University of Arizona
Guidelines for Anesthetic and Analgesic Use in Laboratory Animals

This document is intended as a reference of recommended doses and routes of administration for anesthetics and analgesics for a variety of species. The information provided is not considered all inclusive, original or unique. Rather, the information is extracted reference manuals, textbooks, IACUC protocols, technical bulletins, and journal articles. It is always advisable to **consult a Veterinarian** and **review Laboratory Animal Formularies** for agents and dosages appropriate for specific research needs. **All anesthetic and analgesic regimes to be used must be listed on protocols approved by the IACUC.**

Guidelines for recognizing and categorizing pain should be consulted to determine appropriate analgesic usage. See Charts 1-3 below and IACUC Guidelines at:
http://orcr.arizona.edu/sites/orcr.arizona.edu/files/213%20Guidelines%20for%20Assessing%20Pain.pdf

Pre-emptive analgesia should be used when possible, i.e. relieving the potential pain before the pain is felt. This will result in a quicker, less stressful recovery of the patient.

All drugs used for anesthesia and analgesia must be pharmaceutical grade. Use of non-pharmaceutical grade drugs requires scientific justification and prior IACUC approval before use.

Dosages, Measures, and Methods

BW	body weight	lb	pounds
bid	twice daily	mg	milligrams
d	days	min	minutes
h	hours	ml	milliters
IA	intraarterially	mm	millimeters
IC	intracoelomically	PO	by mouth (per os)
IM	intramuscularly	prn	as needed
in.	inches	q	every (number of hours)
IP	intraperitoneally	s	seconds
IPP	intrapleuroperitoneally	SC	subcutaneously
IT	intratracheally	sid	once daily
IU	international units	Tbs	tablespoons (approximately 15 ml)
IV	intravenously	tid	three times daily
kg	kilograms	tsp	teaspoons (approximately 5 ml)
l	liters	%	g/100 ml

Other sources of information for anesthetic/analgesic doses:

- UAC veterinary care personnel, for advice during protocol preparation and during the conduct of the study.
- Recent scientific and technical journal research and review articles that utilize similar research procedures and anesthetics/analgesic regimes.
- Books and monographs focused on veterinary and laboratory animal anesthesia, surgery and research techniques/procedures.
- Recommended references are provided at the end of this document.

Generic and Trade Names of Common Anesthetic and Analgesic Drugs
(Registered Trade names in parenthesis)
*** Controlled Drug - DEA rules and regulations apply**

ANESTHETICS

Inhalant (Systemic)
Isoflurane (IsoFlo, Aerrane)
Sevoflurane (Ultane)

Injectable (Systemic)
Ketamine (Ketaset, Vetalar, Vetaket)*
Pentobarbital (Nembutal)*
Propofol (Diprivan)
Thiopental (Pentothal)*
Tiletamine/Zolazepam (Telazol)*
Tribromoethanol (Avertin – pharmaceutical grade not available)

Immersion (Systemic, Aquatics)
Tricaine methanesulfonate (Finquel MS-222)

Injectable (Local)
Bupivacaine (Marcaine)
Lidocaine (Xylocaine)

Topical/Ophthalmic
Benzocaine/Tetracaine (Cetacaine)
Proparacaine (Alcaine, Ophthetic)

Sedatives
Acepromazine Maleate (ACE, Atravet)
Detomidine (Dormosedan)
Dexmedetomidine (Dexdor, Dexdomitor)
Diazepam (Valium)*
Etomidate (Amidate)
Medetomidine (Domitor)
Midazolam (Versed)*
Xylazine (Rompun, AnaSed)

Reversal Agents
Atipamezole (Antisedan)
Yohimbine (Yobine)

ANALGESICS

NSAIDs
Acetylsalicylic Acid (Aspirin)
Acetaminophen (Tylenol)
Carprofen (Rimadyl)
Celecoxib (Celebrex)
Flunixin meglumine (Banamine)
Ibuprofen (Advil, Motrin)
Ketorolac (Toradol)
Ketoprofen (Ketofen)
Meloxicam (Metacam)
Naproxen (Naprosyn, Syntex)
Phenylbutazone (Butazolidine)

Opioids
Buprenorphine (Buprenex, Buprenorphine SR)*
Butorphanol (Torbugesic, Torbutrol)*
Fentanyl (Durgesic)*
Fentanyl/Droperidol (Innovar-Vet)*
Meperidine (Demerol)*
Morphine*
Oxymorphone (Numorphan)*
Pentazocine (Talwin)*
Tramadol (Ultram)

Guidelines for Assessing Pain in Rodents and Rabbits

The following Charts are extracted from: Guidelines for the Assessment and Management of Pain in Rodents and Rabbits. Public Statement, American College of Laboratory Animal Medicine. March 2007. 46(2):97-108.

Chart 1: Pain Potential

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	Cesarean Section (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		

Selection of Appropriate Analgesics depends on:

1) Time until onset of effect,
2) Magnitude of its effect, and
3) Duration of its effect.

Chart 2: Criteria and Considerations – Mouse and Rat

a. Non-pharmacological post-operative support methods

Minimal to Mild Pain	Mild to Moderate Pain	Moderate to Severe Pain
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

b. Suggested pharmacological methods - Mouse

Minimal to Mild Pain	Mild to Moderate Pain	Moderate to Severe Pain
Local anesthesia Lidocaine/ Bupivacaine	Lidocaine/ Bupivacaine (Adjunct to systemic analgesic)	Lidocaine/ Bupivacaine (adjunct to systemic analgesic)
Butorphanol 1–5 mg/kg, SC q4h	Buprenorphine 0.05–0.1 mg/kg SC, IP q8–12h	Buprenorphine 0.05–0.1 mg/kg SC, IP q8–12h
Carprofen 2.5–5 mg/kg, SC Once	Carprofen 2.5–5 mg/kg, SC q24h	Carprofen 2.5–5 mg/kg, SC q24h
		Morphine 2–5 mg/kg, SC q2–4h

c. Suggested pharmacological methods- Rat

Minimal to Mild Pain	Mild to Moderate Pain	Moderate to Severe Pain
Local anesthesia Lidocaine/ Bupivacaine	Lidocaine/ Bupivacaine (Adjunct to systemic analgesic)	Lidocaine/ Bupivacaine (adjunct to systemic analgesic)
Butorphanol 2 mg/kg, SC Once	Buprenorphine 0.05 mg/kg SC, IP q6–12h	Buprenorphine* 0.05–0.1 mg/kg SC, IP q8–12h
Carprofen or Ketoprofen 2.5–5 mg/kg, SC Once	Carprofen or Ketoprofen 2.5–5 mg/kg, SC q24h	Carprofen or Ketoprofen* 2.5–5 mg/kg, SC q24h
Meloxicam 1 mg/kg, SC Once	Meloxicam 1–2 mg/kg, SC q24h	Meloxicam* 1–2 mg/kg, SC q24h
		Morphine 2.5–10 mg/kg, SC q2–4h Severe Pain

*Severe pain may be better addressed by the addition of NSAID to an opoid. 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.

Chart 3: Criteria and Considerations – Rabbit

a. Non-pharmacological post-operative support methods

Minimal to Mild Pain	Mild to Moderate Pain	Moderate to Severe Pain
Wound Care	Wound Care	Wound Care
Soft, Absorbent bedding,	Soft, Absorbent bedding, Nest material	Soft, Absorbent bedding
		Modified Food and Water Access
		Increased Food Palatability
		Hydration, SC or IP
		Supplemental Heat

b. Suggested pharmacological methods - Rabbit

Minimal to Mild Pain	Mild to Moderate Pain	Moderate to Severe Pain
Local anesthesia Lidocaine/ Bupivacaine	Lidocaine/ Bupivacaine (Adjunct to systemic analgesic)	Lidocaine/ Bupivacaine (adjunct to systemic analgesic)
Ketoprofen 3 mg/kg, SC Once	Buprenorphine 0.01–0.05 mg/kg SC, IM, IV q6–12h	Buprenorphine 0.01–0.05 mg/kg SC, IM, IV q6–12h
Butorphanol 0.1–0.5 mg/kg, IM, IV q4h	Butorphanol 0.1–0.5 mg/kg, IM, IV q4h	Morphine 2–5 mg/kg, SC q2–4h
Carprofen 4.0 mg/kg, SC 1.5 mg/kg,PO Once	Carprofen 4.0 mg/kg, SC 1.5 mg/kg,PO Once	Fentanyl patch 25 ug/h Transdermal q72h
Meloxicam 0.2-0.3 mg/kg, SC, PO Once	Meloxicam 0.3-1.5 mg/kg, PO q24h	

Anesthetics and Analgesics by Species

All dosages in the following tables are per kg Body Weight unless noted otherwise.

