
- First Aid kits
- Eyewash kits and emergency showers
- Flashlight and replacement batteries

FACILITY MAINTENANCE

Policy: BSA personnel are responsible for monitoring facility maintenance needs. The BSA must be maintained to a high standard of design and function to meet the needs of researchers and to be compliant with all federal regulations.

Procedure: Appropriate NAU departments are notified in the event that repairs are required at the BSA. Routine maintenance occurs on a schedule and as needed basis. If facility users identify repairs, please notify the ACM.

ANIMAL CARE POLICIES AND PROCEDURES

STANDARD OPERATING PROCEDURES (SOPs)

Description: SOPs establish a consistent plan for how all personnel perform routine BSA and laboratory tasks. Personnel are required to read all relevant SOPs prior to beginning work. Topics covered in BSA SOPs regarding animal care include but are not limited to;

- Receiving and disposal of animals
- Surgery protocol
- Zoonotic disease, potential hazards and preventative measures
- Allergic reactions
- Use of personal protective equipment
- Procedures for dealing with animal bites and scratches
- Cleaning of holding area
- Crisis plan including emergency numbers
- Anesthesia, Analgesia and Euthanasia
- Vermin monitoring and control

Policy: A database of common SOPs is maintained in the BSA and they are periodically reviewed and updated by the AV and ACM. Study and laboratory specific SOPs are the responsibility of the PI and should be attached to an IACUC protocol submission.

For laboratories housing animals outside the BSA or performing animal procedures in their labs, SOPs must be clearly posted and should address the following topics;

- Purpose, Scope, Definitions
- Responsibilities of personnel with respect to daily care
- References
- Reagents and Materials
- Equipment used in experiments or for animal care
- Safety precautions
- Procedures used in experiments or for animal care
- Allergy prevention and response
- Anesthesia, Analgesia and Euthanasia
- Commonly performed procedures

Procedure: Personnel must read the SOPs for procedures performed in the IACUC protocol and be familiar with the procedures described. Experienced laboratory members train new members on procedures described in the SOP. Training is documented on the laboratory's training tracking form. A standard SOP form is available from the ACM. An SOP on writing SOPs is also available from the ACM.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Description: Hazards exist in every workplace in many different forms: sharp edges, falling objects, flying sparks, chemicals, noise and other potentially dangerous situations. The Occupational Safety and Health Administration (OSHA) require that employers protect their employees from workplace hazards that can cause injury.

Policy: PPE such as protective clothing, respiratory devices (respirators, dust and particulate masks), face shields, full body suits and barriers must be used to protect against chemical, radiological, biological, or mechanical hazards and irritants capable of causing injury or impairment through absorption, inhalation, or physical contact. NAU policy is that PPE be provided, used and maintained in a sanitary and reliable condition. Engineering controls reduce or eliminate exposure to chemical or physical hazards through one or more of the following methods:

- Elimination of a hazardous technique, process or material
- Substitution of a more hazardous technique, process or with a less hazardous one
- Segregation of people from hazards
- Enclosure of hazards
- Ventilation of the workplace and the source of contaminants
- Repair or replacement of faulty or outdated equipment or machinery

Engineering controls are usually the most effective way to protect personnel because they make changes at the source of the hazards and don't rely on the skill or vigilance of individuals. Engineering controls are often used along with administrative measures and PPE. When engineering controls and administrative controls are not feasible or do not provide sufficient protection, personnel must be provided with PPE. All personnel must be aware of the potential hazards of working with research

animals and conducting experimental procedures. The BSA and PIs must provide the appropriate PPE and training to protect personnel from hazardous exposure.

Procedure: Controlling a hazard at its source is the best way to protect personnel. Depending on the hazard or workplace conditions, OSHA recommends the use of engineering controls and/or work practice controls to manage or eliminate hazards to the greatest extent possible. For example, building a barrier between the hazard and the employees is an engineering control; changing the way in which employees perform their work is a work practice control.

COMMON HAZARDS IN THE RESEARCH SETTING

Description: Working in the BSA presents many possible hazards. An SOP is available at the BSA which identifies general hazards associated with working in an animal research environment. Personnel must be aware of these hazards and know what steps are taken to mitigate the risk of hazard exposure. Common hazards in the research setting can include;

- Chemical Spills
- Radiation Hazards
- Electrical Hazards
- Compressed Gasses
- Natural and Environmental Hazards
- Zoonoses (animal diseases that are transmissible to humans)
- Animal Bites/Scratches/Allergies
- Biological Agents
- Wet Floors
- Heavy Lifting

Policy: Personnel must be familiar with the common hazards associated with working in the BSA and while conducting research in the field setting. Hazards in the field are described in the NAU field safety document available from the Office of Regulatory Compliance.

Procedure: Administrative and engineering controls, PPE, appropriate traffic flow, signs and ergonomics are all used within the BSA to mitigate the risks of hazards. Not all hazards can be eliminated. Personnel are trained by BSA personnel regarding specific hazards and how to minimize risks.

CHEMICAL USE/ STORAGE AND MANUFACTURE'S SAFETY DATA SHEETS

Policy: Personnel must be familiar with the physical and reactive properties of the chemicals they are working with. A Material Safety Data Sheet (MSDS) is a form with data regarding the properties of a particular substance. An MSDS provides workers and emergency personnel with procedures for handling or working with that substance in a safe manner, and includes information such as physical data (melting point, boiling point, flash point, etc.), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill-handling procedures. An MSDS must be present for all chemicals used in the BSA or PI laboratories. These should be stored in a clearly marked binder, visible and known to all personnel in the laboratory. All liquid chemicals must be stored in leak-proof secondary containers to preclude inadvertent leakage and personnel exposure. Several containers may be stored in the same secondary container, as long as chemicals are compatible in the event of a leak. Chemicals must be handled with appropriate engineering controls and PPE. Chemicals may require preparation or handling within a chemical fume hood or biosafety cabinets must be performed in certified hoods/cabinets. Only properly functioning and certified hoods and cabinets may be used for these

purposes. All personnel working with chemicals must be review the MSDS for the chemical(s) they are working with and be aware of the PPE and procedures required for safe handling.

Procedure: Before using any chemical, consult the MSDS for that chemical. Consult the PI, experienced laboratory personnel, the ACM or AV for guidance on chemical use, and storage, PPE and engineering controls for the safe handling of chemicals.

ZOONOSES

Description: A zoonosis is any infectious disease that can be transmitted (in some instances, by a vector or fomite) from non-human animals to humans. Roughly 60% of the known human pathogens are zoonoses and can include viruses, bacteria, fungi, prions and parasites such as round worms and tapeworms. All personnel are made aware of the potential risk for contracting a zoonotic disease from research animals. Proper adaptive measures must be taken (i.e. wearing gloves and face shields, proper animal restraint etc.) to minimize the risk of zoonotic transmission. While animals bred specifically for animal research pose little risk for carrying zoonotic diseases, proper measures must still be taken. Wild animals being handled in the field pose a much greater risk for transmitting a zoonotic disease to researchers including rabies virus, hanta virus, bubonic plague and Lyme disease. Consult with the AV for zoonotic concerns and adaptive measures to be taken to minimize likelihood of transmission.

Policy: All personnel must receive training on zoonotic diseases specific relative to the species they work on. This training is provided by the AV at the BSA. Records of training are maintained at the BSA.

Procedure: Personnel shall take all adaptive steps to minimize the likelihood of zoonotic transmission. In addition to being aware of the potential diseases, all appropriate PPE are worn and animals restrained in a safe manner to reduce bite/scratch risk.

ANIMAL BITE AND SCRATCH PROCEDURES

Description: Bite and scratch wounds inflicted by laboratory animals may cause serious injury. Even bites which appear minor may cause significant problems later due to resultant bacterial infection. Bites from wild caught animals may also cause significant infection, depending on their oral flora. Scratch wounds may similarly become infected or may cause mild to moderate allergic reactions. Larger species and wild mammals may inflict serious injuries. Vascular lacerations from such bites may pose immediate threat to life.

Policy: All injuries, including bite and scratch wounds must be reported to the individual's immediate supervisor, who will complete an incident report form. If necessary, the person should then seek medical attention at Campus Health Services (523-2131), Flagstaff Medical Center (779-3366), or from their personal physician. Zoonotic diseases present additional risks. A description of potential zoonotic diseases should accompany the individual to present to medical providers if the risk of transmission is high.

Procedure: Bite and scratch wounds can often be avoided with appropriate use of PPE and animal handling techniques. Engineering controls and PPE such as protective gloves and long sleeve lab coats should always be utilized for work with animals. Proper handling and restraint is also a powerful tool to reduce potential injuries from animals. Do not handle animals until proper training is received from BSA staff or experienced laboratory personnel.

ANIMAL ALLERGIES

Description: Allergic reactions to various workplace antigens are becoming increasingly common. In an animal facility, such reactions are most often seen after exposure to salivary proteins, urinary proteins or skin dander. The most common allergies are developed to rodents and cats with allergies to dogs, rabbits and other species being less common. Signs of allergies range from mild urticaria (hives) to moderate and severe respiratory compromise depending on the nature of the allergy. Allergic reactions may be immediate or may develop over several months to years. Development of allergies is one of the most common reasons individuals must abandon working with laboratory animals. In individuals who work with rodents, the incidence of allergies can approach 30%.

Common signs of allergies vary considerably depending on the nature of an individual's sensitivity. Most common early signs of allergies may include ocular, nasal discharge and itching. Other early signs may include development of redness and itching of the skin where contact with the allergen occurred. These signs may develop almost immediately or hours after exposure. More severe allergic symptoms usually involve the respiratory system and can include shortness of breath, wheezing, low blood pressure, low or high heart rate and even vomiting and diarrhea.

