

Guidelines for Meeting Policy 102 Surgery Requirements

Physical Requirements for the Surgery Location

The requirements of any surgery site are dictated by the need to maintain an aseptic surgical field designed to minimize the potential of postsurgical infections. This is accomplished by separating the various activities associated with surgery to prevent contamination of the surgical site.

In USDA-regulated species and other large animals this may require a dedicated surgical suite consisting of separate rooms or areas for animal clipping and preparation, surgeon scrub, animal recovery, and the actual surgery room. While a dedicated surgery suite is not a requirement for conducting survival surgery on non-USDA-regulated species, isolation of surgery-related activities from the actual surgery area may help prevent postsurgical infections.

The actual surgery location should be dedicated to that purpose during the procedure with other adjacent or nearby activities minimized to reduce the potential for airborne contamination. The nearby movement of personnel or the performance of other laboratory activities will result in air turbulence and the suspension of dust particles into the air which could potentially contaminate the surgical site. The performance of rodent surgery within HEPA filtered laminar flow hoods greatly minimizes this potential and is strongly recommended. The actual surgery location should be constructed of smooth impermeable surfaces capable of repeated disinfection. Equipment in the immediate surgery area should be limited to that which is essential for the procedure and easily sanitized, sterilized, or disposable. The available lighting should be bright and adequate for the type of procedure intended. If inhalant anesthetics are to be used, a method for both delivery of the anesthetic and scavenging of the waste anesthetic gases must be addressed. In long procedures supplemental heat sources should be provided to maintain animal body temperature. The surgery site should be completely prepared with all needed equipment present prior to bringing the animal to the site.

The animal preparation room should be located remote from the actual surgery location to minimize airborne contamination.

Surgeon scrubbing and animal recovery are two additional essential functions associated with a surgical program. The animal recovery area is ideally near to and within easy sight of the surgical preparation and surgical areas to permit frequent evaluation of animals recovering from surgery and anesthesia. Depending on the species, a source of supplemental heat is generally required during the postsurgical period so access to electrical outlets is generally a requirement for the recovery area. The surgeon scrub area requires the presence of a sink and the appropriate antiseptic soaps and while it should be within the area to minimize contamination of the surgeon, location is generally not critical.

Overall, the surgery area should be carefully designed to minimize the potential of surgical contamination and infection. Final design is heavily dependent upon the species used, intended procedures, and resulting equipment required.

Sterilization of Equipment, Instruments, and Supplies

All equipment, instruments, and supplies that come into contact with the open surgical site must be sterile (3). Heat sterilization (dry heat or steam autoclave) is ideal for heat-resistant surgical equipment (stainless steel, glass, ceramics, and some plastics). For heat sensitive materials, gas sterilization with ethylene oxide, chlorine dioxide, or hydrogen peroxide is an excellent alternative. Liquid sterilants such as chlorine dioxide or gluteraldehydes can be used for cold sterilization though contact time is quite lengthy and the materials must be rinsed with sterile saline or water to remove the liquid sterilants prior to use. Catheters and implants can be sterilized using ionizing radiation though this is usually limited to commercial situations.

Pre-Surgical Animal Evaluation

Animals scheduled for experimental surgical procedures should be healthy and acclimated to their environment prior to surgery. Animals received from other institutions or approved vendors are generally stressed from the shipment and require a period of acclimation and stabilization prior to experimental use. Each animal should receive a pre-surgical evaluation to ensure that they are not overtly ill. Depending on the species, fasting before surgery may be required. Since regurgitation is not typical of rodents, the withholding of food is not necessary unless specifically mandated by the protocol or surgical procedure. Due to the high metabolic demands in rodents, withholding of food for more than six hours should be discussed with a veterinarian. Water should **NOT** be withheld unless required by the protocol.

Preparation of the Surgery Area

Proper preparation of the surgery area with the needed equipment and supplies is a critical step in a successful surgical outcome. A checklist of all needed supplies is often quite beneficial in ensuring that all the needed equipment and supplies are readily available and properly prepared prior to beginning the procedure. Surgery should not be initiated if all required supplies and materials are not at hand. Once the surgery has begun the surgeon should restrict their activities to the immediate surgical area and obtaining any equipment that is not readily available will require either an assistant or the necessity of re-scrubbing/gowning/gloving by the surgeon.

For rodents, all hard surfaces (table, stereotaxic apparatus, etc.) in the immediate area of the surgery should be disinfected prior to anesthetizing the animal. The animal itself should generally be placed on a sterile towel or paper drape if practical.

