

## GUIDELINES FOR RODENT SURGERY AND POSTOPERATIVE CARE

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**PURPOSE:** The purpose of this document is to outline procedures for aseptic surgery and post-operative care of rodents. The U.S. Public Health *Service Guide for the Care and Use of Laboratory Animals* states that survival surgery on rodents should be performed in facilities intended for that purpose, using sterile instruments, surgical gloves, and aseptic procedures to prevent clinical infections. Aseptic technique is used to reduce microbial contamination to the lowest possible practical level. Judicious use of anesthetic and analgesic agents to minimize any pain associated with the experimental procedure is scientifically and ethically imperative. This document should allow all personnel involved to understand what constitutes aseptic technique and what is considered to be appropriate peri- and post-operative care.

### 1) Minimal procedures to be followed for non-survival surgeries

- a) All animals should be sufficiently anesthetized prior to surgery such that they are completely unconscious and show no reaction to pain eliciting procedures. For most rodents, a lack of response to toe pinching is indicative of surgical anesthesia. Refer to the Center for Comparative Medicine guidelines for anesthesia for appropriate anesthetic agents and dosages. All animals are euthanized before recovery from anesthesia.
- b) All personnel handling the animals must wear gloves.
- c) Instruments and work surfaces need not be sterile but must be clean.
- d) The surgical site should be free of hair.
- e) Expired drugs may be used for non-survival procedures and should be specifically labeled for this use. The exception to this is anesthetic and analgesic agents, which must be current.

### 2) Aseptic technique for survival surgeries

- a) Surgery should be conducted on a clean, uncluttered lab bench or table surface. The surface should be covered with a clean drape.
- b) Hair should be removed from the surgical site using clippers, hair plucking, or a depilatory agent. The surgical site should be treated with an antiseptic scrub and then with an antiseptic solution (e.g. povidone iodine scrub and solution, chlorhexidine scrub and solution). A 70% ethyl alcohol wipe removes the scrub prior to applying the solution, which is left on to dry. A complete sterile prep includes 3 wipes each with scrub and alcohol followed by application of antiseptic solution. Small incisions (<5mm) can be prepped by plucking the hair and wiping with ethyl alcohol.
- c) All instruments may be sterilized by the method of choice and on the basis of physical characteristics of the material to be sterilized. Sterile Supply located in the new hospital will autoclave or gas sterilize instruments that are properly wrapped. The Center for Comparative Medicine can also steam autoclave upon request. Sterilization indicators (heat sensitive tape) should always be used to confirm that the materials reached the appropriate temperature. Acceptable techniques for cold sterilization include soaking in 2% glutaraldehyde for 10 hours or 8% formaldehyde + 70% ethyl alcohol for 18 hours. There are several commercially available germicidal agents that are safer to use but attention must be paid to the shelf life of solutions once they are prepared. Gauze pads, intravascular catheters, suture material, etc. should also be sterile. Please note alcohol alone is **not** acceptable.
- d) The surgeon should wash his/her hands with an antiseptic surgical scrub preparation and then aseptically put on gloves. If working alone, the surgeon should have the animal anesthetized and positioned and have the first layer of the double-wrapped instruments or cold pack opened before putting on sterile gloves, so that he/she can remain sterile.
- e) The surgeon should wear a facemask. A cap and sterile gown are recommended but not required.
- f) Ophthalmic ointment should be administered in both eyes to protect the corneas from drying and abrasion.

### 3) Multiple animal surgeries

a) If performing surgeries on more than one animal consecutively, start with a sterile instrument pack. The instruments can be placed in 70% ethyl alcohol in-between animals or in a glass bead sterilizer. The alcohol should be replaced when moderately contaminated with blood or other body fluids. Sterile gloves should be changed between surgeries if the surgeon touches nonsterile surfaces. The surgeon may wipe his/her gloves for 30 seconds with sterile gauze pads soaked in alcohol between animals that are already prepped by another individual.

#### 4) Wound closure

a) The body wall should be closed with absorbable suture material. The skin should be closed with staples, wound clips, or with a nonabsorbable suture material in a simple interrupted pattern. Do not use silk for skin closure. Skin sutures or staples should be removed 7 to 10 days after surgery. The wound should be observed for swelling, heat, discharge and opening of the incision (dehiscence) at least once daily for the first week, and appropriate action taken if a problem is noted.

#### 5) Postoperative management

- a) Rodents should be kept warm with an external heat source both during surgery and afterwards until ambulatory. A heating pad underneath the drape or a heat lamp can be used. Be careful when using a lamp not to overheat. Monitoring rectal body temperature is the best method to ensure that the animal is neither hypo- nor hyperthermic. Rodents under anesthesia are unable to adequately control their body temperature. Hypothermia significantly prolongs anesthesia and impairs recovery.
- b) An analgesic agent should be administered prior to recovery from anesthesia. Preemptive pain management is much more effective than giving medication after observing signs of pain. Buprenorphine at 0.1 mg/kg IM or SC works well for most surgical procedures. If an opiate is not suitable, local anesthesia such as bupivacaine infiltration at the surgical incision may be preferable. Consultation with a veterinarian is advisable if you are unsure of the best choice for analgesia. Oral dosing in the drinking water is generally not an effective method, but may be useful in certain circumstances. Buprenorphine administered subcutaneously provides analgesic blood levels for 8-12 hours. Depending on the procedure, re-dosing twice daily for up to 48 hours may be indicated.
- c) Antibiotics are not necessary if sterile technique is used. However, some procedures warrant the use of peri-operative antibiotics. This can be discussed with a veterinarian.
- d) Once the animal is moving around, it may be returned to the vivarium.
- e) At least once daily the animals should be observed for signs of pain, distress, incision problems. The following list (from *Recognition and Alleviation of Pain and Distress in Laboratory Animals*, NRC 1992) provides various signs to be watched for that would indicate acute pain in rodents.

Decreased appetite. May eat bedding or their offspring.

Decreased urine and fecal output.

Decreased activity.

Piloerection, ungroomed appearance.

Excessive licking and scratching which may progress to self-mutilation.

Abnormal stance or hunched posture.

Respiration can be rapid and shallow with grunting or chattering on expiration.

Pupils might be dilated.

Porphyrin secretion ("red tears") might be seen around the eyes and nose.

Vocalization.

Increased aggressiveness when handled.

- f) Records should be kept of all surgeries performed and any complications encountered. If any of the above signs of pain or distress is observed, a staff member in Center for Comparative Medicine should be notified immediately. Veterinary care will then be provided. If the pain or distress is significant and untreatable, the animal will be euthanized.