Biological Safety

Animal & Vivarium Safety Program

Vivarium Safety Program

Manual

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Purpose

The purpose of this program is to protect the health and safety of both personnel and laboratory/research animals, and to maintain the animal facility and related equipment.

Scope

The scope of the program pertains to laboratory safety within vivarium facilities on campus and animal holding laboratories. Procedures and safe practices regarding facilities, personnel, equipment, tools, and animals are contained within the program. The program affects Vivarium Managers, vivarium laboratory personnel, and their respective departments; Facilities Management; safety personnel (TUPD, EHS); and other institutional bodies (IACUC, IBC). Relevant employees and students are impacted by the requirements within the program.

Definitions

Act: The Act of August 24, 1966 (Pub. L. 89-544), (commonly known as the Laboratory Animal Welfare Act), as amended by the Act of December 24, 1970 (Pub. L. 91-579), (the Animal Welfare Act of 1970), the Act of April 22, 1976 (Pub. L. 94-279), (the Animal Welfare Act of 1976), and the Act of December 23, 1985 (Pub. L. 99-198), (the Food Security Act of 1985), and as it may be subsequently amended.

Activity: For purposes of part 2, subpart C of this subchapter, those elements of research, testing, or teaching procedures that involve the care and use of animals.

Administrative unit: The organizational or management unit at the departmental level of a research facility.

Administrator: The Administrator, Animal and Plant Health Inspection Service, or any person authorized to act for the Administrator.

Ambient temperature: The air temperature surrounding the animal.

Animal: Any live or dead dog, cat, nonhuman primate, guinea pig, hamster, rabbit, or any other warmblooded animal, which is being used, or is intended for use for research, teaching, testing, experimentation, or exhibition purposes, or as a pet. This term excludes birds, rats of the genus *Rattus,* and mice of the genus *Mus,* bred for use in research; horses not used for research purposes; and other farm animals, such as, but not limited to, livestock or poultry used or intended for use as food or fiber, or livestock or poultry used or intended for use for improving animal nutrition, breeding, management, or production efficiency, or for improving the quality of food or fiber. This term also excludes falconry. With respect to a dog, the term means all dogs, including those used for hunting, security, or breeding purposes.

Animal act: Any performance of animals where such animals are trained to perform some behavior or action or are part of a show, performance, or exhibition.

APHIS official: Any person employed by the Department who is authorized to perform a function under the Act and the regulations in 9 CFR parts 1, 2, and 3.

Attending veterinarian: A person who has graduated from a veterinary school accredited by the American Veterinary Medical Association's Council on Education, or has a certificate issued by the American Veterinary Medical Association's Education Commission for Foreign Veterinary Graduates, or has received equivalent formal education as determined by the Administrator; has received training and/or experience in the care and management of the species being attended; and who has direct or delegated authority for activities involving animals at a facility subject to the jurisdiction of the Secretary.

Bird: Any member of the class Aves, excluding eggs, but including birds once the hatching process commences.

Bred for use in research: An animal that is bred in captivity and used for research, teaching, testing, or experimentation purposes.

Business hours: A reasonable number of hours between 7 a.m. and 7 p.m. each week of the year, during which inspections by APHIS may be made.

Business year: The 12-month period during which business is conducted, and may be either on a calendar or fiscal-year basis.

Carrier: The operator of any airline, railroad, motor carrier, shipping line, or other enterprise which is engaged in the business of transporting any animals for hire. Except anyone transporting a migratory bird covered under the Migratory Bird Treaty Act from the wild to a facility for rehabilitation and eventual release in the wild, or between rehabilitation facilities, and has obtained authorization from the U.S. Fish and Wildlife Service for that purpose, is not a "carrier".

Cat: any live or dead cat (Felis catus) or any cat-hybrid cross.

Class "A" licensee (breeder)*:* A person subject to the licensing requirements under part 2 and meeting the definition of a "dealer" (§ 1.1), and whose business involving animals consists only of animals that are bred and raised on the premises in a closed or stable colony and those animals acquired for the sole purpose of maintaining or enhancing the breeding colony.

Class "B" licensee: A person subject to the licensing requirements under part 2 and meeting the definition of a "dealer" (§ 1.1), and whose business includes the purchase and/or resale of any animal. This term includes brokers, and operators of an auction sale, as such individuals negotiate or arrange for the purchase, sale, or transport of animals in commerce. Such individuals do not usually take actual physical possession or control of the animals, and do not

usually hold animals in any facilities. A class "B" licensee may also exhibit animals as a minor part of the business.

Class "C" licensee (exhibitor)*:* A person subject to the licensing requirements under part 2 and meeting the definition of an "exhibitor" (§ 1.1), and whose business involves the showing or displaying of animals to the public. A class "C" licensee may buy and sell animals as a minor part of the business in order to maintain or add to his animal collection.

Commerce: Trade, traffic, transportation, or other commerce:

(1) Between a place in a State and any place outside of such State, including any foreign country, or between points within the same State but through any place outside thereof, or within any territory, possession, or the District of Columbia; or

(2) Which affects the commerce described in this part.

Committee: The Institutional Animal Care and Use Committee (IACUC) established under section 13(b) of the Act. It shall consist of at least three (3) members, one of whom is the attending veterinarian of the research facility and one of whom is not affiliated in any way with the facility other than as a member of the committee, however, if the research facility has more than one Doctor of Veterinary Medicine (DVM), another DVM with delegated program responsibility may serve. The research facility shall establish the Committee for the purpose of evaluating the care, treatment, housing, and use of animals, and for certifying compliance with the Act by the research facility.

Dealer: Any person who, in commerce, for compensation or profit, delivers for transportation, or transports, except as a carrier, buys, or sells, or negotiates the purchase or sale of: Any dog or other animal whether alive or dead (including unborn animals, organs, limbs, blood, serum, or other parts) for research, teaching, testing, experimentation, exhibition, or use as a pet; or any dog at the wholesale level for hunting, security, or breeding purposes. This term does not include: A retail pet store, as defined in this section; and any retail outlet where dogs are sold for hunting, breeding, or security purposes.

Department: The U.S. Department of Agriculture.

Deputy Administrator: The Deputy Administrator for Animal Care (AC) or any other official of AC to whom authority has been delegated to act in his stead.

Dog: Any live or dead dog (*Canis familiaris*) or any dog-hybrid cross.

Dwarf hamster: Any species of hamster such as the Chinese and Armenian species whose adult body size is substantially less than that attained by the Syrian or Golden species of hamsters.

Endangered species: Those species defined in the Endangered Species Act (16 U.S.C. 1531 *et seq.*) and as it may be subsequently amended.

Euthanasia: The humane destruction of an animal accomplished by a method that produces rapid unconsciousness and subsequent death without evidence of pain or distress, or a method that utilizes anesthesia produced by an agent that causes painless loss of consciousness and subsequent death.

Exhibitor: Any person (public or private) exhibiting any animals, which were purchased in commerce or the intended distribution of which affects commerce, or will affect commerce, to the public for compensation, as determined by the Secretary. This term includes carnivals, circuses, animal acts (including free-flighted bird shows), zoos, and educational exhibits, exhibiting such animals whether operated for profit or not. This term excludes retail pet stores, horse, dog, and pigeon races, an owner of a common, domesticated household pet who derives less than a substantial portion of income from a nonprimary source (as determined by the Secretary) for exhibiting an animal that exclusively resides at the residence of the pet owner, organizations sponsoring and all persons participating in State and country fairs, livestock shows, rodeos, field trials, coursing events, falconry, purebred dog and cat shows, bird fancier shows, and any other fairs or exhibitions intended to advance agricultural arts and sciences, as may be determined by the Secretary.

Exotic animal: Any animal not identified in the definition of "animal" provided in this part that is native to a foreign country or of foreign origin or character, is not native to the United States, or was introduced from abroad. This term specifically includes animals such as, but not limited to, lions, tigers, leopards, elephants, camels, antelope, anteaters, kangaroos, and water buffalo, and species of foreign domestic cattle, such as Ankole, Gayal, and Yak.

Farm animal: Any domestic species of cattle, sheep, swine, goats, llamas, horses, or poultry, which are normally and have historically been kept and raised on farms in the United States and used or intended for use as food or fiber, or for improving animal nutrition, breeding, management, or production efficiency, or for improving the quality of food or fiber. This term also includes animals such as rabbits, mink, chinchilla, and ratites when they are used solely for purposes of meat, fur, feathers, or skin, and animals such as horses and llamas when used solely as work and pack animals.

Federal agency: An Executive agency as such term is defined in section 105 of title 5, United States Code, and with respect to any research facility means the agency from which the research facility receives a Federal award for the conduct of research, experimentation, or testing involving the use of animals.

Federal award: Any mechanism (including a grant, award, loan, contract, or cooperative agreement) under which Federal funds are used to support the conduct of research, experimentation, or testing, involving the use of animals. The permit system established under the authorities of the Endangered Species Act, the Marine Mammal Protection Act, and the Migratory Bird Treaty Act, are not considered to be Federal awards under the Animal Welfare Act.

Federal research facility: Each department, agency, or instrumentality of the United States which uses live animals for research or experimentation.

Field study: A study conducted on free-living wild animals in their natural habitat. However, this term excludes any study that involves an invasive procedure, harms, or materially alters the behavior of an animal under study.