Placing the animal on a hard-stainless steel or laminate will accelerate the development of hypothermia.

Anesthesia

Anesthesia and anesthetic monitoring are critical components in all surgical procedures. Anesthesia and anesthetic monitoring is extensively discussed in other standard operating procedures. Monitoring of anesthetic depth varies somewhat based upon the anesthetic agent, animal species, procedure, etc. Although failure to respond to painful stimuli is a good indicator of adequate anesthetic depth, excessive anesthetic depth must be prevented. Maintaining body temperature is critical in smaller animals and is often a major complication of surgery procedures and unrecognized as the cause of significant surgical mortality. Supplemental heat must be provided where applicable. Monitoring of body core temperature is strongly recommended for surgical procedures over 20 minutes in length.

Surgical Preparation

Preparation of the animal should include applying artificial tears ointment (where applicable), and clipping or shaving the surgical site with enough border to keep hair from contaminating the incision (hair removal should be performed in a location remote from the surgical area). If a depilatory product is used, care should be taken to prevent contact of the depilatory with mucous membranes.

The surgical site should be scrubbed at least twice with a germicidal scrub being careful to scrub from the center of the site toward the periphery. The site can then be rinsed with 70% alcohol or dilute iodine solution. Pre-warming the scrub solutions will help minimize hypothermia (70% alcohol will contribute to hypothermia if liberally used).

Surgeon Preparation

When performing surgery, established practices for the conduct of aseptic surgery must be followed.

When performing surgery on non-USDA-regulated rodents, the garments worn by the surgeon must include either a clean lab coat or clean surgical scrubs. The use of a surgical mask and cap is required unless the surgical procedure is being conducted in a laminar flow cabinet. The surgeon must thoroughly scrub his or her hands with a bactericidal scrub prior to donning sterile surgical gloves. The use of sterile surgical gloves is recommended when using "tips-only" technique on rodents where only the sterilized surfaces of instruments are permitted to come into contact with the opened surgical site. Gloves must be changed if worn for other activities.

Multiple Rodent Surgical Procedures (“Batch” surgery)

Rodent “batch” surgery is a process where multiple individual animals are subjected to the identical surgical procedure. Batch surgery is an efficient method to perform the same surgical procedure on multiple animals with the minimum expenditure of time, effort, and supplies. Rodent batch surgery requires at least two individuals to effectively accomplish. A single individual is not capable of preparing, anesthetizing, performing surgery, and monitoring recovery of multiple animals.

In the case of multiple surgical procedures (“batch” surgery) surgical instruments, gloves and other paraphernalia may be used on more than one animal if extreme care is taken to maintain asepsis. Any item used on multiple animals **must** be carefully cleaned and sterilized between animals. Alternating two or more sets of instruments is one way to allow sufficient time for instruments to cool after bead sterilization or for instruments to soak in the sterilant solution for the required period of time to be effectively sterilized. Batch surgeries in rodents typically use the “tips-only” technique where only the sterilized surfaces of instruments are permitted to come into contact with the opened surgical site. Surgical gloves and other supplies may be reused if they are not contaminated between animals.

Wound Closure

The method used to close the surgical wound varies based upon the tissue type, the tension placed on the tissue, and the experimental goals. Materials are generally classified as either “absorbable” or “non-absorbable.” Consultation with the Attending and/or clinical veterinarian concerning the proper or ideal suture selection is recommended.

Post-Operative Recovery

Post-surgical anesthetic recovery period

Frequent and documented observation of animals during the post-surgical anesthetic recovery period is important. The animal, in or out of its cage, must be kept warm. Warm water pads, blankets, or the blue “diaper” pads work well for smaller animals. The use of electric heat pads or heat lamps may overheat the animal and their use is discouraged. If electric heat pads or heat lamps must be used, provision must be made to make frequent observations and turning of a somnolent animal so that the animal will not be overheated. Provision must also be made so that an awake animal can escape the heat source when it becomes too warm. Warmed fluids can be administered subcutaneously, intravenously, or intra-peritoneally if there is any suspicion the animal may be dehydrated. A recovering animal should be watched very closely until securely in sternal recumbency, and able to move around without plugging its nostrils with bedding. Some rodents left overnight on pads or paper bedding will eat that bedding.

