CLSI Animal Care and Use

11.1.55.3 Rev. 2

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TABLE OF CONTENTS

1.0 PURPOSE

The Canadian Light Source Inc. (CLSI) is committed to providing a safe and healthful working environment for all staff, contractors, users, students and visitors. This document provides the general requirements to obtain approval to use live animals and the proper care and ultimate removal of animals from the CLS.

2.0 SCOPE

This document will apply to all personnel involved with the use of large and/or small live animals at the CLS. The use of large animals will be limited to the Biomedical Imaging and Therapy (BMIT) area. The CLS has not been designed to be a long term animal housing facility. In accordance with recommendations from the University of Saskatchewan University Committee on Animal Care and Supply (UCACS) the maximum time a live animal is to be held on site is 72 hours. Depending on the species of animal used there may be specific requirements necessary for their use; this document covers general and common requirements for all animal use. The CLSI HSE Department and/or the UCACS will request animal specific procedures to be provided based on the CLSI experiment proposal submission.

3.0 LIMITATIONS

3.1 EXPERIMENT TERMINATION CRITERIA

If at any time the care and use of animals at the CLS conflicts with recommendations from the UCACS, the experiment will be terminated immediately and the CLSI HSE department, beamline scientist and Director of Research notified.

3.2 GENERAL LIMITATIONS

The current limitations for animal use at the CLS are:

- The use of Risk Group Level (RGL) 2 infected/diseased animals that cannot be contained in an approved primary containment device cannot be considered at the CLS. Small animals housed in approved Containment Level 2 caging systems may be used provided all applicable CLSI requirements are met and the risk to human health and safety is low.
- Animals infected with RGL 3 or 4 pathogens will not be allowed into the CLS.
- No live animals should be held at the CLS for longer than determined by UCACS.
- The UCACS AERB in co-operation with the CLSI HSE department may designate certain experiments as "acute, non-survival" (animals euthanized at the end of the scanning period) if the radiation dose is judged to exceed that which would result in severe injury to the animal.
- The transport of animals from the U of S animal facilities to the CLS must comply with procedures drafted and stipulated by the University. Once animals are received at the CLS, the transport within the building must comply with this document and associated procedures.

- The U of S animal holding facilities must be notified prior to the scheduled experiment to arrange transport of the animals. Advance notification is required if animals are to return to the holding facility as special arrangements, such as quarantine, may be required.

4.0 BACKGROUND

CLS is a synchrotron facility housing state of the art equipment to scan materials covering a wide range of techniques for various scientific purposes. Although small animal work is approved at all beamlines, the BMIT beamlines were specifically designed, in part, for the purpose of imaging and radiation therapy research on small and large animals. Animal care and use at the CLS has been developed with guidance from the Canadian Council on Animal Care (CCAC) and the University of Saskatchewan's University Committee on Animal Care and Supply (UCACS).

4.1 DEFINITIONS AND ACRONYMS

Acute, non-survival: an animal is anaesthetized following receipt at CLS, maintained under anaesthesia for the duration of the experiment and terminated without recovery after the experiment is completed.

Biosecurity: Animal biosecurity refers to measures that prevent the introduction and spread of contagious diseases to other animals.

BSC: Biological Safety Cabinet

BMIT: Biomedical Imaging and Therapy beamline

CCAC: Canadian Council on Animal Care

CFIA: Canadian Food Inspection Agency

CNSC: Canadian Nuclear Safety Commission

HSE: CLSI Health, Safety and Environment Department

HVAC: Heating, Ventilation and Air Conditioning

Invertebrates: animals, such as an insect or mollusk, which lack a vertebral column.

LAA: Laboratory Animal Allergy

Large animal: For the BMIT purposes these animals are defined as having a body weight greater than 120 kg and not greater than 450 kg (maximum weight capacity of the positioning system). Large animals are animals which are too large to be housed and transported in a primary containment device and are usually from the farm animal category (i.e., cows, horses, goats, sheep, etc.)

MSDS: Material Safety Data Sheet

PHAC: Public Health Agency of Canada

POE: Primary Optical Enclosure

PPE: Personal Protective Equipment. PPE is equipment worn by a worker to minimize exposure to specific occupational hazards. PPE does not reduce the hazard itself nor does it guarantee permanent or total protection.

Small animal: For the BMIT purposes these animals are defined as having a body weight under 120 kg (maximum weight capacity of the positioning system). Small

animals are animals that can be housed and transported in a primary holding device, and are usually from the domestic pet or small laboratory animal category (i.e., mice, rats, cats, dogs, etc.).

SOE: Secondary Optical Enclosure

SOP: Standard Operating Procedure

UCACS: University Committee on Animal Care and Supply. The UCACS is the University committee responsible for the oversight of all aspects of the University's experimental animal care and use program.

UCACS AREB: The UCACS Animal Research Ethics Board is the committee that reviews and approves applications (protocols) to use animals.