Handling: Petting, feeding, watering, cleaning, manipulating, loading, crating, shifting, transferring, immobilizing, restraining, treating, training, working and moving, or any similar activity with respect to any animal.

Housing facility: Any land, premises, shed, barn, building, trailer, or other structure or area housing or intended to house animals.

Hybrid cross means an animal resulting from the crossbreeding between two different species or types of animals. Crosses between wild animal species, such as lions and tigers, are considered to be wild animals. Crosses between wild animal species and domestic animals, such as dogs and wolves or buffalo and domestic cattle, are considered to be domestic animals.

Impervious surface: A surface that does not permit the absorption of fluids. Such surfaces are those that can be thoroughly and repeatedly cleaned and disinfected, will not retain odors, and from which fluids bead up and run off or can be removed without their being absorbed into the surface material.

Indoor housing facility: Any structure or building with environmental controls housing or intended to house animals and meeting the following three requirements: (1) It must be capable of controlling the temperature within the building or structure within the limits set forth for that species of animal, of maintaining humidity levels of 30 to 70 percent and of rapidly eliminating odors from within the building; and (2) It must be an enclosure created by the continuous connection of a roof, floor, and walls (a shed or barn set on top of the ground does not have a continuous connection between the walls and the ground unless a foundation and floor are provided); and (3) It must have at least one door for entry and exit that can be opened and closed (any windows or openings which provide natural light must be covered with a transparent material such as glass or hard plastic).

Intermediate handler: Any person, including a department, agency, or instrumentality of the United States or of any State or local government (other than a dealer, research facility, exhibitor, any person excluded from the definition of a dealer, research facility, or exhibitor, an operator of an auction sale, or a carrier), who is engaged in any business in which he receives custody of animals in connection with their transportation in commerce. Except anyone transporting a migratory bird covered under the Migratory Bird Treaty Act from the wild to a facility for rehabilitation and eventual release in the wild, or between rehabilitation facilities, and has obtained authorization from the U.S. Fish and Wildlife Service for that purpose, is not an “intermediate handler”.

Inspector means any person employed by the Department who is authorized to perform a function under the Act and the regulations in 9 CFR parts 1, 2, and 3.

Institutional official: The individual at a research facility who is authorized to legally commit on behalf of the research facility that the requirements of 9 CFR parts 1, 2, and 3 will be met.

Isolation: In regard to marine mammals means the physical separation of animals to prevent contact and a separate, noncommon, water circulation and filtration system for the isolated animals.

Licensed veterinarian: A person who has graduated from an accredited school of veterinary medicine or has received equivalent formal education as determined by the Administrator, and who has a valid license to practice veterinary medicine in some State.

Licensee: Any person licensed according to the provisions of the Act and the regulations in part 2 of this subchapter.

Major operative procedure: Any surgical intervention that penetrates and exposes a body cavity or any procedure which produces permanent impairment of physical or physiological functions.

Minimum horizontal dimension (MHD)*:* The diameter of a circular pool of water, or in the case of a square, rectangle, oblong, or other shape pool, the diameter of the largest circle that can be inserted within the confines of such a pool of water.

Mobile or traveling housing facility: A transporting vehicle such as a truck, trailer, or railway car, used to house animals while traveling for exhibition or public education purposes.

Nonconditioned animals: Animals which have not been subjected to special care and treatment for sufficient time to stabilize, and where necessary, to improve their health.

Nonhuman primate: Any nonhuman member of the highest order of mammals including prosimians, monkeys, and apes.

Operator of an auction sale: Any person who is engaged in operating an auction at which animals are purchased or sold in commerce.

Outdoor housing facility: Any structure, building, land, or premise, housing or intended to house animals, which does not meet the definition of any other type of housing facility provided in the regulations, and in which temperatures cannot be controlled within set limits.

Painful procedure: As applied to any animal means any procedure that would reasonably be expected to cause more than slight or momentary pain or distress in a human being to which

that procedure was applied, that is, pain in excess of that caused by injections or other minor procedures.

Paralytic drug: A drug which causes partial or complete loss of muscle contraction and which has no anesthetic or analgesic properties, so that the animal cannot move, but is completely aware of its surroundings and can feel pain.

Person: Any individual, partnership, firm, joint stock company, corporation, association, trust, estate, or other legal entity.

Pet animal: Any animal that has commonly been kept as a pet in family households in the United States, such as dogs, cats, guinea pigs, rabbits, hamsters, and birds. This term also includes but is not limited to such birds as canaries, cockatiels, lovebirds, and budgerigar parakeets. This term excludes exotic animals and wild animals.

Positive physical contact: Petting, stroking, or other touching, which is beneficial to the well-being of the animal.

Poultry: Any species of chickens, turkeys, swans, partridges, guinea fowl, and pea fowl; ducks, geese, pigeons, and doves; grouse, pheasants, and quail.

Pound or shelter: A facility that accepts and/or seizes animals for the purpose of caring for them, placing them through adoption, or carrying out law enforcement, whether or not the facility is operated for profit.

Primary conveyance: The main method of transportation used to convey an animal from origin to destination, such as a motor vehicle, plane, ship, or train.

Primary enclosure: Any structure or device used to restrict an animal or animals to a limited amount of space, such as a room, pen, run, cage, compartment, pool, or hutch.

Principal investigator: An employee of a research facility, or other person associated with a research facility, responsible for a proposal to conduct research and for the design and implementation of research involving animals.

Quorum: A majority of the Committee members.

Random source: Dogs and cats obtained from animal pounds or shelters, auction sales, or from any person who did not breed and raise them on his or her premises.

Registrant: Any research facility, carrier, intermediate handler, or exhibitor not required to be licensed under section 3 of the Act, registered pursuant to the provisions of the Act and the regulations in part 2 of this subchapter.

Research facility: Any school (except an elementary or secondary school), institution, organization, or person that uses or intends to use live animals in research, tests, or experiments, and that (1) purchases or transports live animals in commerce, or (2) receives funds under a grant, award, loan, or contract from a department, agency, or instrumentality of the United States for the purpose of carrying out research, tests, or experiments: *Provided,* That the Administrator may exempt, by regulation, any such school, institution, organization, or person that does not use or intend to use live dogs or cats, except those schools, institutions, organizations, or persons, which use substantial numbers (as determined by the Administrator) of live animals the principal function of which schools, institutions, organizations, or persons, is biomedical research or testing, when in the judgment of the Administrator, any such exemption does not vitiate the purpose of the Act.

Retail pet store means a place of business or residence at which the seller, buyer, and the animal available for sale are physically present so that every buyer may personally observe the animal prior to purchasing and/or taking custody of that animal after purchase, and where only the following animals are sold or offered for sale, at retail, for use as pets: Dogs, cats, rabbits, guinea pigs, hamsters, gerbils, rats, mice, gophers, chinchillas, domesticated ferrets, domesticated farm-type animals, birds, and coldblooded species. Such definition excludes - (1) Establishments or persons who deal in dogs used for hunting, security, or breeding purposes; (2) Establishments or persons exhibiting, selling, or offering to exhibit or sell any wild or exotic or other nonpet species of warmblooded animals such as skunks, raccoons, nonhuman primates, squirrels, ocelots, foxes, coyotes, etc.; (3) Any establishment or person selling warmblooded animals (except laboratory rats and mice) for research or exhibition purposes; (4) Any establishment wholesaling any animals (except rats and mice); and (5) Any establishment exhibiting pet animals in a room that is separate from or adjacent to the retail pet store, or in an outside area, or anywhere off the retail pet store premises.

Sanitize: To make physically clean and to remove and destroy, to the maximum degree that is practical, agents injurious to health.

Secretary: The Secretary of Agriculture of the United States or his representative who shall be an employee of the Department.

Sheltered housing facility: A housing facility which provides the animals with shelter; protection from the elements; and protection from temperature extremes at all times. A sheltered housing facility may consist of runs or pens totally enclosed in a barn or building, or of connecting inside/outside runs or pens with the inside pens in a totally enclosed building.

Standards: The requirements with respect to the humane housing, exhibition, handling, care, treatment, temperature, and transportation of animals by dealers, exhibitors research facilities, carriers, intermediate handlers, and operators of auction sales as set forth in part 3 of this subchapter.

State: A State of the United States, the District of Columbia, Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, or any other territory or possession of the United States.
Study area: Any building room, area, enclosure, or other containment outside of a core facility or centrally designated or managed area in which animals are housed for more than 12 hours.

Transporting device: An interim vehicle or device, other than man, used to transport an animal between the primary conveyance and the terminal facility or in and around the terminal facility of a carrier or intermediate handler.

Transporting vehicle: Any truck, car, trailer, airplane, ship, or railroad car used for transporting animals.

Weaned: A mammal has become accustomed to take solid food and has so done, without nursing, for a period of at least 5 consecutive days; or that a bird has become accustomed to take food and has so done, without supplemental feeding from a parent or human caretaker, for a period of at least 5 consecutive days.

Wild animal: Any animal which is now or historically has been found in the wild, or in the wild state, within the boundaries of the United States, its territories, or possessions. This term includes, but is not limited to, animals such as: Deer, skunk, opossum, raccoon, mink, armadillo, coyote, squirrel, fox, wolf.

Wild state: Living in its original, natural condition; not domesticated.