Amphibian (Frog)

Anesthesia in Amphibians	Dose & Route	Comments
Benzocaine	200–300 mg/L, bath	Buffer solution (Dissolve in Ethanol first)
Inhalant Anesthetics: Isoflurane * IsoFlo is preferred	To effect: 3–4% induction, 1–2% maintenance; inhalation. 0.5–2.0 ml/L bath or vaporize then bubble in water.	Precision vaporizer; Adequate ventilation or scavenging essential; Levels in water are difficult to control and are NOT recommended
Ketamine (Ketaset, Vetalar, Vetaket)* Combinations recommended: Diazepam (Valium)*	20–40 mg/kg Ketamine + 0.2–0.4 mg/kg Diazepam, IM	Variable results
Tiletamine/ Zolazepam (Telazol)	5–20 mg/kg, IM	Restraint; Variable results
Tricaine methanesulfonate (MS 222)	Immerse in 1 g/L buffered solution, 0.5–2.0g/l buffered bath to effect 50–150 mg/kg, SC, IM, IC Leopard Frogs: 100–200 mg/kg, IC Bullfrogs: 100–400 mg/kg, IC	Buffer with $NaHCO_3$

Analgesia in Amphibians	Dose & Route	Comments
Buprenorphine (Buprenex)*	38 mg/kg, SC	Analgesia > 4h
Butorphanol (Torbugesic, Torbutrol)*	0.2–0.4 mg/kg, IM	Dosage not determined, but assumed to be similar to that in mammals.
Meperidine (Demerol)*	49 mg/kg, SC	Analgesia >4h

Birds

Anesthesia in Birds	Dose & Route	Comments
Bupivacaine HCL (Marcaine)	2 mg/kg infused SC; 2–10 mg/kg infused into incision site; 3mg/0.3 ml saline injected intraarticularly for musculoskeletal pain; 50:50 mix with Dimethyl sulfoxide (DMSO) applied topically	Local; 4-6 hr duration
Diazepam (Valium)*	0.05–0.15 mg/kg, IV 1–1.5 mg/kg IV, IM 2.5–4mg/kg, PO prn 5.5 mg/L drinking water	
Inhalant Anesthetics:	To effect. In general, 0.5–4%	Precision vaporizer;

Isoflurane* Sevoflurane (Ultane)	induction, 1–3% maintenance; inhalation.	Adequate ventilation or scavenging essential; * Anesthetic choice in birds
Ketamine Combinations are recommended:	Dosage depends on usage with other anesthetic/analgesic agent.	Best if used with another agent; See Formulary for combination dosages
Thiopental (Pentothal)*	90 mg/kg, IP; 5.5–11.0 mg/kg, IV	IV dose is short acting
Tribromoethanol (Avertin)	Waterfowl: 1266 mg/kg (on corn) Granivores: 12,000 mg/kg (on grain)	Dissolved in water then poured on corn or grain & rapidly dried.

Analgesia in Birds	**Dose & Route**	**Comments**
Acetylsalicylic Acid (Aspirin)	5.0 mg/kg , PO q8h	
Buprenorphine (Buprenex)*	0.01–0.05 mg/kg, IM q8–12h 6.5 mg/L drinking water	Most species
Butorphanol (Torbugesic, Torbutrol)*	1 –4 mg/kg, IM q6–12h African Grey – 1mg/kg IM	PRN; Not to exceed q 4h
Carprofen (Rimadyl)	5–10 mg/kg, IM, IV, PO	
Ketoprofen (Ketofen)	5–10 mg/kg, IM	
Meloxicam	Consult Veterinary Staff for dosages	

Cat (Feline)

Consult the Veterinary Staff to assure the agents selected are appropriate for the procedure. Other options exist, but are not listed in this chart.

Anesthesia in Cats	**Dose & Route**	**Comments**
Acepromazine Maleate	0.1–0.2 mg/kg , IM, SC 0.5–1.0 mg/lb, PO prn	
Diazepam (Valium)*	1 mg/kg, IV, to Max of 5mg 1 mg/kg IM, PO	
Inhalant Anesthetics: Isoflurane Sevoflurane (Ultane)	To effect. In general, 3–4% induction, 1–2% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential.
Ketamine Combinations are recommended: Acepromazine, Butorphanol, Medetomidine, or Xylazine	10 – 30 mg/kg, IM, IV	Frequently used in combination with other anesthetics or analgesics; See Formulary for combination dosages

Medetomidine (Domitor) - Often used in combination with Ketamine or Butorphanol Reversed with Atipamezole HCL (Antisedan)	Medetomidine : 0.01–0.05 mg/kg, IV or 0.04–0.15 mg/kg IM + Ketamine or Butorphanol *Reversal agent:* Atipamezole: Given IM, Refer to drug insert for dosage (generally 0.5-1 times the dosage of Medetomidine).	Sedative & Analgesic; Potent alpha2-agonist
Tiletamine/ Zolazepam (Telazol)	7.5 mg/kg, IM 10–15 mg/kg, IM, 5–7.5mg/kg, IV	
Xylazine (Rompun, AnaSed)	0.5–1.5 mg/lb, IV; 1 mg/lb, SC; 1–3 mg/kg, IM	Sedative

Analgesia in Cats	**Dose & Route**	**Comments**
Acetaminophen (Tylenol)	Contraindicated	**DO NOT USE IN CATS** Toxic – causes methemoglobinemia
Acetylsalicylic Acid (Aspirin)	10 mg/kg, PO q48h 1 children's aspirin, PO q36h	Children's Aspirin = 1.25 grains
Buprenorphine (Buprenex)*	0.005–0.01 mg/kg, SC, IM q12h 0.005–0.01 mg/kg, IV, SC q8–12h	
Butorphanol (Torbugesic, Torbutrol)*	0.2–0.4 mg/kg, SC q4–6h 0.22 mg/kg, IM 0.4–1.5 mg/kg, PO q4–8h 0.2–0.6 mg/kg, IV, IM	
Carprofen (Rimadyl)	4 mg/kg, IV, SC	
Chlorpromazine	1–2mg/kg, IM,IV,q12h; 2–3mg/kg, PO	Decreases nausea, vomiting
Flunixin (Banamine)	1 mg/kg, PO, IV q24h 0.3 mg/kg, IM	
Ibuprofen (Advil, Motrin)	5 mg/kg, PO q24h	
Ketoprofen (Ketofen)	2 mg/kg, PO initially, then 1 mg/kg / day maintenance 1-2 mg/kg IM, IV, SC sid 1 mg/kg, PO after first 24 h following injection	

Anesthesia/Analgesia in Wild Cats	**Dose & Route**	**Comments**
Ketamine	7–30 mg/kg, IM, IV	Used in combination with Xylazine.
Xylazine (Rompun, AnaSed)	0.5–1.5 mg/lb, IV 1 mg/lb, SC 1–3 mg/kg, IM	Sedative. *Reversal agent:* Yohimbine
Tiletamine/ Zolazepam (Telazol)	10 mg/kg, IM	

Cattle (Bovine)

Anesthesia in Cattle	Dose & Route	Comments
Acepromazine Maleate	0.02–0.05 mg/kg, IV 0.05–0.2 mg/kg, IM, SC	
Bupivacaine	Local injection to effect – SC or intraincisional. 1 ml/5 Kg Max dosage.	Slower onset than Lidocaine but longer (~ 4-8 hour) duration of action
Fentanyl	0.02-0.05 mg/kg IM, IV; 100ug/h patch per 50-60 kg BW up to 72 hours	
Guaifenesin	60–100 mg/kg, IV.	Muscle relaxant during anesthetic induction
Inhalant Anesthetics: Isoflurane Sevoflurane (Ultane)	To effect. In general, 3–4% induction, 1–2% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential.
Ketamine (K) (Ketaset, Vetalar, Vetaket)* Combinations are recommended: IV doses should be mixed with: Diazepam (D)*, Medetomidine (M) Or Xylazine (X)	10 mg/kg Ketamine, IV 2.2–7.5 (K) + 0.1–0.375 mg/kg (D) Or 0.5mg/kg (K) + 0.02mg/kg(M) ,IV; Or 2.2–7.5 (K) + 0.1mg/kg (X), IV	Consult Veterinarian: Calves require different dosages; See Formulary for combinations and appropriate dosages
Lidocaine (Xylocaine)	Local injection to effect – SC or intraincisional	Faster onset than bupivacaine but short (<1 hour) duration of action
Medetomidine Reversal agent: Atipamezole HCL (Antisedan),	0.005–0.03mg/kg Medetomidine ,IM, or 0.01mg/kg Medetomidine ,IV *Reversal agent:* Atipamezole: 0.02 mg/kg, IV	Sedative, Analgesic
Pentobarbital (Nembutal)*	12–30 mg/kg, IV	
Propofol	4–6 mg/kg, IV	
Tiletamine/ Zolazepam (Telazol) Used in Combination: Ketamine (K), Xylazine (X)	4 mg/kg, IV Used in combination with: 4 mg/kg (K) + 0.1mg/kg (X), IM	Restraint; Variable results
Xylazine HCL (Rompun, AnaSed) Reversed with Yohimbine	0.02–0.15 mg/kg, IV 0.05–0.3 mg/kg IM, SC *Reversal Agent:* Yohimbine Up to 0.3mg/kg, IV	

