**Analgesia Guidance for Rodent Procedures**

**Important tips:**
1. Expected post-procedural pain level is based on procedure being performed optimally by skilled personnel. Sub-optimal performance of any procedure is likely to produce MORE pain than is typical. If it is painful in humans, it is likely painful in animals.
2. Consider the effects of using the specific analgesic (NSAID or opioid) on the scientific objectives of the study.
3. Include multiple (or all) options in your protocol to maintain flexibility. See additional information on drugs below chart.
4. Animals should be monitored for pain as follows: moderate pain → at least once daily; severe pain → at least twice daily until analgesia regimen is complete and animal is stable/not exhibiting signs of distress (see green post-op card instructions on p.6).
5. Analgesia lasting longer than required is permitted (i.e., sustained release formulas can be used in most instances).
6. Other analgesic regimens may be proposed. These must be reviewed and approved prior to use. Please contact ASC for assistance: 362-3229.

<table>
<thead>
<tr>
<th>Rodent Procedure Examples</th>
<th>Expected Post-procedural Pain Level</th>
<th>Analgesic Options (see additional info that follows)</th>
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</thead>
<tbody>
<tr>
<td>• IP, SC, or IV injection</td>
<td>No Pain or Minimal Pain</td>
<td>• Analgesia is NOT required.</td>
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<td>• Percutaneous catheter insertion</td>
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<td>• Any of the options below may be used if desired.</td>
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<td>• Tail snip</td>
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<td>In general, if anesthesia is not required, then analgesia is not required.</td>
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<td>• Toe clip</td>
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<td>• Ear notch</td>
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<td>• SC tumor implant by needle</td>
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</tbody>
</table>
| • Retro-orbital blood collection or injection (typically requires general anesthesia) | Mild Pain (analgesia to last at least 8 hours) | Option 1: Local anesthetic  
Option 2: 1 dose of buprenorphine  
Option 3: NSAID (to last at least 8 hours)  
General anesthesia is required. |
<p>| • Skin incision only (any site) |                                   |                                                     |
| • Subcutaneous implant (e.g., osmotic pump, pellet, transponder) |                                   |                                                     |
| • Catheter placement via cutdown |                                   |                                                     |
| • Punch biopsy of skin      |                                   |                                                     |
| • Vascular access port implantation |                                   |                                                     |
| • Ocular (eye) procedure—minor |                                   |                                                     |</p>
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Pain Level</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
<th>Option 4</th>
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</thead>
<tbody>
<tr>
<td>Embryo transfer via lumbar incision</td>
<td>Moderate Pain</td>
<td>Lidocaine or Bupivacaine local at the time of surgery followed by NSAID (12-24 coverage)</td>
<td>Buprenorphine followed by injectable NSAID (12-24 hour coverage)</td>
<td>Buprenorphine followed by injectable NSAID (12-24 hour coverage)</td>
<td>1 dose of Buprenorphine-SR given 1 hour prior to surgery (lasts 72 hours)</td>
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<td>Castration/Vasectomy</td>
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<td>Parabiosis</td>
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<td>Intracranial surgery—minor</td>
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<td>Thyroidectomy</td>
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<td>Thymectomy</td>
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<td>Mammary fat pad manipulation</td>
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<td>Orthopedic procedures—minor</td>
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<td>Ocular (eye) procedure—major</td>
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<td>Tissue dissection/transection (e.g. incisional biopsy or tumor removal)</td>
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<td>Option 1: Lidocaine or Bupivacaine local at the time of surgery</td>
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<td>followed by NSAID (12-24 coverage)</td>
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<td>Moderate Pain (analgesia needs to last 12-24 hours)</td>
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<td><strong>Option 2:</strong> Buprenorphine followed by injectable NSAID (12-24 hour coverage)</td>
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<td><strong>Option 3:</strong> Buprenorphine followed by injectable NSAID (12-24 hour coverage)</td>
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<td><strong>Option 4:</strong> 1 dose of Buprenorphine-SR given 1 hour prior to surgery (lasts 72 hours)</td>
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<td>Thoracotomy (use of local anesthetic on incision site is highly desirable—see following pages)</td>
<td>Severe Pain</td>
<td>Option 1: Lidocaine or Bupivacaine local at the time of surgery followed by NSAID (thoracotomy)</td>
<td>Option 2: Buprenorphine followed by injectable NSAID (24-48 hour coverage)</td>
<td>Option 3: Buprenorphine-SR given 1 hour prior to surgery (lasts 72 hours); +/- local anesthetic; +/- Chewable NSAID tablets to reduce swelling and increase comfort</td>
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<td>Laparotomy (for C-section, GI, kidney, spleen, liver, reproductive, or other abdominal procedures)</td>
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<td>Craniotomy—with bone removal—major</td>
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<td>Laminectomy/Vertebral surgery</td>
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<td>Nerve surgery</td>
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<td><strong>Severe Pain (analgesia needs to last 24-48 hours)</strong></td>
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<td><strong>Option 1:</strong> Lidocaine or Bupivacaine local at the time of surgery followed by NSAID (thoracotomy)</td>
<td><strong>Option 2:</strong> Buprenorphine followed by injectable NSAID (24-48 hour coverage)</td>
<td><strong>Option 3:</strong> Buprenorphine-SR given 1 hour prior to surgery (lasts 72 hours); +/- local anesthetic; +/- Chewable NSAID tablets to reduce swelling and increase comfort</td>
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*Minor procedures typically do not result in permanent or chronic impairment. Healing is rapid with little obvious change in the area or organ.

