Rodent Surgery Workshop (Module 4)
Date August 2017

Research is in our Blood
Module 1, 2 and 3 are prerequisites for this module.
Course contents and objectives

• Aseptic technique
• Surgical instruments
• Surgical draping
• Wound closure
• Pre-operative considerations
• Intra-operative procedures
• Post-operative care
• Practice on a carcass
• QA assessment on a live mouse
What is the purpose of rodent surgery?

- Create research models
- Provide treatment
- Provide surgical training
Good surgical technique is important – the 7 principles to learn and to follow

- Observe strict asepsis
- Handle tissues gently
- Control hemorrhage carefully
- Preserve blood supply
- Minimize tissue tension
- Appose tissues accurately
- Eliminate dead space
Aseptic technique

- **Aseptic technique** is a set of practices and procedures designed to limit contamination of surgical wounds from microorganisms. These include:
  
  - Instrument sterilization
  - Surgical preparation of the animal
  - Surgeon’s preparation
  - Adequate surgical area
  - Sterile surgical technique
Aseptic technique

The risk of contamination of surgical wounds may also depend on:

- Microorganisms present
- Patient’s strain, age, immune status
- Type and length of surgical procedure
- Surgeon’s experience
Surgical gloves vs alcohol sprayed gloves

- If exam gloves are used, they should be washed with a disinfectant before manipulating sterile items.
- Gloves should be changed between animals.
Surgical instruments

- Rodent surgeries require surgical instruments adapted to the small size of the animals.

- F.S.T
- Kent Scientific
- Braintree
- Harvard Apparatus
- Almedic
Surgical instruments: forceps

When not in use

Forceps
Non-dominant hand

plain tip
with teeth
curved
Surgical instruments: scissors

- Scissors
- Iris scissors
- Mayo scissors

- Blunt-blunt
- Sharp-blunt
- Sharp-sharp

- Spring scissors
- Ligature scissors
Surgical instruments: hemostats

MOST COMMON
- Mosquito
- Crile
- Kelly
Instruments: needle holder

- Mayo-Hegar
- Olsen-Hegar (scissors)
Surgical instruments: scalpel

Scalpel with blade
Surgical instruments: scalpel

- Pencil grip
- Fingertip grip
Surgical instruments: scalpel blade safety

Commercial device to remove blades
Instrument cleaning and maintenance

- Clean every instrument before sterilizing step
- Use a good soap or detergent to remove blood, oils and debris
  - Ex: Sparkleen (powder detergent) or Renuzyme (enzymatic detergents)
- Dry the instruments before packaging for the autoclave
- Lubrication and rust inhibitor treatment can make instruments last longer
  - Ex: Surgical milk
- Steam autoclaving
  - Most stainless steel instruments can be autoclaved
  - Available at the Animal Facility
Alternative methods to sterilize

• Alcohol is not effective in sterilizing instruments
  – Does not kill spores and certain viruses
  – [Link](https://www.aaalac.org/publications/Connection/Using_Alcohol_Disinfectant.pdf)

• Glass bead sterilization
  – Useful between surgeries
  – Turn on 30 mins prior to using (heats up to 500F).
  – Let instruments cool prior to using
  – Provided in the surgical suite

• Ethylene oxide (Gas sterilization)
  – Useful for material that is not autoclavable

• Cold sterilization
  – Ex: Glutaraldehyde
Arrive the surgical area so that there are three distinct areas: preparation, surgery, and recovery.

- Prepare non-sterile animal preparation area.
- Used for shaving and sterile preparation of the animal.
Preparation: Sterile surgical area

- Prepare all materials
- The sterile field encompasses the surgical area, the area prepared on the animal, and the front of the surgeon.
- Breaks in sterility occur when the surgeon touches something outside the sterile field. This may be face, a light fixture, an unprepared area of the animal, or a non-sterile instrument.
Pre-operative preparation: surgical site

- Shave the incision site.
- Alcohol 70% → Avoid if using cautery pen
- Chlorhexidine 2%
Surgical Draping - Options

• To consider when using suture materials
Glad Press and Seal®

- Glad’s **Press’n Seal** provides a sterile, inexpensive and effective method to cover the surgical field. Although this is a food/grocery item, at UTSA we have tested it and results have been 100% negative for the presence of any microorganisms and organic material.