Analgesia in Cattle	Dose & Route	Comments
Buprenorphine (Buprenex)*	0.01 mg/kg, IM, IV	

Butorphanol (Torbugesic, Torbutrol)*	0.5 mg/kg, SC, IV	
Carprofen (Rimadyl)	1.4 mg/kg, IV, SC	Only Once
Flunixin meglumine (Banamine)	2.2 mg/kg, IM, IV sid	Up to 3 days
Ketoprofen (Ketofen)	3 mg/kg, IM, IV sid for up to 3 days	
Meloxicam	0.5mg/kg IV, SC ONCE	

Dog (Canine)

Anesthesia in Dogs	**Dose & Route**	**Comments**
Acepromazine Maleate	0.1–0.5 mg/kg, IV, IM, SC 0.25–1.0 mg/lb, PO prn	Sedative
Atropine	0.05 mg/kg IM, IV, SC (Used as a Preanesthetic)	Adjunct: Anticholinergic; decreases fluid secretions, suppresses vagal tone to the heart, prevents bradycardia
Diazepam (Valium)*	1 mg/kg, IV, to Max of 20mg 1 mg/kg IM, IV, PO	Sedative
Inhalant Anesthetics: Isoflurane Sevoflurane (Ultane)	To effect. In general, 3–4% induction, 1–2% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential
Ketamine(K) (Ketaset, Vetalar, Vetaket)* + Medetomidine(M) Or Ketamine(K) + Xylazine (X)	(K) 1–3mg/kg, IV + (M)10–20ug/kg, IV (K) 3–5mg/kg, IM + (M)30–40ug/kg, IM (K) 10mg/kg, IM + (M)2mg/kg, IM	Used as a sedative in dogs, not an appropriate anesthetic for major procedures; See Formulary for more combination dosages
Lidocaine (Xylocaine)	Local injection to effect – SC or intraincisional	Faster onset than bupivacaine but short (<1 hour) duration of action
Medetomidine (Domitor) Often used in combination with Ketamine Reversed with Atipamezole HCL (Antisedan)	Medetomidine : 0.005–0.08 mg/kg, IM, IV, or 0.03–0.04 mg/kg IM + Ketamine or Butorphanol *Reversal Agent:* Atipamezole: Given IM, Refer to drug insert for dosage.	Sedative, Analgesic; Potent alpha2-agonist
Propofol	6–7 mg/kg, IV 1 mg/kg IV for Induction	
Thiopental (Pentothal)*	6–12 mg/lb, IV; lower dose with pre-anesthetic tranquilization	

Tiletamine/ Zolazepam (Telazol)	7.5–25 mg/kg , IM 4–10 mg/kg, IV In Combination: 10mg/kg Telazol + 1 mg/kg Xylazine, IM	
Xylazine (Rompun, AnaSed) Reversal Agent: Yohimbine	0.5–1.5 mg/kg, IV 2.2 mg/kg, SC 1 mg/kg, IM *Reversal agent:* Yohimbine 0.125-0.3mg/kg, IV	Sedative

Analgesia in Dogs	**Dose & Route**	**Comments**
Acetaminophen (Tylenol)	15 mg/kg, PO q8h	
Acetylsalicylic Acid (Aspirin)	10-20 mg/kg, PO q12h Antirheumatic max. dosage – 40mg/kg, PO q 18h	Use buffered tabs only
Buprenorphine (Buprenex)*	0.01–0.02 mg/kg, SC q12h 0.005–0.02 mg/kg, IM, IV, SC q6–12h	
Buprenorphine SR (Bup SR)	0.12-0.27 mg/kg SC q 72 hrs	
Butorphanol (Torbugesic)*	0.1–0.6 mg/kg, SC, IM, IV q2–5h 1–3mg/kg, PO 0.1mg/kg IV, followed by 0.1mg/kg, IM, SC	2 -5 hours of analgesia
Chlorpromazine	0.5mg/kg, IM, q8h; 2–3mg/kg, PO	Decreases nausea, vomiting
Carprofen (Rimadyl)	4 mg/kg IV, SC sid; 1–2.2mg/kg, PO bid	As long as needed, guideline of 3-4 days for soft tissue surgery and 8-10 following orthopedic procedures; Non-Steroidal Anti-inflammatory, analgesia
Flunixin (Banamine)	1 mg/kg, IV, sid for 3 days 1 mg/kg, PO q24h	
Ibuprofen (Advil, Motrin)	5–10 mg/kg, PO q24-48h	
Ketoprofen (Ketofen)	2 mg/kg, IM	

Ferret

Anesthesia in Ferrets	**Dose & Route**	**Comments**
Acepromazine Maleate	0.2–0.5 mg/kg, IM, SC 0.1–0.3 mg/kg, IM, IV	Sedative
Inhalant Anesthetics: Isoflurane Sevoflurane (Ultane)	To effect. In general, 3–4% induction, 0.5–2.5% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential

Diazepam (Valium)*	1–2 mg/kg, IM 0.5–3 mg/kg, IM, SC 1 mg, IV per animal	Sedative
Fentanyl/Droperidol (Innovar-Vet)*	0.15 mg/kg, IM	Sedative/analgesic; May need pre-anesthetic atropine
Ketamine (Ketaset, Vetalar, Vetaket)* Used in Combination with Acepromazine, Diazepam (Valium)*, Xylazine (Rompun, AnaSed)	10–60 mg/kg, IM See Formulary for combination agents and dosages	Frequently used in combination with other anesthetics or analgesics;
Medetomidine (Domitor) Often used in combination with Butorphanol Reversed with Atipamezole HCL (Antisedan)	Medetomidine: 0.08–0.2mg/kg, IM, SC + Butorphanol 0.1–0.2 mg/kg, IM *Reversal agent:* Atipamezole 0.4 mg/kg, IM; Or 1 mg/kg, SC, IV, IP	Sedative & Analgesic; Potent alpha2-agonist
Propofol	2–5 mg/kg, IV	Induction
Tiletamine/ Zolazepam (Telazol) Can combine with Ketamine, Xylazine (see Formulary)	12–22 mg/kg, IM	
Xylazine (Rompun, AnaSed)	1–2 mg/kg, IM 4–6 mg/kg, SC *Reversal agent:* Yohimbine 0.5-1.0mg/kg, IV	Sedative

Analgesia in Ferrets	**Dose & Route**	**Comments**
Acetylsalicylic Acid (Aspirin)	0.5–22 mg/kg, PO q8–24h	
Buprenorphine (Buprenex)*	0.01–0.03 mg/kg, IM, IV, SC q8–12h 0.01–0.5 mg/kg, IV, SC q8–12h	
Butorphanol (Torbugesic)*	0.05–0.1 mg/kg, SC q8–12h 0.4 mg/kg, IM q4–6h	
Carprofen (Rimadyl)	1 mg/kg, PO q12–24h	
Flunixin (Banamine)	0.3–2 mg/kg, PO, SC q12–24h	
Ibuprofen (Advil, Motrin)	1 mg/kg, PO q12–24h	
Ketoprofen (Ketofen)	1 mg/kg, IM, PO, SC q24h	
Pentazocine (Talwin)*	5–10 mg/kg, IM q4h	Analgesic; Narcotic agonist/antagonist

Fish

Anesthesia in Fish	Dose & Route	Comments
Ice Water Bath (4 degrees C or less)	To effect	**Caution**: Method also used for Euthanasia
Ketamine Combinations are recommended: Medetomidine (M) Reverse (M) with Atipamezole (Antisedan)	1–2 mg/kg Ketamine + 0.05–0.10 mg/kg Medetomidine, IM *Reversal agent:* 0.2mg Atipamezole, IM	
Tricaine methanesulfonate (MS 222)	Immerse in buffered solution, 50–100 mg/l bath, induction; 50–60 mg/l maintenance	Buffer with $NaHCO_3$

Analgesia in Fish	Dose & Route	Comments
Butorphanol (Torbugesic, Torbutrol)*	0.05–0.10 mg/kg, IM 0.4 mg/kg, IM Post-op in KOI	Buffer solution

Gerbil

Anesthesia in Gerbils	Dose & Route	Comments
Atropine	0.05–0.1 mg/kg, SC	Adjunct: Anticholinergic; decreases fluid secretions, suppresses vagal tone to the heart, prevents bradycardia
Diazepam (Valium)*	3–5 mg/kg, IP	Sedative
Inhalant Anesthetics: Isoflurane Sevoflurane	To effect. In general, 3–4% induction, 1–2% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential
Ketamine (K) (Ketaset, Vetalar, Vetaket)* Used in Combination: Diazepam* (D), Medetomidine (M), Xylazine (X)	200 mg/kg, IM Immobilization 50mg/kg (K),IM + 5mg/kg (D, IP 75mg/kg (K),IM + 0.5mg/kg (M), IP 50mg/kg (K),IM + 2mg/kg (X), IM	Frequently used in combination with other anesthetics or analgesics; See Formulary for combination dosages
Medetomidine (Domitor) Reversed with Atipamezole HCL (Antisedan)	Medetomidine : 0.1–0.2 mg/kg, SC *Reversal Agent:* Atipamezole: 1 mg/kg, SC	Variable effects ; Light – moderate Sedative & Analgesic; Potent alpha2-agonist
Tiletamine/ Zolazepam (Telazol) + combined with Xylazine (X) (Rompun, AnaSed)	60 mg/kg, IM; (T) 20 mg/kg +(X) 10mg/kg, IP	
Tribromoethanol (Avertin)	250–300 mg/kg, IP (See Appendix 1)	**NOT RECOMMENDED:** 15+ minute duration of anesthesia, ~90 min to complete reco...