U of S: University of Saskatchewan

User: An individual who requires access to the CLS to perform their research and has registered and completed the required training to participate in an experiment at the CLS facility.

Vertebrates: animals, such as mammals, birds, reptiles, amphibians, and fish, which have a vertebral column.

WHMIS: Workplace Hazardous Materials Information System

5.0 REGULATORY REQUIREMENTS

The Canada Labour Code Part II [19] states that the employer has a responsibility to protect the health and safety of the staff, contractors, users, students and visitors, from hazardous substances and activities that could cause personal injury or damage to the environment. This document addresses the unique hazards associated with live animal work by following the standards and guidelines set forth by the CCAC and the UCACS. It also incorporates applicable information from the Public Health Agency of Canada (PHAC) and the Canadian Food Inspection Agency (CFIA) regarding containment specifications to ensure personnel safety when working with animals.

6.0 ROLES AND RESPONSIBILITIES

The roles and responsibilities are defined in the *Health, Safety and Environment Manual* [14].

6.1 PERSONNEL QUALIFICATIONS

All animal care, handling, anaesthesia, and monitoring must be done by personnel with proper training and experience to ensure best practices. The CLSI adheres to the requirements set forth by the UCACS and requires that all animal handlers have completed the U of S web based animal care course [24] or equivalent from their home institution, as well as any relevant practical skills training. As part of the UCACS AREB review of animal care protocols, it is ensured that only trained individuals are involved in animal use and care.

Prior to acquiring access to the CLS and ultimately the BMIT experimental area, all users are required to complete the applicable CLSI training modules specified in the CLSI *Health, Safety and Environment Manual* (training sections) [14]. Personnel who will be

handling animals will be required to complete the CLSI *Animal Awareness* training module [4].

7.0 FACILITY DESIGN

Live animals may be used at any beamline within the facility. The BMIT beamline area is the primary area used for live small animal work. The BMIT beamline area is the only area used for large animal work at the CLS.

7.1 ANIMAL CONTAINMENT FACILITIES

The Canadian Biosafety Standards and Guidelines [2] outlines the requirements for animal containment facilities. The CFIA classifies animal facilities using specific designations for both the containment level and the type of animals to be held. For example, a facility using small animals with RGL2 organisms must comply with the Canadian Biosafety Standards and Guidelines. In general, animal facilities are always designed to a higher level than a laboratory as the actual animal rooms become the primary containment barrier rather than a Biological Safety Cabinet [1].

Small animals housed in approved Containment Level 2 caging systems may be used provided all applicable CLSI requirements are met and the risk to human health and safety is low.

7.2 SECURITY AND ACCESS

The CLS is a secure facility designed such that personnel are only allowed access to certain zones if they have passed specific training modules assigned to those zones. This access is restricted using a card reader system.

Access to the BMIT area will be regulated by using administrative procedures (i.e., training and signage). When animals are being used, signage will be posted reflecting that it is a restricted access area. As with all restricted areas, emergency personnel always have access for safety reasons.

7.2.1 The BMIT Area Designed Safety Features

A gating system has been installed to facilitate the movement of large animals into the animal preparation room. Two tie-off points are installed in the large animal holding pen to ensure that a large animal is secured while preparing the positioning system.

All floors are slip-resistant for the safety of personnel and animals. All surfaces in the animal holding area are sealed and capable of withstanding washing with a pressure sprayer and disinfectants or cleaning compounds.

7.2.2 Positioning Systems

The positioning systems are an integral part of determining the maximum size of animal that can be accommodated in each experimental hutch. The design specifications for the BMIT positioning systems are described in the *BMIT SOE-1 Positioning System Design Specifications* [8] and *BMIT Vertical Positioning System Performance Requirements (MRT- Lift: 120 kg load capacity)* [9].

8.0 ANIMAL USE

8.1 APPROVAL PROCESS FOR ANIMAL RELATED PROPOSALS

As per the CLSI *Health, Safety and Environment Manual* [14], all experiments using the services of the CLS are reviewed and approved for HSE concerns. The CLSI *Proposal Submission Guidelines* [17] describes the process for the submission of an experiment and the review process prior to the start of the experiment.

All research involving the use of live animals and/or animal tissues or fluids must comply with the *CLSI Ethics Guideline: when animals are involved* [11]. Experimental proposals to use live animals at the CLS must include a UCACS animal use protocol application form, describing the experimental procedure(s) including holding, handling, and all other manipulations (including anaesthesia and monitoring), for review by CLSI and the UCACS AREB. Additional detail in the form of SOPs may be requested.

CLSI will authorize an experiment to be conducted only after the activities associated with the experiment have been defined, hazards have been identified, adequate hazard controls have been implemented and all required documents have been submitted. A CLSI experiment permit is issued, identifying the specific controls and precautions required. The permit is posted near the beamline experimental station within the safety information board.