Exposure to animal saliva, urine, and dander may result in signs of allergies in some individuals. Symptoms may range from mild responses to serious medical conditions requiring immediate medical care. Caution should always be exercised with mild allergic responses as they may progress to more serious complications.

Policy: All allergic reactions must be reported to the individual's immediate supervisor, who will complete an incident report form. The person should then seek medical attention at Campus Health Services (523-2131), Flagstaff Medical Center (779-3366), or from their personal physician. All adaptive steps must be taken to minimize contact with allergens. Appropriate engineering controls and PPE including a laboratory coat, gloves and masks should be utilized. Appropriate animal restraint can reduce allergen transmission as well.

Procedure: Mechanisms are in place to minimize the contact of laboratory animal users with dead or live animals, their tissues and waste products. For example, it is expected that a dedicated area/room (where possible) will be used for animal procedures. Additionally, countertops and equipment used for animal work will be cleaned thoroughly between animals if necessary and after animal work has been conducted. Animal caging shall be promptly returned to the BSA for sanitizing. Deceased animals must be bagged, appropriately labeled (including species and any chemical exposure) and promptly disposed of in an appropriate manner.

For a single case of a mild allergic reaction with only one symptom present, immediately wash the affected area with soap and water and monitor your condition. Washing the face, eyes and nose may minimize "hay fever" type allergy symptoms. Report your condition to a supervisor if you feel that the symptoms will recur with continued animal exposure. Allergic responses can be minimized with engineering controls corrective measures, the use of PPE and appropriate animal restraint.

For a single case of a moderate allergic response, remove yourself from contact with animals, their bedding, waste products and cages. Wash hands, face and exposed skin. Immediately report your condition to a supervisor. Depending on the situation, you may be sent to Campus Health Services or to Flagstaff Medical Center for further evaluation and treatment. It is important that you bring

accompanying information detailing the type of exposure. Your exposure and reaction will be documented and subsequent training, education or limited exposure practices may be instituted.

For a severe allergic response, immediately remove yourself from contact with animals, their bedding or cages. Alert the nearest individual, who will contact 911. Affected personnel will likely be transported to Flagstaff Medical Center for evaluation and treatment. Individuals experiencing severe allergic reactions to animals, their dander or bedding, will very likely be restricted from further animal contact. An incident report form will be filled out for all moderate and severe allergic responses. The AV, ACM and the Campus Health Services care provider will be alerted.

ANIMAL BIOSECURITY PRACTICES AND TRAINING

Description: Animal biosecurity is the product of all actions undertaken by an entity to prevent introduction of disease agents into a specific area. Animal biosecurity differs from biosecurity in which measures are taken to reduce the risk of infectious agent theft and dispersal by means of bioterrorism. Animal biosecurity is a comprehensive approach, encompassing different means of prevention and containment. A critical element in animal biosecurity and biocontainment, is the control of disease agents already present in a particular area, and practices to prevent to and between animals.

Policy: Specific Pathogen Free (SPF) animals are purchased from approved vendors who are responsible for animal biosecurity during breeding and delivery. SPF animals are accompanied by health inspection reports issued by the vendor. SPF animals are maintained separate from non-SPF colonies and appropriate PPE are used to mitigate entry of pathogens into SPF colonies. Non SPF animals may undergo quarantine in a dedicated area prior to use in research. A sentinel program for monitoring the facility for common pathogens is in place.

Procedure: Upon delivery, transport cages are disinfected. Animals are given a health inspection and placed into clean caging. During a normal acclimation period animals are observed for any outward evidence of disease. Appropriate PPE is used when handling animals.

GENERAL ANIMAL HUSBANDRY

ANIMAL HEALTH / SICKNESS

Policy: When sickness, injury or any animal care problem is identified, reasonable attempts to contact the PI and primary personnel involved will be made. Contact methods will usually include emails or phone calls. PIs are expected to provide reliable contact information to the IACUC. The PI in consultation with the AV will evaluate the animals or situation and provide a timely response to the IACUC and ACM. If the AV or ACM determine that an animal's health and welfare is an immediate concern they may take immediate action up to and including euthanasia of the animals without the PI's consent in emergency situations or if the PI fails to respond in a timely manner.

The health and welfare of all research animals is the top priority of the BSA. Animals must be checked at least once daily. If an animal is found to be in poor health, BSA staff must be alerted and a notation made in the animal health records. The AV must also be notified so that the animal can be examined and treatment measures taken. If an animal is found deceased of an obvious cause, the animal number and cause of death should be recorded in the animal record and the carcass disposed of normally. If the cause of death is unknown, the death should be recorded in the animal record and the animal refrigerated for post mortem analysis by the AV. Federal Law requires that the AV be notified of all sick, injured, diseased animals or those found dead of unknown causes.

Procedure: Animals are observed for health on a daily basis. Animals in poor health are referred to the AV for assessment and treatment. Every effort is made to contact the PI or laboratory personnel regarding the health status of their animals. Place deceased animals in the refrigerator and contact BSA personnel or the AV so that appropriate evaluation and corrective actions taken to protect the health status of other animals if necessary.

ANIMAL CARE

Policy: Animal care is required by law and must be performed every day including weekends, holidays, and in the event of emergencies. Often there are circumstances that make this challenging. The BSA will provide care at a set per diem charge when needed. When possible advanced notice to BSA personnel must be provided so that they may prepare to meet the requested animal care needs. Animal records must be completed daily and are required for all animals. A clear chain of animal care responsibilities and a defined mechanism for backup animal care must be posted. All cages must be properly labeled with protocol number, cage number or animal identification, genus and species, date received hatched or arrived, company or area in which animal was procured and the Principal Investigator's name.

Procedure: Daily care sheets are required to be filled out for all animals. For animals housed at the BSA, annex personnel routinely provide daily care. With IACUC approval, laboratory personnel may provide animal care for the animals housed at the BSA and, at times, animals maintained long term in PI laboratories. If daily animal care responsibilities are conducted by non-BSA personnel, a primary animal care provider's contact information must be posted on the cage card or on the holding area door. Every animal holding area must have an accurate and current census. When an animal used for an experiment is found dead, sick, injured, transferred to a different protocol or adopted it must be recorded in the animal care records.

EMERGENCY ANIMAL CARE

Policy: NAU has a disaster/emergency response plan in place both for local response at the BSA and for integration with the campus wide response system for larger emergencies. Accordingly, BSA personnel will try respond to the animal facility needs and safely provide animal care. Every effort is made to preserve animal life and evacuation/ relocation procedures are in place. In the event of imminent or long standing danger to the BSA, it may be necessary to euthanize research animals. Every effort is made to contact the PI with updates and for input on decisions regarding their animals.

Procedure: The ACM, AV and the BSA staff are responsible for animal care. In all emergencies, human safety must take priority over animal concerns. The AV and BSA personnel will work in cooperation with local authorities to determine the appropriate response given the situation. In the event of catastrophic building damage or when threats to animal well being is imminent (fire, chemical spill etc.), all efforts will be made to safely remove animals from the facility to temporary alternate housing sites.

ANIMAL HOUSING

Policy: Vertebrate animals must be housed in the BSA and cared for by the BSA staff unless other arrangements are previously approved by the IACUC. Occasionally, animals may be housed in other areas or cared for by other qualified personnel. Regulations require scientific justification and previous IACUC approval to house warm-blooded vertebrates outside of the approved facilities for more than 12 hours. In these cases investigators must justify the variance and document that housing conditions and that husbandry meet federal regulations. The AV and ACM will verify appropriate documentation and inspect the area's suitability for animal housing.

Procedure: Animal housing areas must be clean and uncluttered. Animal room doors must fit tightly within the frame to prevent potential escape and/or injury to animals. All surfaces which contact animals must be smooth, non-corrosive and readily sanitized. An exception is granted for clean single use items such as rodent nestlets, or other items such as bird perches if sanitation is adequate. Only items related to the daily animal care are to be stored in holding rooms. Such items include feed in sealed containers, trash in sealed containers, mops, brooms, etc. All components of the animal facility are cleaned regularly and disinfected as appropriate to the circumstances and at a frequency based on the use of the area and the nature of likely contamination.

ENVIRONMENTAL ENRICHMENT

Policy: Enrichment encourages natural behavior in research animals and is critical to animal welfare. Enrichment is strongly encouraged for all animals in a research protocol.

Procedure: Rodents are provided with polycarbonate domes, paper towel rolls and/or nestlets of compressed bedding material in their cages. Nylon chew toys may be given to rats to encourage gnawing and proper dental health. Sterile wooden sticks are offered to mice and rats. Some mice are provided with exercise wheels to protocol requirements. Terrestrial and semi-aquatic amphibians are provided rocks for basking and hiding and a gravel substrate. Aquatic amphibians are provided terra cotta pieces as hide spots. Birds are provided with perches, hiding areas and nesting materials for breeding species. Reptiles are provided with mulch bedding to promote burrowing. Also reptiles are given basing lights, hiding huts and bowls of water for submersion.

DAILY RECORDS

Policy: Daily records of animal care, room maintenance, and environmental conditions must be maintained in the BSA or other areas where animals are housed. These records must be kept updated by the ACM or by responsible BSA staff and laboratory personnel.

Procedure: At a minimum, these records should include the species and number of animals, cage/bedding changes, feeding and watering of animals, temperature/humidity, and cleaning of the secondary enclosure. The log sheet should be kept on file and should correctly indicate the tasks performed and the frequency of each task. The ACM or AV routinely verifies that complete animal records are being maintained.