Post-surgical period

Daily postsurgical observations should, at a minimum include observations of the condition of the animal and the surgical site. Sutures and/or staples need to be removed by two weeks following surgery. Any foreign substance, including sutures, catheters, implants, etc., left in the incision for long period of time can serve as a nidus of irritation and infection. A veterinarian should examine incisions that do not appear to be healing.

Animals found dead during the post-surgical period should be submitted for diagnostic necropsy. Rapid identification of infectious diseases, post-surgical infections, surgical problems, etc., permits responses by the veterinary or research staff to improve animal welfare, surgical outcomes, minimize variability, and enhance research results.

Medical Records

The maintenance of appropriate research and medical records is both a regulatory and ethical responsibility as well as a mandatory component of any reputable research laboratory. In addition to their value in documenting research activities, medical records provide both a means of documenting observations and treatments regarding animal research subjects as well as a means of communicating animal health and treatment status to others, especially veterinary staff. **Records of postoperative observations and analgesic administration on rodents must be maintained at the cage level for ready inspection.** UK DLAR Surgery record cards (pink, see example below) for documenting the surgical procedure and the postoperative care are available and highly recommended. Alternatively, specialized laboratory-specific cards designed to fit in and placed in the cage card holder may be used. Taping or clipping records to the cage unit is not permitted. In situations where maintenance of more extensive postsurgical records for both animal care evaluation and research documentation is required by the IACUC-approved protocol, these surgical and post-surgical records must be maintained in the animal housing room and readily available until such time as they are no longer pertinent to the animal's daily care. These extensive records do not obviate the need for cage cards which at a minimum must document animal observation and analgesic administration as required by the approved protocol. At the conclusion of the study, rodent surgery and postoperative care records may be maintained by the investigator as research records.

UK DLAR Surgery Record

Protocol _____ Date _____

Cage Card # _____

Procedure _____

Surgeon _____

Anesthetic _____

Time of Analgesic _____

IACUC Approved Analgesic Plan
Indicate drug(s), frequency, and duration of Tx

Pain Category E (exempt procedure)

Lab and Emergency Contact Phone

1 _____

2 _____

Surgery

Surgery

UK DLAR Surgery Record

Date	Time	Site & Health OK?	Drugs/Analgesia Administered, Comments	Initials
		Y N		
		Y N		
		Y N		
		Y N		
		Y N		
		Y N		
		Y N		
		Y N		
		Y N		
		Y N		

See housing room research notebook for post-op health and treatment records

References:

1. **Institute of Laboratory Animal Resources (U.S.).** 2011. *Guide for the Care and Use of Laboratory Animals*. Washington, D.C.: National Academy Press.
2. **United States., United States. Animal and Plant Health Inspection Service.** 2017. *Animal Welfare Act and Animal Welfare Regulations*. Washington, D.C.: U.S. Dept. of Agriculture, Animal and Plant Health Inspection Service.
3. **William A. Rutala PD, M.P.H., David J. Weber MD, M.P.H., HICPAC.** 2008. *Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008*. Centers for Disease Control and Prevention, Atlanta, Georgia.
4. **Field, K., M. Bailey, L.L. Foresman, R. L. Harris, S. L. Motzel, R. A. Rockar, G. Ruble, and M. A. Suckow.** (2007) "Medical Records for Animals Used in Research, Teaching, and Testing: Public Statement from the American College of Laboratory Animal Medicine" *ILAR Journal* 48(1):37-41.
5. UK IACUC Policy 116 Research Surgical and Procedural Records.

POST OPERATIVE EVALUATION

Animal # _____ Species _____ Date of Operation _____
 Pre-operative weight _____ (g or kg) Procedure _____

Date					
Day post-procedure					
Time					
EXTERNAL OBSERVATIONS					
Active?					
Inquisitive?					
Rough hair coat?					
Crusty red eyes?					
Eating?					
Drinking?					
Feces?					
Urine?					
PHYSICAL EXAMINATION					
* Rate & type of breathing?					
Normal gait/paralysis?					
Fecal/urine soiling of coat?					
Diarrhea?					
** Dehydration?					
Bony/thin appearance?					
Vocalization?					
Body weight?					
% change from pre-op weight					
SUTURE/STAPLE LINE					
Wound edges red?					
Swelling around incision?					
Swelling under incision?					
Sutures/staples missing?					
Exudate from incision?					
Sutures/staples removed? (date)					
OBSERVER INITIALS					

* N=normal, L=labored, R=rapid, S=shallow

** Gently pinch up a fold of skin. Skin of dehydrated animals will stay pinched up.