8.2 STANDARD OPERATING PROCEDURES (SOPs)

Although the CLS has guidelines and general requirements that users must comply with while working at the CLS it is impossible for the CLSI to develop SOPs to cover all possible permutations of live animal research. Therefore users may be required to provide SOPs subject to review by the CLSI HSE department and the UCACS AREB. SOPs for holding, handling, emergency response and all other manipulations (including anaesthesia and monitoring) may be required at the CLSI experimental proposal submission stage and/or the animal care review stage.

8.3 OCCUPATIONAL HEALTH AND SAFETY CONCERNS

8.3.1 Personal Injury

Working with animals poses unique risks such as bites, scratches, and kicks. It is a requirement to have trained and experienced animal care personnel working with the animal(s) during an experiment. It is recommended that there is at minimum 2 people involved in the maneuvering of a large animal into the holding area and ultimately into the positioning system. All personnel should remain calm and limit noise when handling large animals in order to help the animal feel safe and calm which may help prevent the animal from causing any injuries to itself or to handling personnel.

The use of needles and sharps while performing manipulations on animals poses a risk. Care and attention must be used when working with sharp instruments to prevent injury. Sharps must be disposed of in designated sharps containers.

Proper Personal Protective Equipment (PPE) must be worn at all times (see section 8.4) to help prevent injuries.

8.3.2 Allergens

Laboratory animal allergies (LAAs) are a significant occupational disease that may affect up to one third of personnel exposed to laboratory animals [21]. A combination of engineering and administrative controls along with effective PPE can eliminate or control allergen exposure. Safety equipment such as fumehoods, biological safety cabinets, gloves and particulate masks should be used when required.

8.4 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The requirements for PPE will differ depending on the size and species of animal being used. This document provides the basic and minimum requirement for PPE use at the CLS. Upon review of proposal submissions additional PPE may be required. PPE is only to be worn in designated areas (i.e., Laboratories, animal holding areas). At no time is PPE to be worn in areas within the CLS Public Access Zone and Free Access Zone, including the beamline corridors, washrooms, and lunch or coffee rooms.

The basic and minimum requirement for PPE working with small animals is:

- Lab coat or tie back gown
- Gloves (nitrile or latex; but leather may be required if biting/ scratching are an issue)

The basic and minimum requirement for PPE working with large animals is:

- Coveralls
- Leather gloves
- Steel toed shoes or rubber boots

Additional PPE items that may be required as per proposal review:

- Booties/ boot covers
- N95 masks
- Safety glasses/ goggles/ face shield
- Hair covers
- Cut resistant gloves
- Aprons

8.5 RESEARCH STAFF PREPARATION BEFORE AND AFTER WORKING WITH ANIMALS

At the CLS facility, Users will remove their outdoor clothing (i.e., jackets, etc.) and hang them in designated locations. Personnel will don the proper PPE before working in the animal preparation area. No PPE (boots, lab coats, gloves, coveralls, etc.) is to be worn in public areas (e.g., experimental floor, washrooms, lunch/coffee rooms, etc.). PPE is to be placed in a dirty clothes hamper or hung for reuse (if not soiled). Personnel are to wash their hands after working in the animal preparation area and prior to leaving the area. A shower is provided in the change room (Room 1111).

8.6 SIZE OF ANIMALS

Specific size limits of large and small animals are required because of the load capacity of the positioning systems used in the BMIT area. The weight load capacity of the Huber positioning system in POE-2 is 120 kg. The weight load capacity of the large positioning system in SOE-1 is 450 kg.

Large animals are animals which are too large to be housed and transported in a primary containment device and are usually from the farm animal category (i.e., cows, horses, goats, sheep, etc.). For the BMIT area purposes, large animals have a body weight of 120 kg to 450 kg. Small animals are animals that can be housed and transported in a primary holding device, and are usually from the domestic pet or small laboratory animal category (i.e., mice, rats, cats, dogs, etc.). For the BMIT area purposes small animals have a body weight of ≤120 kg.

8.7 MAXIMUM NUMBER OF ANIMALS IN THE FACILITY

The CLS is not designed or intended to house animals for long-term stays. Animals are to be transported to the facility for a specific experiment and then transported away. The UCACS recommendations stipulate that the maximum number of animals that can be held in the BMIT animal preparation areas (rooms 1112 and 1113) be the number that can be scanned within the time limit set for holding animals [23]. The number of animals intended to be in the BMIT area at any given time must be stipulated in the experimental proposal submitted and is subject to approval by UCACS and CLSI HSE. The primary concern regarding the number of animals is air quality and sanitation in the animal preparation room.

The maximum number of large animals in the facility at one time will be limited from one to three depending on the species and approval. There may be a large animal held in its transport trailer outside of the CLS; but not held in the animal preparation area as well. The guidelines for large animals will be evaluated in the future by the UCACS.

