USDA SPECIES: GUIDELINES FOR ASEPTIC SURVIVAL SURGERY

The Animal Welfare Act (9 CFR) requires the use of aseptic technique when performing major and minor recovery surgery on regulated species (including primates, cats, dogs, pigs, and rabbits). Major surgery includes penetration and exposure of the cranium, thorax, abdomen or any procedure producing permanent impairment of physical or physiological functions. Minor surgery does not penetrate a body cavity and includes procedures such as blood vessel cut down or corneal surgery. All vertebrate animal use protocols involving regulated species, regardless of funding source, must comply with the guidelines stated in the Guide and the requirements of the Animal Welfare Act.

**Space requirements:** Separate spaces must be used for the following activities: 1) animal preparation, 2) sterile surgery, and 3) postoperative recovery. An IACUC approved dedicated surgical suite must be used for all survival surgical procedures on large animals. The designated surgical suites must be maintained in an aseptic manner (proper surgical attire, limited access, and proper disinfection before and after all surgeries).

**Sterilization of Instruments:** All instruments, catheters, supplies, fluids, or implants that are placed in the surgical field must be properly sterilized prior to surgery. Instruments and reusable items must be cleaned prior to sterilization to remove organic material and surface contamination. Sterilization can be achieved by several means including exposure to heat (autoclave) or chemicals (e.g., Cidex®, ethylene oxide). For autoclaving, a typical protocol encompasses exposure at 250° F and 15 psi for 20 minutes with the items either wrapped in cloth or in a peel pack. For chemical sterilization, the procedures should follow the manufacturer’s specification and environmental health and safety regulations.

Surgical instrument packs must include a sterilization indicator inside and autoclave tape placed on the outside of the pack to demonstrate adequate sterilization has taken place. Packs must be dated when sterilized and used within six months of that date. Sterilized instruments must be stored in enclosed cabinets or drawers until used.

**Preparation of the Surgeon:** Training in proper scrub technique is required. Surgeons must have appropriate training to develop good tissue-handling skills and avoid complications. Good surgical technique requires a knowledge of relevant surgical anatomy, asepsis, gentle tissue handling, minimal dissection of tissue, appropriate use of instruments, effective hemostasis, and correct use of suture material.

For survival surgery, the surgeon and surgical assistants must wear a sterile gown, shoe covers, mask, bonnet, and sterile surgical gloves. Those in the room but not within the sterile surgical field must wear clean scrubs, gloves, shoe covers, mask, and bonnet.

The surgical suite must be properly disinfected after non-survival procedures before resuming aseptic surgeries.
**Animal Preparation:** Except for rabbits, food must be withheld for at least eight hours prior to the surgery. The investigator staff should coordinate with the BRF animal care staff to ensure appropriate preoperative fasting of animals. A yellow dated fasting card will be placed on the animal’s cage and all food will be removed from the cage. A preoperative physical examination should be done on the animal and data entered on the animal’s medical records sheet (see separate Guideline on Record Keeping). The anesthesia/surgery log sheets kept by the PI must be signed and copies submitted to the BRF staff within 24 hours of any procedure.

Animals must be prepped for surgery in a designated preparation room away from the surgical area. Surface debris and loose hair should be removed from the animal. An ophthalmic ointment must be applied to each eye to prevent drying and damage to the cornea. A skin area approximately twice the size of the expected surgical field must be prepared. Hair must be removed from the incision area and the area washed clean of any hair or surface debris with soap and water.

After the animal is transferred to the surgical suite, the skin must be steriley prepped in the following manner: Clean skin with alternating scrubs of an antiseptic soap, such as chlorhexadine or Betadine and alcohol (repeat a total of 3 times). Cover the surrounding skin areas with sterile drapes.

During surgery the animal must be kept warm, preferably by use of a circulating water heating pad/blanket. A clean drape must be placed between the animal and the heating pad. Close monitoring is essential to ensure that the animal will not sustain a thermal injury from the heating source. There must be no unanesthetized animals in the surgery room during surgery.