Analgesia in Gerbils	Dose & Route	Comments
Acetaminophen (Tylenol)	1–2 mg/ml in drinking water	

Acetylsalicylic acid (Aspirin)	100–150 mg/kg, PO q4h; 240 mg/kg, PO q24h;	
Buprenorphine (Buprenex)*	0.1–0.2 mg/kg, SC q8h	
Butorphanol (Torbugesic)*	1–5 mg/kg, SC q4–12h 0.4 mg/kg, IM q4–6h	
Carprofen (Rimadyl)	4–5 mg/kg, SC q24h	
Chlorpromazine	0.5 mg/kg, IM	Decreases nausea, vomiting
Flunixin (Banamine)	2.5 mg/kg, SC q12–24h	
Ketoprofen (Ketofen)	5 mg/kg, SC	Good for musculoskeletal pain
Pentazocine (Talwin)*	10 mg/kg, SC q2–4h	Narcotic agonist/antagonist

Guinea Pig

Anesthesia in Guinea Pigs	**Dose & Route**	**Comments**
Acepromazine Maleate	0.5–1.0 mg/kg, IM	Sedative
Diazepam (Valium)*	2–5 mg/kg, IP; 0.5–3 mg/kg, IM	Sedative
Fentanyl/Droperidol (Innovar-Vet)*	0.22–0.88 mg/kg, IM	Sedative/analgesic - may cause inflammation at site with higher dosages; May need pre-anesthetic atropine
Inhalant Anesthetics: Isoflurane Sevoflurane (Ultane)	To effect. In general, 2–5% induction, 0.25–4% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential
Ketamine (K) (Ketaset, Vetalar, Vetaket)* Used in Combination: Diazepam*(D), Medetomidine (M), Xylazine (X)	22–44 mg/kg, IM Light-heavy sedation 20–100mg/kg (K) + 1–8mg/kg (D), IM 40mg/kg (K) + 0.5mg/kg (M), IP 20–40mg/kg (K) + 2–5mg/kg (X), IM Guinea Pig Mix: Induction – ½ cc/kg Full anesthesia – 1cc/kg	**See Appendix 3 for Guinea pig KAX Cocktail Mix** See Formulary for combinations with other drugs and dosages
Medetomidine (Domitor) Reversed with Atipamezole HCL (Antisedan)	Medetomidine : 0.3 mg/kg, SC *Reversal Agent:* Atipamezole: 1 mg/kg, SC	Sedative, Analgesic; Potent alpha2-agonist; Variable effects
Pentobarbital (Nembutal)* NOT recommend	25–35 mg/kg, IP Marginal -Variable Response	Caution! Potentially significant cardiovascular and respiratory depression

Tiletamine/ Zolazepam (Telazol) + combined with Xylazine (X), Butorphanol (B)	40–60 mg/kg, IM; (T) 40 mg/kg +(X) 5mg/kg, IP (T) 60 mg/kg +(X) 5mg/kg +(B) 0.1 mg/kg, IP	
Xylazine (Rompun, AnaSed)	3-5 mg/kg, IM 5-40 mg/kg, IP *Reversal agent:* Yohimbine 0.5-1.0mg/kg, IV	Sedative

Analgesia in Guinea Pigs	**Dose & Route**	**Comments**
Acetylsalicylic acid (Aspirin)	50–100 mg/kg, PO q4h	
Buprenorphine (Buprenex)*	0.05–0.5 mg/kg, SC q6–12h	
Buprenorphine SR (Bup SR)	0.12-0.27 mg/kg, SC q72 hrs	
Butorphanol (Torbugesic)*	2.0 mg/kg, SC q2–4h	
Carprofen (Rimadyl)	1–4 mg/kg, SC q24h	
Chlorpromazine	0.5 mg/kg, IM; 0.2 mg/kg, SC	Decreases nausea, vomiting
Flunixin (Banamine)	2.5–5 mg/kg, SC q12–24h	
Ibuprofen (Advil, Motrin)	10 mg/kg, IM, PO q4h	
Ketoprofen (Ketofen)	1 mg/kg, SC, IM q12–24h	Good for musculoskeletal pain
Morphine *	2–5 mg/kg, SC, IM q4h	Up to 4 hours of analgesia
Pentazocine (Talwin)*	10 mg/kg, SC q2–4h	Narcotic agonist/antagonist

Hamster

Anesthesia in Hamsters	**Dose & Route**	**Comments**
Acepromazine	0.5–1.0 mg/kg, IM	Sedative
Atropine	0.05–0.1 mg/kg, SC 10mg/kg q20min for organophosphate overdose	Adjunct: Anticholinergic; decreases fluid secretions, suppresses vagal tone to the heart, prevents bradycardia
Diazepam (Valium)*	3 –5 mg/kg, IM, IP	Sedative
Inhalant Anesthetics: Isoflurane Sevoflurane (Ultane)	To effect. In general, 2–5% induction, 0.25–4% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential
Fentanyl/Droperidol (Innovar-Vet)*	0.01 mg/kg, IP NOT recommended	Sedative, analgesic; May cause CNS stimulation

Ketamine (K) (Ketaset, Vetalar, Vetaket)* Used in Combination: Diazepam*(D), Medetomidine (M), Xylazine (X)	20–40 mg/kg, IM Light-heavy sedation; 10-30 mg/100g IP 70mg/kg (K) + 2mg/kg (D), IM 40–100mg/kg (K) + 5mg/kg (D), IP 100mg/kg (K) + 0.25mg/kg (M), IP 80mg/kg (K) + 5mg/kg (X), IM, IP 200mg/kg (K) + 10mg/kg (X), IP	See Formulary for combination dosages; Medetomidine *Reversal agent* is Atipamezole
Medetomidine (Domitor) Reversed with Atipamezole HCL (Antisedan)	Medetomidine : 0.1 mg/kg, SC *Reversal agent:* Atipamezole 1 mg/kg, SC	Light – moderate Sedative, Analgesic; Potent alpha2-agonist; Variable effects
Pentobarbital (Nembutal)* NOT recommend	50–90 mg/kg IP, IP boost with 1.2mg/100g Marginal -Variable Response	Caution! Potentially significant cardiovascular and respiratory depression
Tiletamine/ Zolazepam (Telazol) (T) + combined with Xylazine (X) (Rompun, AnaSed)	(T) 30 mg/kg +(X) 10mg/kg, IM, IP	Telazol alone is **NOT RECOMMENDED**
Xylazine (Rompun, AnaSed)	4 mg/kg, IM 10 mg/kg, IP *Reversal agent:* Yohimbine 0.5-1.0mg/kg, IV	Sedative

Analgesia in Hamsters	**Dose & Route**	**Comments**
Acetylsalicylic acid (Aspirin)	100–150 mg/kg, PO q4h; 240 mg/kg, PO q24h	
Buprenorphine (Buprenex)*	0.01 – 0.05 mg/kg, SC, IV q8-12h 0.5 mg/kg, SC q8h	8 – 12 hours of analgesia
Butorphanol (Torbugesic, Torbutrol)*	1 – 5 mg/kg, SC q4h	
Carprofen (Rimadyl)	5 mg/kg, SC, q24h	
Chlorpromazine	0.5 mg/kg, IM	Decreases nausea, vomiting
Flunixin (Banamine)	2.5 mg/kg, SC q12–24h	
Ketoprofen (Ketofen)	5 mg/kg, SC	Good for musculoskeletal pain
Morphine *	2–5 mg/kg, SC q4h	Up to 4 hours of analgesia
Pentazocine (Talwin)*	10 mg/kg, SC q2–4h	Narcotic agonist/antagonist

