



Use of Radioactive Material in Animals

Standard Operating Procedure

Date: July 2024

Description

This document describes the protocols for the use of radioactive material in animals, which require additional precautions.

Introduction

Principal Investigators (PI) intending to use radioactive material (RAM) in research must be approved as an Authorized User (AU) by the University of Michigan Radiation Policy Committee (RPC), or the research must be performed under an approved AU. PIs who use RAM in animals must obtain additional approval from the [University of Michigan Institutional Animal Care & Use Committee](#) (IACUC). All investigators using RAM in animals are required to design and execute their studies in a manner that prevents unnecessary occupational exposure to ionizing radiation, keeps necessary occupational exposure as low as reasonably achievable, and complies with all applicable state and federal regulations.

Principal Investigators are required to house research animals containing RAM in approved animal care facilities. The PI must provide the [Unit for Laboratory Animal Medicine \(ULAM\)](#) with procedures that animal caretakers must follow with respect to cage handling and the collection and disposal of radioactive animal waste and bedding. To aid investigators, [Environment, Health and Safety/Radiation Safety Service \(EHS/RSS\)](#) and ULAM developed a set of standard protocols for care of animals containing RAM. *Please note that these protocols only address radiological considerations; they are supplemental to all other requisite ULAM animal care procedures for the safe and humane treatment of research animals.*

There are three radioactive animal care protocols described in this document. The protocols are categorized by a color-coding scheme of [GREEN](#), [YELLOW](#), and [RED](#), with **GREEN** imposing the fewest radiation-related requirements and **RED** the most. Depending on the amount of RAM administered to the animal(s) and type of radionuclide, EHS/RSS may task the PI with providing some or all of the animal care for the duration of the experiment.

EHS/RSS will review proposed animal experiments as part of the RPC approval process and will determine the correct color-coded protocol the investigator initially must use for housed animals. The determination is based on the conditions of use specified for each of the three protocols. The protocols address personal hygiene precautions for staff, cage cleaning instructions, and the collection, labeling, and disposal of radioactive waste. The PI obtains appropriately color-coded cage cards from ULAM that correspond to the protocol authorized by EHS/RSS. The color-coded cage cards alert investigators and ULAM personnel to the care restrictions and requirements pertinent to the housed animals.

Investigators approved to house animals in their own laboratories are encouraged to adopt the standard protocols and color-coded cage cards.

In addition to the general color-coded protocols, each investigator retains full responsibility for providing specific written radiological safe-handling instructions to ULAM personnel who are providing special care. For information or assistance, contact EHS/RSS (734-647-1143) or ULAM (734-764-0277).

Responsibilities

Principal Investigator

- **Obtain necessary approvals**

Research involving RAM in animals may **not** begin until the RPC and IACUC approve their respective applications.

RPC approval

Each investigator who wishes to use RAM in animals must either be an RPC-approved AU or collaborate with and perform the research under an AU approved to use RAM in animal studies of the type proposed in the IACUC application.

The RPC requires applicants to submit to EHS/RSS a written protocol describing the proposed research/experiment. At a minimum, the applicant must provide the information requested on the RSS-101 Form "Application for Authorization to Use Radioactive Material" (if not previously submitted) and the information required on the attachment to the [RSS-101 Form](#), "[Supplementary Information - Section 9 EHS/RSS-101 Form](#)."

If the animals are vertebrates, the RPC will also require the applicant or collaborator to obtain IACUC approval. The RPC can provide a conditional, interim approval to RSS-101 applications pending final review and approval of a corresponding IACUC application. However, a copy of the final IACUC approval must be submitted to EHS/RSS **before** RAM can be ordered and experiments can begin.

IACUC approval

The investigator must file an "[Animal Use Application](#)" with the IACUC for approval to purchase and use vertebrate animals in research. The application must indicate the intention to use RAM in animals and describe that use in the experimental protocol. The IACUC applicant must:

1. reference the RPC Approval Number under which the animal research will be performed;
2. indicate the name the AU, if different from the IACUC applicant;
3. list the radionuclide(s) that will be used;
4. indicate the chemical and physical form(s) of the radionuclides;
5. describe the manner of administration;
6. indicate the activity of each radionuclide that will be administered per animal (e.g., μCi per gram animal weight or other similar measure):

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7. indicate the color-coded protocol (**GREEN**, **YELLOW**, or **RED**) recommended by EHS/RSS for the proposed experiment; and
 8. include in the application any special animal care conditions imposed by the EHS/RSS for the purposes of radiological safety or regulatory compliance. [As an example, the EHS/RSS may require animals to be housed in an isolation room; that information must be included in the IACUC application.]

