

WVU IACUC Policy: Surgery Policy for USDA-Regulated Species

Purpose

This document provides guidance and considerations when performing anesthetic and surgical procedures on USDA-regulated species of laboratory animals.

Definitions

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

Paralytic drug (Animal Welfare Act): a drug that causes partial or complete loss of muscle contraction and that has no anesthetic or analgesic properties, so that the animal cannot move, but is completely aware of its surroundings and can feel pain. (*also known as: neuromuscular blocking agents*)

Major operative procedure (Animal Welfare Act): any surgical intervention that penetrates and exposes a body cavity or any procedure that produces permanent impairment of physical or physiological functions.

Aseptic Technique: The use of practices that restrict microorganisms in the environment and prevent contamination of the surgical site.

Background

- A. USDA Animal Welfare Regulations **require** the following considerations when performing a survival surgical procedure:
1. Appropriate provision for pre-operative and post-operative care of animals in accordance with established veterinary medical and nursing practices.
 2. Performed using aseptic procedures including:
 - a. Surgical gloves
 - b. Masks
 - c. Sterile Instruments
 - d. Aseptic surgical technique
 3. Major operative procedures on non-rodents **must** be conducted in a dedicated facility intended for that purpose. The facilities **must** be operated and maintained under aseptic conditions.
 4. Non-major operative procedures and all surgery on rodents do not require a dedicated facility but **must** be performed using aseptic technique.
 5. Operative procedures conducted at field sites do not need to be performed in a dedicated facility but **must** be performed using aseptic procedures.

- B. Multiple Major Surgeries (USDA animals)
1. No animal will be used in more than one major operative procedure from which it is allowed to recover, unless:
 - a. Justified for scientific reasons by the principle investigator in the IACUC-approved protocol.
 - b. Required as routine veterinary procedure or to protect the health or well-being of the animal as determined by the attending veterinarian.
 - c. In other special circumstances as determined by the Administrator via written request to APHIS.
- C. **WVU clinical veterinary staff should be consulted when planning to perform surgery on USDA-covered, non-rodent animals. Surgical and anesthesia support and training can be provided by the veterinary technicians and veterinarians. OLAR veterinary staff must ensure proper training of laboratory staff prior to performing surgery and anesthesia independently on USDA-covered, non-rodent animals.**
- D. **All USDA-covered, non-rodent survival surgery must be conducted in a designated OLAR-managed USDA surgical suite.**

Procedures

A. PRE-SURGICAL PLANNING:

1. IACUC PROTOCOL REVIEW
 - a. All staff involved in the animal surgical procedure **must** review the approved protocol.
 - b. Review all equipment and medications needed for the surgical procedure and place orders in advance.
 - c. Schedule time with OLAR veterinary team to review the protocol and plan dates/times for surgical procedures to ensure their availability.
2. FACILITY
 - a. Schedule OLAR-managed USDA surgical suites (RNI, HSC) ahead for procedures.
3. INSTRUMENT, SUPPLIES AND EQUIPMENT STERILIZATION
 - a. Only sterile instruments and surgical supplies can be used for survival procedures.
 - b. A different sterile set or surgical pack of instruments **must** be used for each animal undergoing survival surgery.
 - c. All instruments and supplies should be sterilized via autoclave (steam or dry heat) or gas (ethylene oxide or hydrogen peroxide) sterilization.
 - Review “IACUC Guidelines: Autoclave Validation and Sterile Pack Processing” for guidance on proper sterilization and storage of surgical instruments/supplies.
4. ANESTHESIA AND ANALGESIA
 - a. Review protocol and order all compounds required for the surgical procedure ahead of time. Anesthesia and analgesia **must** be provided exactly as described in the IACUC-approved protocol. Work with veterinary staff if concerns regarding drug regimens arise during the surgical process. **Only veterinary staff can advise on appropriate care beyond what is approved in the IACUC protocol.**
 - b. Neuromuscular Blocking Agents (Paralytic agents)

