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Preface

The Georgia State University (GSU) Animal Biosafety Level 2 (ABSL-2) Manual serves as a resource for those working in the laboratory environment on how to work safely and eliminate, or reduce, the potential for exposure to biological and other hazards associated with handling animals. The GSU ABSL-2 Manual was developed from the University’s commitment to address and comply with regulations and recommendations for the humane treatment of animals in research and teaching activities as well as the health and safety of the staff, researchers, students, community, and environment. The information presented here reflects the requirements and guidelines of federal, state and local laws and regulations. It is intended that the Principal Investigator (PI) and supervisory personnel will supplement this information with instruction and guidance regarding specific practices and procedures unique to the work being conducted in their laboratories. The Institutional Animal Care and Use Committee (IACUC), Institutional Biosafety Committee (IBC) and Division of Animal Resources (DAR) provide oversight of GSU’s animal biosafety program. This manual will be reviewed and revised as necessary.

The Centers for Disease Control (CDC) and the National Institutes of Health (NIH) have established four levels of animal biosafety required for the use of experimentally-infected animals housed in indoor research facilities (e.g., vivaria), and also for the maintenance of laboratory animals that may naturally harbor zoonotic infectious agents. The CDC/NIH document, “Biosafety in Microbiological and Biomedical Laboratories,” or BMBL, describes the details of the four animal biosafety levels (ABSL), which are designed to provide increasing levels of protection to personnel and to the environment, and are recommended as minimal standards for activities involving infected laboratory animals. A brief summary of each ABSL is provided below:

- **ABSL-1** is required for work in animals 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-2** is suitable for work involving laboratory animals infected with agents associated with human disease and pose moderate hazards to personnel and the environment, and also addresses hazards from ingestion as well as from percutaneous and mucous membrane exposure.
- **ABSL-3** is required 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-4** is required for work with animals infected with dangerous and exotic agents that pose a high individual risk of aerosol-transmitted laboratory infections and life-threatening disease that is frequently fatal, for which there are no vaccines or treatments; or a related agent with unknown risk of transmission.
I. Introduction

A. Scope
The ABSL-2 Manual is applicable to all laboratory, research, service, and support activities at GSU that involve the use of experimentally infected animals under ABSL-2 conditions. ABSL-2 builds on the practices, procedures, containment equipment and facility requirements of ABSL-1.

All animal protocols involving ABSL-2 studies must be reviewed and approved by both the Institutional Animal Care and Use Committee (IACUC) and the Institutional Biosafety Committee (IBC) prior to beginning work. In addition, GSU is required to have a Medical Monitoring Program for Vertebrate Animal Exposure (MMPVAE) that addresses potential hazards associated with the conduct of animal research.

B. Regulatory Requirements
All research and teaching activities involving the use of animals is regulated by the United States Department of Agriculture (USDA) Animal Welfare Act. The Animal Welfare Act regulates the treatment of USDA-covered species in research, exhibition, transport and by dealers. It covers all mammals used in research except rats of the genus *Rattus* and mice of the genus *Mus* that are bred for use in research. There are other exceptions for teaching activities. The IACUC oversees all research and teaching activities involving vertebrate animals. The Animal Welfare Act may be found in the United States Code of Federal Regulations (CFR), Title 7, Chapter 54, Sections 2131 through 2159. The Act is promulgated and enforced by the USDA, Animal and Plant Health Inspection Service (APHIS), and Animal Care (AC).

The Public Health Service (PHS) Policy applies to all institutions receiving animal research funds from PHS organizations, such as the National Institutes of Health (NIH). This law applies to all vertebrate species. The Health Research Extension Act of 1985 provides the legislative mandate for the PHS Policy. It directs the Secretary of Health and Human Services to establish guidelines for the proper care and treatment of animals used in research, and for the organization and operation of animal care committees. Institutions that receive PHS funds must have an Assurance on file at the Office of Laboratory Animal Welfare (OLAW). The assurance is the University’s statement to OLAW that it will abide by the PHS Policy. Animal care and use facilities must be built and operate in compliance with the recommendations of the Institute for Laboratory Animal Research (ILAR) published in the “Guide for the Care and Use of Laboratory Animals” (The Guide). Yearly reports by the University on the status of its animal care program are required.

C. Association for Assessment and Accreditation of Laboratory Animal Care
GSU is accredited by the Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC). AAALAC is a private, nonprofit organization that promotes the humane treatment of animals in science through voluntary assessment and accreditation programs. AAALAC’s voluntary accreditation process demonstrates the institution is effective at setting, achieving and maintaining high standards for animal care and use in science.

All GSU programs and facilities for activities involving animals are evaluated and accredited by AAALAC. The animal care program, including all facilities, is evaluated by the IACUC at least once every six months.

