MICE

Inhalant Anesthesia

Agent(s)	Dose	Comments/Reference(s)
Isoflurane	3-5% Induction 1-3% Maintenance	Administer via precision vaporizer and compressed oxygen or drop method

Injectable Anesthesia

Agent(s)	Dose	Comments
Ketamine Xylazine	80-100 mg/kg IP 5-10 mg/kg IP	Surgical anesthesia
Ketamine Acepromazine	100 mg/kg IP 5 mg/kg IP	Immobilization/anesthesia
Ketamine Midazolam	100 mg/kg IP 5 mg/kg IP	Immobilization/anesthesia
Ketamine Xylazine Acepromazine	80-100 mg/kg IP 10-20 mg/kg IP 2-3 mg/kg IP	Surgical anesthesia
Pentobarbital	40-60 mg/kg IP	Considerable dose variation by strain, gender, genetic modifications etc. Starting at low end of dose range is advisable. Note: Euthanasia dose is 90-100 mg/kg or greater
Tribromoethanol (Avertin)	200-500 mg/kg IP	Non-pharmaceutical grade; special preparation and storage required; Adverse effects likely with repeat dosing

Analgesia

Agent(s)	Dose	Comments
OPIOID		
Buprenorphine	0.05 - 0.1 mg/kg SC, IP q 8-12 hr	DEA required; Preferred analgesic for rodents
Buprenorphine ER-LAB (extended-release buprenorphine)	0.5-1.0 mg/kg SC q 48 hr *Mouse dose rage	Manufacturer: Wedgewood Note: Rat and mouse dose ranges are different. No longer requires refrigeration. **Prescription from RAR veterinarian required. Obtain forms from:** http://web.jhu.edu/animalcare/Instructions%20for%20ordering%20sustained%20release%20buprenorphine
Ethiqa-XR® (extended-release buprenorphine)	3.25 mg/kg SC q72 hr (0.05 mL per 20-gram mouse)	FDA-indexed, available to Researcher DEA license Once the vial is broached, Ethiqa-XR® can be stored at 15° and 25°C +/- 2°C (59° and 77°F +/- 2°F) or refrigerated for 56 days. DO NOT FREEZE.
NSAID		
Carprofen (Rimadyl®)	4-5 mg/kg SC q 24 hr	
Meloxicam (Metacam®)	1-5 mg/kg SC q 24 hr	Note: We do not recommend the use of **meloxicam ER** as independent studies in rodents have not demonstrated efficacy beyond 24 hours post-administration.

Local Block Analgesics

Agent(s)	Dose	Comments/Reference(s)
Lidocaine (1-2%)	Local infusion; do not exceed 7mg/kg	Onset: 5-10 min, Duration: 0.5-1 hr Several methods of administration (field block, infiltrative block etc.).
Bupivacaine (0.5% Marcaine)	Local infusion; do not exceed 8 mg/kg	Onset: 15-30 min, Duration: 4-8 hr Several methods of administration (field block, infiltrative block etc.).
Nocita® (liposomal bupivacaine)	1/mg/kg Local infusion	Duration: up to 96 hr Local infusion of all tissues transected prior to surgical closure.

RATS

Inhalant Anesthesia

Agent(s)	Dose	Comments
Isoflurane	3-5% Induction 1-3% Maintenance	Administer via precision vaporizer and compressed oxygen or drop method

Injectable Anesthesia

Agent(s)	Dose	Comments
Ketamine Xylazine	75-100 mg/kg IP 5-10 mg/kg IP	Provides a good surgical plane of anesthesia for most procedures
Ketamine Acepromazine	75 mg/kg IP 1- 2.5 mg/kg IP	Best used for prolonged restraint or minor surgical procedures
Ketamine Xylazine Acepromazine	40 mg/kg IP 5 mg/kg IP 1 mg/kg IP	Provides a good surgical plane of anesthesia for most procedures
Ketamine Midazolam	75-100 mg/kg IP 4-5 mg/kg IP	Best used for prolonged restraint or minor surgical procedures
Ketamine Dexmedetomidine (Dexdomitor®)	75-100 mg/kg IP 0.15 mg/kg IP	Provides a good surgical plane of anesthesia for most procedures
Pentobarbital	40-50 mg/kg IP	May provide a surgical plane of anesthesia however there is a wide range of dose variability and often a narrow safety margin; caution should be used to avoid overdoses