Horse

Anesthesia in Horse	**Dose & Route**	**Comments**
Acepromazine	0.04-0.1mg/kg IV, IM, SQ	
Detomidine (Dormosedan)	20-40µgm IV, IM	No analgesia, sedation only

Xylazine (Rompun)	1.1mg/kg IV, 2.2mg/kg IM	

Analgesia in Horse	**Dose & Route**	**Comments**
Flunixian meglumine (Banamine)	1.1mg/kg IV or IM SID	Not to exceed 5 days
Phenylbutazone (Butazolidin)	4.4-8.8mg/kg PO SID	

Mouse

Anesthesia in Mice	**Dose & Route**	**Comments**
Acepromazine Maleate	0.5–1 mg/kg, IM; 2–5 mg/kg, IP	Sedative
Bupivacaine	Local injection to effect – SC or intraincisional. Max dosage-0.02 ml/kg.	Slower onset than Lidocaine but longer (~ 4-8 hour) duration of action
Cetacaine	Topical application per bottle directions	
Chloralose	114 mg/kg, IP	**NOT RECOMMENDED**
Diazepam (Valium)*	3–5 mg/kg, IM, IP	Flumazenil reverses 0.2 mg IM
Ethyl Chloride	Topical (for tail biopsy)	
Etomidate	30mg/kg, IP; 5-10mg/kg IV	
Fentanyl/Droperidol (Innovar-Vet)*	Sedation: 0.2–0.33 ml/kg, IM Anesthesia: 0.3–0.5 ml/kg, IM	Sedative/analgesic; May need pre-anesthetic atropine
Inhalant Anesthetics: Isoflurane Sevoflurane (Ultane)	To effect. In general, 3-4% induction 1-2% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential
Ketamine (Ketaset, Vetalar, Vetaket)* Use in Combination: Acepromazine (A), Diazepam*(D), Medetomidine (M), Xylazine (X)	Light sedation 22–44 mg/kg, IM Heavy sedation 100-200 mg/kg IP **100mg/kg (K) + 20 mg/kg (X) + 2.5–5mg/kg (A), IP** 100mg/kg (K) + 2.5–5mg/kg (A), IM 200mg/kg (K) + 5mg/kg (D), IP 50mg/kg (K)+10–15mg/kg (X), IP, IM Males: 50 mg/kg (K) + 1-10mg/kg (M), IP Females: 75 mg/kg(K) + 1-10mg/kg (M), IP	**See Appendix 2 for Mouse KAX Cocktail Mix** See Formulary for combinations with other drugs and dosages Medetomidine *Reversal Agent* is Atipamezole.
Lidocaine (Xylocaine)	Local injection to effect – SC or intraincisional	Faster onset than bupivacaine but short (<1 hour) duration of action

Medetomidine (Domitor) Reversed with Atipamezole HCL (Antisedan)	Medetomidine : 0.03–0.1 mg/kg, SC *Reversal Agent:* Atipamezole: 1.0–2.5 mg/kg, IP	Variable effects ; Light - Moderate Sedative, Analgesic; Potent alpha2-agonist
Pentobarbital (Nembutal)*	40–85 mg/kg, IP (diluted 1:9 in sterile saline)	**NOT RECOMMENDED** autonomic depression
Propofol	10 mg/kg IV induction 55 mg/kg/hr IV maintenance	
Tetracaine (Pontocaine)	0.5% solution topical or ophthalmic application	Topical and ophthalmic solutions available
Tiletamine/ Zolazepam (Telazol)		**NOT RECOMMENDED**
Tribromoethanol (Avertin)	240-575 mg/kg, IP (See Appendix 1 below for mixing instructions)	**NOT RECOMMENDED;** Chemical peritonitis
Urethane Can combine with: Etomidate	1000 – 1200 mg/kg (U) IP 30 mg/kg (E) IP	**NON-SURVIVAL PROCEDURES ONLY** Caution! Prolonged anesthesia; carcinogenic and mutagenic
Xylazine (Rompun, AnaSed) Reversed with Yohimbine	4–8 mg/kg, IM; 10 mg/kg, IP *Reversal agent:* Yohimbine 0.5-1.0mg/kg, IV	Sedative; Best used in combination with Ketamine

Analgesia in Mice	**Dose & Route**	**Comments**
Acetaminophen (Tylenol)	300 mg/kg, PO q	
Acetylsalicylic acid (Aspirin)	100–150 mg/kg, PO q4h	
Buprenorphine (Buprenex)*	0.05–0.1 mg/kg SC, IP q8–12h	
Buprenorphine SR (Bup SR)	1.0 mg/kg SC, q 72 h	
Butorphanol (Torbugesic, Torbutrol)*	1–5 mg/kg, SC q2–4h	Up to 4 hours of analgesia
Carprofen (Rimadyl)	2.5–5 mg/kg, PO, SC q24h	
Celecoxib (Celebrex)	200 mg/kg	
Chlorpromazine	3–35 mg/kg, IM; 5–10 mg/kg, SC	Decreases nausea, vomiting
Flunixin (Banamine)	2.5 mg/kg, SC q12–24h	
Ibuprofen (Advil, Motrin)	7–15 mg/kg, PO q4h;	
Ketoprofen (Ketofen)	5–10 mg/kg, SC	Good for musculoskeletal pain

Meloxicam (Metacam)	1–2 mg/kg, PO, SC q24h	
Morphine*	2–5 mg/kg, SC q2–4h	
Pentazocine (Talwin)*	10 mg/kg, SC q2–4h	Narcotic agonist/antagonist

Non-Human Primates (NHP)

Dosages are primarily for macaques. Consult a UAC veterinarian for other NHP families.

Anesthesia in NHP	**Dose & Route**	**Comments**
Acepromazine Maleate	0.2–1.0 mg/kg, IM, SC, PO	Sedative
Atropine	0.02–0.04 mg/kg, SC, IM, IV	Adjunct: Anticholinergic; decreases fluid secretions, suppresses vagal tone to the heart, prevents bradycardia
Bupivacaine	Local injection to effect – SC or intraincisional	Slower onset than Lidocaine but longer (~ 4-8 hour) duration of action
Diazepam (Valium)*	0.25–1 mg/kg, IM, IV	Sedative
Inhalant Anesthetics: Isoflurane Sevoflurane (Ultane)	To effect. In general, 2–4% induction, 1–2% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential; ^Note: Halothane may result in dose dependent, cardiovascular depression in macaques
Fentanyl/Droperidol (Innovar-Vet)*	0.05–0.1 ml/kg, IM, IV Pre-anesthetic 0.15–0.3 ml/kg, IM, SC For Minor Procedures	NHP's appear to be more sensitive than dogs; high does produce respiratory depression; A Preanesthetic dose of atropine may be necessary.
Ketamine (Ketaset, Vetalar, Vetaket)* Use in Combination: Acepromazine, Diazepam*, Medetomidine, Midazolam, Xylazine	5-40 mg/kg, IM Consult Veterinary Staff for Combinations and dosages	Sedative; Consult Veterinarian and formularies for dosages and combinations per procedures and appropriateness for the type of NHP.
Lidocaine (Xylocaine)	Local injection to effect – SC or intraincisional	Faster onset than bupivacaine but short (<1 hour) duration of action

Medetomidine (Domitor) Follow with Ketamine* Combine with Butorphanol* & Midazolam* Reversed with Atipamezole HCL (Antisedan)	Medetomidine: 0.05–0.1 mg/kg, IM followed by Ketamine [The IV of this dosage provides inconsistent sedation] *Reversal agent* - Atipamezole: 4 times Medetomidine dose, SC, IM,IV	Light - Moderate Sedative, Analgesic; Potent alpha2-agonist; Variable effects Will not produce surgical plane of anesthesia for major procedures. If redosing, use ketamine alone. May be partially reversed with Atipamezole. Note that IM Ketamine combinations often sting upon injection.
Midazolam (Versed)*	0.05–0.15 mg/kg IM, IV Midazolam 0.2-.04 mg/kg, IV + Fentanyl 1-2 ug/kg, IV	Sedative
Pentobarbital (Nembutal)*	20 mg/kg, IV; decrease to 5–10 mg/kg if used in combination with Ketamine	Severe respiratory depression; Inability to modulate depth of anesthesia; Variable responses between species; Prolonged recovery
Propofol	7.5–12.5 mg/kg IV OR ^^2–6 mg/kg, IV followed by 200-600ug/kg/min continuous infusion	Dosage varies with species; Consult Veterinarian; ^^ For non-painful procedures only
Thiopental (Pentothal)*	15–25 mg/kg IV; decrease to 5–7 mg/kg if used in combination with Ketamine	
Tiletamine/ Zolazepam (Telazol)	1–6 mg/kg, IM	Wide range of dosages for different species; Consult Veterinarian; Marked hypothermia
Xylazine (Rompun, AnaSed) Reversed with Yohimbine	0.5 mg/kg, IV; Used with Ketamine for combination *Reversal Agent:* Yohimbine 0.05 mg/kg, IV	Light to moderate sedation; some analgesia