D. Biological Agents and Hazards
Guidance documents from NIH and the Centers for Disease Control and Prevention (CDC) form the basis for the animal biosafety practices included in this manual. Specifically, the CDC/NIH manual, Biosafety in
Microbiological and Biomedical Laboratories (BMBL), describes the appropriate measures and facilities for work with all microbial agents, including bacterial, viral, fungal, parasitic, rickettsia, and prion agents as well as toxins of biological origin. The BMBL also addresses the appropriate measures and facilities for work with vertebrate animals and sets forth animal biosafety level criteria that are detailed in this document.

There are additional guidance documents and regulations imposed by various funding agencies that individual PIs must be aware of and incorporate into their Laboratory-Specific Biosafety Manuals. Biosafety requirements must be followed to ensure the continuation of grant funding from federal agencies and for health and safety purposes.

II. Responsibilities

A. Georgia State University and Responsible Official

GSU provides facilities, staff and established practices that reasonably ensure appropriate levels of safety and security, and follows the provisions of the NIH Guidelines for Research with Recombinant DNA Molecules (NIH Guidelines).

Responsibilities of the University related to ABSL-2 include:

- Appointment of a Biological Safety Officer (BSO) for the institution;
- Providing appropriate training for those conducting research with biohazards or recombinant DNA materials;
- Ensuring research is conducted in full compliance with provisions of the NIH Guidelines.
- Establishing an IBC and IACUC with appropriate expertise and training;
- Implementing policies for safe conduct of biohazardous and recombinant DNA research;
- Maintaining a MMPVAE for personnel; and
- Reporting any significant problems, violations, or significant research-related accidents or illnesses to the NIH Office of Biotechnology Activities (OBA) within 30 days.

B. Institutional Animal Care and Use Committee (IACUC)

Research and teaching involving the use of vertebrate animals conducted under the auspices of GSU is reviewed and approved by the IACUC in compliance with federal regulations. All duties of the IACUC are outlined in the IACU Policies and Procedures Manual.

Responsibilities of the IACUC related to ABSL-2 include:

- Reviewing, approving, disapproving, and requiring modification of all projects involving the use of vertebrate animals conducted under the auspices of GSU;
- Verifying all individuals approved for use of vertebrate animals have received appropriate training prior to granting IACUC approval;
- Verifying approval by the IBC before granting IACUC approval;
- Verifying all animal users have enrolled in the GSU MMPVAE program before granting IACUC approval;
- Monitoring for compliance with the IACUC approved protocol;
- Reporting any significant problems, violations, or significant research-related accidents or illnesses involving biohazards to the IBC, BSO and Responsible Official in a timely manner; and
- Suspending or terminating approval of research that is not being conducted in accordance with IACUC approval.
**C. Institutional Biosafety Committee (IBC)**

Research and teaching involving the use of biological agents, biohazardous materials, toxins and recombinant or synthetic nucleic acid molecules conducted under the auspices of GSU is reviewed and approved by the IBC in compliance with federal regulations.

Responsibilities of the IBC related to ABSL-2 include:

- Reviewing and approving research or teaching activities involving the use of biohazardous materials including regulated animal and plant pathogens, biological toxins and recombinant or synthetic nucleic acid molecules;
- Independently assessing the containment levels of the work, as required by the *NIH Guidelines*, for all experiments, including those involving whole plants and/or animals, cell cultures, tissues, human-derived materials, biological toxins, infectious agents, and regulated pathogens and pests;
- Assessing the facilities, procedures, practices, and training and expertise of personnel involved with biohazardous research;
- Lowering the containment levels for certain experiments in which DNA from Risk Group 2, 3, or 4 or Restricted Agents is cloned into nonpathogenic prokaryotic or lower eukaryotic host-vector systems;
- Performing periodic reviews and/or requiring modifications of recombinant or synthetic nucleic acid molecules and/or biohazardous research and research facilities at GSU to ensure compliance with the *NIH Guidelines* and other government regulations.
- Notifying the PI of the results of the IBC's review and approval;
- Adopting emergency plans covering accidental spills and personnel contamination resulting from research using recombinant or synthetic nucleic acid molecules;
- Reporting significant problems with or violations of the *NIH Guidelines* and any significant research related accidents or illnesses to the GSU Office of Research Integrity and the Responsible Official and when necessary to NIH/OBA; and
- In cooperation with the Responsible Official, suspending or terminating approval of research that is not being conducted in accordance with the IBC's requirements.

**D. Biosafety Officer (BSO)**

The responsibilities of the Biological Safety Officer (BSO) related to ABSL-2 include:

- Advising researchers on proper waste disposal methods for ABSL-2 based on federal and state regulations;
- Assisting in the development of emergency plans for handling accidental spills and personnel contamination in the ABSL-2;
- Consulting with researchers on issues of biosafety and the safe use of biological materials in the ABSL-2;
- Investigating laboratory accidents involving ABSL-2;
- Developing policies and procedures to address issues of biosafety in the ABSL-2;
- Developing implementing and maintaining the university's biosafety program;
- Performing periodic inspections of ABSL-2 laboratories to ensure that laboratory standards are rigorously followed;
- Promoting regulatory compliance and a safe laboratory environment in ABSL-2;
- Providing advice on laboratory security for ABSL-2;
- Providing oversight of the GSU Bloodborne Pathogen Program and conducting training for laboratory personnel with such exposure;
- Providing technical advice to PIs, IACUC, and IBC on research safety procedures related to ABSL-2;
- Providing training in the safe use and practices regarding biohazards for those working in the ABSL-2;
- Reporting to the IBC and the Responsible Official any significant problems, violations of the NIH Guidelines, and any significant research-related accidents or illnesses related to the ABSL-2 of which the BSO becomes aware unless the BSO determines a report has already been filed by the PI;
- Serving as a member of the IBC and IACUC; and
- Reviewing registration forms for research proposals conducted under ABSL-2.
E. Principal Investigator (PI)