Analgesia

Agent(s)	Dose	Comments
OPIOID		
Buprenorphine	0.01-0.05 mg/kg SC, IP q 6-12 hr	DEA required

Buprenorphine ER-LAB (extended-release buprenorphine)	1.0 -1.2 mg/kg SC q 72 hr *Rat dose range	Manufacturer: ZooPharm Note: Rat and mouse dose ranges are different. No longer requires refrigeration. **Prescription from RAR veterinarian required. Obtain forms from:** http://web.jhu.edu/animalcare/Instructions%20for%20ordering%20sustained%20release%20buprenorphine
Ethiqa-XR® (extended-release buprenorphine)	0.65 mg/kg SC q 72 hr (0.1 mL per 200-gram rat)	FDA-indexed, available to Researcher DEA license Once the vial is broached, Ethiqa-XR® can be stored at 15° and 25°C +/- 2°C (59° and 77°F +/- 2°F) or refrigerated for 56 days. DO NOT FREEZE.
NSAID		
Carprofen (Rimadyl®)	5-10 mg/kg SC, PO q 24 hr	For optimal analgesia, give NSAID and buprenorphine.
Meloxicam (Meloxicam®)	1-2 mg/kg SC, PO q 24 hr	Note: We do not recommend the use of **meloxicam ER** as independent studies in rodents have not demonstrated efficacy beyond 24 hours post-administration.

NEONATAL MOUSE & RAT

Inhalant Anesthesia

Agent(s)	Dose	Comments/Reference(s)
Isoflurane	3-5% Induction 1-3% Maintenance	Administer via precision vaporizer and compressed oxygen or drop method. Good first choice.

Hypothermia Anesthesia:

Comments: When inhalant anesthesia is not available or cannot be used safety, hypothermia is a relatively safe and effective alternative to injectable anesthetics in altricial rodents up to 7 days old.
Induction: Place the pup in a latex/nitrile glove finger and immerse the glove finger in crushed ice and water (2-3°C or 35-37°F) up to the level of the head so that the head of the pup is visible. Anesthesia induction takes 5-8 minutes.
Procedure: Remove the pup from the ice bath and place on a re-freezable ice pack. A piece of gauze or cloth should prevent direct contact of the pup's skin with the freezable ice pack. Duration of anesthesia on an ice pack is 15 minutes maximum.

Hypothermia Recovery: Rapid warming should be avoided. Pups can be placed in a small incubator (32-35 °C or 90-95°F) for gradual warming over 20-30 minutes. Once warmed for this time, circulating warm water blankets can be used until mobile where complete recovery takes 30-60 minutes. Once mobile, pups may be mingled with the litter to aid in covering the procedure odors on the pup then the litter returned to the dam.

Injectable Anesthesia: In general, injectable anesthetics are not as safe as hypothermia or isoflurane in neonatal rodents <6-7 days old. Several of the injectable combinations used in adult rodents have been found to be unpredictable and associated with >50% mortality rate. If injectable combinations are used, it is important to begin at the low end of the recommended dose range based on weight and only use the IP route. Also, the recovery period may be prolonged and hypothermia must be avoided by keeping the neonate warm as noted above.

Analgesia

Neonates require analgesics if the procedure being performed is likely to cause greater than just momentary pain.

Agent(s)	Dose	Comments
OPIOID		
Buprenorphine	0.05 - 0.1 mg/kg SC, IP q 8-12 hr	DEA required; Preferred analgesic for rodents