Only one species of animal can be held at any one time in rooms 1112 or 1113 of the BMIT area [23]. There may be times when beamlines other than the BMIT beamlines will require the use of a different species at the same time. In these cases, a designated laboratory will be utilized for holding live small animals. All requirements for animal care and use in this guideline will pertain to the designated laboratory when this occurs. Once both experimental enclosures (POE-2 and SOE-1) are operational there will be occasions where 2 different species of animals are used. This may be approved as long as proper operational practices are in place and biosecurity between the animals is maintained.

Animal biosecurity refers to measures to prevent the introduction and spread of disease from one animal (or one group of animals) to another. Some methods of maintaining animal biosecurity at the CLS include:

- Preventing direct contact between different species of animals
- Containment barrier primary enclosures for small laboratory animals
- Removing potentially contaminated clothing or PPE
- Vermin and insect control (see section 11.0)

8.8 INVERTEBRATES

This document is targeted toward the use of vertebrates at the CLS; however there are also experiments that will request the use of invertebrates (e.g., insects or mollusks). These animals pose similar but slightly different requirements than the vertebrate animals covered thus far. It is very important that these animals are properly contained to avoid escape into the facility, as it may be more difficult to capture an insect than other animals. Users will be required to submit protocols for the transport, holding and all other manipulations of live invertebrates prior to approval for use at the CLS.

9.0 ANIMAL CARE

9.1 TRANSPORTING AND MOVING ANIMALS

All animal research must have prior approval through CLSI administration and the UCACS AREB before transporting live animals to the premises. CLS is not equipped to directly handle any animals from institutions other than the U of S. Animals being transported from outside the U of S campus will require housing during the course of the experiment and may require an acclimatization period prior to the start of the experiment. Arrangements can be made with U of S animal care facilities. At no time will CLS house animals beyond 72 hours.

All transport of animals to the CLS must be arranged with the applicable U of S animal care facility and all transport must comply with the U of S requirements. The transport containers and vehicles must be approved by the University Veterinarian.

Care must be taken in handling containers holding live animals. Containers must be handled gently and never in a manner that may cause physical trauma or stress to the animals (i.e. not tilted needlessly, stacked in a manner that may cause the container to fall, not tossed or dropped, etc.). Once at the CLS all animals must be transported and moved within the facility in compliance with this document and related procedures, as well as any specific recommendations that may be in place for a particular proposal.

Animal transport recommendations:

- Transport containers should provide adequate ventilation with minimum visualization of the animals. Containers should be covered to minimize stress to the animal and to ensure less visibility to staff and visitors in the facility.
- Carts used to transport animals should be selected to minimize noise and provide quiet disturbance-free movement of animals.
- Animals should be transported in animal transport carriers specific to and approved for the species (see section 9.1.1 and 9.1.2)
- When multiple animals may be transported in one container (i.e. rodents) they should not exceed the approved density
- Animals should never be transported through public access areas (i.e., Main Lobby).
- The selected carriers must have ease of access for the user but prevent the escape of the animal.
- At no time shall a live animal be permitted to roam the CLS premises.
- Users must have appropriate animal escape procedures in place.
- Animal handlers must use proper PPE when handling animals to prevent animal bites, scratches, and exposure to allergens.

- Once the experiment is complete all animals and associated materials must be transported back to the U of S (for disposal and/or further experimentation).

9.1.1 Small Animal Transport

Some of the specific requirements for transport caging recommended by the UCACS guidelines [23] are as follows:

Laboratory rodent transport
Laboratory rodents must be transported in filtered transport containers specifically designed for that purpose or micro-isolator filter top holding cages. Transport container lids must be fastened to ensure the animals cannot escape should the cage be inadvertently dropped.

Laboratory rabbit transport:
Laboratory rabbits must be transported in crates approved for that species.

Dog and cat transport:
Dogs and cats must be transported in crates approved for those species.

Fish transport:
Fish must be transported in accordance with the CCAC guidelines on fish [1]. Fish must be transported in opaque enclosed containers (such as buckets with lids) containing the appropriate amount and quality of water for the duration of their stay.

Agricultural Animals: Transport of farm animals should comply with the Recommended Code of Practice for the Care and Handling of Farm Animals – Transportation [22] and Part XII of the Federal Health of Animals Regulations [20].

Poultry Transport:
Poultry must be transported in approved containers for those species.

Farm Animals (Less than 120 kg):

Piglets, lambs, goats, sheep, should be transported in approved containers for their species.

9.1.2 Large Animal Transport

Once the CLS has the capacity and approvals in place, all large animal transport must be done using the appropriate and approved containers for the species being transported.

9.2 ANIMAL RECEIVING

The BMIT area has two entrances from the outside. The North-east entrance serves as the main entrance for users and CLS staff to the BMIT area. The South-east entrance is an overhead door to be used for animal access to the animal area. The animal area is secured by four overhead doors. The corridor doors must remain closed when animals are in the area to prevent animals from entering the CLS corridor and to maintain HVAC system requirements. A gating system is in place to protect the overhead doors and to guide large animals onto the holding area. These gates must be in position before allowing an animal into the area. Small animals may be brought in via the overhead door or the smaller door adjacent to it. At no time are animals allowed to be transported through any other entrances to the CLS (the CLS Public Access Zone (i.e. the main lobby), old entrance, BMIT North-east entrance, etc.)