A PI for an ABSL-2 laboratory is a scientist, trained and knowledgeable in appropriate laboratory techniques, safety procedures, and hazards associated with handling biohazard agents or materials in animals.

Responsibilities of the Principal Investigator (PI) related to ABSL-2 include:

- Maintaining oversight and retaining ultimate responsibility for the conduct of ABSL-2 research;
- Accepting direct responsibility for the health and safety of those working in ABSL-2;
- Complying with all GSU policies and procedures as well as all federal, state and local laws and regulations, and all ethical principles for ABSL-2;
- Obtaining approval for each project from the IACUC, IBC and all other appropriate approvals prior to the commencement of the project;
- Being adequately and appropriately trained in good microbiological and animal care techniques required for ABSL-2;
- Supervising all laboratory and research personnel to ensure the required safety practices and techniques for ABSL-2 are employed;
- Correcting work errors and conditions that may result in accidents, injuries or the release of biohazards;
- Ensuring all laboratory and research personnel and others involved in the ABSL-2 are qualified by education, training and experience to perform the assigned responsibilities;
- Providing instruction and training to those working in the ABSL-2 in (i) the practices and techniques required to ensure safety, and (ii) the procedures for accidents;
- Ensuring ABSL-2 laboratory and research personnel comply with relevant regulations, guidelines, policies, procedures and protocols;
- Ensuring personal protective equipment appropriate for ABSL-2 is provided and used;
- Adhering to approved emergency plans for handling accidental spills and personnel contamination in ABSL-2;
- Developing specific biosafety standard operating procedures for animals and biohazardous materials used in the ABSL-2 laboratory and maintaining a Laboratory-Specific Biosafety Manual;
- Proposing appropriate microbiological practices and animal care techniques to be used for the ABSL-2 research;
- Ensuring the integrity of the physical containment (e.g., biological safety cabinets) and the biological containment (e.g., purity, genotypic and phenotypic characteristics) through annual testing and certification appropriate for ABSL-2;
- Informing DAR and laboratory and research personnel of the reasons and provisions for any precautionary medical practices advised or requested (e.g., vaccinations or serum collection);
- Providing DAR, and all laboratory and research personnel with the protocols that describe the potential biohazards and the precautions to be taken in the ABSL-2;
- Informing DAR and laboratory and research personnel of pertinent changes and risks during the research;
- Complying with IACUC and IBC prompt reporting requirements;
- Reporting any significant problems pertaining to the operation and implementation of containment practices and procedures in writing to the BSO, IBC, IACUC and other authorities as appropriate;
- Cooperating with IACUC and IBC in reviews, inspections, inquiries and other requests;
- Employing sound study design for ABSL-2; and
- Remaining in communication with the IACUC and IBC throughout the conduct of the project.

In addition, PIs are responsible for full compliance with the NIH Guidelines during the conduct of recombinant DNA research:

- Determining whether the recombinant DNA research is subject to the NIH Guidelines;
- Developing specific biosafety standard operating procedures for recombinant DNA materials used;
- Obtaining IBC approval before initiating recombinant DNA research subject to the NIH Guidelines;
• Petitioning OBA, with notice to the IBC, for proposed exemptions from the NIH Guidelines;
• Proposing physical and biological containment levels in accord with the NIH Guidelines when registering research with the IBC;
• Reporting any significant problems, violations of the NIH Guidelines or any significant research-related accidents and illnesses to the BSO, IBC, NIH/OBA and other authorities as appropriate within 30 days;
• Seeking OBA approval, in addition to IBC approval, to conduct experiments specified in Sections III-A and III-B of the NIH Guidelines;
• Seeking the NIH OBA’s determination of containment for experiments that require a case-by-case review; and
• Submitting any subsequent changes to the disclosure to the IBC for review and approval or disapproval.

F. Division of Animal Resources (DAR) and Laboratory Employees
The responsibilities of DAR and laboratory employees related to ABSL-2 include, but are not limited to the following:

• Participating in appropriate training and instruction for ABSL-2, and ensuring the training is adequate and instructions/procedures are fully understood;
• Fully comprehending the potential risks associated with exposure to all biological agents and hazardous materials being used in ABSL-2, as well as fully understanding the associated emergency response procedures;
• Following all laboratory practices and approved protocols, as well as complying with all applicable policies, procedures, and guidelines for ABSL-2;
• Completing required or recommended medical surveillance recommend by the MMPVAE for ABSL-2; and
• Reporting all thefts, security incidents, accidents, spills, exposures or contamination incidents to supervisor.