- **Complete radiation safety training**

EHS/RSS maintains or provides training courses for AUs and individuals handling or administering RAM to animals. This training must be completed before handling RAM or caring for animals that have been administered RAM. EHS/RSS provides customized training for animal care personnel, when requested.

- **Use appropriate cage card protocol as recommended by EHS/RSS**

A color-coded cage card designates each of the standardized protocols. Selection of the appropriate protocol (and hence the appropriate color-coded cage card) is essential to ensuring the safe handling of animals containing RAM. In order of increasing radiological risk, the color codes used are **GREEN**, **YELLOW**, and **RED**.

For some experiments, the radiological conditions may change over the duration of the experiment, warranting use of a less restrictive protocol than recommended by EHS/RSS at the beginning of the experiment (e.g., a **YELLOW** protocol may be downgraded to a **GREEN** protocol because excretion of RAM has largely ceased). Contact EHS/RSS for assistance and approval of downgrades.

These colors help animal care workers understand the level of hazard they might encounter with the radioactive animals:

GREEN – “**GO AHEAD**” indicates to the animal care worker the amount of RAM excreted is minimal and all waste/bedding can be treated as non-radioactive.

YELLOW – “**CAUTION**” indicates to the animal care worker to use caution because the animal and all waste/bedding are likely radioactive.

RED – “**STOP**” warns the animal care worker not to proceed. The PI or designated lab staff is responsible for animal care.

Notify ULAM of cage card color and any special conditions/variances that are necessary (as recommended by EHS/RSS), and obtain the pre-printed cage cards from a ULAM Area Supervisor. Side 1 of each card lists information concerning the AU, radionuclide/activity administered, and duration of animal care. Side 2 lists information needed for the radioactive waste record. Cards are mounted on animal cages or pens. Return completed cards at the end of the experiment to EHS/RSS.

The AU and/or designated lab staff is responsible for providing “**Caution: Radioactive Material**” tape for the duration of the experiment.

For detailed descriptions of each protocol, as well as instructions for completing [cage cards](#) are included in this document.

- **Use appropriate door postings, if required**

Contact EHS/RSS (734-647-1143) for door posting information.

- **Use appropriate techniques to control contamination during experiments**

Radioactive contamination of laboratories and/or animal care facilities can represent a radiological hazard to personnel. More often, contamination is a regulatory nuisance. Follow these rules to avoid laboratory and/or facility contamination:

- Isolate contaminated tools/equipment, or used tools/equipment suspected of being contaminated, in designated areas in the laboratory or in a suitable storage area until it can be surveyed to determine the contamination level. If a tool/equipment is contaminated, label it with **“Caution: Radioactive Material”** tape and decontaminate it as soon as possible.
- Routinely survey tools/equipment following use. Perform contamination surveys following the procedures detailed in [“Conducting a Radioactive Contamination Survey Using a Survey Meter”](#) and [“Conducting a Radioactive Contamination Survey Using a Swipe Test.”](#)
- Do not return tools/equipment to stock or service unless it is completely free of radioactive contamination inside and out.
- Place tools, equipment, or any other apparatus used for handling RAM in nonporous metal trays or pans lined with plastic-backed absorbent (disposable) paper. Survey and change (and properly dispose of) paper frequently.
- Designate one sink in each laboratory for washing radioactive contaminated equipment.
- Do not allow radioactive contamination to remain on work surfaces. If decontamination efforts are unsuccessful (i.e., if contamination exceeds three times background), contact EHS/RSS.

- **Collect radioactive waste for disposal**

EHS/RSS has established guidelines for the appropriate disposal of animal carcasses, pathological waste, and bedding. Follow [“Proper Segregation and Disposal of Low-Level Radioactive Waste Procedures”](#) and the guidelines in the Waste Disposal section.