SUSPENSION OF ANIMAL CARE PRIVILEGES

Policy: In some cases, PIs and their personnel are approved by IACUC to provide daily care for their research animals. This variance from standard husbandry practices is a privilege. If animals are not cared for or the care is not documented per BSA Standard Operating Procedures (SOPs), federal regulations and guidelines and/or the approved IACUC protocol, this privilege may be revoked. The IACUC will be notified of the animal care problem. Decisions made regarding revocation of care privileges will be forwarded to the PI in an official document.

Procedure: If animal care privileges are revoked, BSA personnel will assume care of the animals and will charge the current established per diem rates for this care. A PI may petition the IACUC to resume care of their research animals if they document steps taken to ensure prior problems have been resolved. This request should be sent to the IACUC chair and AV. The request must be accompanied with documentation training received since the incident and corrective measures taken to ensure problems with animal care will not recur.

FOOD, BEDDING AND WATER

Policy: Food and bedding materials must be stored in closed containers to avoid contamination and the potential spread of disease. These containers must be cleaned and sanitized on a regular basis. If food is not stored in its original bag, its milling date or purchase date (if the milling date is unavailable) must be clearly indicated on the food container. With proper storage, food can generally be used up to 6 months after the milling date (1 year for canned food). However, the shelf-life of food can be shortened by several factors, including temperatures above 70°F, extreme humidity, light, oxygen, and pests. The food for animal species such as guinea pigs that require vitamin C has a shelf-life of only 3 months. Animals must have access to "potable, uncontaminated drinking water according to their particular requirements."

Procedure: To avoid contamination, food is maintained in feeders which prevent contact of food with feces and urine. To avoid microbial cross-contamination, the *Guide* recommends either refilling un-sanitized water bottles only if they are returned to the same cage from which they were removed. Watering devices are checked daily to ensure proper operation and must be washed and sanitized at least weekly.

SOILED BEDDING

Policy: Soiled bedding is replaced as necessary to keep animals clean and dry. Bedding changes can vary from daily to weekly depending on animal density, cage size, urinary and fecal output, and experimental conditions. Cages must be cleaned and sanitized on a regularly scheduled basis. The frequency of cage sanitation may vary depending on specific husbandry practices, such as bedding type, cage type and size, animal density, and frequency of bedding changes.

Procedure: Cages are cleaned on a scheduled basis. Soiled bedding is dumped from cages using a dumping station that minimizes the distribution of animal allergens. Soiled bedding is bagged and disposed in the general university trash system. Biohazard bedding is dumped into red biohazard bags and is picked by Office of Regulatory Compliance for incineration.

TEMPERATURE AND HUMIDITY

Policy: Temperature and humidity must be monitored and recorded daily to ensure compliance with regulations. Humidity should be maintained between 30% and 70%. Unless previously approved by the IACUC, temperatures must be appropriate to the species as described in the *Guide*. Temperature extremes can affect research results, alter an animal's performance, or lead to compromised health or death.

Procedure: The BSA HVAC system maintains the environmental parameters for the BSA. Temperature for individual rooms can be manipulated to meet study needs. Control of humidity is provided in one animal holding room (room 131) in the BSA. Humidity levels in this room can be manipulated to meet study needs.

HEATING, VENTILATION AND AIR CONDITIONING (HVAC)

Policy: Ventilation must provide adequate oxygen, remove thermal loads from animal enclosures, dilute gaseous and particulate contaminants, humidity, and create pressure differentials between adjoining spaces.

Procedure: Several factors can affect the minimum ventilation rate but an acceptable standard for animal rooms is 10 - 15 fresh-air changes per hour. The maximum number of animals allowed in a study

area outside of BSA should be reduced proportionately depending upon the air exchange rate. Rooms are set to positive or negative pressure to regulate air flow in and out of the room when the door is open. Negative pressure rooms will draw air from the hallway when the door to the animal holding room is open. Positive pressure rooms will move air out of the animal holding room and into the adjoining space. Rooms can be set to either positive or negative based on project needs.

LIGHTING

Policy: Lighting should be diffused throughout an animal holding area and be sufficient for the well-being of the animals, allow good housekeeping and adequate inspection of animals, and safe working conditions for personnel. Typical light levels in animal holding areas are kept between 30 and 37 lux. Adjustments may be needed for tall caging systems that extend near the ceiling or for species which are particularly light sensitive.

Procedure: Factors such as light intensity and wavelength, circadian rhythms, animal pigmentation and light exposure history, body temperature, hormonal status, age, species, sex, and animal stock/strain should be considered in determining appropriate illumination. Lighting periods can be adapted to meet study needs. Consult the ACM or AV for guidance in determining lighting needs.

NOISE LEVELS

Policy: Unnecessary noise in study and holding areas should be minimized. To the greatest extent possible, activities that might be noisy should be conducted in rooms or areas separate from those used for animal housing. Cell phones, music players, alarms etc., should not be used in animal rooms unless they are parts of an approved protocol or an enrichment program. Personnel must refrain from yelling, loud talking or creating loud noise while performing their tasks within the BSA.

Procedure: Noisy equipment which is part of the facility infrastructure such as the cage washing machine is located in areas of the facility to minimize noise exposure to research animals. Use of cell phones is prohibited in animal holding areas. Hearing protection is provided for users while operating cage wash areas.

SURGICAL AREA

Policy: To maintain a clean surgical environment areas used for surgery must be thoroughly cleaned/disinfected before and after each use. All surgeries must be recorded in a surgical log. Information to be recorded includes the date of the surgery, animal and protocol identification, animal weight, anesthetic regimen, surgical procedures and any complications. Use of the surgical facility must be scheduled in advance with the ACM.

Procedure: Rodent surgeries may be conducted in PI laboratories as long as they are conducted following sterile techniques, and performed in an area designated for that function and can be readily sanitized with a minimum of disturbance, distraction and affect to other animals. All non-rodent vertebrate surgical procedures are conducted in the BSA in the dedicated surgical suite which is disinfected prior to and after each use. To reserve the surgical suite for your work, please contact the ACM.

ANIMAL IDENTIFICATION

Policy: All cages must be identified with unique descriptors as previously described. All animals must be accurately and appropriately identified using NAU IACUC approved procedures. The primary animal care

provider, PI or lab manager should provide contact information either on the cage card or on the animal holding room door.

Procedure: The cage card or animal care record may be used to record dates of procedures like blood draws and surgeries. If a card becomes full, a new card with identical information will be placed in front of the old card. Providing experimental information on the cage card allows care providers specific information when performing daily animal health checks and procedures. Additionally, animals may be identified by leg bands, ear punches, ear tags or tattooing based on protocol requirements. Toe clipping is not permitted by the NAU IACUC.

ANIMAL HANDLING/ RESTRAINT

Policy: The use of proper restraint and handling techniques is required to prevent stress and injury to both the animal and personnel. Handling stress represents an experimental variable and should be minimized whenever possible. PIs are expected to attach SOPs for animal handling and restraint especially for wild animal handling that describe methods for protecting the animals and personnel.

Procedure: Animals can inflict serious injuries to humans and to themselves as a result of improper handling. Personnel are trained, observed, and if performed correctly, deemed proficient to restrain animals by the AV, ACM, PI or experienced laboratory personnel. Training is available from the BSA in proper species specific restraint techniques. Training videos and synthetic models are available for practicing restraint and simple procedures.

MAINTENANCE OF SPECIFIC PATHOGEN FREE ANIMALS (SPF)

Policy: Certain animal colonies must be kept *specific pathogen free*. With this goal in mind, it is necessary to limit the movement of animals specifically to and from laboratories is necessary. The removal and use of animals exterior to the animal facility requires adequate scientific justification. SPF status cannot be guaranteed if animal is removed from the BSA and subsequently returned. Therefore, animals once removed from BSA lose SPF status.

Procedure: All procedures on SPF animals will be conducted within the animal facilities. The use of animals outside the animal facility is an exception and requires prior approval by the IACUC. This policy outlines the procedures to be followed for the use of animals exterior to the facility and provides a framework for the IACUC in the approval of work with animals in laboratories outside of the facility. When procedures are conducted within BSA, trained technical personnel are available to provide assistance to ensure that procedures maintain the SPF status of research animals.

SENTINEL PROGRAM

Description: Rodents at the BSA are maintained free of a wide range of excluded pathogens that can affect animal health status and compromise outcomes in biomedical research.

Policy: All rodents housed in the BSA are tested periodically as part of the rodent health surveillance program. This procedure is conducted annually and more frequently as needed. This is to ensure the specific pathogen free status of the animal housed in our colony and to detect any unwanted or adventitious pathogens entering in to the facility. The presence of unwanted pathogens can have a negative effect on the well being of the animal and impact research results.

Procedure: The rodent health surveillance program involves exposing sentinel animals to soiled bedding from the cages of the animals of interest. A sentinel cage with two sentinel animals (female outbred) are

placed on each side of the rack and are exposed to dirty bedding from the other cages during routine cage change. These sentinel animals, after eight to ten weeks of exposure, are euthanized and submitted for completed health assessment. It includes gross necropsy, parasitological and serological examination for any pathogens. All animals are evaluated for ectoparasites by fur pluck analysis and analyzed for internal parasites by fecal PCR and comprehensive health profile by serum submission. If sentinel testing reveals the presence of pathogens, corrective steps appropriate for the animal and pathogen species will be taken to restore SPF status.

IN HOUSE BREEDING

Policy: Breeding of research animals may be conducted at the BSA or in approved laboratories as part of an approved IACUC protocol. These procedures must be conducted by qualified personnel. Species specific SOPs are required.