G. Division of Animal Resources (DAR)
The DAR manages and administers a centralized program of laboratory animal care and use that complies with all applicable standards and regulations for husbandry as set forth in the Animal Welfare Act, National Research Council Guide for the Care and Use of Laboratory Animals, and the Public Health Service policy on the Humane Care and Use of Laboratory Animals.

The responsibilities of DAR related to ABSL-2 include:

• Establishing standard operating procedures for ABSL-2;
• Maintaining appropriate facilities for ABSL-2 research;
• Providing daily animal husbandry and care according to ABSL-2 requirements;
• Training DAR personnel in animal care techniques required for ABSL-2;
• Instructing investigators and research personnel in appropriate species specific procedures appropriate for ABSL-2;
• Providing surgical and procedural assistance and monitoring of animal in ABSL-2; and
• Providing University/Attending Veterinarian services for ABSL-2.

H. Medical Monitoring Program for Vertebrate Animal Exposure (MMPVAE)
The responsibilities of the MMPVAE related to ABSL-2 include:

• Reviewing and assessing activities in the ABSL-2;
• Recommending appropriate personal protective equipment, specific requirements (i.e. vaccinations etc.) or restrictions for ABSL-2;
• Providing education about zoonotic diseases in prevention, personal hygiene, monitoring requirements, reduction of disease transmission from animals to humans and other related issues specific to ABSL-2;
• Mitigating adverse reactions from exposure to laboratory animals (e.g. allergies); and
• Screenings for appropriately related diseases (for example, hepatitis B and tuberculosis).

III. Incident Reporting

A. Reportable Incidents and Violations

Significant incidents or problems involving research animals, recombinant DNA, or biohazardous materials must be immediately reported to the BSO.

Examples of reportable significant incidents include, but are not limited to the following:

• Any overt or potential exposure to biohazardous materials, such as a needle stick, splash, or contamination;
• Any containment breach, which may be subsequently determined to pose either an overt or potential exposure to individuals;
• Improper disposal of recombinant DNA (waste from recombinant DNA research is considered biohazardous);
• Failure by research personnel to follow guidelines, policies, procedures, and federal, state and local laws and regulations; and
• Failure to obtain appropriate prospective review, registration, approval or oversight of research.

Questions regarding reportable incidents should be directed to the BSO.

B. Principal Investigator Reporting Responsibilities

The Principal Investigator and his/her personnel must report any significant incident or significant research-related accidents and illnesses immediately by contacting the BSO.

Examples of incidents include, but are not limited to the following:

• Overt exposures in an ABSL-2 laboratory, which are defined as exposures that result in direct personnel exposure to biohazardous materials such as injection, spills, splashes, or aerosol inhalation;
• Potential exposures, which are defined as exposures that have a high risk of exposing personnel to biohazardous materials such as spills, containment failure while working with the agent, or equipment failure that may produce aerosols;
• Any illness that may be caused by the animals or agents used in the laboratory; and
• Any incident involving the improper disposal of biohazardous materials, including recombinant DNA.

C. Biosafety Officer Reporting Responsibilities

The BSO is required by the NIH Guidelines to report to the IBC:

• All violations of the NIH Guidelines and significant incidents.
• Any significant research-related accidents or illnesses.

D. Institutional Biosafety Committee Reporting Responsibilities

The IBC is required, by the NIH Guidelines, to report to the appropriate University official and to the NIH/OBA within 30 days any significant incidents, violations of the NIH Guidelines, or any significant research-related accidents and illnesses. The IBC will be responsible for determining what actions, if any, are necessary. For example, the IBC may choose to change the frequency of lab inspections or change the biosafety level of the disclosure based on results of the incident.

Other IBC reporting requirements (to OBA and other agencies) include but are not limited to:
• Research involving recombinant DNA or biohazardous materials without prior IBC approval;
• Lax security, unsafe procedures used in a laboratory setting;
• Improper disposal of recombinant waste; and
• Significant changes to proposed research risk without prior notification and approval by IBC.

Some incidents must be reported to OBA on an expedited basis. Spills or accidents in ABSL-2 laboratories (involving recombinant DNA) resulting in an overt exposure must be immediately reported by the Responsible Official to OBA. The IBC will report to the Responsible Official, who, in turn, will report to OBA, any of the above-described incidents.

Institutional violations that will be reported to the appropriate college, school, or department head may include but are not limited to:

• Lapses in approval of a protocol;
• Failure to comply with guidelines, policies, procedures, and federal, state and local laws and regulations; and
• Unsafe work practices.

E. Responsible Official Responsibilities

Upon receiving a report from the IBC, the Responsible Official (RO) will directly report:

• In writing any problems with or violations (non-compliance) of the NIH Guidelines or any significant incident, accident, or illness related to recombinant DNA, to the NIH/OBA within 30 days or immediately for overt exposure occurring in an ABSL-2; and
• Any significant research-related illness or accident that may be hazardous to public health. GSU will cooperate with state and local public health departments.