- Neuromuscular blocking agents are not commonly used in veterinary medicine and should not be considered for most standard surgical procedures.
 - Use of neuromuscular blocking agents **must** be described and justified in the approved animal use protocol. Use of these agents will likely require full committee review of the protocol. In addition, consideration **must** be given to monitoring appropriate surgical plane of anesthesia in the absence of normal muscle movement. Muscle tone, toe pinch, palpebral response **cannot** be used. Appropriate equipment for monitoring heart rate, blood pressure, end tidal CO₂ **must** be considered.
 - Mechanical ventilation is **required** when using a neuromuscular blocking agent due to paralysis of diaphragm.
- c. Considerations should be given to the following:
- Pre-medications that need to be provided
 - Delivery of gas anesthesia: Intubation or mask. If intubating, ensure there is an individual trained to perform endotracheal intubation and that supplies are available for this procedure.
 - Stomach tube (ruminants) placement
 - Vascular access and IV fluid administration
 - i. Fluids are highly recommended for procedures >1 hour for non-rodent species.
 - ii. IV catheter should be placed in a peripheral vein for delivery of IV fluids at maintenance rates and quick vascular access during an emergency situation.
 - iii. Describe fluid support in the approved IACUC protocol.
 - Heat Support
 - i. Heat support (circulating warm water blanket, heated surgical table, etc.) is recommend for all surgical procedures. **Heating pads are discouraged due to uneven heating and potential for thermal burns.**
 - ii. Animals should **never** directly contact heating devices.
 - Ocular lubricant
 - i. All animals undergoing anesthesia **require** placement of sterile ocular lubricant into their eyes. If this cannot be done, please justify in the approved IACUC protocol.
5. Ensure animals are ordered and arrive with enough time to adhere to appropriate acclimation schedule (see IACUC Policy: Acclimation of Newly Acquired Animals).
6. FASTING
- a. Removal of food/water ahead of surgical procedures may be necessary for certain species to prevent potential vomiting/aspiration or development of bloat (ruminant).
 - b. Pre-operative fasting is not necessary in rabbits and rodents.
 - c. Healthy Dog or Cat > 16 weeks
 - 6-12 hour food withhold; no water withhold necessary
 - d. Ruminant > 4 months
 - 12-24 hour food withhold; no water withhold
 - e. Swine
 - 6-12 hour food withhold; no water withhold
 - f. If a fasting regimen other than what is described in this policy is expected, please describe in the approved IACUC protocol.

7. INHALANT ANESTHESIA EQUIPMENT

- a. All inhalant anesthetic systems **must** be maintained, certified, and used in accordance with the “IACUC Policy & Guidelines: Certification, Maintenance and Use of Equipment Used for Inhalation Anesthesia in Animals”.

8. INCISION CLOSURE

- a. Method of surgical incision closure **must** be described in the IACUC protocol. Including:
 - Material used
 - Layers closed
 - Suture pattern
- b. All individuals **must** be appropriately trained on suture techniques prior to performing incisional closure.
- c. General Recommendations
 - Use simple interrupted pattern to close most surgical incisions. This decreases the risk of complete dehiscence if suture knot security is compromised.
 - Skin: wound clips (rodents) or non-absorbable monofilament suture material are recommended to close skin incisions.

B. SURGERY:

1. PRE-OPERATIVE HEALTH EVALUATION

- a. All animals should appear to be in good health prior to the surgical procedure. Veterinary staff **must** be contacted prior to initiation of surgical procedure if there are health concerns observed.

2. ANIMAL SURGICAL PREPARATION

- a. Surgical preparation should be performed in an area separate from the location that aseptic surgery will be performed. In non-rodent species, this should be a separate room (surgical preparation area).
- b. Provide anesthesia and analgesia as described in the animal use protocol. Intubation should be performed at this time (once animal is appropriately sedated/anesthetized using pre-medications).
- c. Animal is hooked up to appropriate monitoring equipment (pulse ox).
- d. Apply ocular lubricant. Place vascular access catheter.
- e. Hair/Fur/Wool should be removed from surgical site (anything not covered by a drape) using clean clippers.
- f. Remove loose hair from surgical area.
- g. A preliminary surgical scrub should be performed for all survival surgeries, working from the inside of the clipped area outwards, in a prep room near the surgical suite. Alcohol or sterile water should be alternated with either betadine or chlorhexidine scrub/soap (not solution) at least twice to ensure the surgical area is clean.
- h. The animal should be moved to the surgical area and connected to the appropriate anesthetic monitoring equipment.
- i. A complete surgical scrub should be performed. Alcohol or sterile water should be alternated with either betadine or chlorhexidine scrub/soap (not solution) a total of three times to provide

adequate skin disinfection. Final application of betadine or chlorhexidine solution can be applied to protect the site until surgery begins.

- j. The surgeon will drape the surgical area with sterile drapes before the start of any procedure.
- k. Surgical plane of anesthesia should be confirmed prior to proceeding with surgical procedure.
 - A lack of palpebral reflex, ventromedial pupil position, reduced muscle tone, and a lack of response to painful stimuli are indicators of surgical anesthesia in non-rodent mammals. A regular but decreased heart rate and respiratory rate should also be noted.
- l. IV fluid support should be initiated.

3. SURGEON SURGICAL PREPARATION

- a. Surgeon and Surgical Assistant(s)
 - Major Operative Procedures
 - i. Clean scrubs, shoe covers, surgical mask, and hair bonnet
 - ii. Complete a surgical scrub of hands and arms
 - iii. Put on sterile gown and sterile surgical gloves
 - Minor Operative Procedures
 - i. Clean scrubs, shoe covers, surgical mask, and hair bonnet
 - ii. Complete a surgical scrub of hands and arms
 - iii. Put on clean gown and sterile surgical gloves
 - Personnel in surgical room
 - i. Wear clean scrubs, shoe covers, surgical mask, and hair bonnet
- b. Additional PPE (e.g. eye protection) may be required for surgeries involving the use of biological and chemical hazards or other specific procedures.