- **Decontaminate and survey facilities at the end of experiment**

The AU or designated lab staff is responsible for decontaminating all cages and/or pens at the end of an experiment for which a **YELLOW** or **RED** protocol is used, and notifying ULAM after cages and/or pens have been surveyed and are free of residual radioactive contamination (before releasing cages to the cage wash). Perform contamination surveys of cages and/or pens following the procedures detailed in [“Conducting a Radioactive Contamination Survey Using a Survey Meter”](#) and [“Conducting a Radioactive Contamination Survey Using a Swipe Test.”](#)

Cages **must** be free of radioactive contamination **prior** to sending to the ULAM animal cage wash area. Wash and rinse cages and pens with soap and water or an appropriate decontamination agent, then survey the dry cage(s) or pen(s) and the room for contamination using an appropriate survey meter and/or swipes. Consider contamination survey results less than three times background to be free of contamination. Once the cage(s) and/or pen(s) are confirmed to be free of radioactive contamination, the AU or designated contact person **must** notify the ULAM Area Supervisor. The AU or designated contact person is responsible for removing all animal cage cards and any other postings on the cage(s), pen(s), or room doors. Return animal cage cards to EHS/RSS.

Contact EHS/RSS (734-647-1143) with any questions regarding contamination surveys of animal cages, pens, and/or rooms, or to arrange for facility release surveys.

- **Maintain a record of contamination surveys performed on cages**

The AU is responsible for maintaining documentation of all survey results for cages, pens, and rooms. Survey records are subject to inspection by EHS/RSS and the U.S. Nuclear Regulatory Commission.

ULAM

- **Provide GREEN, YELLOW, or RED cage cards to AUs per EHS/RSS specification**
 - ULAM obtains cage cards from EHS/RSS for distribution to AUs.
- **Provide animal housing**
- **Conduct animal care for GREEN or YELLOW cage cards unless other arrangements are made with the lab**
- **Contact EHS/RSS for confirmatory/release survey of a room or pen (if necessary)**
- **Provide training and approve research staff to perform animal care for RED cage card (isolation room)**

EHS/RSS

- **Confer with and advise PI on proper cage card (GREEN, YELLOW, or RED)**
- **Notify AU of cage card color and any special conditions/variances that are necessary**
 - EHS/RSS lists special conditions (if necessary) in the EHS Safety Findings of the IACUC approved animal protocol.
- **Oversee radiation safety, including confirmatory contamination surveys**
 - EHS/RSS personnel perform routine audit surveys of rooms used to house radioactive animals, and room/pen release surveys (upon request).
- **Supply door postings, if required**
- **Collect waste containers (EHS/Hazardous Material Management)**
- **Conduct facility release surveys in ULAM isolation rooms**
- **Provide appropriate radiation safety training**

Potential Hazards

Exposure to high levels of ionizing radiation can cause adverse health effects, which may be prompt or delayed. Prompt effects occur after the exposure reaches a dose threshold, which varies by radionuclide and activity (amount). An example of Use of Radioactive Material in Animals

a prompt effect is a skin burn received by direct exposure to many minutes of medical fluoroscopy. An example of a delayed effect is cancer. The risk of cancer induction is proportional to exposure, without a threshold. Occupational exposures are typically very low (especially in animal research), so the risk of adverse health effects is extremely low. Personal monitoring devices (dosimeters) are typically not required for ULAM personnel when caring for radioactive animals. Contact EHS/RSS (734-647-1143) for more information or to evaluate any exposure of concern.

Occupational Dose Limits

Annual occupational dose limits for ionizing radiation are:

- 5,000 mrem to the whole body
- 15,000 mrem to the lens of the eye
- 50,000 mrem to the skin, or organ or tissue other than the lens of the eye
- 50,000 mrem to the extremities (i.e., arms below the elbow)

Engineering Controls

Shielding may be required for certain radionuclides/activities used in animal procedures, as determined by EHS/RSS.

Work Practice Controls

GENERAL SAFETY RULES FOR ANIMAL CARE WORKERS (ULAM OR LAB PERSONNEL)

Observe the following rules in order to protect yourself against inhalation, absorption, or ingestion of RAM:

- Do not eat, drink, smoke, prepare or store food, or apply cosmetics in laboratories or facilities where RAM is used or stored.
- Do not store food and beverages in the same storage location (refrigerator, freezer, etc.) as RAM. Storage locations of RAM must be appropriately labeled.
- Wear latex or nitrile gloves when handling RAM. Two pairs of gloves are recommended.
- Wear protective clothing (lab coats, gowns, etc.) when handling RAM.
- Leave protective garments in the laboratory or animal housing room when work is completed or until monitored and surveyed free of contamination. Dispose of single use garments in designated radioactive waste containers.
- Wear an N-95 mask when handling **YELLOW** or **RED** cage card animal bedding, if cages are opened outside of a ventilated biosafety cabinet (BSC) or changing station.
- Do not work with RAM if there are uncovered open cuts or abrasions on your body (e.g., finger, hands, or arms).
- Lab personnel monitor your hands, feet, clothing, and work area for contamination when working with RAM.
- Follow [cage card instructions](#) listed in this document.