Responsibilities

A. Environmental Health & Safety (EHS)/Biosafety Officer

1. EHS will assist in spill cleanup, decontamination, and disposal as required.
2. EHS will provide safety training and information as required.
3. EHS/Biosafety Officer will investigate and document all reported incidents that are related to laboratory animals and vivaria, making recommending corrective actions.
4. EHS will coordinate with personnel to seek medical surveillance as required.
5. EHS will test safety equipment as required.
6. EHS will review and revise the program as needed for compliance with applicable regulations and TU policy.

B. Institutional Animal Care and Use Committee (IACUC)

1. IACUC will provide oversight of animal care and use by vivarium laboratory personnel.
2. IACUC will review and approve protocols for animal research.
3. IACUC will inspect the animal facility on a semi-annual basis per USDA and NIH guidelines.

C. Institutional Biosafety Committee (IBC)

1. IBC will oversee, review, and approve animal research that involves biological agents and potentially infectious materials.

D. Deans, Department Heads, and Principal Investigators (Supervisors)

1. Supervisors must know the hazards in their area and the appropriate hazard control methods, providing site-specific information in the program detailing personnel, hazards, and procedures.
2. Supervisors must place employees in a safe environment, ensure facility upkeep, and provide required personal protective equipment from their department/college.
3. Supervisors will ensure that personnel receive appropriate safety training as required.
4. Supervisors will conduct periodic worksite audits of animal work activities under their control.
5. Supervisors will notify EHS of any hazardous conditions that affect worker safety.

E. Vivarium Manager

1. The Vivarium Manager will work with personnel to maintain a safe environment for their work and animals, and ensure a clean, well-maintained facility.
2. The Vivarium Manager is responsible for training laboratory personnel in the specific procedures of their respective vivarium spaces.
3. The Vivarium Manager will work will laboratory personnel to develop standard operating procedures for their respective vivarium and relevant work areas.

F. Attending Veterinarian(s)

1. The Attending Veterinarian(s) will provide oversight of the health and well-being of animal species within the vivarium.

G. Vivarium Laboratory Personnel

1. Laboratory personnel must use vivarium laboratories in a manner consistent with federal, state, and local regulations and TU Policy.
2. Laboratory personnel must report emergencies/severe illnesses/injuries to 911, TUPD, EHS, and if applicable, Facilities Management and seek immediate medical assistance.
3. Laboratory personnel must contact the Vivarium Manager, IACUC, Principal Investigator/Supervisor, and/or the affiliated veterinarian with concerns about animal health and welfare.
4. Laboratory personnel must report any other safety concerns or near miss accidents to their Supervisor and/or EHS.
5. Laboratory personnel must maintain a safe laboratory.
6. Laboratory personnel must attend relevant training and receive required immunizations related to their animal work.

Introduction

In laboratories, personnel are exposed to hazards that depend upon the substance or subject with which they are working, but also the equipment and tools they use to do their work. Depending on the type of laboratory, the hazards may be biological, chemical, ergonomic,

physical, and psychological (which is harder to quantify and mitigate), or some combination of these. In a vivarium or animal laboratory, there will be hazards of each type. The impact of the hazard and mitigation techniques will vary based on duration, frequency, and intensity of potential exposure to the hazard.

Biological risks exist for those who handle animals and their tissues. Working with animals involves planning, appropriate facilities, safe work practices, training, and the right tools and equipment, including personal protective equipment. Before understanding what is required for hazard control, one must understand the hazards involved. The hazards associated with handling animals are physical injuries, allergic reactions, and zoonotic diseases. There may be additional biological hazards from infectious agents intentionally introduced to the animals for research purposes or those that exist outdoors in field research.

Chemicals are another risk class that involves chemical products, such as those used for cleaning and maintenance of the facility, in animal care, or for research purposes. Such chemicals include biocides, buffers, cleaners, compressed gases, controlled substances (drugs), and water treatment chemicals. These chemicals present hazards such as asphyxiation, corrosive, flammable, irritant, oxidizing, toxic, or otherwise dangerous to the environment. Some chemicals may have a combination of these hazards or also present physical hazards as compressed gases that may act as projectiles or release high pressure. Other hazards in vivarium laboratories may include ergonomic, physical (due to slips, fire, electrical, cuts, or other physical contact), and radiation.

It is key to use engineering controls, administrative controls, proper work practices and hygiene, and personal protective equipment to reduce the incidence of vivarium injuries or their potential causes. The following manual will illustrate general safety methods for reducing or isolating hazards in the vivarium, and how to respond to them. Proper planning of the facility and in the research may also eliminate hazards. Communication and training will also work to reduce hazards encountered in this type of environment.

Applicable Regulations

- 7 U.S.C. § 2131 – Animal Welfare Act
- 21 U.S.C. § 801-904 – Controlled Substances Act
- 21 U.S.C. § 951-971 – Controlled Substances Import and Export Act
- 21 CFR Part 1300-1321 – Drug Enforcement Administration
- 29 CFR 1910 Subpart I – Personal Protective Equipment (specifically 29 CFR 1910.132 – 29 CFR 1910.134, and 29 CFR 1910.138)
- 29 CFR 1910.101 – Compressed Gases
- 29 CFR 1910.151(c) – Medical Services and First Aid
- 29 CFR 1910.1030 – Bloodborne Pathogens
- 29 CFR 1910.1200 – Hazard Communication
- 29 CFR 1910.1450 – Occupational Exposure to Hazardous Chemicals in Laboratories

Procedure

A. Authorization Policy, Oversight, & Reporting

1. Entry Authorization

a) Access to vivaria and animal laboratories are restricted to relevant personnel and students only. Personnel will be familiar with all safety procedures.
b) Visitors must be authorized by the Vivarium Manager, escorted by vivarium personnel, and wear personal protective equipment as required.
c) Vivarium entry and exit are to take place through a secure entrance (which may be used for entry/exit) and a secure, dedicated second exit (for exit only).

2. Oversight
   a) The Institutional Animal Care and Use Committee (IACUC) and Institutional Biosafety Committee (IBC) are dedicated governing bodies at TU that oversee biological research and biosafety in coordination with EHS.
   b) Principal investigators are to submit all animal research protocols to IACUC for review and approval.
   c) In addition, principal investigators are to submit animal research protocols that contain any of the following factors to IBC for review and approval:
      i. *Agents that can infect and/or cause disease in humans, including bacteria; biological toxins, viruses, fungi, rickettsia, prions, protozoans, or parasites;*
      ii. *Genetically-altered organisms (including transgenics and knockouts);*
      iii. *Human cell lines, blood, bodily fluids, and tissues;*
      iv. *Recombinant/synthetic DNA, RNA, or cells that are transfected/transduced; or*
      v. *Viral vectors.*
   d) The attending veterinarian(s) will have expertise in the health and well-being of species in the vivaria, providing clinical oversight and support to vivarium personnel with respect to animal care and treatment, and their guidance must be followed.
   e) Personnel will not conduct experiments/procedures that have not be approved by the appropriate oversight parties.
   f) Inspections of animal facilities will take place on a periodic basis (see Step G).

3. Unauthorized Animals
   a) Unauthorized animals are not allowed in vivaria on campus as they may impact research, cause nuisance or harm, or become harmed.
   b) If unauthorized animals are found, they may be removed and impounded by Baltimore County Animal Control and responsible parties may be subject to disciplinary action.
   c) Vivarium personnel must follow and understand the following policies and procedures regarding animal use:
      i. *Animals on Campus Policy*
      ii. *Guidelines for Animals in University Buildings*

4. Reporting
    a) Vivarium personnel will notify their Supervisors/Principal Investigator of any potential or known exposures to animals or their products in the course of animal work.
    b) Vivarium personnel will report injuries, illnesses, incidents, and near misses to the Supervisor/Principal Investigator and appropriate oversight parties.
    c) Vivarium personnel will notify appropriate oversight parties of unauthorized entry, unauthorized animals, or other security concerns in vivarium locations, and if there is an immediate threat, TUPD at 410-704-4444.
5. Failure to regard oversight parties, proper authorization, and procedures may result in individuals facing disciplinary action, suspension of animal activities, laboratory shutdown, and/or other consequences.

