Rodent Surgical Training

The Basics in Rodent Surgical Training
Surgical Training Requirements

• The following must be completed before conducting surgeries at Marquette University
  • Completion of this Surgical Training Presentation
  • View the NIH Training in Survival Rodent Surgery DVD
  • Read the IACUC Rodent Surgical Guidelines
  • Obtain additional specific training for your lab
Contents of Surgical Training

1. General Principles of Surgery
2. Record Keeping
3. Anesthesia and Analgesia
4. Instrument Preparation
5. Animal Preparation
6. Conducting Surgery
7. Postoperative Care
8. Pain Recognition
Training Notes to the new surgeon

• Familiarize yourself with the relevant anatomy of the animal you will be working with.

• Observe an experienced surgeon perform the procedure you are about to complete.

• Develop your technique on training animals if you can. Cadaver animals may also be used.
General Principles of Surgery
General Principles of Surgery
Prepare in Advance

• Consult with the Marquette University Vet. All aspects of the surgical procedure and post-operative care of the animals must be described in the IACUC protocol.

• Make sure you have all the supplies you need.

• Study a description of the procedure. Use practice animals when available.
Aseptic technique encompasses all procedures designed to prevent the introduction of bacterial contamination into the surgical wound and includes:

- the use of sterile instruments
- Appropriate surgical preparation of the animal
- The use of sterile gloves and appropriate attire
- Appropriate location for conducting the surgery
- Maintenance of sterility throughout the surgical procedure
Monitor the Animal’s Condition

- Animals must be anesthetized during surgery.
- Animal must not be able to feel pain.
- Depth must not be too deep to impede with heart and lung function.
- ARC website has information on anesthetics and analgesics
• Immediately following surgery animals must be monitored closely to insure that they recover without problems.
• Suggested for 7-14 days, observe and evaluate the animal for complications (infection, bleeding, or poor wound healing).
General Principles of Surgery
Note on Non-Survival Surgery

• Non-survival surgery - animal is not allowed to regain consciousness - animal is euthanized prior to recovery.

• Aseptic technique not often necessary

• At a minimum, surgical site should be clipped and scrubbed, surgeon must wear gloves and a lab coat, and instruments are clean.

• Depth of anesthesia must always be monitored throughout the surgery and adjusted as needed.
Record Keeping

- PIs and staff are responsible for maintaining accurate records and surgical logs.
- The Marquette IACUC must approve a labs surgical log before it is used.
- Surgical records serve as documentation that the surgery was conducted humanely and by appropriately trained individuals.
- Surgical records and logs will be inspected by the IACUC and other regulatory agencies.
- Records should be kept in the surgical area or animal room.
Record Keeping
Surgical log must include

• Date of surgery
• Protocol # / Animal # / surgeon name
• Pre-surgical analgesia used (dose, route, frequency)
• Surgical start and end time
• Animal weight
• Anesthesia used (dose, route, frequency)
• Intra-operative monitoring and observation
• Post-surgical analgesia used (dose, route, frequency)
• Post-surgical monitoring and observation
Surgical Anesthesia & Analgesia

Anesthesia

• General anesthesia - a condition in which the animal is unconscious and completely insensible to pain.

• There are two types of general anesthetic agents - Injectable and inhalant anesthetics.
Injectable anesthetics

- Administered via a sterile needle and syringe (intraperitoneal injection)
- Duration of anesthesia is usually prolonged
- Amount delivered to the animal must be calculated based on the animal body weight
- Recovery time is usually much longer
Surgical Anesthesia & Analgesia
Inhalant anesthetics

• Requires special equipment to deliver a controlled dose (anesthetic vaporizer)
• Animal needs to breath in the gas - recovery is very rapid
• Isoflurane is generally used
• Duration and depth of anesthesia is easily controlled
• User must be trained on the proper use of vaporizer
The ideal dose of general anesthesia acts on the central nervous system to eliminate the sensation of pain as well as consciousness.

However, anesthetics may also affect breathing and heart function such that high doses can put the animal’s life in jeopardy.
Monitoring the Depth of Anesthesia - what to look for

• **No pain** - need to verify. Tail or toe pinch to confirm. If the animal moves it is too lightly anesthetized.

• **Not too deep** - need to verify the animal is not down too far. If too deeply anesthetized breathing rate will slow and shallow.

