

The table below categorizes common procedures according to their pain producing potential. Selection of an appropriate analgesic should take the procedure's pain producing potential into account.

## ← PAIN POTENTIAL →

Consult with an NINDS veterinarian concerning your procedures.

Minimal to Mild Pain	Mild to Moderate Pain	Moderate to Severe Pain
Catheter implantation	Minor laparotomy incisions	Major laparotomy/organ 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	IC injection	
Intracerebral electrode implantation	Headcap/headpost placement	
Vasectomy	Cranial window placement	
Vascular access port implantation		
Alzet pump implantation	Alzet pump with tunneling >1cm	

**Suggested pharmacologic methods for MICE** (Dobromysky et al, 2000; Flecknell, 1996; Swindle et al, 2002; Wixson and Smiler, 1997). **The ultimate decision on the appropriate use of an analgesic and its dosage must be made in coordination with the veterinary staff because of the many variables associated with pain management.**

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, SQ q 4 h	Buprenorphine 0.05 - 0.1 mg/kg, SQ q 8-12 h	Buprenorphine <sup>1</sup> 0.05 - 0.1 mg/kg, SQ q 8-12 h
Meloxicam 2mg/kg SQ Q24h	Meloxicam 2mg/kg SQ Q24h	
Carprofen or Ketoprofen 2.5 - 5.0 mg/kg, SQ once	Carprofen or Ketoprofen 2.5– 5.0 mg/kg, SQ q 24 h	Carprofen or Ketoprofen <sup>1</sup> 2.5– 5.0 mg/kg, SQ q 24 h
		Morphine 2 - 5 mg/kg, SQ q 2-4 h

<sup>1</sup> Severe pain may be better addressed by the addition of a NSAID to an opioid (such as meloxicam and buprenorphine). This multimodal approach allows for action at different points on the pain pathways, and will allow for a lower dosage of both components (Dobromylskyj et al., 2000). Buprenorphine, alone, is recommended for only moderate pain management.

**Note: no matter how large a dose of a less potent drug is given, analgesia cannot be achieved equal to a more potent drug. This is known as the ceiling effect.**

**Suggested pharmacologic methods for RATS** (Dobromylskyj et al, 2000; Flecknell, 1996; Roughan and Flecknell, 2003; Roughan and Flecknell, 2004; Swindle et al, 2002; Wixson and Smiler, 1997). **The ultimate decision on the appropriate use of an analgesic and its dosage must be made on site by the veterinary staff because of the many variables associated with pain management.**

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 SQ once	Buprenorphine 0.05 mg/kg, SQ q 6 – 12 h	Buprenorphine <sup>1</sup> 0.05 mg/kg, SQ q 6 – 8 h
Carprofen or ketoprofen 2.5 – 5 mg/kg SQ once	Carprofen or ketoprofen 2.5 – 5 mg/kg SQ q 24h	Carprofen or ketoprofen <sup>1</sup> 2.5 – 5 mg/kg SQ q 24h
Meloxicam 1 mg/kg SQ once	Meloxicam 1 – 2 mg/kg SQ q 24 h	Meloxicam <sup>1</sup> 1 – 2 mg/kg SQ q 24 h
		Morphine 2.5 - 10 mg/kg, SQ q 2 – 4 h Severe Pain

<sup>1</sup> 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 each component (Dobromylskyj et al., 2000). Buprenorphine, alone, is recommended for only moderate pain management.

**Note: no matter how large a dose of a less potent drug is given, analgesia cannot be achieved equal to a more potent drug. This is known as the ceiling effect.**

References:

1. ACLAM, "Guidelines for the Assessment and Management of Pain in Rodents and Rabbits," July, 2006 for further details.  
<http://www.aclam.org/education-and-training/position-statements-and-reports>
2. Fish, RE, Brown MJ, Danneman PJ, Karas AZ (eds). Anesthesia and Analgesia in Laboratory Animals. ACLAM Series, New York: Academic Press, 2008.