B. Vivarium Hazards

1. Biological Hazards
    a) Animal Hazards
        i. The hazards associated with handling animals can be placed into three (3) categories: physical injuries, allergic hazards, and zoonotic diseases.
            1) Physical injuries may include bites, scratches, stings, strain, or physical trauma.
            2) Allergic hazards may include reactions to pet dander, hair/fur, and protein-based allergens associated with feces, urine, venom/biotoxins, etc. Hazards may be inhaled, ingested, injected, or contacted by skin.
            3) Zoonotic diseases are infectious agents shared by humans and animals. Common zoonotic agents include bacteria, viruses, parasites, fungi, and prions.
        ii. Hazards in Step B1a(2) and B1a(3) may be present on equipment and tools used to handle animals (e.g. needles or containers that house or transport animals), on surfaces, on dispensed food, bedding, and other animal-contacted or adjacent areas.

    b) Infectious Agents/Microbiological Hazards
        i. Aside from zoonotic diseases, hazards from infectious agents include those intentionally used in research or accidentally introduced to the vivarium that are not derived directly from living research animals or their parts.
        ii. Such agents that may be used in animal research include the following:

1) *Agents that can infect and/or cause disease in humans, animals, and plants including bacteria; biological toxins, viruses, fungi, rickettsia, prions, protozoans, or parasites;*
2) *Genetically-altered organisms (including transgenics and knockouts);*
3) *Human cell lines, blood, bodily fluids, and tissues;*
4) *Recombinant/synthetic DNA, RNA, or cells that are transfected/transduced; or*
5) *Viral vectors.*

iii. *Personnel that is ill may accidentally introduce infection to the animal facility.*
iv. *Personnel may bring allergens/contaminants from other facilities or space within the building or on campus by contaminated equipment or clothing.*

c) Biologically-Derived Odors
   i. *Aside from allergic reactions to protein-based allergens, there may be visceral, physical reaction by personnel to odors from animals (e.g. nausea).*
   ii. *Odors may include ammonia, amines, nitrogen- and sulfur-based odors from animal wastes, blood, tissue/carcass, and decaying matter; animal feed odors; defensive scents or odors produced by animals, etc.*

d) Sharps
   i. *Sharps may be introduced during animal operations (e.g. drug administration), food preparation, sample preparation, etc., and may be soiled by blood or other potentially infectious materials.*
   ii. *Sharps include but are not limited to needles, syringes, lancets, knives, razor blades, capillary tubes, microscope slides, and metal shavings. A separate category of sharps may be broken glass, which is disposed separately.*

2. <u>Chemical Hazards</u>
   a) Biocides are acutely toxic, corrosive, and dangerous to the environment.
      i. *Animal treatment chemicals (e.g. antibiotic, antiviral, fungicide) that are used to kill microbes harmful to research animals by direct application.*
      ii. *Aquarium biocides (e.g. algaecide) used to clean the container.*
      iii. *Disinfectants used to kill microbes on nonporous surfaces.*
      iv. *Pesticides that are used to exterminate undesired animals and deter infestation introduce toxic hazards to both human and animal subjects.*

   b) Buffered salts and solutions used to clean equipment or treat/test aqueous solutions range in hazard level from irritant to toxic and corrosive. Cage washers, for example, use highly corrosive liquids to clean equipment.
   c) Cleaning chemicals used to remove dirt, oil, or other impurities from nonporous surfaces are toxic and highly corrosive.
   d) Compressed gases used for animal treatment and research present chemical hazards specific to the gas used such as corrosive, flammable, oxidizing, and/or toxic).

e) Controlled substances such as anesthetic and analgesic drugs used in the research and care of animals (e.g. surgery, pain management, testing, euthanasia) may introduce narcotic effect hazards to humans. Such substances may take the form of gas, liquid solution, or solid, typically as powder, and personnel may accidentally be exposed to the agent by inhalation, ingestion, injection, or skin contact.
f) Filtering media (e.g. activated carbon) and water softeners used to treat water may be irritants to eyes and mucous membranes as solids/powder.

3. Ergonomic Hazards
   a) Each of the following present ergonomic hazards to personnel:
      i. *Prolonged use of computer workstations.*
      ii. *Prolonged or repetitive motion activities in the laboratory.*
      iii. *Improper lifting of equipment or heavy boxes.*

4. Physical Hazards
   a) Facility
      i. *Slip, trip, fall, and collision hazards may exist due to wet floors, doors, or floor drains.*
      ii. *Self-closing doors may present a pinch hazard.*
      iii. *Other hazards may be present due to facility failures (e.g. security breach, utility outage).*

   b) Equipment & Processes
      i. *Autoclaves and cage washers present high pressure and high temperature hazards with potential for explosions, burns, pinch/crush hazards (door), and pull/entanglement hazards. Entrapment is also possible with walk-in style cage washers.*
      ii. *Compressed gas storage has a risk of high-pressure release, rupture, and potentially projectile. Rapid, unventilated, and/or large release of gas may cause asphyxiation.*
      iii. *Electrical & fire hazards may be present due to electrical equipment used.*
      iv. *Heavy equipment or boxes may present pinch/crush hazards.*
      v. *Sharps present cut or stab/impalement hazards.*

   c) Field Research
      i. *Physical injuries or entrapment from trees and bushes, unlevel ground/holes, rocks, etc.*
      ii. *Engulfment hazards from running or standing water.*

5. Radiation Hazards*
   a) TU currently does not use radionuclides, radioactive particles, or gamma rays in animal research*.

b) TU currently does not use strong magnetic fields or related devices for animal research*.
c) Instruments that use intense radiofrequency, microwave, infrared, laser, high-intensity visible light, and some bands of ultraviolet may cause tissue heating, eye damage/skin burns, and skin cancer.
d) Instruments that use ultraviolet C (UV-C) or X-rays may cause serious health effects such as radiation sickness, cell damage, birth defects, or cancer.

C. Engineering Controls

1. <u>Barriers & Containers</u>
   a) Facility
      i. Use self-locking doors for entry/exit to the vivarium and animal laboratories.
      ii. Animal facilities will have impervious, nonporous surfaces to decrease the likelihood of mold growth.
   b) Animals
      i. Use animal cages to house animals.
      ii. Install barriers/enclosures for animals as required.
      iii. Use appropriate animal transports to move animals within facility.
   c) Tools & Equipment
      i. Autoclaves
         1) Use autoclaves to sterilize laboratory glassware, instruments, aqueous liquid wastes, and biohazardous waste.
         2) Autoclaves have safety features including interlocks, pressure gauges, and alarms to prevent accidents and minimize exposure to potential hazards.
         3) The autoclave chamber is used to contain the sterilization process, preventing direct contact with potentially infectious materials.
      ii. Cage Washers
         1) Use cage washers to clean and sterilize animal cages placed on carts through chemical and mechanical scrubbing action.
         2) Carts are enclosed within the washer during the cleaning process.
      iii. Needles
         1) Use self-capping needles/syringes. Do not recap needles/syringes.
         2) Use needle holders. Never leave uncapped or exposed sharps on a benchtop.
         3) Place needles and other sharps waste into sharps containers.

d) Agents/Chemicals
   i. *Use appropriate storage containers (e.g. flammables cabinet, compatible bottles) for chemicals and use secondary containment.*
   ii. *Controlled substances used for the care of animals should be stored in a separate, locked cabinet or reinforced safe.*
   iii. *Use odor control absorbents to reduce/neutralize exposure to airborne odors.*
   iv. *Use central vacuum or approved methods to scavenge anesthetic gases used for animal operations.*

2. General Ventilation
   a) Increasing the ventilation rate and humidity in animal rooms may reduce allergens. If feasible, this should be done.
   b) Direct airflow away from workers and toward the backs of the animal cages.
   c) Install ventilated animal cage racks or filter-top animal cages.
   d) Filtration
      i. *Use ventilation and/or laboratory-grade filtering air purifier (not ozone-producing or electronic/ionizing) with a HEPA filter to remove hazardous aerosols within the laboratory.*
      ii. *Care in maintaining/disposing HEPA filters would be required.*

3. Local Exhaust Ventilation
   a) Use animal transfer stations (where available) to capture airborne contaminants during cage changes and animal handling.
   b) Use biosafety cabinets to conduct work that generates hazardous aerosols and droplets when appropriate.
   c) Use fume hoods and snorkel exhausts for chemical preparation as necessary. Do not use these devices for chemical storage or hazard removal for open containers.

4. Restraints
   a) Use animal restraints and muzzles to avoid bites.
   b) Use bracket/restraints for gas cylinders to be secured in place within animal laboratories.

D. Administrative Controls

1. Maintain unobstructed access to all exits, fire extinguishers, electrical panels, eyewashes/safety showers.
   a) Electrical panels and fire extinguishers should have at least 36 inches of clearance in all directions.
   b) Eyewashes must have at least 6 inches of clearance in front of the unit.
   c) Safety showers must have at least 32 inches of clearance in front of the unit.

2. Animal Treatment
    a) Treat animals with care, for their safety and your own.
    b) Use proper precautions when handling all animals.
        i. *Understand clearly the purpose and procedure of the activity before you begin work.*
        ii. *Animals should be handled gently so as not to produce undue excitement or trauma.*
        iii. *Avoid subjecting specimens to stressful conditions such as exhaustive exercise or painful stimuli.*
        iv. *Where there is potential for biting, leather gloves shall be worn.*
        v. *Identify any hazard presented by the live specimen such as toxoplasmosis from cat litter dust, venom, allergens, etc. and develop work practice controls, provide engineering, and/or PPE prior to obtaining the specimen.*
    c) Maintain animal health to reduce the instance of disease transmission.
    d) Decrease animal density to reduce allergen production rate.
    e) Provide adequate spacing between animals.
    f) Keep animals and their products separated from others as required.
    g) Practice vigilance when working with animals. Be aware of your surroundings and their whereabouts.
    h) Always try to keep animals calm or less agitated to avoid unpredictable or aggressive behaviors. Reduce noise and vibration where possible.

3. Hazard Communication & Procedures
    a) Label all hazardous materials (e.g. chemicals) and store properly, in appropriate area away from incompatible materials.
    b) Label all biological samples and chemicals.
    c) List and track chemical inventory and wastes.
    d) Understand safety data sheets.
    e) Click here to request for assistance with CIDB equipment, inventory/tags, training, or other needs.
    f) Spill kits (e.g. biological, chemical) shall be prepared or made available by your department.