*Major procedures require more extensive tissue resection and organ involvement resulting in delayed healing or chronic inflammation.*
**Additional Information on Rodent Analgesics**

### 1. Systemic Analgesics

**Buprenorphine (Buprenex®)**  
Narcotic/Opioid (Schedule III)  
Drug concentration in ampule: 0.3 mg/ml  
Dosages:  
- Rats: 0.01-0.05 mg/kg given SC or IP every 8-12 hours *  
- Mice: 0.05 – 0.1 mg/kg given SC or IP every 8-12 hours  
  *may cause pica (eating of non-food substances) in rats; use low dose for SD rats

**Buprenorphine-Sustained Release (“Bup-SR”)**  
Narcotic/Opioid (Schedule III) from ZooPharm—compounding pharmacy  
Buprenorphine SR-LAB releases over 72 hours and provides blood levels greater than 1.0 nanogram/ml in rodents for post-operative analgesia.  
Drug Concentration: 1 mg/ml (5 ml vial)  
Contact DCM to acquire.  
Dosages:  
- Rats: 1.0 - 1.2 mg/kg* [for a single 72-hour SC injection]  
- Mice: 0.5 – 1.0 mg/kg* [for a single 72-hour SC injection]  
Additional comments:  
  See FAQs at SR Veterinary Technologies

**Carprofen (Rimadyl®)**  
Non-steroidal anti-inflammatory (NSAID)  
There are 2 formulations for dosing by different routes.

1) **Carprofen Oral (chewable tabs):** from Bio-serv  
   Flavored chewable tablet containing 2 mg carprofen/5 gram tablet.  
   Placebo tab (no carprofen) can be used 3 days prior to surgery to acclimate the animal.  
   Leave on the cage floor for easy access; nutritionally complete. Stimulates appetite and allows mice time to recover undisturbed.  
Dosages:  
- **Rat Average Dose:** One 5 gm Tablet/100 g of body weight (BW) daily  
- **Mouse Average Dose:** ½ of a 5 gm Tablet needed for up to 4 mice daily
2) Carprofen Injectable:
Drug concentration in bottle: 50 mg/ml
Store at 4˚ C
Drug is viscous and needs to be diluted in sterile water 1:10 or more.
Administer injectable solution subcutaneously in the scruff (loose skin on dorsal neck) using a 25 or 27g needle.
Dosages:
   **Rats**: 5 mg/kg IP or SC every 6-8 hours **
   **Mice**: 5 mg/kg IP or SC every 6-8 hours **
   **or 8-12 hours if supplemented with chewable NSAID

Meloxicam (Metacam)
Non-steroidal anti-inflammatory (NSAID)
There are 4 formulations for dosing by different routes.