Analgesia in NHP	**Dose & Route**	**Comments**
Acetaminophen (Tylenol)	5–10 mg/kg, PO q6h	
Acetylsalicylic Acid (Aspirin)	10–20 mg/kg, PO q6–8h; 100 mg/kg, PO q24h 25 mg/kg rectal suppository	Analgesia; anti-inflammatory; antipyretic; Use enteric-coated tablet
Buprenorphine (Buprenex)*	0.005–0.01 mg/kg, IM, IV q6–12h 0.01–0.03 mg/kg IM, IV q12h	
Butorphanol (Torbugesic, Torbutrol)*	0.1–0.2 mg/kg, IM q4–12h	
Carprofen (Rimadyl)	2–4 mg/kg, PO, SC q12–24h	

Chlorpromazine	1–6 mg/kg, IM; 2–5mg/kg, PO	Decreases nausea, vomiting
Fentanyl (Durgesic)*	0.005–0.1 mg/kg, IV 0.05–0.1 mg/kg, SC, IM	
Flunixin meglumine (Banamine)	0.5 mg/kg, IM q24h; 1 mg/kg, IV q12h; Prosimians: 0.5 mg/kg, IM q24h; 10mg/kg, IM	
Hydropmorphone	0.1mg/kg IM q4h or IV q2h	
Ibuprofen (Advil, Motrin)	20 mg/kg, PO q24h	
Ketoprofen	2mg/kg IV, IM q24h	
Ketorolac	0 0.5 – 1.0 SC or IM; Use pre-operatively for preemptive analgesia and post-operatively every 8 -12 hour for up to 4 days.	Depending on the procedure, may be used as sole analgesic, or as multi-modal analgesia with buprenorphine.
Medetomidine (Domitor) See above for Anesthetic dosages Reversed with Atipamezole HCL (Antisedan)	0.08 mg/kg, IM *Reversal Agent:* Atipamezole 1x Medetomidine dose, SC, IM, IV (general)	Analgesic; Light - Moderate Sedative; Potent alpha2-agonist; Refer to Formulary for specific species differences.
Meperidine (Demerol)*	2–10 mg/kg, IM q4h; 2 mg/kg, IV q 2–4h	Analgesic and sedative
Morphine*	1–2 mg/kg, PO, SC, IM, IV q4h	
Naproxen (Naprosyn, Syntex)	10 mg/kg, PO q12h	antipyretic
Oxymorphone*	0.03–0.2 mg/kg, SC, IM, IV q6–12h New World Primates: 0.075 mg/kg, SC, IM, IV q4–6h Old World Primates : 0.03-0.2 mg/kg, SC, IM, IV q4–6h	Analgesia
Pentazocine (Talwin)*	1.5–3 mg/kg, SC, IM q2–4h NOT to exceed 60mg	Narcotic agonist/antagonist
Tramadol	3-5mg/kg PO BID	For mild pain.

Pig

Anesthesia in Pigs	**Dose & Route**	**Comments**
Acepromazine Maleate	Pigs: 10 mg/cc (Dose at 1 cc/kg): Not to exceed 15 mg total. Mini-Pigs: 0.03–0.1 mg/kg, IM	Mini-Pig: low dose for catheter placement, higher dose for tranquilization
Atropine	0.05(mini-pigs) – 0.5 (Bigger pigs)	*Adjunct:* Anticholinergic;

	mg/kg, SC, IM, IV	decreases fluid secretions, suppresses vagal tone to the heart, prevents bradycardia
Bupivacaine	Local injection to effect – SC or intraincisional. 1 ml/5 Kg Max dosage.	Slower onset than Lidocaine but longer (~ 4-8 hour) duration of action
Diazepam (Valium)*	0.5–10 mg/kg, IM; 0.5–1.5 mg/kg, IV	Sedative
Fentanyl/Droperidol (Innovar-Vet)*	Sedation: 0.07–0.10 ml/kg, IM Mini-pigs: 1mg/9–14kg, IM Sedation; 1ml/12–25kg, IM Tranquilization for minor procedures	Sedative/analgesic; Lower dose takes 20 minutes to maximum effect
Inhalant Anesthetics: Isoflurane Sevoflurane (Ultane)	To effect. In general, 4–5% induction, 1–2% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential
Ketamine Used in Combination: Diazepam*(D), Medetomidine (M), Midazolam, Xylazine (X) Best if include Butorphanol to increase analgesia.	15–20 mg/kg, IV; 15–25 mg/kg, IM Combinations: 10–18mg/kg (K) + 1-2mg/kg (D), IM Or 1-2mg/kg (D), IM then 12-20mg/kg (K), IM Or 10mg/kg (K) + 0.08mg/kg (M), IM Or 11 mg/kg (K)+ 2 mg/kg (X) + 0.22mg/kg Butorphanol, IM	Alone: poor anesthetic; Better if used in combination with other agents
Lidocaine (Xylocaine)	Local injection to effect – SC or intraincisional	Faster onset than bupivacaine but short (<1 hour) duration of action
Midazolam	0.5 mg/kg IM	
Pentobarbital (Nembutal)*	25–35 mg/kg, PO; 30 mg/kg, IP; 20–30 mg/kg, IV	
Thiopental (Pentothal)*	24–30 mg/kg BW IP 5–19 mg/kg BW IV	
Tiletamine/ Zolazepam (Telazol)	Consult Veterinary staff for combinations and dosages	Refer to Formulary
Xylazine (Rompun, AnaSed)	0.5–10 mg/kg, IM *Reversal agent:* Yohimbine 0.125-0.3mg/kg, IV	Sedative

Analgesia in Pigs	**Dose & Route**	**Comments**
Acetylsalicylic Acid (Aspirin)	10–20 mg/kg, PO q4–12h	Analgesia, anti-inflammatory; antipyretic; Use enteric-coated tablet;. Lower dose q4h, higher does q12h
Buprenorphine (Buprenex)*	0.005–0.1 mg/kg, IM, IV q12h	Up to 12 hours of analgesia; The higher dose should be

		used with all major surgical procedures
Buprenorphine SR (Bup SR)	0.12-0.27 mg/kg, SC q72h	
Butorphanol (Torbugesic, Torbutrol)*	0.1–0.3 mg/kg, IM, IV q8-12h	
Carprofen (Rimadyl)	2-4 mg/kg IV, SC, q 24h	Non-steroidal Anti-Inflammatory
Chlorpromazine	0.5–4.0 mg/kg, IM; 0.55–3.3mg/kg, IV	Decreases nausea, vomiting
Flunixin meglumine (Banamine)	0.5–2.2 mg/kg, SC, IV q12–24h	Non-Steroidal Anti-inflammatory
Ketoprofen (Ketofen)	3 mg/kg, IM sid for up to 3 days	Non-steroidal Anti-Inflammatory
Medetomidine (Domitor)	0.08 mg/kg, IM	Light - Moderate Sedative, Analgesic; Potent alpha2-agonist
Meloxicam	0.2mg/kg IV, SC, PO q24h	
Meperidine (Demerol)*	2–10 mg/kg, IM q4h; 2 mg/kg, IV q 2–4h	
Morphine*	0.1 mg/kg IV 0.2 mg/kg, IM q4h; 0.2–0.9 mg/kg, SC	Not recommended for recovery procedures.
Phenylbutazone	Consult Veterinary Staff for dosages	See Veterinary Formulary

Rabbit

Anesthesia in Rabbits	**Dose & Route**	**Comments**
Acepromazine Maleate	0.25–1 mg/kg IM 1–5 mg/kg , SC, IM (Lower dosage is preferred)	Preanesthetic; Sedative
Atropine	Due to serum atropinase, some rabbits require very high doses: 0.1–3.0 mg/kg, SC, IM	Adjunct: Anticholinergic; decreases fluid secretions, suppresses vagal tone to the heart, prevents bradycardia
Diazepam (Valium)*	1–5 mg/kg, IV; 5–10 mg/kg, IM	Preanesthetic Sedative; tranquilizer. Used with Ketamine
Fentanyl/Droperidol (Innovar-Vet)*	0.15–0.44 ml/kg, IM (0.22 ml/kg is optimal)	May cause muscle necrosis
Inhalant Anesthetics: Isoflurane Sevoflurane (Ultane)	To effect. In general, 3–4% induction, 1–2% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential

