


<b>LABORATORY ANIMAL RESOURCES CENTER (LARC)</b>			
Title: Mouse Anesthetic, Analgesic and Tranquilizing Drugs			
SOP#: D-5	Date in Effect: 1/11/2016		
Revision #: 1	Revision Date: 1/11/2016		
In Effect <input checked="" type="checkbox"/> Rescinded <input type="checkbox"/>	Date Rescinded:		
Author: Tamila Stott Reynolds	LARC Director (Initials)	TSR	

**A) PURPOSE**

To provide guidelines to research personnel on the appropriate use of anesthetic, analgesic or tranquilizing (AATs) drugs for murine species.

**B) SCOPE**

AAT use will be limited to principal investigators and their technicians listed on an approved, current IACUC protocol, LARC veterinarians and LARC staff under veterinary supervision.

**C) RESPONSIBILITIES**

- 1) The tables below list some commonly used agents for mice, and are not all-inclusive.
- 2) If drug use will be for neonatal or geriatric animals, or if conditions such as organ compromise, pregnancy/lactation or obesity are present, consult with LARC veterinarian.
- 3) ANY drug to be used must be included in the applicable IACUC approved protocol before it may be used without direct AV consult and approval. Questions concerning use of these or any drugs for animal research should be addressed to the AV.
- 4) Use of non-pharmaceutical grade compounds such as urethane and Tribromoethanol (Avertin) must be scientifically justified and approved in the ACUC protocol. Such agents also require consultation and human risk assessment by the UTEP EH&S Department.
- 5) Maximum administration volumes for routes of injection in the adult mouse are: IP < 2.0cc; SC < 3.0cc; IM < 0.05cc; IV < 0.2cc.
- 6) A mouse is at a surgical plane of anesthesia if a hind toe pinch does not illicit limb withdrawal or an overt increase in respiratory rate.
- 7) During anesthesia, monitor respiration and provide temperature support.
- 8) Proper licensure and storage for controlled substances must be observed, and every drug listed must be properly disposed upon expiration; they may NOT be kept for training purposes.

## D) DEFINITIONS

- 1) EH&S: Environmental Health & Safety
- 2) PO: Oral
- 3) SC: Subcutaneous
- 4) IP: Intraperitoneal
- 5) ID: Intradermal
- 6) IM: Intramuscular
- 7) IV: Intravenous
- 8) q: every; *e.g.*, q3h = every three hours

## E) PROCEDURES

- 1) Administration of substances should adhere to LARC SOP 3-D.
- 2) Proper training must be assured; if training is needed, contact the LARC.

## F) REAGENTS/MATERIALS

### GENERAL ANESTHETICS – INJECTABLE COCKTAILS FOR SURGICAL PLANE ANESTHESIA

Drug Generic Name	Concentration	Dose	Route	Indications / Comments
Ketamine + Xylazine	Ketamine 100mg/mL Xylazine 20mg/mL	Ketamine 90.0mg/kg Xylazine 10.0mg/kg	IP, IM	LOW DOSE Surgical Anesthesia
Ketamine + Xylazine	Ketamine 100mg/mL Xylazine 20mg/mL	Ketamine 120.0mg/kg Xylazine 10.0mg/kg	IP, IM	HIGH DOSE Surgical Anesthesia
Ketamine + Xylazine + Acetylpromazine	Ketamine 100mg/mL Xylazine 20mg/mL Acetylpromazine 10mg/mL	Ketamine 30.0mg/kg Xylazine 6.0mg/kg Acetylpromazine 1.0mg/kg	SC, IP	Surgical Anesthesia
Ketamine + Dexmedetomidine	Ketamine 100mg/mL Dexmedetomidine 1mg/mL	Ketamine 40.0-50.0mg/kg Dexmedetomidine 0.25-1.0mg/kg	IP	LOW DOSE Surgical Anesthesia
Ketamine + Dexmedetomidine	Ketamine 100mg/mL Dexmedetomidine 1mg/mL	Ketamine 75.0mg/kg Dexmedetomidine 1.0mg/kg	IP	HIGH DOSE Surgical Anesthesia

\*Occasionally ketamine effects (even when administered in a cocktail) mimic impending consciousness, which may be confirmed using a hind toe pinch to evaluate for withdrawal or respiratory increase prior to administration of additional anesthetic to avoid overdose.