- [https://www.youtube.com/watch?v=3-NxOc4CdcS&list=UUFS9rani6KxEnT_qkHUyXw](https://www.youtube.com/watch?v=3-NxOc4CdcS&list=UUFS9rani6KxEnT_qkHUyXw)

- [https://www.youtube.com/watch?v=3WEgxfXh74&list=UUFS9rani6KxEnT_qkHUyXw&index=2](https://www.youtube.com/watch?v=3WEgxfXh74&list=UUFS9rani6KxEnT_qkHUyXw&index=2)

- [https://www.youtube.com/watch?v=09nMBxInNra4&list=UUFS9rani6KxEnT_qkHUyXw&index=7](https://www.youtube.com/watch?v=09nMBxInNra4&list=UUFS9rani6KxEnT_qkHUyXw&index=7)
Wound closure

- Sutures
- Wound clips
- Tissue glue
Wound closure: sutures

- **Type**
  - Absorbable
  - Non-absorbable

- **Material**
  - Monofilament
  - Multifilament – Braided

- **Needle**
  - Cutting
  - Reverse cutting
  - Taper

- **Size** (for rodents)
  - 3-0
  - 4-0
  - 5-0

McGill
# Suture Materials

<table>
<thead>
<tr>
<th>Absorbable</th>
<th>Catgut/Plain/Chromic gut</th>
<th>Multifilament, natural fiber moderate tissue reactivity, rapid loss of strength</th>
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</thead>
<tbody>
<tr>
<td>Vicryl</td>
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<td>Multifilament, absorbable in 60-90 days.</td>
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<tr>
<td>PDS</td>
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<td>Monofilament, absorbable in 6 months, not very inflammatory, harder to use (not very flexible)</td>
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<tr>
<td>Monocryl</td>
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<td>Monofilament, less inflammatory</td>
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<tr>
<td>Non-Absorbable</td>
<td>Silk</td>
<td>Multifilament, natural fiber, resorption in 2 years, loses tension with time.</td>
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<td>Stainless</td>
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<td>Monofilament, inert, can cut tissues.</td>
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<td>Nylon</td>
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<td>Monofilament or multifilament, poor knot security.</td>
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<tr>
<td>Prolene/Polypropylene</td>
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<td>Monofilament, very secure knots, the least inflammatory and most resistant to infection.</td>
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</table>
Wound closure – Simple discontinuous
Wound closure – Simple discontinuous - tips

**SUTURE SPACING**

Spacing between sutures is typically equal to the distance from needle entry to wound margin. Although not an absolute formula, in general sutures should enter and exit at an equal distance from the wound margin, where $X = X = X$.

**EQUAL BITES:** The “bite” that is taken on one side of the wound, must be equal to the bite taken on the second side.

**EQUAL DEPTHS:** The depth that the needle passes through the tissue should be equal on both sides.
Basic principles of rodent surgery

Pre-operative  Intra-Operative  Post-operative
Pre-operative preparation

Pre-operative considerations:
- Weigh animal(s)
- Administer anesthetic according to its species-specific Anesthesia SOP
- Anesthetize the animal according to its species-specific Anesthesia SOP
- Apply ophthalmic ointment in both eyes to prevent corneal desiccation
- Administer from 0.2 to 0.5mL/kg body weight of isotonic fluids, subcutaneously
- Provide source of heat
- Remove hair over the surgical area with a clipper, depliable cream or by plucking allowing a perimeter of at least 1cm around surgical site
- Clean surgical area with chlorhexidine 2%
- Move your animal to the surgical area
- Wear sterile or alcohol-sterilized gloves
- Perform 3 passages (70% alcohol and 2% chlorhexidine)
- Cover the animal with a sterile drape
Arrange the surgical area so that there are three distinct zones: preparation, surgery, and recovery.
Pre-operative preparation: surgeon’s prep

- Wash hands
- Personal protective equipment
- Gloves
Pre-operative preparation: instruments