4. Read and follow all signs and labels for laboratories, equipment, and tool, and regard warnings and alarms appropriately.
    a) Click here to request lab door sign assistance.
5. Be familiar with the Laboratory Safety Manual.
6. Follow all policies, standard operating procedures (including laboratory- or operation-specific), equipment operator manuals, emergency response planning, and training.

a) Through education, reduce risk and avoid animal-derived injury/illness from physical injuries, allergens, or zoonotic disease from trainings and procedures.
b) Trainings that apply include, but are not limited to, the following: biological safety, CITI Training/animal handling, respiratory protection, and personal protective equipment (see Step K).

7. Other safe work practices within the workplace should be followed as required.
8. Purchasing
   a) Acquire animals, chemicals, laboratory equipment, and personal protective equipment through your department.
      i. *Purchase of controlled substances for research requires a Maryland Controlled Substance registration and federal DEA license.*
9. Scheduling
   a) Reduce time in the animal area.
   b) Take breaks outside of the vivarium.
   c) Make schedule adjustments as necessary.
   d) Rotate job duties to reduce exposure.
   e) Use the buddy system when working in the laboratory to avoid being alone in case of an emergency.

E. Laboratory Hygiene/Personal Protective Equipment

1. Laboratory Hygiene
   a) Do not bring food or drink meant for human consumption into the vivarium.
   b) Do not consume food or drink in these areas, apply cosmetics, contact lenses, smoke, or chew gum around animals, in animal care areas, nor in laboratories (smoking is not allowed on the TU campus).
   c) Do not use freezers, refrigerators, microwaves, ovens, or other preparation devices in the vivarium for food or drink meant for human consumption, living animals, or volatile chemicals.
      i. *Only use these devices for animal feed, biological preparations if appropriate, and nonhazardous, non-volatile chemicals if appropriate.*
      ii. *Clean and disinfect devices as required.*
   d) Wash hands with soap and water for 20 seconds after handling any potentially hazardous materials or animals, even if gloves are worn.
   e) Never touch hands to your face while working in the vivarium.
   f) Avoid wearing loose hair, clothing, or jewelry.
   g) No horseplay.
   h) Handle animals, bodily fluids, and tissues carefully. Do not act hastily.
   i) Avoid direct animal contact where possible.

j) Avoid putting hands or body parts near the mouth, anus, or mucous membranes of animals.

2. Personal Protective Equipment (PPE)
   a) Always wear the appropriate protective eye protection, body protection, and gloves when performing animal work or any work within the vivarium laboratory that requires its use.
      i. *Eye protection may include safety glasses for impact hazards, splash goggles for splash hazards, and face shield from splash hazard or cryogen use.*
      ii. *Body protection (e.g. lab coat, gown, scrubs, coveralls) must be worn over clothing. Such clothing should only be worn while handling animals, their products, or using chemicals. If non-disposable, these must be laundered onsite or by professional vendor made aware of the hazards.*
      iii. *Gloves made of disposable latex, nitrile, or vinyl are for general use. If allergic to latex or other material, find an acceptable alternative. Gloves for general use should be discarded after each use and only worn within the area the animal work is taking place and do not wear them outside of the facility nor throughout the facility.*
         1) *Use specialized low-temperature gloves for cryogens and high-temperature gloves for autoclaves as required.*
   b) Personnel should wear protective clothing that is dedicated to animal work (not only wear street clothes that will be worn elsewhere); wearing street clothes elsewhere may expose others outside the vivarium, including sensitive individuals.
   c) Personnel must wear long pants and closed-toe shoes.
   d) Wear particulate respirators as required, after training and fit test. Follow Steps E2d-E2e in the LAOHP for more guidance.
   e) Wear covers for hair and shoes as required.
   f) Hearing protection may be worn on the occasion where there is loud or continuous noise.
   g) Remove PPE prior to exiting the laboratory.
   h) Dispose of soiled garments or launder. Non-disposable cloth PPE (e.g. lab coat, scrubs) should be laundered onsite in dedicated laundry units or by professional laundry service that is aware of the potential hazards (never taken home to be washed).
   i) PPE shall be obtained through your department.

F. Medical Surveillance

1. For information on medical surveillance and information on disease prevention, please read the Occupational Health Program (LAOHP) for working with animals.

2. The LAOHP questionnaire and Biological Safety Forms may be found in Appendix D of the program manual for LAOHP.
3. Vivarium personnel should participate in medical surveillance and reporting to avoid potential animal allergies and in post-exposure monitoring to minimize recurrence and additional exposure.
4. Vivarium personnel should receive the appropriate immunizations/vaccinations based on the hazards to which one may be exposed.
5. Vivarium personnel, when pregnant or planning to be pregnant, should take the appropriate measures to protect oneself.

G. Inspections & Maintenance

1. Inspections
   a) IACUC, including the attending veterinarian and the Biosafety Officer (EHS), shall conduct semi-annual inspections in vivaria to observe animal care and the maintenance of facilities.
   b) TUPD shall conduct occasional inspections of vivaria to investigate reports of emergencies.
   c) EHS shall conduct periodic inspections of vivaria to observe maintenance of facilities, to check safety equipment, and to investigate reports of emergencies.
   d) Facilities Management shall conduct periodic inspections of vivaria to maintain equipment and to investigate reports of emergencies.
   e) The Vivarium Manager, Principal Investigators, and other vivarium personnel shall conduct laboratory inspections in vivaria as necessary to ensure compliance with procedures and for regular maintenance of facilities.
   f) External government agencies (e.g. USDA) shall conduct periodic regulatory inspections and assessments with respect to vivaria on campus.

2. Maintenance
   a) Equipment & Tool Maintenance
      i. Conduct maintenance on equipment (e.g. autoclaves, cage washers, filters) on a scheduled basis.
         1) Animal cages and fish tanks should be cleaned as regularly as appropriate. This will dependent upon the animals used, the size of the container, materials used, and the frequency and volume of buildup/wastes produced.
         2) Biosafety cabinets and fume hoods must be certified at least once annually. Repair as required.
         3) Eyewashes/safety showers should be flushed weekly and documented in an eyewash log or on tags, and they should be tested on an annual basis.
         4) Fire extinguishers and related equipment will be maintained independent of laboratory personnel.
         5) Water tanks used for aquaria and/or cleaning should be checked for integrity regularly.

ii. *Use the autoclave to sterilize glassware and compatible tools.*
iii. *Use the cage washer to sterilize animal cages.*
iv. *Disinfect and decontaminate equipment as required.*

b) Housekeeping
   i. *Avoid cross-contamination between clean and dirty areas.*
   ii. *Keep animal areas clean. Disinfect as required.*
   iii. *Avoid creating aerosols or droplets from animals and their products or distributing animal allergens.*
   iv. *Clean up spills promptly.*
   v. *Maintain floors by keeping floors free of containers, debris, and liquids. Disinfect as required. Use a wet mop instead of a dry mop to reduce dust/aerosol production. Wet floors can be hazardous, so use a wet floor sign as appropriate until dry.*
   vi. *Dispose of all trash (paper towels, tubes, etc.) outside the room and promptly dispose of wet/damp organic materials.*
   vii. *Pesticide use should be coordinated with IACUC (including EHS and the attending veterinarian). Once approved, use as directed by the manufacturer with the appropriate PPE.*

c) Storage
   i. *Do not store porous materials in animal laboratories.*
   ii. *Store boxes in an appropriate location.*
   iii. *Do not store items on the floor or in the sink.*
   iv. *Do not store items in a way that would block entry/exit from inside or from the outside of the room.*
   v. *Do not use corridors for storage.*
   vi. *Store biological and chemical hazards in the appropriate containers.*
   vii. *Practice proper lifting techniques.*

d) Waste Disposal
   i. *Dispose of all wastes in appropriate waste containers:*
      1) *Unused animal food – removed as Municipal Solid Waste [Trash]*
      2) *Animal wastes, Bedding, carcasses, biohazard-contaminated PPE, and other biohazardous materials - Biohazardous Waste, Biohazard box, removed by EHS upon request*
      3) *Broken glass - Broken Glass box, up to ¾ full prior to removal, removed as Municipal Solid Waste [Trash]*
      4) *Sharps - Biohazard Sharps container, up to ¾ full prior to removal, removed by EHS upon request*

5) *Chemicals (liquid/solid) and chemical-contaminated PPE – Hazardous Waste – approved HDPE container or compatible, removed by EHS upon request*
6) *Compressed gas cylinders – Cap and remove by vendor*

ii. *Close and seal all containers appropriately when full.*

H. Recordkeeping

1. EHS
   a) EHS will maintain a copy of submitted protocols/research forms and other laboratory safety forms (i.e. related to Biological Safety, Chemical Safety, Laboratory Safety, etc.)
   b) EHS will maintain records for safety inspections, safety equipment maintenance, and investigations. Results will be made available to the Vivarium Manager, laboratory personnel, and oversight parties upon request.
   c) EHS will maintain personnel safety training records for trainings coordinated through EHS and SafeColleges.
   d) EHS will maintain a copy of medical surveillance records and the results will be made available to the appropriate parties (e.g. primary care physician) at the request of the affected individual.

2. IACUC/IBC
   a) IACUC and/or IBC will maintain a copy of submitted protocols/research forms if applicable.
   b) The parties will maintain inspection records related to their duties.