Procedure: The use of breeding colonies and animal reproduction is common in laboratory animal science. Reproduction and colony management is performed by qualified personnel and must not exceed IACUC approved numbers. The AV, ACM and other qualified personnel should be consulted for guidance in preparing for animal breeding.

ANIMAL TRANSPORTATION

Policy: Any animal transportation across state lines or importation internationally must comply with all applicable regulations and must occur via approved ports. Documentation of appropriate paperwork from the state or country of origin, appropriate United States Fish and Wildlife Service (USFWS), Arizona Game and Fish Department (AGFD) or Animal and Plant Health Inspection Service (APHIS) permits, and customs inspections must be filed with the IACUC for any animal importation. All transportation must be previously approved through the IACUC to ensure proper permits and practices are in place. Research animals originating from NAU and transported across state lines or international boundaries must have a recent examination and be issued a health certificate from a USDA accredited veterinarian (the NAU AV). Please contact the ACM for more information.

Vehicle Requirements for Transporting Animals

An NAU official vehicle should be used for the transport of research animals. While allowed with approval, transporting animals in vehicles not specifically designated for animal transportation (e.g., personal or rented vehicles) is strongly discouraged. Contact the BSA for details concerning animal transportation in vehicles. The following contains general guidelines when a commercial animal transport company is not used:

1. The cargo space must be constructed and maintained to protect the health of the animals and prevent exposure to exhaust fumes,
2. Animal spaces must have sufficient air supply for the normal respiration of all animals,
3. Animal space air supply shall not be shared with human air supply if there is risk of aerosol zoonotic transfer,
4. To ensure animal health is not compromised the ambient temperature of the vehicle must be maintained between 45°F and 85°F and monitored at least once hourly.
5. The vehicle must be thoroughly cleaned before and after transportation of the animals,
6. The vehicle must be free of chemical fumes or other odors,
6. All vehicles will be inspected by the ACM or AV for suitability for use. All vehicles must be sufficiently clean and have reliable environmental controls to maintain the temperature within ranges suitable for the animal species being transported, and

7. Users of University vehicles must have successfully completed NAU driver safety.

Animal Transport Through Common Use Areas

Policy: The movement of animals and their exposure to novel environments (noise, smell, wind, extreme temperatures, humidity, etc.) is stressful for laboratory animals. To minimize experimental variability, stress should be kept to a minimum when transporting animals through common areas.

Procedure: All animal transportation through common areas should be planned to minimize transit time, reduce zoonotic potential, prevent contamination of the BSA, protect animals from injury and minimize exposure of the general public to animal allergens. All animal cages must be covered with an opaque material when transporting through common areas to preclude identification or spread of allergens and zoonoses. Similarly, animal cadavers must be transported in opaque durable plastic bags and covered by opaque material. If animals were exposed to biohazardous materials, follow guidelines put forth by the IACUC and the Office of Regulatory Compliance. Personnel should not engage in discussions regarding research animals while they are in transit or in public. The path of transport should be carefully chosen making every attempt to avoid high traffic areas or areas which may pose a risk to research animals.

THE INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE

THE ROLE OF THE IACUC

The role of the IACUC is to oversee and routinely evaluate the institution's animal care and use program. The NAU IACUC follows federal regulations to establish policies for the care and use of laboratory animals. Regulations observed include those set forth in the United States Department of Agriculture's (USDA) Animal Welfare Act and Animal Welfare Regulations (AWA), Public Health Services (PHS) Policy on the Humane Care and Use of Laboratory Animals, the Guide for the Care and Use of Laboratory Animals 8th edition (the Guide), the Office of Laboratory Animal Welfare (OLAW), the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) regulations among others. Websites for these agencies are listed at the beginning of this manual.

The AWA authorizes the USDA to regulate the use of warm-blooded vertebrates in research and teaching. The AWA sets standards for many aspects of animal research including housing and feeding requirements, veterinary care, animal transport, and IACUC oversight of all aspects of animal research. The overarching goal of the AWA is to standardize a high level of humane care and use of research animals. This includes minimizing pain or distress in research animals and also mandates that research involving animals is ultimately valuable to human or veterinary science. The PI and IACUC must ensure that the correct animal model and number of animals are used to maximize applicable data while using the fewest animals as possible. All alternatives to the use of animals in research must be considered carefully. The AWA is a complex document and the USDA periodically issues policy statements to clarify aspects of the AWA. These policy statements are found on the USDA Animal Care website. Laboratory mice and laboratory rats and birds are not currently covered by the AWA, but this exemption is under review.

The "Guide" is a document published by the National Research Council and adopted by OLAW as the basis by which PHS funded animal programs and research projects function. The Guide, much like the AWA, details the humane care and use of animals in research and extends coverage to all vertebrate animals. The Guide must be adhered to for all studies conducted with PHS funding. The PHS policy on Humane Care and Use of Laboratory Animals requires that institutions have an OLAW approved Animal Welfare Assurance before carrying out any activities involving live vertebrate animals. Accordingly, NAU

has an approved AWA assurance on file with OLAW and any non-compliance with the Guide will be reported to OLAW for all National Institutes of Health (NIH) funded protocols. Non-compliance may result in loss of funding and possible repayment of grant funds. PHS policy requires institutions with animal welfare assurances to submit verification of IACUC approval for competing applications or proposals subsequent to peer review but prior to award.

The NAU Policy on the humane care and use of animals was formulated to reflect the university's commitment to the humane care and use of animals and compliance with applicable regulations. The university policy extends the provisions of PHS policy, the Guide and the AWA to the use of all vertebrate animal species in research and teaching. The IACUC oversees compliance with this policy and uses the following methods to ensure compliance:

1. Semi-annual review of animal care and use programs
2. Semi-annual inspection of animal care and use facilities
3. Preparation of reports of care and use program and facilities evaluations
4. Oversight of training and educational programs
5. Making recommendations to the Institutional Official (IO) regarding any aspect of the animal program, facilities, or personnel training
6. Reviewing and approving, requiring modifications in, or withholding approval of proposed and ongoing protocols using research animals
7. Recommending suspension of animal-based activities which are not in compliance with federal standards, and
8. Implementing the use of the 3R's (Reduction, Refinement, Replacement)

The actions stated above support research and teaching activities by:

1. Assuring investigators, educators, granting agencies, and the public of a sincere and methodical review of the humane care and use of research animals.
2. Facilitating involvement of the AV and other scientists in application of new experimental animal procedures and problem solving.

IACUC MEMBER COMPOSITION

The IACUC is required by federal regulations to have members from different areas of the scientific and non-scientific community. At a minimum, this includes a committee chair, a veterinarian and a scientist. The Guide extends this requirement to also include a non-scientist and a non-affiliated member of the local community. The community member is to represent the public view point and trust with regard to the use of animals in research. Graduate students are encouraged to participate on the IACUC. Qualified and committed candidates are asked to join the IACUC. If accepted, service to the IACUC is typically for a period of 3 years.

IACUC MEMBER TRAINING

All members of the IACUC will receive training in relevant regulations and humane care and use of laboratory animals. Continuing training will occur at least annually at convened IACUC meetings or special sessions. This training may be conducted by the Chair, AV, ACM, other members, IACUC coordinator or invited speakers. Topics will include regulatory changes, new concepts in humane care and use of laboratory animals, review of existing practices or new approaches to the NAU animal care program. Specific members or the coordinator may be periodically asked to attend conferences such as IACUC 101, PRIM&R, etc., and then conduct training based on the conference.

REQUIREMENTS TO BE A PRINCIPAL INVESTIGATOR (PI): The PI must be a NAU Faculty member or equivalent, or adjunct faculty with approval of the chair and dean for the specific department at NAU. PI status may also be obtained in certain cases with approval by the IACUC and IO.

DUPLICATE REVIEW

OLAW and the USDA have agreed that it is not required that a program be reviewed by more than one IACUC. Thus, if an NAU investigator is involved in an animal study at another institution, and the animal work occurs at that institution, the work does not have to be approved by the NAU IACUC. A copy of the approved IACUC protocol from the other institution should be submitted to the NAU IACUC and will be kept on file during the study. If animals are to be housed or received at NAU for a study that is approved at another institution, the NAU IACUC may require an NAU protocol or may vote to accept the cooperating institution's approved form.

SCIENTIFIC JUSTIFICATION

Many non-standard techniques require scientific justification. Acceptable justification may be accomplished by one of the following methods:

1. A small pilot study may be performed to document the need for a non-standard practice. Results are reviewed by the IACUC before granting final approval for the variance. Arguments that grants will not cover pilot studies are not accepted; the IACUC is sensitive to this issue but must ensure regulatory compliance. Financial considerations are not allowed to influence the humane care and use of animals.
2. A literature review that conclusively demonstrates conventional methods will not work for the study may be submitted with the protocol.
3. The IACUC may "grandfather" previously accepted techniques if the investigator provides compelling evidence that newer techniques will deleteriously affect the study. Long standing use of now discouraged techniques, does not justify continued use. The IACUC may require a pilot study to document the required need for antiquated techniques.

THE IACUC PROTOCOL FORM

Policy: This form is used to provide information to the IACUC regarding all aspects of an animal research proposal. Completion, review and approval are required prior to initiating any animal research activities.

Procedure: Consult the IACUC coordinator for the most recent protocol form. It is also available online at the IACUC webpage. A PI completes this form and submits signed physical and electronic copies to the IACUC coordinator who then assigns a designated reviewer who serves as the point of contact for all members of the IACUC to convey comments regarding the protocol under review.