Until the BMIT receiving area is complete, the route of transport for small animals will be through the controlled loading dock (1069). Prior to the delivery of small live animals, one of the Research Team members is required to notify the CLSI stores personnel (657-3657) of the upcoming delivery. Trained personnel affiliated with the particular experiment must be at the entrance to accept the animals, ensure they are in good condition and placed in the appropriate holding location. At no time will animals be left unattended at the loading dock. The cages will be transported on carts. At no time are large animals to be received via this entrance.

9.3 ANIMAL CAGING, CONTAINERS, PENNING

Caging for holding all laboratory rodents while at the CLS will be filter top microisolator units [23]. Appropriate shelf rack units will be available for holding the cages in the designated rooms. Caging for holding other caged animals (e.g., rabbits, poultry, cats, dogs, etc.), and penning for slightly large animals (i.e., sheep, goats, etc.) will be made available by prior arrangement with the U of S animal care facilities. Where the animal is large enough (i.e., horse, cow, etc.) that only one animal is allowed in the BMIT holding area at a time, the BMIT fixed pen is approved for holding the animal. No other penning system or device would be required.

All animal holding equipment used at the CLS should be mobile / portable for ease of movement and sanitation. When the holding equipment (e.g., shelf racks, floor pen panels) is cleaned and not in use, it must be stored in a specified location.

9.4 HUSBANDRY

Animals can be stressed by the smallest changes to their daily routines. Animal care facilities are designed to ensure complete consistency in environmental conditions such as lighting, humidity, temperature, ventilation and sound minimization. Since the CLS is meant to only hold animals temporarily, some of these design features and abilities are not available in the holding areas. This section will provide recommendations for the best care of the animals with the current design of the facility.

9.4.1 Food and Water

All animals must have food and water available at all times, unless specified and approved in the animal care protocol. Users must supply enough food and water for each animal for the entire duration of their stay at the CLS. Food and water restrictions may be approved by UCACS AREB in specific cases. Thought and effort must be put into planning animal research at the CLS as live animals will need to urinate and defecate on a frequency based on the food and water intake. The release of excrement can pose problems for equipment and increase the time required for cleaning in the hutch areas.

9.4.2 Lighting- Photoperiod Control

The photoperiod cycle for the animals being held at the CLS should be maintained as much as possible. Ideally the lighting should be on a timer-controlled system. A timer controlled system is not currently available in rooms 1112 and 1113. When small animals are held in another designated laboratory, efforts should be made to maintain the photoperiod cycle by turning off the laboratory lights from 7 pm to 7 am. Signage should be posted to reflect this requirement. Signage will be provided through the CLSI HSE department.

9.4.3 Ventilation

The CCAC guidelines [1] provide the guidelines for the HVAC system(s) in animal facilities. The CCAC guidelines were taken into account in the design of the BMIT area to provide a healthy and comfortable environment for the animals and personnel. Not all of the requirements were necessary due to the fact that the BMIT animal area is a short term animal holding area only.

9.4.4 Temperature and Humidity

As per the UCACS guideline document [23], temperature and humidity should be maintained as appropriate for the species of animal being held. These levels should be monitored and recorded on a daily basis to ensure that these environmental factors are maintained in the holding area. Where room temperatures can't reach the ideal temperature for the species and age of animal (young pigs, for example), arrangements should be made to provide supplemental heat via heat lamp and/or space heater.

9.4.5 Noise

While animals are being held in the BMIT animal preparation room (room 1112 or 1113) or designated laboratory, every effort should be made to minimize unnecessary noise generation to minimize the stress on the animals.

9.5 ANIMAL HOLDING PERIODS

CLS is not an animal care facility and has not been designed to meet all of the CCAC guidelines on laboratory animal facilities [1]. Therefore the CLS is able to accommodate short-term animal holding only. No live animals should be held at the CLS for longer than determined by UCACS (currently 72 hours).

9.6 MONITORING/ OBSERVING ANIMALS

All animals being held at the CLS must be observed by qualified personnel to assess their health and well-being. Assessment of the animal's condition, check of food and water, sanitation, and environmental conditions (e.g., temperature) should be done. The qualified personnel must record the observations in an appropriate log book. Any unusual observations should be promptly reported to the CLSI HSE department and the attending veterinarian (e.g., UCACS Clinical Veterinarian).

Animals must be monitored while in the experimental enclosures. There are lead windows in the experimental hutch doors and camera systems which enable users to monitor animals while being scanned. Users should submit protocols regarding the response taken when something does not go as anticipated with the animal in the hutch. This response will vary with the experiment and species of animal used.