Ketamine (Ketaset, Vetalar,Vetaket)* Use in Combination: Acepromazine, Diazepam*, Medetomidine, Midazolam, Xylazine	Ketamine alone, ~60 min sedation: 20–50 mg/kg IM; 15–20 mg/kg IV Rabbit Mix (see Appendix 2): Induction –½ cc/kg Full anesthesia– 1cc/kg	**See Appendix 3 for Rabbit KAX Cocktail Mix** See Formulary for combinations with other drugs and dosages
Lidocaine (Xylocaine)	Local injection to effect – SC or intraincisional	Faster onset than bupivacaine but short (<1 hour) duration of action
Medetomidine (Domitor) Used in combination with Ketamine, Midazolam, Propofol Reversed with Atipamezole HCL (Antisedan)	0.25–0.5 mg/kg, IM; *Reversal Agent:* Atipamezole 0.001 mg/kg, SC, IV, IP; Give 5x Medetomidine dose (in mg)	Light - Moderate Sedative; Analgesic; Potent alpha2-agonist See Formulary for combination agents and dosages.
Meloxicam (Metacam)	0.3-1.5 mg/kg, PO q24h 0.2mg/ml drinking water	Non-Steroidal Anti-inflammatory; analgesic
Pentobarbital (Nembutal)*	30–50 mg/kg IV, IP	Not recommended. Marginal analgesia; autonomic depression.
Proparacaine HCl	One drop in each eye. Anesthetic effect takes 30 seconds and lats ~15 min.	Topical Ophthalmic anesthetic.
Propofol	7.5–15 mg/kg, IV	
Thiopental (Pentothal)*	15–30 mg/kg, IV	
Tiletamine/ Zolazepam (Telazol)	3 mg/kg, IM 10 mg/kg, Intranasal (No renal compromise reported)	**CAUTION – NOT RECOMMENDED** for use in rabbits; causes mild-severe renal tubular necrosis depending on the dosage
Tetracaine (Pontocaine)	0.5% solution topical or ophthalmic application; 2-3 drops in each eye.	Primarily used for ocular procedures.
Xylazine (Rompun, AnaSed) Reversed with Yohimbine	1–3 mg/kg, SC, IM *Reversal agent:* Yohimbine 0.2-1.0 mg/kg, IM, IV	Preanesthetic; lower end of dose is recommended

Analgesia in Rabbits	**Dose & Route**	**Comments**
Acetaminophen (Tylenol) Often combined with Codeine	200–500 mg/kg, PO; 1–2 mg/ml drinking water Combined with Codeine: 1 ml elixir/100ml drinking water	Analgesia; Non-steroidal anti-inflammatory

Acetylsalicylic Acid (Aspirin)	10–100 mg/kg, PO q8–12h; 100 mg/kg, PO q4h	Analgesia; Non-steroidal anti-inflammatory; antipyretic
Buprenorphine (Buprenex)*	0.02–0.1 mg/kg SC, IV 0.01–0.05 mg/kg, SC, IM, IV 0.5 mg/kg , pert rectum q12h	6-12h analgesia
Buprenorphine SR (Bup SR)	0.12-0.27 mg/kg SC q 72 hrs	
Butorphanol (Torbugesic, Torbutrol)*	0.1–0.5 mg/kg, IM, IV, SC q4h	Up to 4 hours of analgesia
Carprofen (Rimadyl)	1–2.2 mg/kg, PO q12h 4 mg/kg, SC q24h	Non-Steroidal Anti-inflammatory, analgesia
Flunixin (Banamine)	1.1 mg/kg, IM q12h 1–2 mg/kg, SC q12–24h 0.3–2 mg/kg, PO, IM, IV q12–24h	Do not use more than 3 days
Ibuprofen (Advil, Motrin)	10–20 mg/kg, PO q4h	May have Gastrointestinal side effects
Ketoprofen (Ketofen)	3 mg/kg, SC q24h Topical gel: apply q6–12h	Good for musculoskeletal pain
Meloxicam	0.2 mg/kg SC, IM, SID	
Pentazocine (Talwin)*	5–10 mg/kg, SC q2–4h	Narcotic agonist/antagonist

Rat

Anesthesia in Rats	**Dose & Route**	**Comments**
Acepromazine Maleate	0. 5–1 mg/kg IM	Sedative
Chloralose	5% concentration: 31–-65 mg/kg, IP	Recommended dose is 55 mg/kg, IP
Diazepam (Valium)*	4 mg/kg, IP: 3–5 mg/kg IM	Sedative
Ether	To effect. Inhalation.	An explosion proof hood must be utilized;
Fentanyl/Droperidol (Innovar-Vet)*	0.02–0.06 ml/100g, IP 0.1–0.5 ml/kg, IM (Lower dose for sedation; higher dose for anesthesia)	
Inactin (Thiobutabarbital)	80–100 mg/kg, IP	Short-acting barbiturate: sedative, anticonvulsant and hypnotic. Used for induction.

Inhalant Anesthetics: Isoflurane Sevoflurane (Ultane)	To effect. In general, 3–4% induction, 1–2% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential
Ketamine (Ketaset, Vetalar,Vetaket)* Use in combination with one or more: Acepromazine, Diazepam*, Medetomidine, Xylazine	44–100 mg/kg, IM Best used in Combinations. Rat Mix: Induction–½ cc/kg Full anesthesia –1cc/kg	**See Appendix 3 for Rat KAX Cocktail Mix** See Formulary for combinations with other drugs and dosages
Medetomidine (Domitor) Best when combined with Ketamine or Fentanyl Reversed with Atipamezole HCL (Antisedan)	0.03–0.1 mg/kg, SC See Formulary for combination agents and dosages. *Reversal agent* – Atipamezole: 1 mg/kg, SC	Light - Moderate Sedative, Analgesic; Potent alpha2-agonist; Variable effects
Pentobarbital (Nembutal)*	30–50 mg/kg, IP	**NOT RECOMMENDED**; autonomic depression
Pentothal (Sodium Thiopental)*	30 mg/kg, IV 40 mg/kg, IP	Short anesthesia
Propofol	7.5–10 mg/kg, IV induction 55 mg/kg/hr IV maintenance	
Tetracaine (Pontocaine)	0.5% solution topical or ophthalmic application	Topical and ophthalmic solutions available
Thiobutabarbital (Inactin)	80–100 mg/kg, IP	**NON-SURVIVAL PROCEDURES ONLY**
Tiletamine/ Zolazepam (Telazol) Combined with Butorphanol, Xylazine	20–40 mg/kg, IP Alone or combined with: Butorphanol 1.25–5 mg/kg, IP Or Xylazine 5–10 mg/kg, IP	
Tribromoethanol (Avertin)	300 mg/kg, IP (See Appendix 1 below for mixing instructions)	**NOT RECOMMENDED;** Chemical peritonitis
Urethane	1000-1200 mg/kg, IP	**NON-SURVIVAL PROCEDURES ONLY** Prolonged anesthesia. Caution: carcinogenic and mutagenic.
Xylazine (Rompun, AnaSed) Reversed with Yohimbine	1–8 mg/kg,, IM; 10 mg/kg IP *Reversal agent:* Yohimbine 0.5–1 mg/kg, IV	Best used in combination with Ketamine or Telazol: see Formularies

Analgesia in Rats	**Dose & Route**	**Comments**

Acetaminophen (Tylenol)	100–300 mg/kg, PO q4h	
Acetylsalicylic Acid (Aspirin)	100–150 mg/kg, PO q4h	
Atropine	0.05–0.1 mg/kg, SC	May cause organophosphate toxicity in some strains
Buprenorphine (Buprenex)* Can also combine with Carprofen	0.01–0.5 mg/kg, SC, IV q6-12h; 0.1–0.25 mg/kg, PO q8-12h; 0.02 mg/ml drinking water Combination: 0.05 mg/kg SC, IM + 5 mg/kg Carprofen, PO	6-12 hours analgesia
Buprenorphine SR (Bup SR)	1 mg/kg, SC q 72h	
Butorphanol (Torbugesic, Torbutrol)*	0.05–2.0 mg/kg, SC, IP q2–4h	2-4 hours analgesia
Carprofen (Rimadyl) Can combine with Buprenorphine (see above)	2.5–5 mg/kg, PO, SC q24h	Non-Steroidal Anti-inflammatory, analgesia
Flunixin (Banamine)	1.1–2.5 mg/kg, SC, IM q12h	Analgesic; Non-Steroidal Anti-inflammatory
Ibuprofen (Advil, Motrin)	10–30 mg/kg, PO q4h	Analgesic; Non-Steroidal Anti-inflammatory; 4 hours analgesia
Ketoprofen (Ketofen)	5 mg/kg, PO, SC, IM q24h	Non-Steroidal Anti-inflammatory; Good for musculoskeletal pain
Meloxicam (Metacam)	1–2 mg/kg, PO, SC q24h	Non-Steroidal Anti-inflammatory; analgesic
Morphine*	2–10 mg/kg, SC q2–4h	Up to 3 hours analgesia