<http://www.research.nau.edu/compliance/iacuc/forms.aspx>

Reminders

- Completion of an IACUC protocol form does not obviate other regulatory requirements that may bear upon a study, such as: acquisition of applicable local, state or federal permits; regulations imposed by international entities such as CITES; requirements of the USA and other countries regarding export/import of specimens collected.
- Similarly, acquisition of permits or approval of your project from any management agency does not supersede IACUC protocol review. These are separate, though related, processes.

- Begin the protocol submission and review process with plenty of time to allow for review, resubmission, occupational health requirements and training. You are strongly encouraged to contact the IACUC coordinator for guidance or with any questions regarding the NAU IACUC submission and approval process.

PROTOCOL MODIFICATIONS

All animal-related activities must be explicitly outlined in the IACUC protocol. Any changes in animal use which affect animal well-being must be previously approved as a modification to the protocol. The IACUC Chair and AV work in conjunction to approve minor modifications (e.g. addition of personnel to the protocol, increase in animal numbers less than 10%). Significant modifications (e.g. those which may cause an increase in pain or distress, new or additional procedures, an increase in animal numbers greater than 10% an addition of animal species, change of PI, change in anesthetic agent etc.), must be reviewed and approved by the IACUC.

ANNUAL REPORTS

Annual Reports must be submitted for all protocols on or before the anniversary date of the protocol's approval. These reports must describe the number of animals used during the previous year, a summary of the progress and accomplishments from the reporting year and a description of any problems encountered. The report must also discuss means to correct recurrent problems. The committee will review the annual report and have an opportunity to make comments and ask for additional information or clarification on the report.

Non-Federally funded and/or non-USDA covered species:

An annual report must be submitted on or before the anniversary date of the protocol's approval, otherwise the protocol will become inactivated. Once a protocol is inactivated, research using animals may not legally occur. Any animals housed will continue to incur per diem charges but may not be used for research or teaching purposes until the annual report is filed. Failure to file an annual report within 30 days after the due date will result in expiration of the protocol. Appropriate oversight agencies including any applicable funding agencies will be notified of the protocol's expiration. A new protocol must then be submitted, reviewed and approved by the IACUC for research to resume.

Federally funded and/or USDA covered species:

An annual report must be submitted on or before the anniversary date of the protocol's approval, otherwise, at a convened meeting with a quorum of members present, the IACUC will vote to suspend the protocol. Consultation of the Institutional Official will take place prior to any protocol suspension. Upon suspension of the protocol, notification reports will be sent to AAALAC, USDA, OLAW and appropriate funding agencies. Any animals housed will be transferred to a holding protocol and will continue to incur per diem charges but may not be used for research or teaching purposes. A new protocol must then be submitted, reviewed and approved by the IACUC for research to resume. Funding agencies typically will not support costs involved in care of animals for which an approved protocol does not exist.

TRIENNIAL REVIEW AND FINAL REPORTS

IACUC protocols are approved and are valid for a period of three years. At the end of that three year period, a Final Report must be generated for IACUC review. Like annual reports, final reports must describe the number of animals used during the previous year, a summary of the progress and accomplishments from the reporting year and a description of any problems encountered. If the project will continue beyond three years a new protocol must be submitted for review. Protocol renewals must be submitted at least one month before the expiration date to allow adequate time for the committee

to perform a complete review prior to the three year expiration date of the original protocol. Failure to submit Final Reports can result in suspension of future research activities and may warrant a report of non compliance to funding agencies involved. Reports must be submitted on completed protocols before IACUC consideration of new protocols can take place. Links to annual and final report forms are available on the Office of the Vice President for Research- IACUC webpage:

<http://www.research.nau.edu/compliance/iacuc/forms.aspx>

SEMI-ANNUAL EVALUATION OF LABORATORY ANIMAL PROGRAMS AND FACILITIES

Policy: Semiannual evaluations of laboratory animal programs and facilities are performed by the IACUC at least once every six months. Subcommittees of at least 2 IACUC members perform the inspections; any member wishing to participate in any inspection will be included. When possible, the AV also attends inspections. All animals, animal holding/housing and laboratory animal use areas are inspected. Any problems in animal care, physical plant, or the care and use program (occupational health, sanitation, veterinary care, surgery, analgesia, post operative care and euthanasia, etc.) or failures to comply with USDA and PHS policies are addressed.

Procedure: Variations from federal and NAU policies are noted as major if they have potential to immediately affect animal or human health. Minor deficiencies do not have immediate impact on animal and human health but nonetheless must be corrected appropriately and in a time frame determined by the IACUC (usually less than two weeks). Major deficiencies have the capacity to impact the health and welfare of animals and personnel and must be corrected immediately. Final reports of these inspections must list deficiencies as major or minor, provide a plan of how deficiencies will be corrected, and state a deadline for their correction. Investigators are required to provide written response to the IACUC explaining how deficiencies will be corrected.

It is important that a laboratory representative be formally designated for each animal use area and that each director is thoroughly familiar with the operation of the resource and applicable standards. The representative should be present during the IACUC inspection if possible in order to provide the IACUC with information about programs and discuss plans and schedules for corrective action of any deficiencies.

POST APPROVAL MONITORING AND GRANT TO PROTOCOL CONGRUENCY REVIEW

Policy: *The Guide for the Care and Use of Laboratory Animals* (Guide) states that the Institutional Animal Care and Use Committee (IACUC) is the responsible body for the oversight and regulatory compliance of the entity's animal research program. Two components of this program; the Grant to Protocol Congruency review (GPC) and the Post-Approval Monitoring (PAM) programs provide mechanisms for reviewing and correcting congruency of research scope with grant and protocol descriptions. These reviews occur at separate times in the grant application to conduct of the research timeline. With GPC, it is the responsibility of NAU to institute programs, policies and procedures to assure that research described in the grant application are congruent (consistent) with corresponding protocols approved by the IACUC.

GPC Procedure: All vertebrate animal research at NAU with NIH funding will be evaluated for congruency of research scope between the grant application (vertebrate animals and research strategy sections) and the IACUC protocol. As determined by the IACUC, major differences in any of the 5 required areas represent a significant change in the scope of the research and will be documented and reported to the funding agency as being no-congruent. Minor differences,

such as the addition of a new strain of mouse, or small differences in a procedure, technological advancements etc. are not considered non-congruent and are not reported to NIH or other agencies.

PAM Procedure: All IACUC approved animal use protocols will be evaluated using the PAM process and will include at a minimum, the semi-annual inspection, annual and final reports. All protocols with surgical procedures or USDA Pain Category E designation will receive additional scrutiny. Results of these findings are reported to the IACUC for assessment and action. Major deviations from the protocol are those which pose an immediate threat to health and welfare of research animals. Immediate corrective actions are required to correct these deficiencies. Failure to correct major deficiencies may result in suspension of research privileges.

RECOMMENDATIONS TO THE INSTITUTIONAL OFFICIAL

IACUC semiannual program facility review reports are forwarded to the Vice President for Research who is the Institutional Official (IO). Reports outline recommendations regarding the program, facilities, and personnel training and provide deadlines for correction of deficiencies. The IO must notify the USDA, PHS, or other relevant funding agencies if major deficiencies are not corrected within 2 weeks of the deadline.

SUSPENSION OF ANIMAL ACTIVITIES

As per federal regulations, the IACUC may suspend an activity that it previously approved if it determines that the activity is not being conducted in accordance with the approved protocol. If the IACUC suspends an animal protocol, the Institutional Official, in consultation with the IACUC, shall review the reasons for suspension, take appropriate corrective action, and report that action with a full explanation to relevant Federal agencies. If the activity is supported by PHS funds, the IACUC, through the IO, must file a full report to OLAW. If there is sufficient evidence of serious noncompliance, it may be prudent for the IACUC to suspend an activity pending the outcome of a full investigation. In these cases, a preliminary report will be sent to OLAW and the USDA, through the IO, on the understanding that a full report will be submitted upon completion.

The IO, in consultation with the IACUC, has the power to impose further sanctions on an investigator found to be responsible for mistreatment or noncompliance. Each case must be considered individually and all cases will result in precedents being set, and the implications of these should be considered. The institution must also consider whether to announce its findings publicly.

REPORTING CONCERNS INVOLVING ANIMAL CARE AND USE--"WHISTLE BLOWING"

Any alleged violations of IACUC policy or animal abuse at NAU may be submitted to any IACUC member, the AV, ACM or IO. Written allegations should include as much information as possible, including: the date, time, location, and nature of the violation, animal species and number of animals involved, identification of animals if possible, and relevant details. While such format is optimal, verbal allegations of violations will also be investigated. Confidentiality will be maintained if requested; anonymous reports are accepted if sufficient details are provided to investigate the complaint. The IACUC will investigate allegations and take appropriate action to rectify violations. Serious violations will result in protocol suspension and reporting to the IO and appropriate Federal agencies.

Northern Arizona University is committed to ensuring humane care and use of animals in research and teaching. Individuals with concerns involving the care and use of animals should report their concerns to any one of the following:

Vice President for Research:

William Grabe PhD, 523-6294, William.Grabe@nau.edu

Institutional Official:

John McGregor 523-7258, John.McGregor@nau.edu

Institutional Care and Use Committee Chairperson:

Tom Greene BS, RLATG, CPIA, 523-1330, Tom.Greene@nau.edu

Attending Veterinarian:

Scott Nichols MS, DVM, 523-7318, Scott.Nichols@nau.edu

Institutional Animal Care and Use Committee Coordinator:

Tom Greene BS, RLATG, CPIA, 523-1330, Tom.Greene@nau.edu

Or any Institutional Animal Care and Use Committee member

Any Individual who, in good faith, reports a concern regarding animal welfare issues can request anonymity and will be protected against reprisal.