IV. Animal Biosafety Level Two (ABSL-2)

ABSL-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 requirements include:

• Access to the animal facility is restricted;
• Personnel must have specific training in animal facility procedures, the handling of infected animals, and the manipulation of pathogenic agents;
• Appropriate personal protective equipment must be utilized;
• Enrollment and monitoring in the MMPVAE is required;
• Personnel must be supervised by individuals with adequate knowledge of potential hazards, microbiological agents, animal manipulations, and husbandry procedures; and
• A biological safety cabinet (BSC) or other physical containment equipment is used when procedures involve the manipulation of infectious materials or where aerosols or splashes may be created.

The following standard and special practices, safety equipment and facility requirements apply to ABSL-2.
A. Standard Microbiological Practices for ABSL-2

GSU has established the following standard microbiological practices for ABSL-2 using the BMBL as guidance.

1. DAR, in conjunction with the IBC, has established and enforces policies, procedures, and protocols for emergencies involving ABSL-2.
2. IACUC addresses worker safety and health concerns (enrollment in the MMPVAE) as part of the animal protocol review.
3. Prior to beginning a study, animal protocols utilizing ABSL-2 agents must also be reviewed and approved by the IACUC and IBC.
4. Standard operating procedures specific to the animal facility are prepared in consultation with the DAR director and appropriate safety professionals.
   The standard operating procedures are available and accessible. Personnel are advised of potential hazards and are required to read and follow instructions on practices and procedures.
   Consideration is given to specific biohazards unique to the animal species and protocol in use.
5. The DAR Associate Director ensures that animal care, laboratory, and support personnel receive appropriate training regarding their duties, animal husbandry procedure, potential hazards, manipulations of infectious agents, necessary precautions to prevent hazard or exposures, and hazard/exposure evaluation procedures (physical hazards, splashes, aerosolization, etc.). Personnel must receive annual updates and additional training when procedures or policies change. Records are maintained by DAR for all hazard evaluations, employee training sessions, and staff attendance.
6. The MMPVAE has been established according to identified risks and includes the following:
   a. DAR supervisors informing MMPVAE personnel of potential occupational hazards within the ABSL-2, including those associated with research, animal husbandry duties and animal care and manipulations;
   b. An animal allergy prevention program;
   c. A private disclosure method of personal health status that may impact an individual’s susceptibility to infection and ability to receive immunizations or prophylactic interventions;
   d. Providing all personnel, and particularly women of childbearing age, with information regarding immune competence and conditions that may predispose them to infection; and
   e. Encouraging individuals having immune compromised conditions and other conditions that may predispose the individual to infection to self-identify to the MMPVAE for appropriate counseling and guidance; and
   f. Screenings for appropriately related diseases (for example, hepatitis B and tuberculosis).
7. Personnel using respirators must be enrolled in the GSU MMPVAE respiratory protection program.
8. Signage incorporating the universal biohazard symbol must be posted at the entrance to ABSL-2 areas where infectious materials and/or animals are housed or are manipulated when infectious agents are present. The sign must include the animal biosafety level (ABSL-2), general occupational health requirements, personal protective equipment requirements, the animal facility supervisor’s name (or names of other responsible personnel), telephone number, and required procedures for entering and exiting the animal areas. Identification of all infectious agents is necessary when more than one agent is being used within an animal room.
9. Security-sensitive agent information and occupational health requirements are posted.
10. Emergency and disaster recovery plans as a contingency for man-made or natural disasters are established.
11. Access to the ABSL-2 is limited. Only those persons required for program or support purposes are authorized to enter the ABSL-2, animal facility and the areas where infectious materials and/or animals are housed or manipulated.
   All persons including facility personnel, service workers, and visitors are advised of the potential hazards (physical, naturally occurring, or research pathogens, allergens, etc.) and are instructed on the appropriate safeguards.
12. Protective laboratory coats, gowns, or uniforms are recommended to prevent contamination of personal clothing.
   Clothing that covers the legs (long pants or long skirts) and closed-toed shoes are required.
   Gloves are worn to prevent skin contact with contaminated, infectious, and hazardous materials and when handling animals.
Gloves and personal protective equipment should be removed in a manner that prevents transfer of infectious materials outside of the areas where infectious materials and/or animals are housed or manipulated. Disposable protective equipment must be removed when leaving the areas where infectious materials and/or animals are housed or are manipulated. Disposal protective equipment is appropriately contained and decontaminated prior to disposal. Disposable personal protective equipment is not reused.

13. Persons must wash their hands after removing gloves and before leaving the ABSL-2 and areas where infectious materials and/or animals are housed or manipulated.

14. Eye, face and respiratory protection should be used in rooms containing infected animals as dictated by the MMPVAE risk assessment.

15. Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human consumption is not permitted in all laboratory areas including the ABSL-2. Food must be stored outside of the ABSL-2 in cabinets or refrigerators designated and used for this purpose.