Place your instruments

Between surgeries

Avoid contamination
Pre-operative preparation: animal prep

- Weigh your animals
- Administer analgesia
- Anesthetize animal
- Apply ophthalmic ointment
- Remove hair over the surgical site. Remove loose hair with gauze.
- Administer fluids
- Wipe the skin surface with 70% alcohol followed by 2% chlorhexidine solution or povidone-iodine solution.
Pre-operative preparation: surgical site

- Remove hair
- Wash site
- Wash site
- Drape
Basic principles of rodent surgery

- Pre-operative
- Intra-Operative
- Post-operative
Intra-operative procedures: monitoring

Reflexes
Respiratory rate
Heart rate
Body temperature

Available to rent
Intra-operative procedures: the incision
Intra-operative procedures: tissue handling

- Handling tissues with fingers
- Excessive pulling of tissues
- Gauze soaked with sterile saline

McGill
Intra-operative procedures: blunt dissection
Intra-operative procedures: hemostasis

Use caution in presence of oxygen or flammable substances!

Cautery pen

Hemostats

McGill
Intra-operative procedures: wound closure
Post-operative care
Post-operative care: immediately after surgery

Arrange the surgical area so that there are three distinct zones: preparation, surgery, and recovery.

- Clean cage
- Source of heat
- SC fluids
Post-operative care: recovery

Keep the animal warm. Warmth will aid in speedy recovery.

Do not return animals or cages to the animal holding area until all animals appear normal.

observe

moist food/gel
Post-operative care: cage cards
# Post-operative care: recordkeeping

## Rodent Procedure Log

**Investigator:**  
**Protocol:**  
**Performed by:**

Instructions: Complete the log for rodent procedures requiring anesthesia, analgesia or post-procedure care (i.e., surgeries, experimental infections). Keep the log in the housing room until access in your record for 5 years for future review by the QA/EEC.

### ANESTHESIA
- intramuscular: 20mg/kg (or 5-10 mg/kg SC, every 24 hr)  
- subcutaneous: 5-10 mg/kg SC or IP, every 48 hr  
- i.v. or i.p.: 5-10 mg/kg SC or IP

### ANALGESIA
- non-steroidal anti-inflammatory drug (NSAID)  
- morphine 2.5 mg  
- ketamine 10 mg/kg SC  
- acepromazine 0.5-1 mg/kg SC or IP

### OTHER AGENTS ADMINISTERED
- saline  
- tear gel  
- glaucoma drops  
- other:

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<tr>
<th>Animal ID</th>
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<th>Anesthesia</th>
<th>Analgesia</th>
<th>Other</th>
<th>Heat Source Provided</th>
<th>Recovery</th>
<th>Comments/observations</th>
<th>Initials</th>
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Comments/Postnotes:

* Dose can vary with the sex, the age, the strain, and the body condition of the animal.
Post-Operative Care

- Provide moist food in cage.
- Administer general analgesia for 72 hours post-op.
- Remove sutures if necessary after 7-10 days.

* Surgery, performed properly, does not need prophylactic antibiotics or any other treatments, other than pain relief.
Potential signs associated with pain or distress

- Decreased food and water intake (body weight changes/dehydration)
- Isolation
- Rapid open mouth breathing
- Aggression
- Unkept appearance (piloerection, rough coat)
- Decreased activity
- Twitching/trembling
- Vocalization
- Facial appearance

![Pain Scale Image]
Next steps

• Schedule practice sessions on carcasses
• **Workshop session with anesthetized animal (from your protocol or on a workshop animal) with or without recovery.**
• Obtain and prepare necessary materials (Glen, Shriners, CMARC pharmacy)
• Booking of hoods, surgery table - iLab
• Anesthetic machine reservation – iLab
Specific Surgical Procedure

- Jove video
- See specific surgery powerpoints if applicable
• Refreshers can be scheduled upon request. Don’t be shy to ask for help.
• Handout and website can be consulted for more complete information or AHT's can be contacted for any questions.
• Glen animal health technicians: vetglen@muhc.mcgill.ca
• McGill SOP: http://www.mcgill.ca/research/researchers/compliance/animal/sop

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