Personal Protective Equipment

See [GENERAL SAFETY RULES FOR ANIMAL CARE WORKERS](#).

Transportation and Storage

Animals that have been administered RAM **must** be relocated (walked) in a manner that prevents any contamination of hallways, elevators, etc. Solid bottom transfer containers are **MANDATORY**. Radioactive animals **must not** be relocated (walked) across public streets or sidewalks without approval of EHS/RSS (734-647-1143).

Animals that have been administered RAM must not be transported in vehicles on campus or elsewhere using publicly accessible roads unless EHS/RSS determines that doing so is permissible under U.S. Department of Transportation regulations. EHS/RSS must approve the relocation of animals containing RAM and strongly discourages the relocation of animals between detached or separate facilities. EHS/RSS will not transfer such animals, which must be transported in accordance with ULAM provisions.

Waste Disposal

EHS/RSS has established guidelines for the appropriate disposal of animal carcasses, tissues, and pathological waste; the PI and/or designated lab staff is responsible for proper carcass/tissue disposal.

Carcasses and tissues removed from animals, as well as cage/pen wastes (i.e, animal excreta and bedding), **must** be collected in strong, leak-proof (yellow) plastic bags provided by EHS/Hazardous Materials Management (HMM) (734-763-4568) and sealed tightly with **“Caution: Radioactive Material”** tape. Bags must be tagged/labeled with the AU/Investigator’s name, radionuclide(s), total collected activity or total activity in carcass, and date RAM was administered. Place these bags in a designated freezer for radioactive animals and waste. EHS/HMM will collect and dispose of all forms of radioactive waste.

EHS/HMM provides bags and tags for labeling all radioactive animal and pathological waste, upon request by AUs who use RAM in animals.

For more information about disposal of animal carcasses/tissue, bedding, and pathological waste, see [“Proper Segregation and Disposal of Low-Level Radioactive Waste Procedures.”](#)

Spill Procedure

Principal Investigator

In the event of a spill or emergency involving RAM, the immediate objectives are to attend to any medical emergency, prevent or reduce the opportunity for personnel contamination, prevent the dispersal or spread of contamination, and decontaminate the affected area. All individuals working with RAM should be familiar with the “SWIM” response to a radioactive spill:

- **Stop work, stop the spill.**

Provide first aid to injured personnel. DO NOT let the possibility of radioactive contamination hinder first aid and lifesaving efforts.

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- **Warn all individuals in the general vicinity that a radioactive spill or accident has occurred.**
 - Keep personnel out of the contaminated area/room.
 - Keep potentially contaminated personnel from leaving the affected area until confirmed to be free of contamination.

 - **Isolate the spill to prevent the spread of contamination.**
 - If liquid, lay absorbent paper over area of spill.
 - If fine powder, lay damp absorbent paper on area of spill.
 - If airborne contamination is possible, control facility air flow by turning off fans, hoods, and ventilation, and close all doors and windows. To have ventilation turned off, contact:
 - Campus and Medical School: Call Facilities & Maintenance Central Shops Building Automation Systems (734-763-4013)
 - Hospitals (Brehm, Cancer Center): Call Hospital Maintenance (734-936-5054)

 - **Mitigate the spill**

Determine if your clothing or skin is contaminated using appropriate survey equipment.

If clothing is contaminated, carefully remove contaminated clothing and place it in a plastic bag. Label the bag with **“Caution: Radioactive Material”** tape, name, and date.

If skin is contaminated, initiate decontamination by lathering intact skin areas with mild soap/detergent and warm water for several minutes.

Notify your area supervisor and contact EHS/RSS (734-647-1143) if there is skin contamination or floor contamination, or if there are questions about the appropriate response to a spill.

For large spills (i.e., >1 liter), a large area of contamination (i.e., >10 square feet), skin contamination, or if contamination spreads outside the room or origin, decontamination must be performed under EHS/RSS supervision. ULAM Area Supervisors or AUs must contact EHS/RSS ([Emergency Reporting](#)) if any such emergencies occur.

