Guidelines on Rodent Survival Surgery and Record Keeping

Background:
Successful surgical outcomes require appropriate attention to presurgical planning, personnel training, anesthesia, aseptic and surgical technique, assessment of animal well-being, appropriate use of analgesics, and animal status during the surgical procedure as well as postoperative care.

Post-operative infections in rodents may occur. The infections, which may not be apparent on observation, cause distress to animals and can affect the results of an experimental study. To minimize surgically induced infections in rodents, aseptic surgical procedures must be used in rodents expected to recover from surgery and survive.

Training:
PI’s and their staff conducting surgical procedures must have appropriate training to ensure that good surgical techniques are practiced including asepsis, tissue handling, appropriate use of instruments, effective hemostasis, and correct use of suture material. All training techniques must be described and addressed in Appendix D on the Marquette University Animal Protocol Form. Note: if there will be future additional staff that will be performing surgeries, and are not listed as surgeons on the protocol at the time of IACUC approval, Appendix G (found on the ORC website) must be completed and submitted to IACUC@marquette.edu for review before the staff performs any procedures.

Definitions:
**Major Survival Surgery** – Any surgical procedure that penetrates and exposes a body cavity, produces substantial impairment of physical or physiologic functions, or involves extensive tissue dissection or transection.

**Minor Survival Surgery** – Any procedure that does not expose a body cavity and causes little or no physical impairment.

**Nonsurvival Surgery** – Any procedure that an animal is euthanized before recovery from anesthesia.

**Aseptic Surgical Procedures** – Surgery performed using procedures that limit microbial contamination so that significant infection or suppuration does not occur.

**Sterilization** - The process whereby all visible microorganisms are eliminated or destroyed. The criterion of sterilization is the failure of organisms to grow if a growth supporting medium is supplied.

**Disinfection** – The chemical or physical process that involves the destruction of pathogenic organisms. All disinfectants are effective against vegetative forms of organisms, but not necessarily spores.
Surgical Facilities/Area:
- It is recommended that aseptic surgery be performed in dedicated facility spaces in either a dedicated operating room/suite or an area that provides separations from other activities within a laboratory or animal facility.
- Most bacteria are carried on airborne particles or fomites, so surgical facilities should be maintained and operated in a manner that ensures cleanliness and minimizes unnecessary traffic.
- All surgical areas must be clean, uncluttered, and sanitizable.
- Prior to or after completion of all surgical procedures, all organic debris should be removed from all work surfaces. The surfaces should be disinfected using Clidox®, Sporicidin® solutions or other appropriate disinfectants.
- If performing surgeries in lab areas it is important to note that the portion of the room may not be used for any other purpose during the time of surgery.

Aseptic Technique:
- Aseptic technique is used to reduce microbial contamination to the lowest possible practical level.
- Preparation of the animal, such as removing hair and disinfection of the operative site with at least three alternating scrubs of Betadine and alcohol is required.
- Body covering such as a clean lab coat and sterile surgical gloves must be worn by all surgeons working in the immediate surgical field and anyone touching the animal’s internal tissue.
- A more rigorous aseptic technique would include draping the surgical site with sterile drapes and the use of sterile surgical gloves, caps, masks, and gowns. Use of these more rigorous techniques is recommended when multiple surgical procedures are to be performed on a single animal, or when more infection-susceptible species are used.
- All instruments, supplies, and wound closure materials must be sterile.
- Surgical procedures may be performed on multiple animals during a single session using one sterile surgical pack, providing care is taken to minimize contamination and the instrument tips are sterilized using a bead sterilizer.

Presurgical Planning:
- Presurgical planning should include input from all members of the surgical team.
- The surgical plan should identify personnel, their roles and training needs; and equipment and supplies required for the procedures planned; the location and nature of the facilities in which the procedures will be conducted; and the perioperative animal health assessment and care. Most, if not all if this information is addressed in Appendix D in the Marquette University Animal Protocol Form.
- Presurgical planning should specify the requirements for postsurgical monitoring, care and recordkeeping, including the personnel who will perform these duties.
- The PI and the attending veterinarian share responsibility for ensuring that postsurgical care is appropriate.
Pre-Operative
- Prepare instruments by sterilizing prior to use. Multiple methods are available for sterilizing instruments prior to contact with animals tissues. These include autoclaving, dry heat sterilizing, ethylene oxide, or chemical agents.
  - Autoclaving or dry heat sterilizing are preferred methods at Marquette University.
  - Alcohol is not a recognized method for sterilizing instruments.
- Surgery should be conducted in a disinfected, uncluttered area that promotes asepsis during surgery. A separate prep area and surgery area should be present. Please see the ARC staff for surgery locations/suites.
  - Disinfect the surgical area by cleaning with Clidox®, Sporicidin® solutions or other appropriate disinfectant.
- Anesthetize the animal according to approved IACUC protocol methods.
- Prepare the animal by removing hair from the surgical site. Perform this procedure in an area separate from where the surgery is to be conducted (prep area).
- Prepare the surgical site(s) with an appropriate skin disinfectant.
  - Alternating a surgical scrub with 70% alcohol will allow for good surgical skin disinfection.
  - Starting at the incision site, using gauze or cotton tip applicators apply the surgical scrub in a circular motion moving outwards away from the incision site. Repeat with alcohol in a circular motion from the incision site. Repeat this procedure 3 times.
  - AAALAC recognizes a 1 min rinse with alcohol as a suitable disinfectant.
- Prevention of hypothermia during surgery is important. Care should be given to keep the animal warm during a procedure that will last more than 30 minutes. SpaceDrapes® and/or VetEquip® offer products for thermoregulation for longer procedures.