• **Blood oxygen levels** - can be checked with a pulse oximeter or visual. Look at the ears and paws making sure they stay pink and do not turn white.
Depth should be monitored by performing a toe or tail pinch test about every 5-10 minutes.

Although it is ideal to continuously monitor respiration there are some procedures that may make it difficult to check/monitor respiration. When you conduct your toe or tail pinch you should also make it a point to check respiration at that time.
Surgical Anesthesia & Analgesia

Analgesia

• Analgesic medication must be provided for research animals subjected to procedures which may be expected to induce more than momentary or slight discomfort.

• Pain adversely impacts the welfare of the animals.

• Management of pain - an analgesic plan can be found in the approved IACUC Protocol.
• Analgesic medication can be given before procedures and just after the surgical procedure.
• Intention is to establish effective analgesia before the animal recovers from anesthesia (preemptive analgesia).
• May reduce the duration of post-operative pain and reduce the amount of medication needed to provide effective pain relief.
Surgical Anesthesia & Analgesia Analgesia

• Analgesic medication can be provided in many different ways...
• Injection
• Food or fluid intake
• Topically
Instrument Preparation and Sterilization
Instrument Preparation and Sterilization

• All instruments and other equipment used to perform surgery must be sterilized prior to use.

• Self sealing envelopes with one side made of clear plastic is used in a steam sterilizer.
Instrument Preparation and Sterilization

What’s in the pack?

• All surgical instruments and other sterile material that may be needed during the procedure.

• If pre-packaged (sterile) material and equipment was purchased it may be aseptically placed onto the surgical table.
Instrument Preparation and Sterilization
Sterilization methods most common used...

- Steam sterilization - Autoclave
  - Exposed to steam under pressure
  - Indicator strip used

- Dry heat sterilization - glass bead sterilizer
Instrument Preparation and Sterilization
Glass Bead Sterilizers

- Central well with glass beads that heat to 500 F.
- Used to sterilize instruments tips between multiple rodent surgeries.
  - Tips are placed into the hot glass beads for about 5-10 seconds and must be cooled before use.
  - Not used as the sole method of sterilization (instruments must be first autoclaved).
• Reusing Instruments
  • The instruments must be initially sterilized by autoclaving.
  • Instruments should be wiped with alcohol or sterile saline to remove blood and tissue particles between animals.
  • The tips of instruments must be placed in a hot bead sterilizer between animals.
  • (recommended) that a new set of sterile instruments be used after every 4-5 animals.
  • If the instruments have become contaminated by contact with a non-sterile surface or non-sterile portions of the body (GI tract) new sterile instruments should be used on other animals.
Animal Preparation
Animal Preparation

• Prep includes

• Removal of the fur

• Cleansing of the skin around the surgical site
Animal Preparation
Protect the Eyes & Fur Removal

• Eyes under general anesthesia remain open - corneal surface will dry out.
• Eye ointment is recommended to be placed in the eyes.
• Remove hair around the incision site by clipping or plucking.
• Must take place in an area separate from surgical location.
Rodents lose body heat quickly during anesthesia.
The animals should be placed on a warm surface when procedures are done.
Scrubbing should follow a circular pattern that begins at the incision site and gradually moves outward.
Postoperative Care
• **Immediate Post Operative Care**
  
  • During immediate post operative care animals must be observed until they are able to right themselves and maintain sternal recumbancy.
  
  • The animal must be able to pull itself into sternal recumbancy when laid on its side before it may be left unattended.
Postoperative Care

• Extended Post Operative Care
  • Animals and wounds should be monitored once per day until animal returns to normal behavior.
  • Be aware of the IACUC policy on staple removal.
  • Daily observations should continue for a minimum of one week post surgery.
  • Daily observations and abnormal findings as well as any medical treatment must be documented in the surgical log.
Postoperative Care

- Unexpected complications may happen. Talk to PI or consult the ARC Veterinarian.
- Hypothermia - very important to keep animals warm during and after surgery.
- Anesthetic overdose - repeated boosters + prolonged recovery = organ failure.
- Swollen surgical wound - tightly placed sutures or infection.
- Abnormal behavior - Be familiar with signs of pain or distress.
Signs of Pain or Distress

- Decreased activity or reluctance to move
- Abnormal gait or posture
- Rough, greasy-looking coat
- Dark, red material around the eyes and nose in rats
- Decreased appetite
- Aggressiveness when handled
- Excessive licking or chewing of a body part or area