ULAM

Contamination potentially encountered by ULAM personnel, while caring for animals, changing bedding, or working with contaminated cages, involves a much lower activity/concentration than the RAM administered to animals by an investigator. The risk posed by such contamination is low and adequately managed by the proper use of PPE (as described in [Work Practice Controls](#)). It's unlikely that clothing/scrubs under PPE would become contaminated, requiring removal. However, should ULAM personnel suspect contamination, follow the instructions above ([Mitigate the Spill](#)).

Emergency Reporting

For radiological emergency assistance during normal working hours (8:00 a.m. to 4:30 p.m.), call EHS/RSS (734-647-1143).

For radiological emergencies after hours or on weekends/holidays, call the U-M Department of Public Safety & Security (DPSS) (734-763-1131) and request radiation safety assistance. DPSS will mobilize the on-call EHS Incident Response Team.

For emergency assistance regarding animal care during normal working hours (8:00 a.m. to 4:30 p.m.), call ULAM (734-764-0277). Call DPSS (734-763-1131) after hours and on weekends/holidays. Each investigator retains full responsibility for providing written protocols covering emergency situations that may arise with animals.

Training of Personnel

EHS/RSS

EHS/RSS provides training for research staff that work with RAM in animals. All research staff working with RAM in animals are required to complete the **Radiation Safety Orientation Course** (EHS_RSS103w) via [My LINC](#). Furthermore, all personnel must read, acknowledge (sign), and fully adhere to this SOP when handling RAM or using RAM in animals. EHS/RSS provides customized radiation safety training, as needed; contact EHS/RSS (734-647-1143) to arrange for customized training.

ULAM

Trains and approves research staff to perform animal care for **RED** cage card (isolation room).

GREEN PROTOCOL – “GO-AHEAD”

CONDITIONS FOR USE

- No appreciable excretion of RAM will occur, as determined by EHS/RSS.

PERSONAL HYGIENE

- Wear PPE required for room entry.
- Remove PPE when exiting the room and discard in appropriate PPE waste receptacle.

ANIMAL CARE

- Animal carcasses and tissue must be properly disposed per EHS/HMM guidelines (see [Waste Disposal](#)). The PI and/or designated lab staff is responsible for proper carcass/tissue disposal.
- Treat waste and bedding as non-radioactive solid waste. This does not apply to carcasses.
- ULAM workers may provide all routine animal care, cage manipulation, and cleaning.

ADDITIONAL INFORMATION

- Standard protocol code **GREEN** is appropriate until the animal is humanely euthanized or undergoes additional procedures.
- A new cage card **must** be used each time any animal receives RAM.

YELLOW PROTOCOL – “CAUTION”

CONDITIONS FOR USE

- Animal bedding is assumed to be contaminated and must be collected and stored as radioactive waste, as determined by EHS/RSS.
- Animal cage/room must meet general animal facility housing requirements, as determined by EHS/RSS in consultation with ULAM, or an isolation room must be used.

PERSONAL HYGIENE

- Wear PPE required for room entry, including an impermeable gown. Two pairs of shoe covers must be worn while cleaning pens.
- Use either a ventilated BSC / changing station or N-95 mask when changing bedding.
- Remove PPE (including outer shoe covers only) when exiting room and discard in designated radioactive waste receptacle. Do not commingle used PPE with animal bedding or pathological waste.

CAGE AND PEN CLEANING

- After cages are changed, contact AU and/or designated lab staff to arrange for a cage contamination survey. If no one is available to survey the cage, set the cage aside and label with “**Caution: Radioactive Material**” tape (provided by AU/lab staff) until it can be surveyed.
- Use strong, leak-proof (yellow) plastic bags supplied by EHS/HMM to collect bedding.
- Place absorbent paper on the floor under the waste container to catch spilled bedding.
- For large animals, try to collect feces before cleaning pens/cages.
 - Collect and place into containers for radioactive waste collection.
- Scrape cages as clean as possible.
- Survey cage for contamination (performed by AU or their designee).
- Once the cage is decontaminated, discard disposable gloves in designated radioactive waste container. Using new/clean gloves, seal yellow bag and label with the EHS/RSS provided “**Radioactive Animal/Pathological Waste**” tag. Be sure to complete all of the information requested on tag.
- Initial Side 2 of cage card each day the cage is cleaned (see [Instructions for Completing Cage Cards](#)).
- Store bags in the freezer designated for radioactive animal carcasses and waste.