Intraoperative Monitoring
- The animal must be maintained in a surgical plane of anesthesia throughout the procedure.
  - Careful monitoring and timely attention to problems increase the likelihood of a successful surgical outcome.
  - Monitoring includes routine examination of anesthetic depth and physiologic functions and conditions such as body temperature, cardiac and respiratory patters.
  - Recommended criteria that will be used to assess adequacy of anesthesia and animal intraoperative well-being include;
    - Absence of response to toe and/or tail pinch
    - Absence of spontaneous movement
    - Respiration rate or pattern
- Begin surgery with sterile instruments and sterile surgical gloves. A sterile field must also be maintained for the sterile instruments, this can include the autoclaved instrument holder, a sterile drape, or the inside of sterile packaging. Sterile instruments and gloves must not touch anything outside the sterile field, otherwise they will be considered non-sterile.
- Instruments may be used for similar surgeries provided they are maintained clean and disinfected between animals. Instrument tips can be sterilized within a bead sterilizer, requiring 10-15 seconds within the heated beads. It is recommended that instruments must be allowed to cool for approximately 30-60 seconds prior to reuse.
- Close surgical wounds using appropriate techniques and materials. Note: surgeons must be aware of the MU IACUC Policy on the use of Wound Clips/Sutures following surgery.
Post-Operative

- Observation of the animal and intervention as necessary during recovery from anesthesia and surgery is an important component of postsurgical care.
- After surgery, animals should be in a clean, dry and comfortable area where they can be observed frequently by trained staff. Animals may be placed inside their home cage on a paper towel. Heating pads may be placed under the home cage during recovery for proper thermoregulation. SpaceDrapes® and/or VetEquip® offer products for thermoregulation for post-operative recovery. Management and observation of postoperative pain or discomfort must be accounted for as well. Please see the link on IACUC recommended best practices and guidelines for anesthesia and analgesia.
- Analgesics must be given unless withholding them is scientifically justifies and approved by the IACUC.
- After recovery from anesthesia, monitoring can be less intense but should include attention to basic biologic function (eating, drinking, urinating, defecating) and to behavioral signs of postoperative pain, monitoring of the surgical incision site for wounds that may break open along the surgical suture, and the timely removal of skin sutures, clips or staples.
- **Nonpharmacologic** control of pain may be effective and should not be overlooked as an element of postprocedural or perioperative care for research animals. Appropriate nursing support may include a quiet, darkened recovery or resting place, timely wound or bandage maintenance, increased ambient warmth and a soft resting surface, rehydration with oral or parenteral fluids, and a return to normal feeding through the use of highly palatable foods or treats (Guide p. 122).

**NON-Survival Rodent surgeries**

An animal is euthanized before recovery from anesthesia. At minimum the surgical site must be clipped, surgery should wear gloves, and the instruments and surrounding area should be clean.

**Anesthesia, Surgery and Post-Procedural Records**

- For reference there is a posted Surgery Form on the IACUC website that can be used by labs.
- Records of anesthesia, surgery and/or post-procedural care must minimally include:
  - Animal identification if needed, date of the procedure, surgeon’s full name, and protocol number as well as a description of the surgical procedure.
  - The type and dose of anesthesia used as well as ongoing findings during anesthetic/surgical procedures (supplemental doses as well as assessment and adequacy of anesthesia depth).
  - Any analgesic used and the dosage, post-surgical recovery health of the animal, and additional comments for any variations from the normal and expected events during the recovery period. This may include any notations on actions taken and the animal’s response to these actions as well as any actions taken to alleviate pain and distress. Also, time that the animals returned to the colony needs to be recorded.
- These records must be readily available to the IACUC Committee or their designee, the attending veterinarian, and representative of regulatory and accrediting organizations.
References:
1. AAALAC FAQ E.2 www.aaalac.org
2. Guide for the Care and Use of Laboratory Animals