PERSONNEL TRAINING AND TUTORIAL SERVICES

Policy: The Federal Animal Welfare Act (administered by the USDA) and regulations of the Department of Health and Human Services (including PHS) require training and continuing education for all scientists, research technicians, animal care staff and others involved with animal care and use. These laws and regulations require IACUC to function as an oversight agent of NAU to determine that personnel that conduct procedures on or care for animals or animal tissues are qualified and trained to do so with their proposed animal species.

Accordingly, prior to IACUC approval of protocols, personnel identified to work with animals must successfully complete the Collaborative Institutional Training Initiative (CITI) “Working with the IACUC” and applicable “Species Specific Trainings”. The ACM maintains documentation of CITI and other university required training for all personnel listed on the IACUC protocol. Personnel listed on an IACUC protocol must be proficient in all procedures they will be conducting in the course of animal research. Proficiency is determined in a number of ways and can include computer based assessments, oversight by experienced laboratory members, the ACM and AV.

Training Modules Available at the BSA

The following training modules are available from the BSA;

Level One: Intended to teach basic techniques that will increase the user’s comfort level while working with animals. It will also serve to increase knowledge of rules and regulations. Most personnel listed on a protocol should take this introductory training.

- Rules and regulations for working in the BSA,
- Security,
- IACUC policies,
- Animal handling and restraint, and
- Animal husbandry

Level Two: These training modules are intended to give individuals specific experience on the techniques they will be utilizing in their protocol.

- Injections;
 - Intravenous (IV)
 - Intramuscular (IM)
 - Intraperitoneal (IP)
 - Subcutaneous (SQ)
- Blood Collection Techniques;
 - submandibular
 - tail vein
 - saphenous
 - tail nick

Level Three: These training modules are intended to give individuals specific experience on the techniques they will be utilizing in their protocol;

- Anesthesia (gas and injectable)
- Euthanasia (based on 2007 AVMA Guidelines on Euthanasia)
- Oral gavage under anesthesia
- Retro-orbital blood collection under anesthesia

Procedure Specific Training Program: The BSA also provides training specific to procedures in IACUC approved protocols. This may consist of videos, on line tutorials, or hands-on training with the AV. The main areas addressed in protocol-specific training are;

- Aseptic Surgical Techniques
- Patient Monitoring
- Species Specific Anesthesia, Analgesia and Post Operative Monitoring
- Species Specific Pain Assessment and Treatment
- Species Specific Euthanasia

The IACUC requires documentation of proficiency for invasive procedures including but not limited to; surgical procedures, retro-orbital eye bleeds, and decapitation. The AV or ACM will observe individuals, determine proficiency and document successful completion of training.

Training Tutorials: Online training tutorials are available through the BSA. Topics covered include;

- Basic animal handling and restraint
- Rodent injections
- Rodent blood collection methods
- Rodent survival surgery
- Surgical suture patterns

Training For Research Personnel: NAU provides appropriate training opportunities to members of research teams to insure that they have the necessary knowledge and expertise for the specific animal procedure proposed in the protocol. All research groups receive training in animal care and use legislation, IACUC functions, ethics of animal use, occupational health and safety, animal biosafety, the 3 R's (Reduction, Refinement, Replacement), animal handling, aseptic surgical technique anesthesia, analgesia and euthanasia as required by statute. In addition, training is also tailored to the needs of the research group.

Continuing education programs within each laboratory is geared toward specific laboratory techniques relevant to unique procedures performed in the laboratory. Typically the PI or experienced laboratory members provide training to new personnel. Documentation of training is maintained in individual laboratories by populating the "Training Log Form". Training records are evaluated at the semi-annual inspection and are collected with annual reports. The ACM maintains all training records at the BSA.

Training for IACUC Members: The IACUC is responsible to ensure that IACUC members are provided with training opportunities to understand their work and role. New members are given a copy of the "New IACUC Member Booklet", which includes information on;

- NAU IACUC Policies and Procedures
- IACUC SOPs
- IACUC Training Resources
- USDA Annual Reports
- Animal Welfare Assurance
- Semi Annual Facility Inspections
- Semi Annual Program Review
- AVMA Guidelines on Euthanasia
- Relevant Legislation, Regulations and Guidelines

Continuing education is provided quarterly to IACUC members in the form of a group exercise where IACUC scenarios are discussed. Additionally, each IACUC committee member has been provided a copy of the most current edition of the Guide and relevant chapters are discussed at convened meetings. Additionally as resources allow, members are encouraged to attend meetings on IACUC regulatory topics.

Training for BSA Personnel: Personnel caring for animals are appropriately trained through on the job training. Staff members are trained and have the experience to complete the required animal husbandry tasks. Non-degree training through a certification program is available through AALAS and participation in local and national laboratory animal science organizations and meetings are encouraged. Additionally, on the job training and reference materials are provided to each employee responsible for animal care. Specific training can cover the following topics;

- Animal Handling and Restraint
- General Husbandry Practices
- Personal Protective Equipment (PPE)
- Common Hazards in the BSA
- Allergies and Chemical Sensitivities
- Zoonoses
- Disaster / Emergency Response
- Security and Animal Activism
- Large equipment Safety

Practical Training Evaluation

- Trainee observes procedure several times
- Trainee practices procedure (on cadaveric or synthetic models if appropriate)
- Trainee attempts procedure with trainer present. Depending on the complexity of the procedure and the skill of the trainee, this step may be repeated several times

- When the trainer is satisfied that the trainee is adequately trained in a procedure, the trainee is allowed to perform the procedure independently with the trainer nearby for consultation

Training Resources

The Animal Welfare Act:

http://awic.nal.usda.gov/nal_display/index.php?info_center=3&tax_level=4&tax_subject=182&topic_id=1118&level3_id=6735&level4_id=11092&level5_id=0&placement_default=0

Public Health Service Policies:

<http://grants.nih.gov/grants/olaw/references/phspol.htm>

The Guide for the Care and Use of Laboratory Animals:

<http://grants.nih.gov/grants/olaw/Guide-for-the-Care-and-Use-of-Laboratory-Animals.pdf>

American Biological Safety Association (ABSA)

www.ABSA.org

Association for the Assessment and Accreditation of laboratory Animal Care International (AAALAC):

<http://www.aaalac.org/>

American Association for Laboratory Animal Sciences (AALAS)

www.AALAS.org

OCCUPATIONAL HEALTH AND SAFETY: An Occupational Health and Safety Program is an essential component of an animal use program. This program focuses on maintaining a safe and healthy workplace. All NAU personnel who work with animals or their tissue, body fluids or waste must enroll in this program. Components of the program include;

- Medical health evaluation and treatment
- Tuberculosis screening
- Appropriate vaccinations (tetanus, hepatitis, rabies etc.)
- Zoonotic risks / control and prevention strategies
- Pulmonary and auditory functions
- Allergies and chemical sensitivities
- Heavy lifting and job specific tasks
- Hazard identification / risk assessment and prevention
- Personnel hygiene

An Occupational Health Risk Assessment Form is completed by the applicant. The form is available on the IACUC website: <http://www.research.nau.edu/compliance/iacuc/index.aspx>

The IACUC will not approve an individual for participation in an animal research protocol until all components of the occupational health enrollment process have been completed.

Depending on the level of animal contact, personnel will be contacted by Campus Health Services for additional evaluation, scheduling of vaccines etc. Once approved by Campus Health Services, additional occupational health training is provided at the BSA for individuals who need specific training in personal protective equipment (PPE), animal handling, zoonotic diseases and bite/scratch prevention and reporting. Additionally, housekeeping and maintenance personnel are offered training in building and

animal related procedures when their work is conducted within the BSA. Annual reviews of applicant's health status and animal contact level must be completed.

RESPONSIBLE CONDUCT OF RESEARCH

Policy: It is the responsibility of the Office of the Vice President for Research (OVPR) to ensure that research at NAU is conducted in accordance with the highest ethical standards, and in compliance with the National Institutes of Health (NIH) and National Science Foundation's (NSF) recent requirement for all researchers, including students, to complete a research ethics training course prior to the release of funding.

Procedure: To fulfill this requirement, the OVPR has recently subscribed to a series of Responsible Conduct of Research (RCR) courses through an online resource called [Collaborative Institutional Training Initiative](#) (CITI). These courses make research ethics training available to faculty, students, and staff at NAU. All aspects of research have ethical considerations, from data collection to peer review to student mentoring. The RCR courses focus on Research Misconduct, Data Acquisition and Management, Responsible Authorship, Responsible Peer Review, Mentoring, Conflict of Interest, and Collaborative Research. Also, other related courses on animal research and human subject research are offered. All learning modules include examples and case studies, and each ends with a short quiz. Anyone affiliated with NAU can log on to the CITI website to take the courses. The examples and case studies can be adapted for classroom use in a research methods course in any subject area. Training is documented and maintained by the ACM.

CONFLICTS OF INTEREST

Policy: To preserve the integrity and quality of research conducted at NAU, there must not be any actual or perceived financial or non-financial conflicts of interest undermining the public's trust.

- While the IO may not serve as a voting member of the IACUC, they may attend meetings and provide information minimally necessary to assist discussions but must avoid all conflicts of interest relative to their supervisory, managerial, or fiscal authority.
- No IACUC member may participate in the review, discussion, or approval of a research protocol in which the member is personally involved or has a financial conflict, except to provide information requested by the IACUC.
- Principal Investigators may be requested to provide information to the IACUC during discussions but must not be present for committee deliberation and voting.
- All conflicts must be noted in the minutes, including members who are excused from discussion and voting due to a conflict of interest.
- If the AV is listed as a PI, collaborator or participant in an NAU IACUC protocol, an outside veterinarian will be consulted for review of the protocol.