3. Vivarium Manager/Principal Investigators
   a) The Vivarium Manager will maintain inspection and maintenance records for the facility.
   b) The Vivarium Manager will maintain a copy of medical surveillance records and the results will be made available to the appropriate parties (e.g. primary care physician) at the request of the affected individual.
   c) Vivarium Manager/Principal Investigators will maintain personnel safety training records that are department-specific, laboratory-specific, animal-specific, or that relates to hands-on techniques.
   d) Principal Investigators shall maintain written documentation of all procedures performed on live animals.
      i. *Animal health records must be sufficiently detailed to convey necessary information to all personnel involved in the animal's care and be sufficiently comprehensive to demonstrate the delivery of adequate health care, consistent with professional standards.*
      ii. *Individual records will be maintained for animals used individually and located in the vivaria for extended time periods (e.g., cats, dogs, ferrets, and goats). Group records (e.g. cage cards) may be maintained for animals housed and treated as a group (e.g. rodents).*

iii. *Health records for USDA-regulated species must include the following:*
   1) *Identity of the animal*
   2) *Descriptions of any illness, injury, distress and/or behavioral abnormalities and the resolution of any noted problem.*
   3) *Dates, details and results (if appropriate) of all medically-related observations, examinations, tests, and other such procedures.*
   4) *Dates and other details of all treatments, including the name, dose, route, frequency, and duration of treatment with drugs or other medications. (A "check-off" system to record when treatment is given may be beneficial.)*
   5) *Treatment plans should also include a diagnosis and prognosis, and detail the type, frequency, and duration of any treatment and the criteria and/or schedule for re-evaluation(s) by the attending veterinarian.*
   6) *Surgical records should also include detailed pre- and post-, as well as intra-operation, notes.*

iv. *Please contact the Principal Investigator/Vivarium Manager for the area in which your animals are housed for specific forms and recordkeeping requirements.*
   1) *The information required will include, but may not be limited to, all procedures performed on live animals (including surgery), the types and amounts of drugs administered (e.g., anesthetic agents, analgesics, tranquilizers), complications arising from any procedures undertaken, as well as objective data on the routine health status of the animal.*

v. *All animal records will be maintained in close proximity to the animals.*

vi. *At the time of termination of animals from a protocol, the animal's records will be removed from the animal room/area and filed in the Vivarium office for a minimum of three years past the expiration of the protocol or the animals' final disposition, whichever is longer.*

vii. *Related controlled substance records must be maintained in accordance with 21 CFR (FDA). These records must be kept with controlled substances in a secured area per federal regulation.*

I. Program Evaluation

1. Periodic Review
   a) Periodic review of the effectiveness of the program is essential.
   b) EHS will conduct periodic surveys to determine the effectiveness of the program.
   c) IACUC and other oversight parties may contribute data and insights into how to improve the program.
   d) Evaluation will be based on health outcomes, facility upkeep, number and type of incidents related to the animal facilities, and compliance.

J. Emergency Procedures

1. Personnel Injury/Illness/Exposure
   a) In case of emergency, call 911 or TUPD for 410-704-4444; if applicable, contact the National Poison Control Center at 1-800-222-1222.

b) See Appendix A for other emergency contact telephone numbers or Appendix B for information on injuries, illnesses, poisoning, or other health-related emergencies).
c) First aid kits for minor injuries are provided by your department and will be found within the vivarium facility.
d) Eyewashes and safety showers are available for use by personnel in laboratory spaces as required.

2. Contamination/Spill
   a) In case of a major contamination or spill (e.g. immediately dangerous to life or health, cannot be contained to the room), immediately exit the facility and do not re-enter the contaminated environment until the condition can be corrected.
   b) Warn others in the vivarium of the emergency on your way out of the facility.
   c) Contact EHS at 410-704-2949.
   d) Report the nature/hazard of the spill (i.e. whether biological or chemical, volume or mode of contamination [airborne, toxic, etc.]), and any other pertinent information.

3. Facility
   a) Fire/Emergency Evacuation
      i. *In case of fire or required evacuation (e.g. natural gas leak, severe weather event), stop work immediately and evacuate the facility, shutting down operations on the way out of the laboratory/vivarium.*
      ii. *Warn others in the vivarium of the emergency on your way out of the facility.*
   b) Security Threat/Breach
      i. *In case of security threat, contact TUPD at 410-704-4444.*
      ii. *Security threats may include unauthorized individuals entering the vivarium, individuals threatening or harming laboratory personnel, animals, the facility, or research being conducted, or otherwise intentionally causing harm or trespassing.*
   c) Facility Failure
      i. *In the event of a facility failure or malfunction (e.g. power outage, HVAC failure, water outage) the Continuity of Operations Procedures for the animal facility should be followed.*
      ii. *Contact Facilities Management at 410-704-2481 for the following:*
         1) *Natural gas leak, water leaks/flooding, HVAC, telecommunications, electrical, or any other mechanical/infrastructural issues.*
         2) *The laboratory/vivarium door is difficult to open, sticks, or the opening mechanism (e.g. key lock, card reader) does not work.*

4. Animal Treatment Inquiry, Injury, Illness, or Threat
   a) Immediate Threat
      i. *If there are unauthorized animals in the vivarium, this should be reported to the Supervisor, Vivarium Manager, IACUC, EHS, and/or TUPD.*

ii. *EHS and/or TUPD will investigate and have unauthorized animal(s) removed by Baltimore County Animal Control. Individuals responsible may face disciplinary action.*
iii. *Whistleblowers will be kept anonymous.*

b) Animal Injury/Illness
   i. *Contact your Supervisor and make others in your area aware of any hazards related to injured/ill animals. Quarantine the animal, if required.*
   ii. *Try to keep the animal comfortable or in minimal pain, if possible.*
   iii. *Contact the attending veterinarian as soon as possible for further guidance.*

c) Animal Welfare Inquiry/Concerns
   i. *If there is concern about the treatment or welfare of an animal in the vivarium, this should be reported to the Supervisor, Vivarium Manager, and/or IACUC.*
   ii. *Individuals responsible may face disciplinary action.*
   iii. *Whistleblowers will be kept anonymous.*

K. Training

1. Personnel involved with animal care and use must be qualified, through experience and/or training, to perform their research, teaching, husbandry, and support responsibilities.
   a) Animal care and use include husbandry (including non-contact feeding and observations), handling, manipulating, or performing procedures on animals, whether in a laboratory, in the field or in an animal facility.
   b) Duties also include touching dirty animal caging and accessories, animal waste, or carcasses.
2. All animal users must complete required training prior to starting animal work. Principal Investigators and Vivarium Managers are responsible for ensuring the proper training and proficiency of all personnel assigned to their facility. Training should be specific to the species and animal use procedures.
3. Any employee or student working with animals shall receive training. The training shall include online training and specific departmental training.
   a) Animal researchers should enroll in CITI Training, which may be arranged through the TU Office of Sponsored Programs and Research at ospr@towson.edu.
   b) Specific departmental training may include laboratory specific training, animal facility-specific training, hands-on animal handler training, and technique/operation-specific training.
4. For training in Bloodborne Pathogens, Chemical Lab Safety, Personal Protective Equipment, or Respiratory Protection, it may be assigned/accessed virtually through Vector Solutions SafeColleges found at the following URL: https://towsonehs-md.safecolleges.com/training/home. Workers shall request training by emailing safety@towson.edu or by calling the Environmental Health & Safety (EHS) office at 410-704-2949. If respiratory protection is required for use of respirators, a respiratory fit test is also required and may be scheduled through EHS. Refer to the Respiratory Protection Program for more information.

5. Re-training for specific safety programs shall take place as required, typically on an annual basis. However, re-training may also take place on an as-needed basis, such as violations or noncompliance with policies and procedures, when the need is determined by Supervisor or oversight parties, and/or suspension of animal activities.

Resources

A. CDC-NIH

1. Office of Laboratory Animal Welfare Resources
2. Guide for the Care and Use of Laboratory Animals, 8th Edition
3. Insects and Scorpions
4. Venomous Spiders

B. OSHA

1. Laboratory Safety: Working with Small Animals
2. Rodents, Snakes, and Insects
3. Rescuers of Animals
4. Laboratory Safety Guidance

C. USGS

1. Safe Work Practices for Working with Wildlife

D. Towson University/Environmental Health & Safety

1. Animals on Campus Policy
2. Guidelines for Animals in University Buildings
3. Towson University Institutional Animal Care & Use Committee (IACUC)
4. Occupational Health Program (LAOHP)
5. TU Health Center Information
6. To request guidance, training, hazardous waste disposal, or for general inquiries, contact EHS by emailing safety@towson.edu or by calling the Environmental Health & Safety (EHS) office at 410-704-2949.

E. Concentra Occupational Health (COH)

TU is contracted with COH to provide immunizations/vaccinations. Vaccination/ declination forms must be submitted to EHS prior to work. COH also provides physical examinations, drug testing, urgent care, and workplace injury services for employees. COH has several Maryland locations; the closest to the TU main campus is 1830 York Road, Suite F, Timonium, MD 21093. Contact COH staff at 410-252-4015. Complimentary transportation is available for work-related injuries. You may also make a telemedicine visit by: Concentra Telemed.

Appendix A: Emergency Contact Telephone Numbers

FIRE - RESCUE - EMERGENCY MEDICAL SERVICE : 911

At the emergency blue-light and yellow phones located around campus, press the emergency button to be connected to the University Police who can contact 911 for you, or dial 911 on the keypad to be connected directly to the 911 Center. Give the dispatcher all of the requested information.