### GENERAL ANESTHETICS – SINGLE AGENTS FOR SURGICAL PLANE ANESTHESIA

Drug Generic Name	Concentration	Dose	Route	Indications / Comments
Pentobarbital	50mg/mL	40.0mg/kg (LOW) 85.0mg/kg (HIGH)	IP	CV/pulmonary depression severe
Tribromoethanol (Avertin)	20mg/mL	250.0mg/kg	IP	NON-survival Surgical Anesthesia
Urethane		1000mg/kg	IP	NON-survival; may be combined with alpha-chloralose, 100-120mg/kg IP
Isoflurane	4-5% / Liter O <sub>2</sub>	To Effect	Inhal.	Induction of Surgical Anesthesia
Isoflurane	1-3% / Liter O <sub>2</sub>	As required	Inhal.	Maintenance of Surgical Anesthesia

### EMERGENCY DRUGS FOR REVERSAL OR RESCUE SITUATIONS

Drug Generic Name	Concentration	Dose	Route	Indications / Comments
Atipemazole	5mg/mL	0.5-1.0mg/kg	SC	REVERSES <u>ONLY</u> Xylazine or dexmd. (alpha agonists) <u>NOT</u> ketamine*
Glycopyrrolate	0.2mg/mL	0.01-0.02mg/kg	SC	Anticholinergic – bradycardia rescue
Doxapram HCl	20mg/mL	0.5-1.0mg/kg	SC	Respir. stimulant; POTENTIATES PENTOBARBITAL EFFECT (caution)
Naloxone	0.4mg/mL	0.01-0.10mg/kg	SC,IP	Mu Opioid Reversal

### TRANQUILIZERS/SEDATIVES – INJECTABLE SINGLE AGENTS FOR LIGHTER ANESTHESIA

Drug Generic Name	Concentration	Dose	Route	Indications / Comments
Acetylpromazine	10mg/mL	2.0-5.0mg/kg	IM, IP	Lt. to Hvy. Sedation
Diazepam	5mg/mL	5.0mg/kg	IP	Light Sedation
Xylazine	20mg/mL	10.0mg/kg	IP	Light Sedation

### LOCAL ANESTHETICS – INJECTABLES FOR LOCAL SITE ANESTHESIA/ANALGESIA

Drug Generic Name	Concentration	<u>MAXIMUM</u> Dose	Route	Indications / Comments
Lidocaine	1%	10.0mg/kg	SC, ID, splash	Onset: 1-3m Duration: 20-40m
Bupivacaine	0.25%	5.0mg/kg	SC, ID, splash	Onset: 20m Duration: 4-6h

## ANALGESICS – INJECTABLE & ORAL DRUGS FOR SYSTEMIC PAIN RELIEF

Drug Generic Name	Dose	Route	Frequency	Indications / Comments
Acetaminophen	1.0 – 2.0 mg/mL in Drinking Water	PO	Change bottle q3d	NSAID; In Drinking Water
Buprenorphine	0.05-0.1mg/kg	SC,IP,IV	q8-12h	Opioid
Butorphanol	1.0-5.0mg/kg	SC	q4h	Opioid
Carprofen	5.0-10.0mg/kg	SC	q24h	NSAID
Flunixin**	2.5mg/kg	SC,IM	q12h	NSAID
Ibuprofen	7.0-15.0mg/kg	PO	q4h	NSAID
Ketoprofen	1.0-2.0mg/kg	IM,SC	q12-24h	NSAID
Meloxicam	1.0-2.0mg/kg	PO, SC	q24h	NSAID

\*\*A recent study (Tubbs et al., 2011) suggested that flunixin (Banamine) may not provide adequate analgesia after abdominal surgery in mice.

### G) EQUIPMENT

- 1) Needles for parenteral administration should be of the appropriate gauge and length; as a general rule, 27-23g needles of 0.5-1.0" in length are appropriate for most routes.
- 2) Many drugs are susceptible to degradation by light, heat or both. If you are uncertain about light sensitivity, ensure it and any aliquots are stored in amber or foil-wrapped containers (and properly labeled on the outside of the wrapping).
- 3) A precision vaporizer is used to deliver inhalants unless approved by the IACUC.

### H) SAFETY PRECAUTIONS

- 1) Utilize proper and adequate restraint while administering injections to avoid human and animal injury. Humans are exquisitely sensitive to xylazine; do not recap needles.
- 2) Preparation of substances such as urethane and others presents a safety risk; consult with EH&S for proper instruction and personal protective equipment (PPE).

### I) REFERENCES

- 1) Carpenter JW. 2004. *Exotic Animal Formulary*. Saunders, 3<sup>rd</sup> edition. St. Louis, MO.
- 2) Fox JG, Anderson LC, Loew FM, Quimby FW. 2002. *Laboratory Animal Medicine*. Academic Press, 2<sup>nd</sup> edition. New York, NY.
- 3) Hawk CT, Leary SL. 1999. *Formulary for Laboratory Animals*. Iowa State University Press, 2<sup>nd</sup> edition. Ames, IA.
- 4) Quesenberry KE, Carpenter JW. 2003. *Ferrets, Rabbits, and Rodents: Clinical Medicine and Surgery*. Saunders, 2<sup>nd</sup> edition. St. Louis, MO.
- 5) Thurmon JC, Tranquilli WJ, Benson GJ. 1996. *Lumb and Jones Veterinary Anesthesia*. William & Wilkins, 3<sup>rd</sup> edition. Baltimore, MD.
- 6) [Tubbs JT](#), et al. Effects of buprenorphine, meloxicam, and flunixin meglumine as postoperative analgesia in mice. [J Am Assoc Lab Anim Sci](#). 2011 Mar;50(2):185-91.