4. The surgical instrument pack should not be opened until surgery is ready to begin.

5. MONITORING AND RECORDS

- a. Anesthetic depth and vitals should be assessed and recorded in surgical records **at least** every 15 minutes throughout the procedure.
 - Recommend use of monitoring equipment to assess heart rate, oxygen saturation, body temperature, and/or blood pressure
 - Mucus membrane color, capillary refill time, respiratory rate are recommended parameters to evaluate during an anesthetic procedure.
- b. Anesthetic monitoring forms are available (contact veterinary staff) and can be utilized to record the animal weight, dose, route and time of substances administered including anesthetics, analgesics, antibiotics and fluids. Notes should also be made of all significant peri-operative events, such as beginning of surgery, organ manipulation, end of surgery, and any complications that occur during the procedure.
 - All surgical records should be placed into each animal's individual health record for non-rodent species.
 - Surgical records should remain in the animal room for ~1 week for rodent species and then maintained by the veterinary staff with the cohort's medical records.
- c. Cards **must** be placed on each cage/pen of the animal undergoing a surgical procedure. These may be provided by the lab or by OLAR. These cards will be filled out and updated by the PI/research staff.

- d. All surgical records **must** be available and easily accessed for review by USDA VMO during unscheduled inspections.
- e. All records shall be maintained for the duration of the activity (protocol, procedure, or life of the animal) and for an additional three years after the completion of the activity.

6. ANESTHETIC EMERGENCY

- a. Contact Veterinary Staff for guidance.

7. POST-OPERATIVE MONITORING AND CARE

- a. Animals **must** be monitored from anesthetic induction through anesthetic recovery.
- b. After surgical procedure is completed, anesthetic reversal agents can be administered, if indicated.
- c. Heat support should continue to be provided until animal is able to maintain sternal recumbency.
- d. Supplemental oxygen can be provided during the recovery period.
- e. Anesthetized animals cannot be left unattended until the endotracheal tube is removed (if applicable) and can maintain sternal recumbency.
 - If the animal is intubated, it should be monitored until swallowing reflexes or chewing returns. Animal is then extubated after the cuff is deflated (if applicable).
 - IV catheters can be removed after the intubation tube is removed if there is no additional need for IV drug administration.
 - The animal should not be placed in the same primary enclosure with other animals until fully recovered from anesthesia.
- f. After sternal recumbency is achieved, animals **must** continue to be monitored at an appropriate frequency until fully recovered from anesthesia (e.g. return to normal level of alertness and responsiveness, self-righting, able to stand unaided).
 - Supplemental oxygen and/or continued heat support may be beneficial during this time, and if utilized it should be recorded.
- g. Post-operative analgesics, antibiotics and other substances **must** be administered according to the IACUC-approved protocol.
- h. Consideration should be given to non-analgesic supportive care measures:
 - Supplemental Nutrition
 - Access to food (food on cage floor for rodents)
 - Hay for rabbits and ruminants
 - Subcutaneous (SQ) fluids
 - Nesting or bedding material provided
 - Nail trims (prevent from scratching incision site)
- i. After major operative procedures, the animal should be monitored **at least** twice daily for three days postoperatively, or according to the IACUC protocol. After that period, the animal should continue to be monitored **at least** daily for 1-week post-surgery.
 - All monitoring, drug administration, and progress notes **must** be documented in the animal's records.
 - Veterinary staff **must** be contacted if health concerns arise, including continued pain after analgesia administration.
 - The following parameters should be considered during post-op monitoring:
 - i. Incision site: sutures intact, signs of infection, pain, or dehiscence.

- ii. Attitude
 - iii. Activity level
 - iv. Appetite
 - v. Weight/Body Condition Score
 - vi. Hydration status
 - vii. Species appropriate grimace score
- j. Wound clips, staples or sutures used for skin closure should be removed 7-14 days post-operatively, or according to veterinarian recommendations and the IACUC-approved protocol.

C. NON-SURVIVAL SURGERY:

1. Non-survival surgery does not require aseptic technique or a dedicated facility.
 - a. Consider implementing aseptic technique for non-survival procedures of extended duration due to risk of contamination.
2. The animal should be anesthetized according to procedures outlined in the IACUC-approved protocol. **All drugs (anesthesia, analgesia, sedatives, euthanasia solutions) used for non-survival procedures must be within the expiration date.**
3. Animals should be appropriately monitored throughout the surgical procedure and records maintained.
4. The surgical site should be free of hair/fur/wool.
5. Surgeon/surgical assistant **must** wear:
 - a. Clean scrubs/disposable gown/lab coat, shoe covers, surgical mask, hair bonnet and gloves.
6. Animals **must** be euthanized before recovery from anesthesia. **If animals recover from anesthesia (even briefly) this is considered a survival surgical procedure.**
7. Expired and non-sterile medical materials may be used in non-survival procedures.
 - a. Expired items should be stored separately and properly labeled.

References

1. [Animal Welfare Act and Animal Welfare Regulations](#), United States Department of Agriculture, 2017.
2. [Guide for the Care and Use of Laboratory Animals](#), National Research Council, 2011.
3. [Policy #3 Veterinary Care](#), USDA Animal Care Policy Manual, issued March 14, 2014.