To Enter Animal Pen

- Place absorbent paper on the floor outside the pen.
- Place all supplies needed on paper.
- Use tools/equipment designated (dedicated and labeled) as “**RADIOACTIVE**” (i.e., potentially contaminated).
- Put on two pairs of shoe covers and two pairs of gloves.
- Enter the pen; do not let animal out of the pen.
- Collect cage waste materials in strong, leak-proof (yellow) plastic bag(s) supplied by EHS/HMM.
- Scrape tools clean.
- Leave tools in the designated area within the pen.

To Leave Animal Pen

- Place supplies on paper outside the pen.
- If removing tools/equipment designated as “**RADIOACTIVE**” (i.e., potentially contaminated), they must be surveyed and found to be (or decontaminated to) less than 3 times background.
- Stand on paper, remove one outer shoe cover, and step on the floor; repeat with other foot. Do not step on “clean” floor with a “dirty” (outer) shoe cover.
- Place removed outer shoe covers in designated radioactive waste container.
- Remove the outer pair of gloves and place in designated radioactive waste container.
- Transfer supplies and tools from the paper to their designated storage area.
- Wearing inner gloves, roll up paper and place it in designated radioactive waste container.
- Discard the inner pair of gloves in designated radioactive waste container.
- Using new gloves, seal a yellow plastic bag and label it with EHS “**Radioactive Animal/Pathological Waste**” tag.
- Store carcasses and yellow radioactive waste bags in the freezer designated for radioactive animal carcasses. The PI and/or designated lab staff is responsible for proper carcass/tissue disposal.

FURTHER ANIMAL CARE

Use initial standard protocol **YELLOW** until the animal is either humanely euthanized or undergoes additional procedures. When applicable and approved by EHS/RSS, the standard protocol can be reclassified from **YELLOW** to **GREEN** if the conditions of use for **GREEN** protocol are met (i.e., no measurable radiation dose from the animal and no radioactive excreta).

RED PROTOCOL – “STOP”

Before using this protocol, the AU **MUST** notify the ULAM Area Supervisor of the person who will be providing the necessary animal care, as well as any special non-radiological considerations (i.e., biohazards, toxic chemicals, etc.). This person must perform animal care tasks in accordance with ULAM procedures and any additional instructions from the ULAM Area Supervisor.

CONDITIONS FOR USE

- The degree of hazard may require isolation of the treated animal(s). This will be determined by EHS/RSS.
- Access to the isolation room is restricted to necessary personnel only.
- Arrangements for an isolation room must be made with ULAM prior to the start of the planned experiment.
- The AU, together with EHS/RSS, will determine the duration of the isolation and whether downgrading to a lower protocol level may be appropriate.
- The AU or another trained individual provides all routine care of the animal for the designated care period, including manual cage cleaning (in the isolation room) and room cleaning. The person(s) providing animal care must be identified on Side 2 of the cage card (see [Instructions for Completing Cage Cards](#)).
- The AU is responsible for decontamination of the room and equipment at the conclusion of the experiment. Decontamination results must be documented and the records are subject to EHS/RSS inspection.

ROOM PREPARATION

- If EHS/RSS has determined isolation is necessary, contact the ULAM Area Supervisor well in advance of the planned experiment to make arrangements for an isolation room.
- Post isolation room with a “DO NOT ENTER” sign and a code RED cage card. These signs cannot be removed until decontamination results prove to be less than 3 times background as determined by the AU.

PERSONAL HYGIENE

- Wear PPE required for room entry, including an impermeable gown. Two pairs of shoe covers must be worn.
- Use a ventilated BSC / changing station or N-95 mask when changing bedding.
- Remove PPE (including outer shoe covers only) when exiting the room.

CAGE AND PEN CLEANING

The AU or designee is responsible for decontamination and routine cage cleaning. Investigators are not allowed to use ULAM cage wash facilities. Husbandry tasks must be completed during regular working hours.

Cage cleaning – AU or designee is responsible for cage cleaning and contamination survey; this must be performed in the isolation room. (Note: If no one is available to survey the cage, set the cage aside and mark with “**Caution: Radioactive Material**” tape until it can be surveyed.)

- Use strong, leak-proof (yellow) plastic bags supplied by EHS/HMM to collect bedding.
- Place absorbent paper on the floor under designated waste container to catch spilled bedding.
- Scrape cages as clean as possible.
- Survey cage for contamination (to be performed by AU or designee).

To Enter Animal Pen

- Place absorbent paper on the floor outside pen.
- Place all supplies needed on paper.
- Use tools designated/labeled as “**RADIOACTIVE**” (i.e., potentially contaminated).
- Put on two pairs of shoe covers and two pairs of gloves.
- Enter the pen – do not let animal out of pen.
- Collect cage waste in leak-proof (yellow) plastic bags supplied by EHS/HMM.
- Scrape tools clean.