9.7 PREPARATION FOR SCANNING AND MANIPULATION

All animal manipulations (i.e., injections, infusions, restraint, sample collection, anaesthesia, etc.) must be described in the experimental proposal, animal use protocol application form, and/or specific SOPs that are submitted by the user for approval by the UCACS AREB and the CLSI HSE department. All manipulations must be done in areas

identified and approved for that purpose. These manipulations can only be done by trained and qualified personnel.

An anaesthetic gas scavenger must be used or the gas anaesthesia administered in a fume hood. A recovery area is required for animals coming out of general anaesthesia to provide safety for both the animals and personnel.

9.8 MONITORING RADIATION DOSES

Due care and attention must be taken with regard to maximum amounts of radiation that an animal can be exposed to for imaging and therapy applications. The dose must be based upon the advisement of a veterinarian or scientist in charge. The total radiation dose should be estimated and the animals monitored for any adverse reactions. Euthanasia may be required after experiments which result in high radiation doses to the animals.

9.9 STORAGE AND SECURITY OF CHEMICALS AND CONTROLLED SUBSTANCES

The CLSI *Laboratory Safety* [15] document provides information on the proper use, storage and disposal of chemicals in accordance with their WHMIS designation. Hazardous chemicals must be used in the proper engineering device (i.e., fumehood) and stored in the appropriate cabinet or area when not in use. All controlled substances, anaesthetics and/or narcotics used in animal experiments must be maintained in a secure and lockable location as designated by CLSI personnel.

9.10 SANITATION OF ANIMAL AREAS AND EQUIPMENT

The cleaning of animal areas and equipment is the responsibility of the experimental team for each particular experiment. The beamline scientist will be ultimately responsible to ensure that the experimental team cleans the areas and equipment according to specific SOPs.

All areas where animals are held, used or transported must be kept neat and clean and uncluttered. The caging and equipment used for the animal experiments must also be cleaned as part of each experiment. Depending on the proposal/animal experiment the user may be required to supply a specific disinfecting SOP outlining the amount/type of contamination (i.e., animal dander, excrement, etc.), the frequency of cleaning, the type of disinfectant used, contact time for the disinfectant required, PPE to be worn, and animal equipment (i.e., cages, penning, etc.) utilized.

The basic and minimum requirements for cleaning/disinfecting CLS animal use areas are:

- Animal areas are to be kept clean and uncluttered at all times.
- Proper PPE must be worn when disinfecting the animal areas.
- The complete disinfecting of surfaces, areas and equipment must be done between animal experiments and between the utilization of different species.
- The experimental user group must ensure there is a thorough cleaning at the end of their experiment and the beamline scientist must approve the cleaning before another experiment can begin.

- When using a water sprayer system of any type, care must be taken to minimize aerosol production as much as possible as excrement may harbor organisms that can be harmful to humans.
- If the pit in an experimental hutch has been contaminated, a water hose must be elongated into the space along with other cleaning equipment, and the contamination cleaned.
- A barrier device (i.e., flood gating system, etc.) must be placed in front of the SOE-1 hutch door when washing the floor in 1113 in order to prevent water from penetrating the hutch.
- All cleaning in the hutch area must be done carefully and with minimal force to ensure sensitive and expensive equipment is not damaged in the process.
- The sumps should be monitored and flooded (when required) as part of the cleaning process when there is a large amount of contamination present (i.e., excrement from a large animal).

9.11 WASTE DISPOSAL

Animal carcasses and tissues must be disposed of using an incinerator or other approved destruction method (i.e., alkali digestion). Biological/ biomedical waste must be chemically inactivated, autoclaved or transported to an approved facility for proper disposal. The CLS does not house an autoclave, incinerator, or other method for the destruction or inactivation of biological materials. The U of S provides this service to the CLSI at a fee.

The CLSI *Hazardous Material Management Plan* [13] specifies the requirements for the proper disposal of all wastes, including biohazardous waste, animal carcasses and soiled bedding from the CLS. Animal carcasses, tissues, or other biological materials required for further analysis will be removed by the scientist and/or members of the research team in appropriate containers following the CLSI *Sample and Material Transport Procedures* [18].

In general, the requirements for the collection and removal of biological wastes from the CLS are indicated below, but the CLSI *Hazardous Material Management Plan* [13] provides the complete requirements for disposal and must be followed.

- Animal tissues and carcasses destined for disposal should be placed in a heavy-duty cardboard box lined with double plastic bags and placed in a freezer until they are removed from the premises for disposal. The box must not weigh more than 20kg.
- No other waste (e.g. culture plates, gloves, test tubes, sharps, etc.) should be included with the animal carcasses. They should be disposed of separately.
- Animal tissues and carcasses should only be removed from their storage location (i.e., freezer), and placed in the proper outer transport container on the day of pick up from the U of S Waste Management Facility (WMF) or transport by the experimental team.
- Special arrangements must be made for larger or heavy carcasses or tissues. Contact CLSI HSE in advance.
- If bedding was used with healthy animals, it can be bagged and disposed of in the general waste (i.e., Loraas disposal system).

