

Assessment and Management of Pain

Listed below are procedures that are frequently presented with rodent and rabbit protocol proposals. The intensity and duration of post-surgical post-procedural pain will vary according to a number of factors such as the invasiveness of procedure, degree of tissue trauma, surgical time, skill of the surgeon and the tissues or organs that will be involved.

Procedures and Their Potential to Cause Pain:

Pain Potential		
Minimal to Mild Pain	Mild to Moderate Pain	Moderate to Severe Pain
Catheter implantation	Minor laparotomy incisions	Major laparotomy incision
Tail clipping	Thyroidectomy	Thoracotomy
Ear notching	Orchidectomy	Heterotopic organ transplantation
Superficial tumor implantation	C-section	Vertebral procedures
Orbital sinus venotomy	Embryo transfer	Burn procedures
Superficial lymphadenectomy	Hypophysectomy	Trauma models
Ocular procedures	Thymectomy	Orthopedic procedures
Multiple ID antigen injections		
Intracerebral electrode implantation		
Vasectomy		
Vascular access port implantation		

Non-Pharmacologic Postoperative Support Methods for Mice and Rats		
Minimal to Mild	Mild to Moderate	Moderate to Severe
Wound care	Wound care	Wound Care
House singly until ambulatory	Soft, absorbent bedding, nest material	Soft, absorbent bedding, nest material
	Modified food and water access	Modified food and water access
	House singly until ambulatory	Increased food palatability
	Supplemental heat	Supplementary heat and hydration, SC or IP
		House singly until ambulatory

Signs of Pain and Distress in Mice	
Mild to Moderate Pain/Distress Signs	Severe or Chronic Pain/Distress
<ul style="list-style-type: none"> • Eyelids partially closed • Changes in respiration • Rough hair coat • Increased vibrissal movements • Unusually apprehensive or aggressive • Possible writhing, scratching, biting, self-mutilation • Hunched posture • Sudden running movements (escape) • Aggressive vocalization when handled or palpated • Guarding 	<ul style="list-style-type: none"> • Weight loss (decreased appetite)* • Dehydration • Incontinence • Soiled hair coat • Eyes sunken, lids closed • Wasting of muscles on back • Sunken or distended abdomen • Decreased vibrissal movements • Unresponsive • Separates from group • Hunched posture • Ataxia, circling • Hypothermia • Decreased vocalization • Reduced rearing <p>*May see weight loss even with moderate pain/distress</p>

Suggested Pharmacologic Methods for Mice		
Minimal to Mild	Mild to Moderate	Moderate to Severe
Local anesthesia Lidocaine/Bupivacaine	Lidocaine/Bupivacaine (adjunct to systemic analgesic)	Lidocaine/Bupivacaine (adjunct to systemic analgesic)
Butorphanol 1-5 mg/kg, SC q 4 h	Buprenorphine 0.05-0.1 mg/kg, SC q 8-12 h	Buprenorphine* 0.05-0.1 mg/kg, SC q 8-12 h
Carprofen 2.5-5 mg/kg, SC Once	Carpofen 2.5-5.0 mg/kg, SC q 24 h	Carpofen* 2.5-5.0 mg/kg, SC q 24 h
		Morphine 2-5 mg/kg, SC q 2-4 h

*Severe pain may be better addressed by the addition of a NSAID to an opioid. This multimodal approach allows for action at different points on the pain pathways and will allow for a lower dosage of both components. Buprenorphine, alone, is recommended for only moderate pain management.

Signs of Pain and Distress in Rats	
Mild to Moderate Pain/Distress Signs	Severe or Chronic Pain/Distress Signs

- Eyelids partially closed
- Porphyrin staining around eyes, nose
- Rough hair coat and/or hair loss
- Increased aggression (towards humans and cage mates)
- Reduced exploratory behavior
- Aggressive vocalization when handled
- Licking, biting and/or scratching
- Guarding

- Eyes closed
- Poor skin tone
- Muscle wasting along back
- Dehydration
- Weight loss (decreased appetite)*
- Incontinence
- Soiled hair coat
- Depressed/unresponsive
- Sunken or distended abdomen
- Self-mutilation
- Recumbent position with head tucked into abdomen
- Decreased vocalization
- Hypothermia
- Reduce rearing
- Eating of bedding

*May see weight loss even with moderate pain/distress

Suggested Pharmacologic Methods for Rats

Minimal to Mild	Mild to Moderate	Moderate to Severe
Local anesthesia Lidocaine	Local anesthesia Lidocaine/Bupivacaine (adjunct to systemic analgesic)	Local anesthesia Bupivacaine (adjunct to systemic analgesic)
Butorphanol 2 mg/kg, SC once	Buprenorphine 0.05 mg/kg, SC q 6-12 h	Buprenorphine* 0.05 mg/kg, SC q 6-8 h
Carprofen or ketoprofen 2.5-5 mg/kg, SC once	Carprofen or ketoprofen 2.5-5 mg/kg, SC q 24 h	Carprofen or ketoprofen* 2-5-5 mg/kg, SC q 24 h
Meloxicam 1 mg/kg, SC once	Meloxicam 1-2 mg/kg, SC q 24 h	Meloxicam* 1-2 mg/kg, SC q 24 h
		Morphine 2.5-20 mg/kg q 2-4 h Severe Pain

*Severe pain may be better addressed by the addition of an NSAID to an opioid. This multimodal approach allows for action at different points on the pain pathways, and will allow for a lower dosage of both components. Buprenorphine, alone, is recommended for only moderate pain management.

Clinical Assessment of Post-Procedural Pain in Rabbits:

- reduced activity
- failure to groom
- reduced food and/or water intake
- squint-eyed
- pale eyes (if albino)
- changed posture, tucking of abdomen, tensing of muscles
- guarding, attempting to hide, or aggressiveness
- grinding of teeth

Non-Pharmacologic Pain Management Recommendations for Rabbits

Minimal to Mild	Mild to Moderate	Moderate to Severe
Wound care	Wound care	Wound care
Soft, absorbent bedding	Soft, absorbent bedding	Soft, absorbent bedding
		Modified food and water access
		Increased food palatability
		Hydration, SC or IP
		Supplemental heat

Suggested Pharmacologic Methods for Rabbits

Minimal to Mild	Mild to Moderate	Moderate to Severe
Local anesthetic Lidocaine/Bupivacaine	Local anesthetic Bupivacaine (adjunct to systemic analgesics)	Local anesthetic Bupivacaine (adjunct to systemic analgesics)
Ketoprofen 3 mg/kg, SC once	Buprenorphine 0.01-0.05 mg/kg, IM, IV q 4 h	Buprenorphine 0.05 mg/kg, SC, IM, IV 6-12 h
Butorphanol 0.1-0.5 mg/kg, IM, IV q 4 h	Butorphanol 0.1-0.5 mg/kg, SC, IM, IV 6-12 h	Buprenorphine 0.05 mg/kg, SC, IM, IV 6-12 h

Carprofen 4.0 mg/kg, SC 1.5 mg/kg, PO once	Carprofen 4.0 mg/kg, SC, q 24 h 1.5 mg/kg, PO, q 12 h	Fentanyl patch 25 µg/h Transdermal q 72 h
Meloxicam 0.2-0.3 mg/kg, SC PO once	Meloxicam 0.3-1.5 mg/kg, PO q 24 h	