To Leave Animal Pen

- Place supplies on clean paper outside the pen.
- If removing tools/equipment designated as “**RADIOACTIVE**” (i.e., potentially contaminated), they must be surveyed and found to be (or decontaminated to) less than 3 times background.
- Stand on paper, remove one outer shoe cover, place it in the designated radioactive waste container, and step on the floor; repeat with other foot. Do not step on “clean” floor with a “dirty” (outer) shoe cover.
- Remove the outer pair of gloves and place them in the designated radioactive waste container.
- Transfer supplies and tools from the clean paper to their designated storage area in the room or pen.
- Roll up paper and place it in a designated radioactive waste container.
- Discard the second pair of gloves in the designated radioactive waste container.
- Using new/clean gloves, seal yellow bag and label with EHS/RSS provided “**Radioactive Animal/Pathological Waste**” tag.
- Store carcasses/tissue and animal bedding in the freezer designated for radioactive animal carcasses. The PI and/or designated lab staff is responsible for proper carcass/tissue disposal.

Decontamination of Animal Pens and Equipment



- Scrape cages and pens as clean as possible.
- Keep cleaned tools/equipment out of service until verified to be successfully decontaminated (i.e., survey results less than 3 times background).
- Thoroughly mop and rinse the isolation room floor using ULAM-recommended cleaner(s). Floor must also be surveyed for contamination. Room cannot be released until it has been verified that it has been successfully decontaminated (survey results must be less than 3 times background). Mop must also be surveyed for contamination and properly disposed of as radioactive waste, if contaminated.

FURTHER CARE

- Animals may be returned to a general animal care facility when conditions of use meet the [YELLOW](#) or [GREEN](#) protocol requirements for general use facilities. EHS/RSS must review and approve AU procedures prior to reclassifying animals to **YELLOW** or **GREEN** protocols for release to general care facilities.
- ULAM personnel may assume animal care responsibilities when standard protocols **YELLOW** or **GREEN** can be used.
- EHS/RSS will assist the AU with the evaluation of radiation conditions and selection of the proper RSS animal care standard protocol.

INSTRUCTIONS FOR COMPLETING CAGE CARDS

SIDE 1

 **CAUTION**  **RADIOACTIVE MATERIAL** _____
Card Sequence No.
(if multiple cards)

Lab Contact: _____ Phone: _____ Authorized User: _____
Animal I.D. or Species: _____ Animals / cage: _____ Rm / Bldg: _____

Radionuclide: _____ $\mu\text{Ci}/\text{Animal}$: _____ $\mu\text{Ci}/\text{cage}$: _____ Date Administered: _____
Animal Care Start Date: _____ Animal Care End Date: _____

Will animal(s) be euthanized at end of the animal care period? Yes No


If "No," designate future animal care requirements: _____

Investigator must provide additional cage cards with estimated daily excretion (see other side) over the duration of care period. Note Card Sequence No. in upper right corner.


Return used cards to Radiation Safety Service: 1239 Kipke Dr. 1010 (CSSB)
Radiological Emergencies: 647-1143 (business hours) / 763-1131 (DPSS; after hours)

1. **Contact Person.** Name of person directly responsible for the animal.
2. **Phone.** Telephone number for contact person during regular work hours.
3. **RSS Authorized User's Name.** Name of PI authorized by RPC to use RAM in animals.
4. **Animal ID (or Species).** For animals assigned individual ID numbers, record both the common species name and the ID number. For all others, record common species name.
5. **Animals/Cage.** Number of animals being housed together at the start of the care period. A notation must be made if this number changes during the care period.
6. **RM/Bldg Location.** Building and room number in which animals are housed during the designated care period.
7. **Radionuclide.** Include all radionuclides if more than one is administered.
8. **$\mu\text{Ci}/\text{Animal}$.** Complete this item when only one animal is housed per cage or pen (or N/A).
9. **$\mu\text{Ci}/\text{Cage or Pen}$.** Complete this item when two or more animals are housed together (or N/A).
10. **Date Administered.** Month and day radionuclide was administered to the animal(s).
11. **Animal Care Start Date.** Include day of week and date (month/day) when this protocol begins.
12. **Animal Care End Date.** Include day of the week and date (month/day) for the last day this protocol will be in effect.
13. **Will animal(s) be euthanized at end of this animal care period?** If an animal will be euthanized on date designated in item 13, answer YES.
14. **Future animal care requirements.** If response to item 13 is NO, specify the next protocol to be used and prepare an appropriate cage card to be ready for use.