16. All procedures are carefully performed to minimize the creation of aerosols or splatters of infectious materials and waste.

17. Mouth pipetting is prohibited. Mechanical pipetting devices must be used.

18. Policies for the safe handling of sharps such as needles, scalpels, pipettes, and broken glassware have been implemented and must be followed. When applicable, laboratory supervisors adopt improved engineering and work practice controls that reduce the risk of sharps injuries. Precautions must always be taken with sharp items. These include:
   a. The use of needles and syringes or other sharp instruments in the ABSL-2 is limited to situations where there is no alternative such as parenteral injection, blood collection, or aspiration of fluids from laboratory animals and diaphragm bottles.
   b. Disposable needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal. Used disposable needles must be carefully placed in puncture-resistant containers used for sharps disposal. Sharps containers should be located as close to the work site as possible.
   c. Non-disposable sharps must be placed in a hard-walled container for transport to a processing area for decontamination, preferably by autoclaving.
   d. Broken glassware must not be handled directly; it should be removed using a brush and dustpan, tongs, or forceps. Plastic ware should be substituted for glassware whenever possible.
   e. Use of equipment with sharp edges and corners should be avoided.

19. Equipment and work surfaces are routinely decontaminated with an appropriate disinfectant after work with an infectious agent and after any spills, splashes, or other overt contamination.

20. Animals and plants not associated with the work being performed are not permitted in the areas where infectious materials and/or animals are housed or manipulated.

21. An effective integrated pest management program is followed.

22. All wastes from the ABSL-2 (including animal tissues, carcasses, and bedding) are transported from the ABSL-2 in leak-proof containers for appropriate disposal in compliance with applicable institutional, local, and state requirements.

23. All potentially infectious materials are decontaminated before disposal using an effective method.

**B. Special Practices**

GSU has established the following special practices for ABSL-2.

1. Animal care, laboratory, and routine support personnel are provided the MMPVAE as dictated by the risk assessment and administered appropriate immunizations for agents handled or potentially present before entry into the ABSL-2. When appropriate, a baseline serum sample is stored.

2. Procedures involving a high potential for generating aerosols should be conducted within a biosafety cabinet or other physical containment device. When a procedure cannot be performed within a biosafety cabinet, a combination of personal protective equipment and other containment devices must be used.
Restraint devices and practices that reduce the risk of exposure during animal manipulations (e.g., physical restraint devices, chemical restraint medications) should be used whenever possible.

3. Decontamination by an appropriate method (e.g., autoclave, chemical disinfection, or other approved decontamination methods) is necessary for all potentially infectious materials and animal waste before movement outside the areas where infectious materials and/or animals are housed or are manipulated. This includes potentially infectious animal tissues, carcasses, contaminated bedding, unused feed, sharps, and other refuse.

DAR has implemented procedures for decontaminating routine husbandry equipment as well as sensitive electronic and medical equipment.

Materials to be decontaminated outside of the immediate areas where infectious materials and/or animals are housed or manipulated must be placed in a durable, leak-proof, covered container and secured for transport. The outer surface of the container is disinfected prior to moving materials. The transport container must have a universal biohazard label.

4. GSU has a waste disposal program in compliance with applicable institutional, local, and state requirements. Autoclaving of content prior to incineration is recommended.

5. Equipment, cages, and racks should be handled in a manner that minimizes contamination of other areas. Equipment must be decontaminated before repair, maintenance, or removal from the areas where infectious materials and/or animals are housed or manipulated.

6. Spills involving infectious materials must be contained, decontaminated, and cleaned up by staff properly trained and equipped to work with infectious material.

7. Incidents that may result in exposure to infectious materials must be immediately evaluated and treated according to procedures described in the safety manual. All such incidents must be reported to the animal facility supervisor or personnel designated by the institution. Contact GSU MMPVAE for more information. Medical evaluation, surveillance, and treatment should be provided as appropriate and records maintained.

C. Safety Equipment (Primary Barriers & Personal Protective Equipment)

GSU has established the following primary barriers and personal protective equipment practices for ABSL-2.

1. Proper personal protective equipment (e.g., gloves, lab coats, face shields, respirators, etc.) and/or other physical containment devices or equipment are required when working in a ABSL-2. A risk assessment is conducted to determine the protective equipment that may be required.

2. When indicated by risk assessment, animals are housed in primary biosafety containment equipment appropriate for the animal species, such as solid wall and bottom cages covered with filter bonnets for rodents or other equivalent primary containment systems for larger animal cages. A risk assessment determines the appropriate type of personal protective equipment to be utilized by those individuals in contact with animals.

3. Scrub suits and uniforms are removed before leaving the ABSL-2. Reusable clothing is appropriately contained and decontaminated before being laundered. Laboratory and protective clothing should never be taken home.

4. Gowns, uniforms, laboratory coats, and personal protective equipment are worn while in the areas where infectious materials and/or animals are housed or manipulated and removed prior to exiting. Disposable personal protective equipment and other contaminated waste are appropriately contained and decontaminated prior to disposal. Disposable gowns, uniforms laboratory coats and personal protective equipment are not reused and are disposed with other contaminated waste.