Towson University Police Department [TUPD]: (410) 704-4444
For Other Emergencies

Department of Environmental Health and Safety: (410) 704-2949

Concentra Urgent Care [Timonium, MD]: (410) 252-4015
For Occupational Health, Medical Consultation and Evaluation

Facilities Management - Work Control Center: (410) 704-2481

Appendix B: First Aid & Reporting Instructions

Note: The following are suggested medical care facilities. Individuals may choose their own providers for medical care.

For major, immediate illness/injuries: Call 911 and/or go to the nearest hospital (UMD St. Joseph Medical Center, 7601 Osler Dr, Towson, MD 21204)

For minor injuries/illnesses and chronic/ongoing work-related injuries:
Employees: Concentra Occupational Health is open on Monday-Friday, 7:30AM-6:00PM (Concentra Occupational Health, 1830 York Road, Suite F, Timonium, MD 21093). Complimentary transportation is available for work-related injuries. You may also make a telemedicine visit: by visiting Concentra Telemed.

Students: TU Health Center is open on Monday-Friday, 8:00AM-5:00PM. (Ward West, University Avenue; TU Shuttle Bus service stops here, check schedule for times/stops). Please note that when Towson University is closed, the Health Center is also closed. There is an after-hours answering service and on-call physician available when the center is closed.

Other Nearby Medical Facilities:
MedStar Urgent Care Facility (MHUC) at the following locations:

- Towson at Hillside Avenue is open on Monday-Friday, 8:00AM-8:00PM (MedStar Urgent Care, 7825 York Road, Towson, MD 21204; Phone: 855-910-3278)
- Towson at Anneslie is open on Monday-Friday, 8:00AM-8:00PM (MedStar Urgent Care, 6317 York Road, Towson, MD 21212; Phone: 833-735-1958)

Please see next page for First Aid & Reporting Instructions table.

	Hazard Class:	Biological, Chemical	Biological, Chemical	Biological	Biological, Chemical	Chemical Physical	Chemical, Physical, Radiological	Biological		All	
Personnel Action	**Incident Type:**	Severe Allergic Reaction, Anaphylaxis	Accidental Ingestion	Animal Contact (Bite, Scratch, Other Contact) Biotoxin/ Venom	Accidental Inhalation	Burns/ Contact Exposure	Burns > 3 inch diam., deep/ all skin layers; covers hands, feet, face, groin, buttocks, or major joint/ encircles arm or leg	Injection Needlestick, Sharps Exposure		*If victim is unconscious/ not breathing/ no pulse:	**If victim is conscious, but not breathing normally:
	Severity:	Major	Major	Major	Major	Minor	Major	Minor	Major	Major	Major
Reduce Danger		Stop work immediately.								Stay with victim, if safe to do so. Ensure area is secure.	
		Exit the area, if possible. Seek fresh air.								Keep calm.	
Contact Emergency Medical Services		Call 911 or TUPD at (410) 704-4444					Call 911 or TUPD at (410) 704-4444			Call 911 or TUPD at (410) 704-4444	
		Consult Poison Control Center at 1-800-222-1222 or Safety Data Sheets (SDS) for the chemical [find Section 4: First Aid Measures].								Consult Poison Control Center at 1-800-222-1222 or Safety Data Sheets (SDS)	
Use First Aid		Use EpiPen/ equivalent. *See Right **See Right	Wash affected area (foaming soap & water, or for chemicals – use water only; 15-minute minimum) and/or use eyewash/shower (15-minute minimum) Flush splashes to the nose, mouth, or skin with water. Do not induce vomiting unless instructed.							*Use CPR/AED until assistance arrives.	**Use CPR only.
		If bleeding, apply firm pressure and wrap. Dry, use first aid kit for ointment and bandage as required, and/or mark area for post-exposure identification/treatment.									
Alert Others		Warn/seek assistance from other personnel, if necessary. Notify Supervisor or have other personnel do so, after commencing first aid.									
Seek Immediate Medical Treatment		Minor Incident: Students – TU Health Center during the times, dates, and address listed. Employees – Concentra Occupational Health during the times, dates, and address listed. Other nearby providers are listed, if the above are not available. Major Incident: UMD St. Joseph Medical Center, Emergency Room, 24 hours/day, 7 days/week.								**Drive self, drive other(s), or request transport.**	
Report Injury/Incident		File a First Report of Injury with Human Resources, and submit an Environmental Health & Safety Incident Report Form within 24 hours of the injury (or your Supervisor may do this on your behalf). For fatal accident or hospitalization, report to EHS within 8 hours (or TUPD at 410-704-4444 after office hours).									
Seek Post-Exposure Care		Seek medical advice from your primary care physician after initial treatment and advise them that you work with animals. Employees may go to Concentra for follow-up, post-exposure treatment as required.									

Appendix C: Vivarium Safety Regulations & Standards

7 U.S.C. § 2131: Animal Welfare Act
https://www.aphis.usda.gov/media/document/17164/file

21 U.S.C. § 801-904: Controlled Substances Act
https://www.govinfo.gov/content/pkg/USCODE-2014-title21/html/USCODE-2014-title21-chap13-subchapI.htm

21 U.S.C. § 951-971: Controlled Substances Import and Export Act
https://uscode.house.gov/view.xhtml?path=/prelim@title21/chapter13/subchapter2&edition=prelim

21 CFR Part 1300-1321: Drug Enforcement Administration
https://www.ecfr.gov/current/title-21/chapter-II

29 CFR 1910 Subpart I: Personal Protective Equipment
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.132
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.133
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.138

29 CFR 1910.101: Compressed Gases
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.101

29 CFR 1910.151(c): Medical Services and First Aid
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.151

29 CFR 1910.1030: Bloodborne Pathogens
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1030

29 CFR 1910.1200: Hazard Communication
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1200

29 CFR 1910.1450: Occupational Exposure to Hazardous Chemicals in Laboratories
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1450
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1450AppA

Appendix D: Vivarium Facilities on Campus

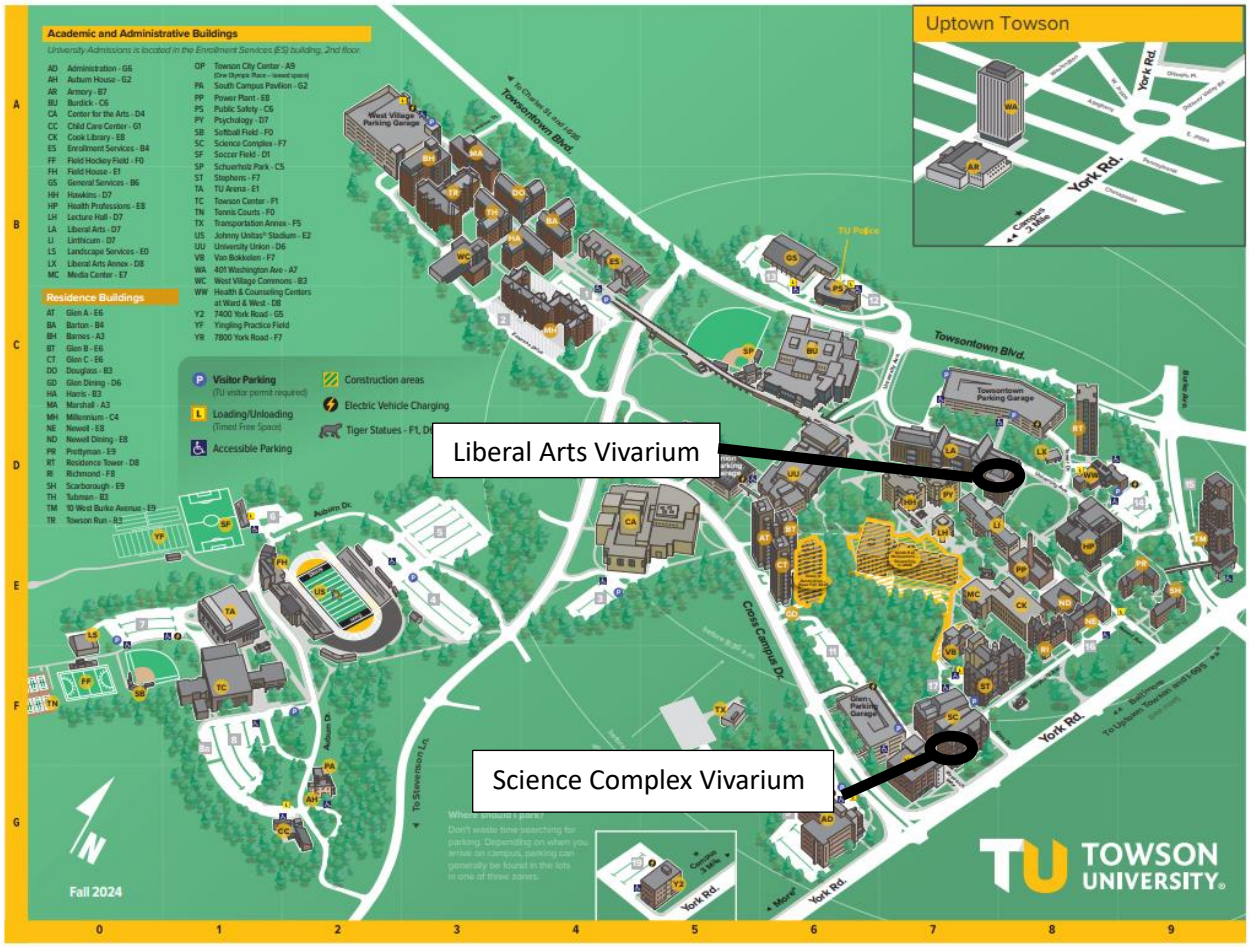

Figure 1. Campus Vivarium Map. The map displays the main campus at Towson University, and includes vivarium by building, as of 2/19/2025. Black loop marks represent an approximate location for the respective vivarium highlighted.