- If bedding is contaminated with an RGL2 material, the bedding must be either chemically inactivated and then disposed of in the regular garbage, or collected in a proper biological waste collection vessel and transported through the U of S to the approved external waste facility for inactivation and disposal.
- All sharps are to be collected in proper sharps containers, and disposed following the requirements in the CLSI *Hazardous Material Management Plan* [13].

10.0 EQUIPMENT

10.1 FUMEHOODS

Fumehoods are engineering controls that operate by drawing potentially contaminated air from an enclosed workspace directly out of a building or space. Fumehoods are available in the CLSI labs and the BMIT animal preparation area for use with hazardous materials. The fumehood is a requirement for the use of any volatile chemicals or anaesthetics. Where administration of gas anaesthesia within a fume hood is not practical for the purposes of the experimental work, an anaesthetic gas scavenging system provided by the user may also be used. Procedures for fumehood failure can be found in the CLSI *Emergency Response Plan* [12].

10.2 BIOLOGICAL SAFETY CABINETS

Biological Safety Cabinets (BSCs) are primary devices intended to contain and minimize exposure when working with biohazardous materials [16]. BSCs provide three types of protection; personnel, product and environmental. BSCs utilize vertical laminar airflow (i.e., uniform air velocity in one direction along parallel flow lines) to achieve a barrier of protection against airborne contaminants, such as microorganisms. BSCs use High Efficiency Particulate Air (HEPA) filters to clean air going into the work area and out to the environment. The HEPA filter removes airborne particles from the air, but does not remove chemical fumes.

The CLS has Class II type A2 BSCs available for use with RGL 2 biological agents and small animals that may be infected with RGL 2 agents. It recirculates 70% of the air used in the cabinet and exhausts 30% into the laboratory. **Volatile chemicals should not be used in the BSC as the recirculation of air can concentrate minute amounts of volatile vapor.**

These cabinets are tested annually. The BSCs must be used in accordance with the CLSI *Operation, Maintenance, and Spill Cleanup Procedures for a Biosafety Cabinet* [16] and *Laboratory Safety* [15] document. Procedures for BSC failure can be found in the CLSI *Emergency Response Plan* [12].

At no time will any infectious agents, carcinogens, toxic or volatile materials be used in an engineering device that is not certified to provide personnel protection to that type of hazard.

10.3 OVERHEAD HOIST AND ANIMAL RESTRAINT SYSTEM

Cranes and hoist systems are used very frequently at the CLS to manipulate large equipment. Anyone operating these systems must have completed the appropriate training. A portable crane system may be used to manipulate large animals in the preparation area. Large animals will be placed in the restraint/ positioning system in the holding area. The restraint system will be rolled into the experimental hutch and locked

in position possibly using the overhead crane system in the SOE-1. Once the positioning system, restraint system or combination is installed, procedures will be developed for their use and maintenance.

11.0 VERMIN AND INSECT CONTROL

Insects can act as vectors capable of transporting viruses and pathogens to and from facilities and are a risk to animal biosecurity. They must be prevented as much as possible from entering animal holding facilities or laboratories.

The following preventative measures are in place at the CLS to make an effort to meet this requirement.

- CLSI has a contract with a local exterminator to set live traps at various locations along the main floor of CLS near entry points and remove any vermin when required.
- Insect tape and attractants will be set up in specific locations near the entry points of the BMIT area and other entry locations at the CLS.
- Areas where animals are used will be kept clean and tidy to prevent attraction of vermin in those areas.
- Feed and bedding will be brought in on an experiment basis and will be in minimal quantities based on the 72 hour animal holding limit.
- Doors to animal areas will be kept closed and never propped open.
- If insects penetrate the BMIT area effort should be made to exterminate them with the use of insect swatters or sprays. Ensure that any sprays used are not harmful to animals or workers that may be in the area.
- If any wild animals are observed in the CLS animal areas, report this finding to your supervisor and the CLSI HSE department. Arrangements will be made to capture the animal and the occurrence must be noted in the experimental run report.

12.0 EMERGENCIES INVOLVING ANIMALS

The CLSI *Emergency Response Plan* [12] provides the general steps for personnel in the event of various types of emergencies including animal related emergencies (i.e., animal escape). This section of this document expands on these general requirements in order to be more specific for emergencies when animals are involved. This information will also be summarized in information sheets and posted in areas where animals are used.

12.1 ANIMAL ESCAPE

Measures should be taken to prevent any animal escape from occurring. These preventative measures include: the use of proper caging systems, restraints, transport methods, qualified personnel, number of personnel involved in transporting/ moving animals, proper sedation/ anaesthetic techniques used, and ensuring that the area doors are closed when animals are being handled. In the event an animal escapes, steps must be taken to ensure the animal's safe return to its cage, pen or restraint system. As animals are only to be manipulated in specific enclosed areas the risk of animals escaping onto the experimental floor should be low.