SIDE 2



CAUTION
RADIOACTIVE MATERIAL



Radioactive
Waste Record

Approved Authorized User: _____ Radionuclide: _____ T 1/2: _____
 Investigator: Fill in **day, date,** and **estimate of maximum radioactivity excreted (μCi)** for each day of care requested.

Day						
Date						
Est'd μCi Excreted						
Cage or Pen Cleaned by:						

Animal Care Personnel: Record initials on days cage/pen is cleaned.
 Collect wastes in plastic bags provided by EHS-HMM and seal with radioactive warning tape.
 Label bag with EHS-HMM provided animal waste tag.


15. **RSS Authorized User.** AU's name ONLY (do not enter contact person's name here).
16. **Radionuclide.** List all radionuclides administered.
17. **T_{1/2}.** List half-lives of all radionuclides administered. Be sure related information is in the same order as in Item 17.
18. **Day.** List the day of week for each consecutive day of care specified by Items 12 and 13 on Side 1 of cage card.
19. **Date.** List the date (month/day) for each consecutive day of care specified by Items 12 and 13 on Side 1 of cage card.
20. **Estimated Excretion.** Record an estimate of maximum radioactivity that could be excreted each day on a per cage or per pen basis. Since each daily estimate is independent of the other estimates, the sum of the estimates often will be greater than the total administered activity.
21. The person(s) providing the animal care must initial the card each day after they clean the cages. They are responsible for the proper collection, packaging, labeling, and disposal of the cage litter as radioactive waste. If care exceeds 5 days, obtain a new cage card from ULAM.

DOOR POSTINGS

Door signs may be required for certain animal rooms; the need for a door posting will be determined by EHS/RSS. Contact EHS/RSS (734-647-1143) for posting information. Here are **examples** of door postings used by Nuclear Medicine researchers for **YELLOW** and **RED** protocols.

YELLOW PROTOCOL

Authorized Personnel ONLY
Yellow Card Protocol



Caution: Radioactive Materials

Radionuclide: _____ Amount: _____ <mCi and Half Life: _____
Date/Time Administered: _____ Date/Time Ending: _____
Building: _____ Room: _____ Date Posted: _____

Instructions / Special Precautions For Non-Laboratory Staff


- 1) Time Restrictions: Limit time spent in animal housing room to:
 - a. ___ minutes/visit
 - b. Maximum of ___ minutes/day
- 2) Contact laboratory staff in case of emergency.
- 3) Contact veterinarian (734-764-0277) for any animal related concerns.
- 4) Do not touch animal(s), body fluids or feces when this is posted.
- 5) Do not remove, clean or spray cage tray when this is posted.
- 6) Resume normal duties when approved by ULAM area supervisor OR the signage has been removed.

Follow Standard Yellow Card Protocol
 Follow these additional procedures:

Hazardous Agent(s): Radioactive Animals
Protocol(s) #:
PI Name:
Questions - Radiation Safety Services (RSS): 734-764-6200
Questions - Laboratory Contact Name: _____ Phone: _____
After Hours Emergency Contact: UM DPSS 734-763-1131
After Hours Laboratory Contact Name: _____ Phone: _____

RED PROTOCOL


Authorized Personnel ONLY
Red Card Protocol



Caution: Radioactive Materials

Radionuclide: _____ Amount: _____ <mCi and Half Life: _____
Date/Time Administered: _____ Date/Time Ending: _____
Building: _____ Room: _____ Date Posted: _____

Instructions / Special Precautions For Non-Laboratory Staff



- 1) DO NOT ENTER THIS ROOM WHEN THIS SIGN IS POSTED.
- 2) Lab will be providing all care while this sign is posted.
- 3) Contact laboratory staff in case of emergency.
- 4) Contact veterinarian (734-764-0277) for any animal related concerns.
- 5) Resume normal duties when approved by ULAM area supervisor OR the signage has been removed.

Hazardous Agent(s): Radioactive Animals
Protocol(s) #:
PI Name:
Questions - Radiation Safety Services (RSS): 734-764-6200
Questions – Laboratory Contact Name: _____ Phone: _____
After Hours Emergency Contact: UM DPSS 734-763-1131
After Hours Laboratory Contact Name: _____ Phone: _____