5. Safety glasses are required as the minimal level of eye protection in an ABSL-2 laboratory. Eye and face protection (mask, goggles, and face shield or other splatter guard) are used for manipulations or activities that may result in splashes or sprays from infectious or other hazardous materials and when the animal or microorganisms must be handled outside the BSC or containment device.

   a. Eye and face protection must be disposed of with other contaminated laboratory waste or decontaminated before reuse.

   b. Persons who wear contact lenses should also wear eye protection when entering areas with potentially high concentrations of airborne particulates.
6. Gloves are worn to protect hands from exposure to hazardous materials. A risk assessment is performed to identify the appropriate glove for the task, and alternatives to latex gloves are available.
   a. Gloves are changed when contaminated, glove integrity is compromised, or when otherwise necessary.
   b. Gloves must not be worn outside the ABSL-2.
   c. Gloves and personal protective equipment should be removed in a manner that prevents transfer of infectious materials.
   d. Do not wash or reuse disposable gloves. Dispose of used gloves with other contaminated waste.
7. Persons must wash their hands after handling animals and before leaving the areas where infectious materials and/or animals are housed or manipulated. Hand washing should occur after the removal of gloves.

Please refer to the table below for specific personal protective equipment for ABSL-2.

<table>
<thead>
<tr>
<th>Table 1</th>
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<tbody>
<tr>
<td><strong>ABSL-2</strong></td>
</tr>
<tr>
<td>- Protective laboratory coats, gowns, or uniforms must be worn while in areas where infectious materials and/or animals are housed or manipulated.</td>
</tr>
<tr>
<td>- Eye and face protection (mask, goggles, face shield or other splatter guard) must be worn when performing manipulations or activities that may result in splashes or sprays from infectious or other hazardous materials and when the animal or microorganisms must be handled outside the BSC or physical containment device.</td>
</tr>
<tr>
<td>- Personnel who wear contact lenses should also wear eye protection when entering areas with potentially high concentrations or airborne particulates.</td>
</tr>
<tr>
<td>- Gloves must be worn to prevent skin contact with contaminated, infectious and hazardous materials and when handling animals.</td>
</tr>
<tr>
<td>- A surgical mask, hair bonnet, and booties must be worn.</td>
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</tbody>
</table>

* Safety is improved when personal protective equipment (PPE) is used in combination with physical containment devices or equipment, such as BSCs.

**D. Laboratory Facilities (Secondary Barriers)**

GSU has established the following secondary barriers for ABSL-2.

1. The ABSL-2 is separated from areas that are open to unrestricted personnel traffic within the building. External facility doors are self-closing and self-locking.
2. Doors to areas where infectious materials and/or animals are housed open inward, are self-closing, are kept closed when experimental animals are present, and should never be propped open. Doors to cubicles inside an animal room may open outward or slide horizontally or vertically.
3. A hand-washing sink is located in the area where infectious materials and/or animals are housed or manipulated.
   a. Additional sinks for hand washing are in other appropriate locations within the facility.
   b. Sink traps are filled with water and/or appropriate disinfectant to prevent the migration of vermin and gases.
4. The ABSL-2 is designed, constructed, and maintained to facilitate cleaning and housekeeping. The interior surfaces (walls, floors, and ceilings) are water resistant.
   a. Penetrations in floors, walls, and ceiling surfaces, including openings around ducts, doors, and doorframes, are sealed to facilitate pest control and proper cleaning.
   b. Floors are slip-resistant, impervious to liquids, and resistant to chemicals.
   c. Cabinets and bench tops are impervious to water and resistant to heat, organic solvents, acids, alkalis, and other chemicals.
   d. Spaces between benches, cabinets, and equipment are accessible for cleaning.
   e. Furniture is minimized. Chairs used in ABSL-2 are covered with a non-porous material that can be easily cleaned and decontaminated. Furniture is capable of supporting anticipated loads and uses.
f. Sharp edges and corners have been avoided.

5. External windows are not present in the ABSL-2.

6. Ventilation is in accordance with the Guide for Care and Use of Laboratory Animals.
   a. The direction of airflow into the ABSL-2 is inward; animal rooms maintain inward directional airflow compared to adjoining hallways.
   b. A ducted exhaust air ventilation system is provided.
   c. Exhaust air is discharged to the outside without being recirculated to other rooms.

7. Ventilation system design should consider the heat and high moisture load produced during the cleaning of animal rooms and the cage wash process.

8. Internal facility appurtenances, such as light fixtures, air ducts, and utility pipes, are arranged to minimize horizontal surface areas, to facilitate cleaning and minimize the accumulation of debris or fomites.

9. Floor drains are maintained and filled with water and/or appropriate disinfectant to prevent the migration of vermin and gases.

10. Cages are autoclaved or otherwise decontaminated prior to washing. Mechanical cage washer has a final rinse temperature of at least 180°F (82°C). The cage wash area is designed to accommodate the use of high-pressure spray systems, humidity, strong chemical disinfectants, and 180°F water temperatures during the cage/equipment cleaning process.