Small animals:

If a small animal escapes it must be retrieved before opening up the contained area (i.e., lab or experimental enclosure). The animal handler must ensure that proper personal protective equipment (PPE) is worn as animals that are scared or anxious may bite or scratch the handler as a defense mechanism. The animal handler should stay calm and quiet while approaching the animal. Once the animal is captured, it should be placed back into its caging or restraint system.

Large Animals:

All large animals used in the BMIT area will be handled by two trained animal handlers. If a large animal gets loose prior to securing in the restraining device, remain calm and quiet (and alert others in the area to do the same), take your time, be patient and stay alert as you may need to move quickly. Always have a safe escape route planned in advance. Once the loose animal quiets down, approach the animal calmly and secure the animal.

12.2 ANIMAL GOES DOWN WITHOUT WARNING

Unexpected emergencies can occur with animals just as they do for humans. Animals may die unexpectedly or emergency anaesthesia/euthanasia might have to be done. Plans must be in place for the safe moving and removal of these animals from the CLS. Users may be required to submit procedures for this type of event with their experimental submissions as the response will vary with the experiment and species of animal used.

12.3 POWER FAILURES

In the event of a power failure the CLS is equipped with emergency lighting in many areas including corridors and select types of equipment are on emergency backup power. Laboratories and computer operations are especially vulnerable, but added precautions must be taken in areas where animals are held as these types of disruptions will add undue stress to the animals.

12.4 FIRE ALARMS

All individuals at the CLSI must follow the CLSI *Building Evacuation Plan* [10] in the event of a fire alarm. Any animals in the facility at the time of a fire alarm will remain in their holding areas. The need for their evacuation will be determined by the Saskatoon Fire Department (SFD) personnel so that the animals are only moved or removed from a building if the threat of fire is imminent on their holding area. This minimizes the stress to animals.

In the event where anaesthesia is in the process of being administered or has been administered, these animals must be monitored by a trained animal handler at all times. The responding SFD unit must be informed and contact be made with the individual staying with the animal through the Chief Fire Warden or designate in the event of an evacuation. If the SFD unit deems it necessary to move that animal and evacuate the individual, this must be done immediately. At no time will the SFD jeopardize human life safety (when in imminent danger) to rescue animals.

12.5 MEDICAL EMERGENCIES

The CLSI *Emergency Response Plan* [12] gives the general requirements for medical emergencies at the CLS. If at any time an injury occurs, only those individuals trained in first aid may administer it. When animals are involved:

For minor (non-critical) injuries (i.e., cut, scratch, bite, etc.):

- Secure the animal in appropriate holding cage or pen or have someone else do it.
- Administer immediate first aid; depending on the injury this may be washing the wound and applying a bandage, or applying pressure to a stop a bleeding wound.
- Once the wound is cleaned; bandage the wound as appropriate.
- Seek medical assistance for proper wound care and additional treatments.
- Follow CLSI *Accident/Incident Reporting* Procedure [3].

For major (c*ritical) injuries:*

- *Call for* help (9-911) and have a properly trained person secure the animal if loose.
- Secure any other hazards in the area.
- Administer immediate first aid until help arrives.
- Provide all necessary information to emergency medical personnel.
- Notify your supervisor and CLSI HSE Department.
- Follow CLSI *Accident/Incident Reporting* Procedure [3].

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REVISION HISTORY

Revision	***Date***	***Description***	***Author***
A	2008-03-25	Original Draft	Corrine Harris
B	2008-04-15	Incorporate information from the BMIT team and members of the University of Saskatchewan Animal Care Community. Send out for official review.	Corrine Harris
C	2008-04-28	Incorporated comments/changes from official review process and sent out for final review.	Corrine Harris
0	2008-04-29	Issued for use.	Corrine Harris
0A	2009-05-26	Corrected title to Biological Safety Coordinator on title page. In consultation with BMIT team and U of S Veterinarian modified section 3.0 to remove limitation on terminal experiments only and added requirement for estimating total radiation dose and monitoring effects in section 9.8. Moved section 7.2.1 to section 9.2. Moved section 7.2.2 to section 9.4.2. Moved section 10.0 to section 8.8. Incorporated the live animal transport information from CLSI *Sample and Material Transport Guidelines (11.7.1.1.Rev. 0)*. Replaced reference to U of S Biosafety Cabinet Course with CLSI *Operation, Maintenance and Spill cleanup Procedures for a Biosafety Cabinet (BSC) (11.7.55.2).* Alphabetized bibliography and adjusted references in text. Minor changes to almost all other sections.	Jamie Van Cleemput
1	2010-01-27	Incorporated Changes & issued for use	Jamie Van Cleemput
1A	2014-09-23	Changed name to CLSI Animal Care and Use.	Allen Hodges
2	2015-01-12	Issued for use.	Allen Hodges