1. Meloxicam Oral (chewable tab): available from Bio-Serv
   Flavored chewable 5 gram tablet –nutritionally complete
   Dosages:
      **Mouse Dose**: One 5 gm tablet/mouse/day (0.05 mg meloxicam/tablet)
      **Rat Dose**: One 5 gm tablet/rat/day (0.25 mg meloxicam/tablet)
   Placebo tab (no meloxicam) can be used 3 days prior to surgery to acclimate the animal
   Leave on the cage floor for easy access
   Nutritionally complete

2. Meloxicam Oral Solution (for oral dosing): drug concentration is 1.5 mg/ml
   Dilute 1:10 before use
   Dosing procedure (obtain training before attempting): While gently restraining mouse or rat, administer oral suspension directly into mouth one drop at a time until animal ingests fluid. Do not attempt to forcefully inject entire dose at once as animal may aspirate liquid and die.
   Dosages:
      **Rats**: 0.5 mg/kg PO every 12 hours up to 3 days
      **Mice**: 2.5 - 5 mg/kg PO every 12 hours up to 3 days
3. Meloxicam Injectable: (5 mg/ml)
   Administer injectable solution subcutaneously in the scruff (loose skin on dorsal neck/shoulder area) using a 25 or 27g needle.
   Dosages:
   - Rats: 1 mg/kg once daily up to 3 days
   - Mice: 5-10 mg/kg once daily up to 2 days

4. Meloxicam SR (sustained release) injectable: (2mg/ml)
   - Rats and Mice: Administer 4 mg/kg [in one 72-hour SC injection]
   See FAQs at SR Veterinary Technologies

2. Local anesthetics that provide analgesia
   Can be used in conjunction with systemic analgesia (NSAIDs or opioids)
   Provide local pain relief. Especially indicated in certain types of surgery (e.g., thoracotomy)
   Use pre-operatively (before the incision is made)
   Inject into SC space below planned incision site

   **Bupivacaine (Marcaine®) 0.5% (= 5 mg/ml) – sold in 50 ml vial**
   - Dilute (1:2) in sterile water to 2.5mg/ml (0.25%)
   - Do not exceed dose of 8 mg/kg total based on animal body weight
   - Can be used in addition to systemic analgesia (NSAIDs or opioids)
   - Provides local pain relief; inject into SC space below planned incision site
   - Use pre-operatively (before the first incision)
   - Duration of action: slower onset than lidocaine, but longer duration (approx. 4-8 hours)

   **Lidocaine (Xylocaine®) 2% (= 20 mg/ml) – sold in 50 ml vial**
   - Some formulations of lidocaine include epinephrine to promote vasoconstriction (to keep anesthetic agent in area longer). Beware if epinephrine is not desired.
   - Dilute (1:4) with sterile water to final concentration of 5 mg/ml (0.5%)
   - Do not exceed 7 mg/kg total based on animal body weight
   - Duration of action: faster onset than bupivacaine, but short (<1 hour) duration
Post-Surgical Monitoring Records

**Completed by:** Investigator

**Purpose:** Comply with ASC's post-operative record requirements

**When to use:** After completing surgical or anesthetic procedure at least until analgesia is no longer needed and animal is stable.

**Details:**

1. Research staff fills out post-surgical monitoring card completely, including type of procedure, number of animals, who performed procedure, ASC protocol number, date and end time of procedure, type of analgesia & other drugs provided, lab emergency contact & phone number; frequency of observation, and date of suture/staple removal, if applicable.

2. (Back of card) Research staff should provide dates and times of all post-procedural monitoring and treatments and initial each day.

3. Place card in cage card holder behind the regular cage card.

4. DCM animal caretakers should DOC cages daily and pay special attention to specific instructions, dates, and that animals are being monitored, noting that there is adequate feed or water available and that the cage is not excessively soiled.

5. Card should be removed once post-procedural conditions are no longer active (i.e., analgesia no longer needed, wound has healed, staples or sutures removed, AND animal is stable/not exhibiting signs of distress).

6. Completed cards should be kept on file for at least 2 years by research staff as documentation that post-surgical monitoring was properly conducted.

Also see:

ASC Rodent Survival Surgery Policy