**Intra Operative Care:** Aseptic conditions must be maintained throughout the procedure. Animals must be carefully and continuously monitored. Use of a pulse oximeter and temperature monitor is required. Blood pressure (invasive or non-invasive) and end tidal CO₂ monitoring is highly recommended for more invasive surgeries, but can be used for any surgery. For animals larger than rabbits, an IV catheter is required for major procedures that are expected to last more than 30 minutes to allow delivery of emergency drugs. For surgeries in which the thoracic cavity is exposed, mechanical intermittent positive pressure ventilation must be provided.

Documentation of heart rate, blood oxygen saturation, respiratory rate, and body temperature must be recorded **at least every fifteen minutes.** The animal must be continuously warmed to maintain suitable body temperature. Animals anesthetized longer than 30 minutes must be properly hydrated. Typically this is achieved by administering isotonic fluids at a rate of 5 ml/kg/hr. Additional fluids should be administered if blood loss occurs during surgery. Contact the BRF veterinarians for further recommendations.
Suture Selection: Absorbable suture must be used for abdominal wall closure and when sutures are left within any body cavity and survival is greater than 72 hours. Non-absorbable suture, skin staples, or wound clips must be used for closure of the skin. *PIs are encouraged to use a subcuticular suture pattern for closure of skin wounds rather than external closure materials in order to prevent animals from chewing on sutures and causing complications.* Silk sutures must not be used for skin closure, and are only recommended for securing catheters within vessels. Appropriately sized suture should be selected. For most large animal surgeries, 0, 2-0, 3-0, or 4-0 suture is appropriate. Please contact a BRF veterinarian for suture size or specific suture selection recommendations.

Postoperative Care: Animals must be continuously monitored during recovery from anesthesia until they can maintain sternal recumbency. Emergency airway equipment must be maintained near the recovery area (e.g. proper sized endotracheal tubes, laryngoscopes). Hydraulic lift tables or sufficient personnel should be used to move animal weighing more than 50 lbs from the operating room to and from the recovery and/or preparation areas. Animals must be allowed to recover in the BRF designated recovery area, or placed in a transport cage in the recovery room with equipment for supportive therapy until they are capable of standing, unless approved by BRF attending veterinarian and IACUC protocol.

Animals may not be allowed to recover in an animal housing room unless approved by the BRF veterinarian. Once the animal can maintain sternal recumbency, it must be monitored at least every 15 minutes until capable of standing, unless approved by BRF attending veterinarian and IACUC protocol.

Animals must be kept warm and dry to prevent hypothermia. Circulating hot water pads should be removed once the animal is sternal. Once the animal is returned to its cage, heating lamps can be directed on the animal until fully recovered if desired, but care must be used to ensure that the area and the animal does not overheat. Recovered animals must not be kept in the same cage as anesthetized animals. PI staff must immediately contact BRF veterinary staff if any complications are suspected.

Postoperative analgesia and antibiotics must be given in accordance with the approved IACUC protocol. Surgical sites must be monitored for infection (pain, redness, swelling or discharge, or self-trauma). The animals must be monitored for signs of systemic infection as evidenced by behavioral or physical changes. Surgical clips or sutures must be removed at 10-14 days post-surgery unless appropriate medical justification can be provided. All of this information must be entered into the Medical record for that animal.

Record Keeping:
The Principal Investigator must keep records with the following information including dates and signatures:

- IACUC approved protocol number;
- Animal(s) identification;
- Type of procedure;
• Type of anesthetic including dose and route;
• Type of analgesic, if given, including dose and route;
• Type of antibiotic, if given, including dose and route;
• Postoperative monitoring (time, observations, date of clip removal, etc.);
• Postoperative observations should be recorded daily for 10 days unless an exception is approved in advance by the BRF veterinarian.
• Complications;
• Date of surgery;
• Observations of adverse events made by anesthetists must be recorded on the anesthesia/surgery log sheet.
• All incidences of morbidity or unexpected mortality must be reported to the BRF veterinarian immediately and documented in the animal health record.

A copy of each animal’s health record must be kept in the animal holding room or in an approved, accessible location for the veterinarians and BRF staff. The animal health record includes all treatment records, all anesthesia records, surgical records, and records of post-op care. Sample forms for these are available on the website and in the BRF office.