11. Illumination is adequate for all activities, avoiding reflections and glare that could impede vision.

12. BSCs are installed so that fluctuations of the room air supply and exhaust do not interfere with proper operations.
   a. BSCs are located away from doors, heavily traveled laboratory areas, and other possible airflow disruptions.
   b. HEPA filtered exhaust air from a Class II BSC can be safely re-circulated back into the laboratory environment if the cabinet is tested and certified at least annually and operated according to manufacturer’s recommendations.
   c. BSCs can also be connected to the laboratory exhaust system by either a thimble (canopy) connection or directly to the outside through an independent, hard connection.
   d. Proper safety cabinet performance and air system operation are verified.
   e. BSCs receive routine maintenance, and are inspected and recertified at least once a year to ensure correct performance. Recertification should be performed after the following events:
      i. HEPA filters are changed;
      ii. maintenance repairs are made to internal parts;
      iii. a BSC is relocated (a moveable BSC does not require recertification if it is moved a short distance, e.g. across a hallway, but a moveable BSC would require recertification if moved to another building or if damaged during relocation); and
      iv. cleanup of a major contamination event.
   f. All BSCs should be used according to manufacturer’s specifications to protect the worker and avoid creating a hazardous environment from volatile chemicals and gases.

13. If vacuum service (i.e., central or local) is provided, each service connection should be fitted with liquid disinfectant traps and an in-line HEPA filter placed as near as practicable to each use point or service cock. Filters are installed to permit in-place decontamination and replacement.

14. An autoclave is located in the animal facility to facilitate decontamination of infectious materials and waste from the ABSL-2. Autoclaves receive routine inspection and maintenance.

15. Emergency eyewash and shower are readily available in ABSL-2.

V. Potential Hazards and Exposures

A. Bites and Scratches
The risk of animal bites and scratches is associated with handling of animals and is best avoided by proper handling techniques and wearing appropriate personal protective equipment. Knowledge of animal behavior and how animals respond to their immediate physical environment is important in reducing risk of injury.
Animals respond to sights, sounds, and smells as people do, but they also may hear, smell, and react to things that people do not detect. For example, if an animal hears a high-pitched sound, it may become frightened and react defensively. Many animals have a flight zone, and, if approached by another animal or the handler, the affected animal may try to escape. Unsuccessful escape may cause the animal to act aggressively. Inappropriate handling of an animal can cause discomfort, pain, and distress and provoke an animal to bite or scratch. Animal bites and scratches that cause minor skin damage are sometimes disregarded by animal workers who are unfamiliar with the number of diseases that can be spread by such injuries. Even minor bites and/or scratches can result in infections and illnesses if they are not properly treated. Scrapes and injuries from contaminated equipment associated with animal care and housing, such as cages, can be as great a risk as direct animal contact and should be addressed similarly.

Most animals used in research are bred specifically for that purpose and do not have the potential for transmitting the kinds of pathogenic organisms that those in the wild do; however, there are some illnesses and infections that can be passed from animals to people (i.e., zoonosis). With research animals, biological hazards are of most concern when the animals are naturally infected (e.g., macaques may have Simian Herpes B virus) or if animals are infected with a bacteria, virus, etc. as part of the experimental work. It is of critical importance that appropriate personal protective equipment and other appropriate protective measures be used to prevent infection.

The most important step to prevent infection following any bite, scratch, (or puncture from sharps exposure as discussed below) is to immediately and thoroughly wash the injury with soap and water. Inform a supervisor and follow the university procedures for on the job injuries (signs posted on exit doors of the animal facility).

**B. Physical Hazards**

Sharps such as needles, broken glass, syringes, pipettes, and scalpels are all commonly found in animal facilities and laboratories and present a physical hazard. Use extra care to avoid inadvertent contact and injury. Needle stick injuries represent substantial risk of becoming infected especially when injecting animals with microbial agents or drawing blood.

The animal facilities have puncture-resistant and leak-proof containers for disposal of sharps. To prevent needle sticks, it is critical to always place used needles directly into the sharps container without recapping or attempting to bend, shear, break, or remove the needle from the syringe.

**C. Chemical Hazards**

Potentially hazardous chemicals used in animal laboratories include solvents, acids, bases, fixatives, sterilants and anesthetics. Each chemical product should be handled carefully and label directions followed as well as the recommended personal protective equipment used. Safety Data Sheets (SDSs) are available in the animal facility. The SDS provide additional information on the hazards and precautions related to a chemical’s use. Users must be certain they understand the proper use of the chemical material before it is used.

**D. Animal Allergies**

Allergies to animals may adversely affect worker health. Workers who are continually exposed to animal allergens tend to have progressively more frequent and severe symptoms, and may develop asthma. It is critical that all workers seek to minimize their exposure to animal allergens. Prudent work practices include consistent use of personal protective equipment, housing animals in filter-top cages, working in well-ventilated areas and using ventilated hoods for soiled bedding disposal to minimize exposure to animal allergens.