

Recommended Surgical Analgesic Protocols for Mice and Rats

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This is a handout that accompanies a hands-on rodent surgery workshop in the Laboratory Animal Resources Center, <http://research.utsa.edu/research-funding/laboratory-animal-resources-center/training/>.

General Dosages

	Mouse	Rat	
Buprenorphine	0.05-0.1 mg/kg SC q8-12h	0.01-0.05 mg/kg SC q8-12h	O
Buprenorphine SR LAB	0.5-1 mg/kg SC q72h	1-1.2 mg/kg SC q72h	O
Buprenorphine ER	3.25 mg/kg SC q72h	0.65 mg/kg SC q72h	O
Oxymorphone	0.2-0.5 mg/kg SC q4h	0.2-0.5 mg/kg SC q4h	O
Morphine	1-2.5 mg/kg SC q2-6h	1-2.5 mg/kg SC q2-6h	O
Ketoprofen	2-5 mg/kg SC q24h	2-5 mg/kg SC q24h	N
Carprofen	2-5 mg/kg SC q12-24h	2-5 mg/kg SC q12-24h	N
Carprofen (50 mg/ml) in Drinking Water	10 mg/kg --- 0.12 ml carprofen in 89.88 ml of drinking water (0.067 mg/ml) stable x 7d. Start treatment 12-24 h prior to surgery		N
Meloxicam	1-2 mg/kg SC, PO q12h	1-2 mg/kg SC, PO q12h	N
Meloxicam SR LAB	4 mg/kg SC q72h	4 mg/kg SC q72h	N

SC: Subcutaneous; **PO:** Orally; **q:** Every; **h:** Hours

O = Opioid, **N** = NSAID

Lidocaine/Bupivacaine Pre-Operative Infiltration

- Incision site and underlying tissues
- 1-2% lidocaine/0.25-0.5% bupivacaine (50/50) mix by volume
- May need to dilute, esp. for mice (e.g. 1/10 dilution)
- Epinephrine prolongs action

Local Anesthetic	Onset	Duration	Do not exceed (toxic dose)
Lidocaine (xylocaine)	1-3 minutes	20-40 minutes	10 mg/kg
Bupivacaine	~20 minutes	4-6 hours	6 mg/kg

RECOMMENDED PERI-OPERATIVE ANALGESIC PROTOCOLS FOR MICE AND RATS

Mild Pain

Preemptive¹ (once)		Lidocaine/bupivacaine as local infiltration
Post-surgical	Drug	Buprenorphine, morphine or oxymorphone
	Frequency	Once

Mild to Moderate Pain – OPTION 1

Preemptive (once)		Lidocaine/bupivacaine as local infiltration
		<i>AND</i>
		Buprenorphine, morphine or oxymorphone
Post-surgical	Drug	Buprenorphine
	Duration	1-2 days

Mild to Moderate Pain – OPTION 2

Preemptive (once)		Lidocaine/bupivacaine as local infiltration
		<i>AND</i>
		Buprenorphine, morphine or oxymorphone
Post-surgical	Drug	Carprofen, ketoprofen or meloxicam
	Duration	1-2 days

Moderate to Severe Pain

Preemptive (once)		Lidocaine/bupivacaine as local infiltration
		<i>AND</i>
		Buprenorphine, morphine or oxymorphone
Post-surgical	Drug	Buprenorphine
	Duration	2 days
		<i>AND</i>
	Drug	Meloxicam (use highest dose)
	Duration	2-3 days
		<i>AND</i>
	Drug	Morphine for severe pain
	Duration	As needed

¹ Administration of analgesics prior to induction of pain.

Examples of mild, moderate and severe post-surgical pain in mice and rats*

Mild:

- Subcutaneous pump or pellet implantation
- Tail clipping
- Intracerebral electrode implantation
- Simple laparoscopic biopsies
- Superficial lymphadenectomy
- Vascular access port implantation

Moderate:

- Vascular catheterization
- Embryo transfer
- Ovariectomy
- Orchiectomy
- Craniotomy
- Thyroidectomy
- C-section
- Embryo transfer
- Hypophysectomy
- Thymectomy
- Minor laparotomy incisions

Severe:

- Orthopedic procedures
- Thoracotomy
- Organ transplantation
- Major laparotomy procedures
- Vertebral procedures

***IMPORTANT CONSIDERATION:** This is a guideline for classifying pain categories to common surgical procedures in mice and rats to aid the investigator, the Attending Veterinarian and the animal care committee in deciding an appropriate peri-operative analgesic protocol. This classification must be considered against other factors, such as length of procedure, extent of tissue dissection, degree of blood loss, materials implanted, unexpected surgical events, health status, age, strain, and surgeon's experience and skill.