TISSUE TRANSFER

Policy: In addition to oversight of the humane care and use of laboratory animals, the IACUC and Office of Regulatory Compliance (ORC) oversee the transfer of animal tissues to NAU. To ensure compliance with state, federal, and international regulations, the following policies apply to animal tissue use at NAU.

1. An NAU IACUC protocol is required for collecting tissues from live animals.
2. Animal tissues collected under an IACUC protocol from another institution and used for research at NAU must list NAU personnel on that protocol. A copy of the protocol must be reviewed and approved

by the NAU IACUC and Biosafety Officer prior to tissue transfer. Copies of permits and other supporting documentation may also be required. If approved, no additional documentation is required. The Office of Regulatory Compliance can provide information on appropriate shipping of animal tissues.

3. Oversight of non-animal tissue transfer is the responsibility of the NAU Biosafety Officer. Consult with the ORC with regard to biological safety risks, and the responsibility of the PI with for compliance with import/transportation regulations.

4. Animal tissue submitted by private individuals for non-research analysis at NAU does not require NAU IACUC approval. However, if animal tissue submitted by private individuals will be used for research purposes at NAU, an approved IACUC protocol is required.

FIELD STUDIES

Policy: The same regulations that apply to research protocols within NAU animal facilities apply to vertebrate animals studied in the field. Thus, a protocol is required for any activity that involves more than observing animals in their natural environment. This includes but is not limited to trapping, tagging, exclusion netting, etc. Any volunteers or collaborators on field study projects must complete a Volunteer Registration form (available from NAU Human Resources) and complete all requisite training (i.e. CITI modules, animal restraint, allergens etc). It is the responsibility of the PI to provide this documentation to the IACUC prior to volunteer participation.

Procedure: This section provides information to Principal Investigators who conduct animal related research in the field setting. Depending on the nature of the research an NAU IACUC protocol may need to be submitted and approved prior to the initiation of a field study. This document provides guidance for several frequently asked questions regarding field work and IACUC review.

FAQs

The USDA defines a field study as being “any study conducted on free living wild animals in their natural habitat which does not involve an invasive procedure and which does not harm or materially alter the behavior of the animals under study”. Currently, studies that fit this strict definition are exempt from IACUC protocol submission and review.

Additionally, field research conducted on invertebrates, or the salvage of dead vertebrates, does not need to be reviewed by the NAU IACUC but may require permits from state or federal agencies.

To determine if a study requires an IACUC protocol submission, answer the following questions.

Does Your Study?

1. Greatly disturb the animals under study?

Yes (submit normal IACUC protocol) No

(ex. testing predator vocalization, supplemental feeding, nest manipulations)

2. Involve an invasive procedure?

Yes (submit normal IACUC protocol) No

(ex. blood sampling, tagging)

3. Cause potential harm/injury to the animal?

Yes (submit normal IACUC protocol) No

(ex. net capture, bagging)

If **YES to any** of the questions, the study requires IACUC approval prior to conducting field research. Complete the protocol form and submit to the IACUC for review and approval. In addition, complete the NAU Field Research Safety Plan available on the ORC website.

<http://www.research.nau.edu/compliance/iacuc/>

If **NO to all three** of these questions and the study will only involve observation of free ranging animals, please complete the NAU Field Research Safety Plan available on the ORC website. An IACUC protocol submission is not required.

<http://www.research.nau.edu/compliance/orc/>

If an NAU IACUC Protocol is Required, Read the Following Information

The majority of Federal regulations and guidelines involving animal welfare focus mainly on biomedical and behavioral research, teaching, and testing that takes place in the laboratory. However, field research is still falls under the oversight of several federal agencies and often state and local agencies as well.

NAU, the BSA and the IACUC are subject to regular unannounced inspections by external reviewers, and any departures from regulations or guidelines can endanger funding from sources such as NSF, NIH, and others. The use of animals in research is a hotly debated topic and the integrity of the University must be maintained at all times. The University often requires training in the responsible conduct of research. In order to assure institutional compliance with these regulations and guidelines, the IACUC must review **ALL** projects involving the use of live vertebrates that involve animal handling and manipulation or if research methods materially alter the animal's behavior or environment in any way.

Permits for Field Studies

When designing a study it is your responsibility to ensure that all necessary federal and state permits are obtained before any field research commences. An approved NAU IACUC protocol does not supersede the requirement to obtain additional authorization and permitting, e.g., federal bird banding permit, scientific collecting permit, private land authorization etc. These permits must be obtained and provided to the IACUC prior to protocol approval.

Occupational Health for Field Studies

Participation in the NAU Occupational Health Program (OHP) is required for all participants listed on an IACUC protocol. Field conditions can be unpredictable and sometimes dangerous. Also, exposure to animal to human diseases (zoonoses) and animal allergens present significant risk to personnel. The OHP enrollment form can be found on the NAU IACUC website; <http://research.nau.edu/vpr/IACUC.html>

Field Study Resources

- **Guidelines for the Capture, Handling, and Care of Mammals.**
 - American Society of Mammalogists
 - <http://www.mammalsociety.org/committees/comanimalcareuse/98acucguidelines.PDF>
- **Guidelines for the Use of Wild Birds in Research.**
 - Ornithological Societies of North America
 - http://www.nmnh.si.edu/BIRDNET/GuideToUse/Guidelines_2d_edition.pdf
- **Guidelines for the Use of Live Amphibians and Reptiles in Field and Laboratory Research**

- Herpetological Animal Care and Use Committee (HACC) of the American Society of Ichthyologists and Herpetologists (ASIH), 2004.
- <http://www.asih.org/files/hacc-final.pdf>

➤ **Guidelines for the Use of Fishes in Research**

- American Fisheries Society, American Institute of Fishery Research Biologists, American Society of Ichthyologists and Herpetologists.
- <http://www.fisheries.org/afs/publicpolicy/guidelines2004>

➤ **Guidelines for the Proper Care and Use of Wildlife in Field Research**

- The Wildlife Society: National Wildlife Federation.
- [Guidelines for Proper Care and Use of Wildlife in Field Research](#)

These guidelines deal with issues such as collection procedures, humane methods of euthanasia, identification practices, tissue collection methods, and transport, release of specimen and field specific content.

Field Procedures

Procedures performed in the field, unlike the laboratory, may be performed under variable conditions. Regulations require any person performing an invasive field procedure must demonstrate adequate proficiency in performing the technique, or they must be trained by experienced members of the research team. Additionally, specific technique training is available at the Research Annex. Each person performing an invasive technique (blood, draws, biopsies, euthanasia etc.) must be able to demonstrate proficiency in the technique to be performed.

Trapping of Target and Non-Target Species

Because of the unpredictable nature of field studies using nets and traps, it may be difficult to predict how many of your target species will actually be encountered/ captured. The IACUC recommends that you use information gathered from previous field work in your study area, literature review or feedback from local regulatory agencies such as Arizona Game and Fish in predicting how many of your target species you may encounter / capture. If a specific number of captures is required, please list that number.

Unintended captures (side catch) are also a component of field work. Efforts should be taken to reduce/ eliminate side catch if possible by;

- Using species specific capture methods,
- Checking capture devices more frequently and releasing non target species,
- Not placing capture systems in areas with high density of non target species, and
- Selecting times of the day and the appropriate season to maximize target species capture.

Mortality of side catch must be reported to the IACUC. Death of protected and endangered species must be reported to local state regulatory agencies such as Arizona Game and Fish.

Premature Euthanasia in Field Research

The need to prematurely euthanize diseased or injured wild animals occurs infrequently during the course of research in the field. However the requirement to have proficiency in a given technique is still

required by the American Veterinary Medical Association and the NAU IACUC. Proficiency can be achieved in training sessions at the BSA using cadaveric specimens. Proficiency can also be demonstrated by past training or successful field experience.

Methods used for premature euthanasia of sick and injured animals in the field vary greatly from laboratory practices and it can be difficult to figure out which method is accepted for your species.

The NAU IACUC adheres to the AVMA 2013 Guidelines on Euthanasia. Portions of this document provide details for preferred and acceptable means of field euthanasia.

<https://www.avma.org/KB/Policies/Pages/Euthanasia-Guidelines.aspx>

Contact the AV or ACM for guidance in determining the appropriate euthanasia methods for the species you are expected to encounter during your research. You may be required to attend training sessions before beginning your research in order to demonstrate proficiency in a given euthanasia technique.

SURGICAL PROCEDURES

The AV must be consulted on all protocols with surgical components. Pre-surgical planning includes input from all members of the surgical team including the AV, surgeon, anesthetist and support staff. The surgical procedure is described in the protocol form and is reviewed by the AV and IACUC. Necessary equipment and drugs are identified and acquired during the planning phase. In consultation with the AV PIs generate sedative, anesthetic, analgesics and antibiotic plans appropriate for the species and procedure. Post surgical monitoring frequency, record keeping and personnel qualifications are evaluated.

Major and Minor Surgical Procedures: are defined as any procedure which penetrates a body cavity, produces substantial physical or physiologic impairment or involves extensive tissue dissection or transection. A minor surgical procedure is considered as any procedure which does not expose a body cavity and causes little or no physical impairment.

Aseptic Technique: Includes efforts to reduce microbial contamination to the lowest possible level. Procedures are conducted in a dedicated surgical room or in laboratory spaces (rodents only) which have been properly disinfected. Aseptic technique includes appropriate preparation of the surgical site, use of surgical mask, cap and sterile gloves by the surgeon and sterilization of surgical instruments and implanted materials (if any).