Appendix E: Planning to Eliminate/Substitute Vivarium Hazards

The following methods may be used to eliminate some types of hazards in the vivarium facilities or substitute them for less hazardous methods in research.

A. Elimination

1. The best hazard control is eliminating the hazard. This is best done by not bringing a particular animal or their products to the campus.
2. Do not use animals or agents that cause severe hazard to humans. This may harm laboratory personnel as well as the greater campus community. The Science Complex Vivarium facility has recently been promoted to Animal Biosafety Level 2 (ABSL-2), so animal work and risk level are to be limited to that facility, although there are BSL-2 laboratories on campus.
3. Have the poisonous animal parts or toxic products removed prior to receiving the animal (i.e. defang or declaw, if appropriate).
4. Avoid use of animals where hazards are not well-understood.
5. Avoid introduction of hazardous agents or methods into the animal experiment/research where possible.
6. Reduce or eliminate the use of radiation (radionuclides, X-ray, laser) on animals or their products.

B. Substitution

1. Consider animal research that involves less hazardous animals or less hazardous species of a particular animal type, if possible.
2. Use animals or species that produce less allergens or exposure or are bred to not have a specific allergen.
3. Use domesticated animals instead of wild animals for experiments.
4. Use non-invasive or less invasive research methods to reduce exposure to animal tissues.
5. Use less hazardous chemicals or materials to conduct an experiment (e.g. approved use of an attenuated strains of a biological agent).
6. Use animal bedding that does not produce dust (e.g. corncob) or absorbent padding (e.g. cage liners).

Appendix F: Animal Biosafety Levels Information

Per CDC/NIH, the following is required at all Animal Biosafety Levels:

1. Administration
   a) IACUC Approval
   b) Authorized access to facilities
   c) Animal handling training
   d) Medical surveillance program
   e) Written safety manual(s)
2. Facility/Engineering Controls
   a) Facilities separate from general building traffic
   b) External doors self-closing or self-locking
   c) Animal room doors open inward, self-closing
   d) Water-resistant, easily-cleaned surfaces; horizontal surfaces kept to a minimum
   e) Sealed, break-resistant windows, if applicable
   f) Floor drain traps filled with water or disinfectant
   g) No recirculation of exhaust air
   h) Rooms have negative pressure gradient to adjacent hallway
   i) Handwashing sink available in facility
3. Housekeeping
   a) Pest control program
   b) Decontaminate work surfaces and equipment
4. Procedures
   a) Minimize aerosols
   b) Transport wastes in leak-proof covered containers
   c) Handle sharps safely
   d) 180°F cage wash rinse temperature
   e) Adequate illumination
5. PPE/Hygiene
   a) Protective clothing recommended, not worn outside facility
   b) No eating, drinking, chewing gum, applying cosmetics or contact lenses, or smoking
   c) No food or drink storage within facilities
   d) No touching face while within facilities

Animal Biosafety Level 1

Animal Biosafety Level 1 is suitable for work involving well characterized agents that are not known to cause disease in immunocompetent adult humans, and present minimal potential hazard to personnel and the environment. ABSL-1 facilities should be separated from the general traffic patterns of the building and restricted as appropriate. Special containment equipment or facility design may be required as determined by appropriate risk assessment. Personnel must have specific training in animal facility procedures and must be supervised by an individual with adequate knowledge of potential hazards and experimental animal procedures.

Animal Biosafety Level 2*

Animal Biosafety Level 2 builds upon the practices, procedures, containment equipment, and facility requirements of ABSL-1. ABSL-2 is suitable for work involving laboratory animals infected with agents associated with human disease and pose moderate hazards to personnel and the environment. It also addresses hazards from ingestion as well as from percutaneous and mucous membrane exposure.

ABSL-2 requires that:

1. Access to the animal facility is restricted;
2. Personnel must have specific training in animal facility procedures, the handling of infected animals and the manipulation of pathogenic agents;

3. Personnel must be supervised by individuals with adequate knowledge of potential hazards, microbiological agents, animal manipulations and husbandry procedures; and
4. Procedures involving the manipulation of infectious materials, or where aerosols or splashes may be created, should be conducted in BSCs or by use of other physical containment equipment. Appropriate personal protective equipment must be utilized to reduce exposure to infectious agents, animals, and contaminated equipment. Implementation of employee occupational health programs should be considered.

Animal Biosafety Level 3**

Animal Biosafety Level 3 involves practices suitable for work with laboratory animals infected with indigenous or exotic agents, agents that present a potential for aerosol transmission and agents causing serious or potentially lethal disease. ABSL-3 builds upon the standard practices, procedures, containment equipment, and facility requirements of ABSL-2. ABSL-3 laboratory has special engineering and design features.

ABSL-3 requires that:

1. Access to the animal facility is restricted;
2. Personnel must have specific training in animal facility procedures, the handling of infected animals and the manipulation of potentially lethal agents;
3. Personnel must be supervised by individuals with adequate knowledge of potential hazards, microbiological agents, animal manipulations and husbandry procedures; and
4. Procedures involving the manipulation of infectious materials, or where aerosols or splashes may be created, must be conducted in BSCs or by use of other physical containment equipment. Appropriate personal protective equipment must be utilized to reduce exposure to infectious agents, animals, and contaminated equipment. Employee occupational health programs must be implemented.

Animal Biosafety Level 4**

Animal Biosafety Level 4 is required for work with animals infected with dangerous and exotic agents that pose a high individual risk of life-threatening disease, aerosol transmission, or related agent with unknown risk of transmission. Agents with a close or identical antigenic relationship to agents requiring ABSL-4 containment must be handled at this level until sufficient data are obtained either to confirm continued work at this level, or to re-designate the level. Animal care staff must have specific and thorough training in handling extremely hazardous, infectious agents and infected animals. Animal care staff must understand the primary and secondary containment functions of standard and special practices, containment equipment, and laboratory design characteristics. All animal care staff and supervisors must be competent in handling animals, agents and procedures requiring ABSL-4 containment. Access to the animal facility within the ABSL-4 laboratory is controlled by the animal facility director and/or laboratory supervisor in accordance with institutional policies.

ABSL-4 builds upon the standard practices, procedures, containment equipment, and facility requirements of ABSL-3. However, ABSL-4 cabinet and suit laboratories have special engineering and design features to prevent microorganisms from being disseminated into the environment and personnel. The ABSL-4 cabinet laboratory is distinctly different from an ABSL-3 laboratory containing a Class III BSC.

***There is a single ABSL-2 facility at Towson University; this work will be limited to this area. There are, however, BSL-2 laboratories outside of the vivaria.**

**** Currently, there are no ABSL-3/BSL-3 or ABSL-4/BSL-4 facilities at Towson University; therefore, this work is prohibited.**

Appendix G: Vivarium Research Requirements Flowchart for Principal Investigators

Step 1: Provide Research Protocols & Obtain Approvals	Complete/Submit Protocols to IACUC for Review; if Hazardous Agents Involved, Complete/Submit to IBC for Review, upon Approval, Submit to IACUC for Review	Complete/Submit EHS Forms for Infectious Materials and/or work with Recombinant DNA
Step 2: Complete General, Project-Specific & Animal Handling Training	Receive General Workplace Training through SafeColleges/Vector Solutions Receive CITI Training	Receive Hazardous Waste Generator & CIDB Trainings
Step 3: Obtain Health Clearance	Complete/Submit BBP Forms Receive HBV Vaccination, Titer Data, or Complete/Submit Declination Form	Complete/Submit LAOHP Questionnaire Visit PLHCP for Physical Examination Receive Other Relevant Vaccinations
Step 4: Request Space Arrangement	Complete/Submit Vivarium Space Request	Obtain Approval for Vivarium Space Use
Step 5: Complete Facility- & Equipment-Specific Trainings	Complete Vivarium Orientation Complete Equipment-Specific Training	Review Vivarium SOPs Review Relevant Sections of LAOHP & Vivarium Safety Program
Step 6: Organize Laboratory	Purchase/Obtain & Configure Equipment Create/Review Laboratory-Specific Standard Operating Procedures (SOPs)	Purchase/Obtain & Acclimate Animals Purchase/Obtain Chemicals & Other Consumables
Step 7: Obtain Personnel Approvals & Training	Obtain Access Authorization to Vivarium for Laboratory Personnel Provide Personnel Training & Orientation	Obtain Personnel Signatures Upon Completion of SOPs Review and Required Trainings
Step 8: Execute Post-Approval Responsibilities	Conduct Research and Maintain Area Assist Post-Approval Monitoring Continue Medical Surveillance Complete/End Research	Submit Research Protocol Amendments as Required Report Issues, Seek Assistance as Required