Intra-operative Monitoring: Anesthetic depth for rodents, reptiles and amphibians is typically assessed by monitoring respiratory and heart rates and toe pinch reflex.

Post Operative Care: Following the surgical procedure, animals shall be placed into a clean, dry, warm area where they can be regularly observed. Attention is given to assessing cardiovascular and respiratory function. Fluid and pain management is also addressed during this phase. Completion of a record of post operative care is maintained and must be available for review by the AV.

ANESTHESIA / ANALGESIA

Policy: Anesthesia must be appropriate for the species and technique being performed. The AV must be consulted when determining appropriate anesthetic and analgesic plans. The AV reviews all anesthetic and analgesic plans described in the protocol application to assure that they are correct in dose, route of delivery, frequency of administration and are appropriate for the species and procedure. All personnel conducting administration of anesthetic and analgesic agents must be knowledgeable of the drugs being used. Proficiency using these drugs must be demonstrated prior to use. Animals must be monitored for

sufficient depth of anesthesia with appropriate techniques such as toe pinch reflex, cardiac and respiratory rates. Consideration must be given for analgesic administration during the patient preparation phase to minimize pain “wind up” and to ensure that sufficient levels of analgesia have been achieved prior to waking from anesthesia. An appropriate post-operative analgesic plan must be formulated in conjunction with the AV. Strong scientific justification is required for withholding analgesia.

EUTHANASIA

Policy: The NAU IACUC requires that all investigators follow the 2013 American Veterinary Medical Association (AVMA) Guidelines on Euthanasia when formulating euthanasia techniques. All personnel performing euthanasia must be proficient in the proposed technique and with the species being used. Euthanasia technique must be appropriate for the species being used. The technique must be performed swiftly and with minimal stress/ discomfort to the animal and with respect for observers.

Procedure: Consult the AV or ACM for training in accepted euthanasia techniques prior to performing the procedure.

NEUROMUSCULAR BLOCKING AGENTS

Policy: Use of neuromuscular blocking agents (NMBs) is strongly discouraged; they may not be used without adequate (i.e. surgical plane) anesthesia. Due to the inherent difficulties in assessing the level of anesthesia in paralyzed animals, NMBs will be approved only with strong scientific justification and when the investigator demonstrates ability to monitor animals appropriately. If the IACUC is uncertain of qualifications of the investigator to monitor the animals, they may require the veterinarian to observe and assure sufficient anesthesia.

Procedure: Controlled ventilation should be established prior to injection of the NMBs. During paralysis, heart rate and electroencephalogram must be monitored continuously for signs of insufficient anesthesia (reaction to pain, stress). Core temperature, blood gases and fluid and electrolyte balance must be maintained during paralysis. Provision must be made for periodic voiding of the urinary bladder.

PROLONGED ANIMAL RESTRAINT

Policy: Restraint limiting an animal's physical movement beyond normal, approved caging should be used only when less invasive methods are inadequate to meet the goals of the study. Prolonged restraint is prohibited without frequent observation by animal care or investigative staff. Animals restrained regularly should be conditioned to the restraint apparatus prior to study initiation to minimize stress-induced data variation. Restrictions regarding restraint also apply to wildlife in live traps or mist nets. Use of nets or traps for wildlife requires consideration of how non target species (not of primary interest to the study) will be handled. For example, migratory birds may be caught in nets designed to trap rodents. Such netting may, therefore, require permits related to the Migratory Bird Act.

FOOD OR WATER RESTRICTION/DEPRIVATION

Policy: Food or water restriction, other than pre-surgical fasting, may be necessary in protocols. As this has the potential for causing significant distress to the animal, the IACUC has established the following guidelines;

1. Full Committee Review is required for protocols involving complete food or water deprivation of 18 hours or more, depending upon the species in question. Due to individual variation in water requirements, average guidelines for water intake or urine output are not appropriate.
2. Restricted animals should be monitored daily for health judged by stability of performance, development of dehydration (skin turgor, mucous membrane drying, urine output, urine specific gravity, packed red blood cell volume), and signs of stress. Disturbances of normal activities can signal stress, including changes in normal sleep cycles, abnormal social interactions, and emergence of abnormal behaviors such as cage chewing, hair picking, abnormal vocalizations, and aggression.
3. Weight loss must be monitored and recorded daily. Animals must not lose more body weight than defined in the approved protocol.
4. In general, the IACUC limits weight loss to 10% unless scientific justification is approved for exception to this policy. Other parameters for measuring health appropriate to the species should be monitored in consultation with AV. Rats, for example, tend not to drink when food is unavailable and should be observed for signs of dehydration. Investigators must communicate with the animal care staff to prevent animals from receiving improper rations. The staff must be informed about periods of restriction and deleterious symptoms to be evaluated.

CHRONIC IMPLANTS

Policy: Chronic implants, such as intravenous and intracranial catheters, present frequent post-surgical challenges. Aseptic surgical technique must be meticulous. Post-surgical catheter access must also utilize sterile technique and one must inject only sterile solutions using careful aseptic technique. Inoculation of even a few organisms into a catheter may cause sepsis and death.

Procedure: Consult with the AV for any studies regarding chronic implants. Formulate pain treatment and antibiotic plans as well as criteria for euthanizing an animal should the implant fail to perform adequately.

SCREENING OF BIOLOGICAL MATERIALS FOR VIRUSES

Policy: To protect animals and personnel from contagious disease, all biological materials to be implanted into animals must be certified pathogen-free prior to introduction into the recipient animals. If such certification is not available, the IACUC may require materials to be MAP (Mouse Antibody Production) or PCR (Polymerase Chain Reaction) tested prior to use or that recipient animals be quarantined throughout the study.

LD50 TESTING

Policy: LD50 (Lethal Dose to 50% of subjects) tests are controversial among scientists, legislators, and the public primarily due to the ethics of using a large number of animals and evaluating only mortality. Classic LD50 tests are strongly discouraged and investigators should explore alternative end point criteria. LD50 tests may be approved by the IACUC only when scientifically justified. Full committee review is required for LD50 studies.

Procedure: PIs are to consider all other alternatives to death as an endpoint. Strong scientific justification must be included in the protocol application. Toxicity testing procedures based on the principles of **reduction** and **refinement** (e.g., Limit Test, Up and Down Procedure etc.) should be used fewer animal numbers to generate statistical significance. LD50 and modified lethal dose testing should only be used until alternative test methods become validated.

DETERMINATION OF ALTERNATIVE ENDPOINTS:

Policy: Determination of humane alternative endpoints to death for which distress is prevented, relieved or terminated involves planning between the PI, the AV and the IACUC. Alternative endpoint criteria are defined prior to IACUC protocol approval. The use of alternative humane end points contributes to refinement and reduction. Suitable alternative endpoints are determined based on species and procedure and can include;

- Weight loss over a short period of time
- Anorexia
- Maximum tumor burden or size (1.5 cm in any direction for mice, 2.5 cm for rats)
- Health problems refractory to clinical care
- Physiological, psychological and behavioral disturbances.

Procedure: Consult with the AV to determine appropriate alternative endpoints for your study. As animals begin to develop these symptoms they may need to be evaluated on more than a once daily basis. Make appropriate plans for personnel to provide added monitoring and care during after hours, weekends and holidays.

BLOOD COLLECTION

Policy: Blood volume withdrawn from an animal should be the minimum required for a study. Survival venipuncture should be aseptic. Phlebotomists should be trained to minimize pain and distress for the animal. Exsanguination is a stressful experience and should only be performed in anesthetized or recently euthanized animals.

Procedure: Blood volume of an animal is about 70 ml/kg. For a single blood draw, up to 10% of blood volume may be removed, i.e. 0.21 ml for a 30 g mouse; 2.1 ml for a 300 g rat. Retro-orbital or cardiac bleeding must occur under general anesthesia and be performed by highly experienced personnel. Consult with the AV for blood collection methods and volumes for other species.

EXPIRED PHARMACEUTICALS

Policy: The use of expired pharmaceuticals, biologics, and supplies is not consistent with acceptable veterinary practice or adequate veterinary care and may only be used with strong justification and without a reasonable alternative. These materials may only be used with IACUC approval and only in terminal procedures. Such products must be labeled to indicate they will not be used for survival procedures. Euthanasia, anesthesia and analgesia agents must never be used beyond their expiration date, even if a procedure is terminal.

Procedure: Monitor all pharmaceuticals for expiration date. Return all expired pharmaceuticals to the BSA for proper disposal.

CONTROLLED SUBSTANCES

Policy: Controlled substances are purchased through the BSA and under the AV's DEA license. Controlled must be stored in a double locked cabinet within the BSA or, in rare circumstances, in PI laboratories. Controlled substances will be dispensed by the AV to personnel in small quantities and on an as needed basis.

Procedure: Identify the controlled substances required for use. Contact the AV who will coordinate with the ACM to purchase the needed quantities of controlled substances. On the day of use, contact the AV to have the controlled substances dispensed.

ADOPTION/DISPOSITION OF EXCESS LIVE ANIMALS

Policy: Animals which are not required for a specific study or which survive a study and are not infected with potentially hazardous agents may be transferred to another study if humane and scientific considerations are met, i.e. animals may not be subjected to multiple major survival surgeries. Animals may be also be adopted at the end of a study if there are no public or animal health concerns which preclude such adoption, if the PI, AV and the IACUC agree to the adoption.

Procedure: Complete a protocol amendment form to transfer animals from one protocol to another. To adopt a research animal, complete the adoption paperwork available from the ACM and have the AV perform a physical health exam.