Reptiles

Anesthesia in Reptiles	**Dose & Route**	**Comments**
Inhalant Anesthetics: Isoflurane * IsoFlo is preferred Sevoflurane (Ultane)	To effect. In general, 3–4% induction, 1–2% maintenance; inhalation. 0.5–2.0 ml/L bath or vaporize then bubble in water. *Use with Butorphanol, see below	Precision vaporizer; Adequate ventilation or scavenging essential; Levels in water are difficult to control; *NOT recommended
Ketamine (Ketaset, Vetalar, Vetaket)* + Diazepam (Valium)*	Most Species: 10 mg/kg SC, IM, q30min. OR 20–60 mg/kg + 2–5mg/kg IM Diazepam	Alone provides Sedation; Combination provides Anesthesia with improved muscle relaxation
Tricaine methanesulfonate (MS 222)	200–300 mg/kg, IPP	

Tiletamine/ Zolazepam (Telazol)	Lizards: 30mg/kg IM Alligators: 15 mg/kg IM	Adequate for minor procedures

Analgesia in Reptiles	**Dose & Route**	**Comments**
Acepromazine Maleate	0.05–0.5 mg/kg, IM	Use with Preanesthetic
Buprenorphine (Buprenex)*	0.005–0.02 mg/kg, IM, q 24-48h 0.01–1.0 mg/kg, IM	Most species/analgesia
Butorphanol (Torbugesic, Torbutrol)*	0.5–2.0 mg/kg, IM or 0.2– 0.5 mg/kg IV, IO Lizards: 0.05 mg/kg, IM, q24h x 2–3d Lizards: 1.0–1.5 mg/kg SC, IM **	Preanesthesia; analgesic **Administer 30 minutes prior to Isoflurane induction – smoother, shorter induction
Carprofen (Rimadyl)	1-4 mg/kg, PO, SC, IM, IV, q 24h follow with half the dose q 24–72 h	Non-Steroidal Anti-inflammatory, analgesia
Flunixin (Banamine)	0.1–0.5 mg/kg, IM, q12–24h Lizards: 1–2 mg/kg IM q 24h x 2 treatments.	Up to 3 days; Non-steroidal Anti-Inflammatory

Reptiles (Snakes)

Anesthesia in Snakes	**Dose & Route**	**Comments**
Inhalant Anesthetics: Isoflurane * IsoFlo is preferred	To effect. In general, 3–4% induction, 1–2% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential
Ketamine + Diazepam (Valium)*	20–60 mg/kg SC, IM 60–80 mg/kg, IM Ketamine + 0.2–0.8 mg/kg IM Diazepam	Alone provides Sedation; Combination provides Anesthesia with improved muscle relaxation
Pentobarbital (Nembutal)*	15–30mg /kg IPP	
Tiletamine/ Zolazepam (Telazol)	10–22mg /kg IM	

Analgesia in Snakes	**Dose & Route**	**Comments**
Acepromazine Maleate	0.05– 0.5 mg/kg, IM	Use with Preanesthetic
Buprenorphine (Buprenex)*	0.005–0.02 mg/kg, IM, q 24–48h 0.01–1.0 mg/kg, IM	Most species/analgesia
Butorphanol (Torbugesic, Torbutrol)*	1–2 mg/kg, IM	Preanesthesia, analgesic
Carprofen (Rimadyl)	1v4 mg/kg, PO, SC, IM, IV, q 24h follow with half the dose q 24–72 h	Non-Steroidal Anti-inflammatory, analgesia
Flunixin (Banamine)	0.1–0.5 mg/kg, IM, q12–24h	Up to 3 days; Non-steroidal Anti-Inflammatory

Reptiles (Turtles)

Anesthesia in Turtles	**Dose & Route**	**Comments**

Inhalant Anesthetics: Isoflurane * IsoFlo is preferred Sevoflurane (Ultane)	To effect. In general, 3v4% induction, 1v2% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential
Ketamine + Diazepam (Valium)*	20–60 mg/kg SC, IM 60–80 mg/kg, IM Ketamine + 0.2–1.0 mg/kg IM Diazepam	Alone provides Sedation; Combination provides Anesthesia with improved muscle relaxation
Pentobarbital (Nembutal)*	10–18 mg/kg IC	
Tiletamine/ Zolazepam (Telazol)	10–20 mg/kg IM	

Analgesia in Turtles	**Dose & Route**	**Comments**
Acepromazine Maleate	0.05–0.5 mg/kg, IM	Use with Preanesthetic
Buprenorphine (Buprenex)*	0.005–0.02 mg/kg, IM, q 24–48h 0.01 –1.0 mg/kg, IM	Most species/analgesia
Butorphanol (Torbugesic, Torbutrol)*	0.4–1.0 mg.kg, IM, SC (0.2 mg.kg IM used experimentally in Tortoises)	Preanesthesia , analgesic
Carprofen (Rimadyl)	1–4 mg/kg, PO, SC, IM, IV, q 24h follow with half the dose q 24–72 h	Non-Steroidal Anti-inflammatory, analgesia
Flunixin (Banamine)	0.1–0.5 mg/kg, IM, q12–24h	Up to 3 days; Non-steroidal Anti-Inflammatory

Sheep

Sheep should be fasted 12-24h prior to induction; withhold water for only 6 h.

Anesthesia in Sheep	**Dose & Route**	**Comments**
Acepromazine Maleate	0.05–0.2 mg/kg, IM, SC	
Atropine	0.1 –1.0 mg/kg, SC, IM, IV Repeat q 15–30 minutes	Adjunct: Anticholinergic; decreases fluid secretions, suppresses vagal tone to the heart, prevents bradycardia
Diazepam (Valium)*	0.2–0.5 mg/kg, IM, IV	Sedative
Inhalant Anesthetics: Isoflurane Sevoflurane (Ultane)	To effect. In general, 3–4% induction, 1-2% maintenance; inhalation.	Precision vaporizer; Adequate ventilation or scavenging essential
Fentanyl	0.02-0.05 mg/kg IM, IV 50ug/h Patch per 25-50 kg BW up to 72 hours	Opiate Analgesic

Ketamine Used in Combination: Diazepam*, Medetomidine, Xylazine	2–7 mg/kg, IV; 22-44 mg/kg, IM Combinations: Consult Veterinary Staff for combinations and dosages	Alone: poor anesthetic; Better if used in combination with other agents
Lidocaine (Xylocaine)	Local injection to effect – SC or intraincisional	Faster onset than bupivacaine but short (<1 hour) duration of action
Propofol	3.0-7.0 mg/kg IV	
Pentobarbital (Nembutal)*	20–40 mg/kg, IV	
Thiopental (Pentothal)*	20–25 mg/kg, IV	
Tiletamine/ Zolazepam (Telazol)	Consult Veterinary staff for combinations and dosages	Refer to Formulary
Xylazine (Rompun, AnaSed) Recommended to use with Butorphanol, plus dose of Ketamine Reverse with Yohimbine	Use 20mg/ml concentration Combination: 100mg/ml Xylazine + 1 ml Butorphanol + 8 ml Sterile water: 0.05 mg/kg, IV And give 1 ml Ketamine, IM *Reversal agent:* Yohimbine 0.2 mg/kg, IV	Sedative; analgesic

Analgesia in Sheep	**Dose & Route**	**Comments**
Acetylsalicylic Acid (Aspirin)	10–20 mg/kg, PO q4h	Use enteric-coated tablet
Buprenorphine (Buprenex)*	0.005-0.01 mg/kg, IM q4–6h	4–6 hours analgesia
Butorphanol (Torbugesic, Torbutrol)*	0.5 mg/kg, SC q2–3h	2–3 hours analgesia
Fentanyl	0.02-0.05 mg/kg IM, IV 2-3mcg/kg/hr transdermal patch	
Flunixin (Banamine)	1 mg/kg, IM, IV sid for up to 3 days	
Ketoprofen (Ketofen)	1 mg/kg, IM, IV sid for up to 3 days	
Medetomidine (Domitor)	5–30 ug/kg, IM; 10 ug/kg, IV	
Meperidine (Demerol)*	2–10 mg/kg, IM, SC; 2 mg/kg, IV, IM q2–4h	
Pentazocine (Talwin)*	2 mg/kg, IM q4h	Analgesic; Narcotic agonist/antagonist
Phenylbutazone	4–8 mg/kg, PO q 24h; 2–5 mg/kg, IV q 24h	

APPENDIX 1. Tribromoethanol (TBE, Avertin®) Solution - Avertin® is no longer available as a pharmaceutical grade drug. Scientific justification with IACUC approval is required prior to the use of TBE as an anesthetic. **Dilute TBE Solution must be used within 14 days of initial preparation and be properly stored.** Containers must be labeled with the concentration, date of preparation, and use-by date.

Tribromoethanol (TBE) Solutions

100% Stock TBE:

- 10g tribromoethyl alcohol (2, 2, 2 tribromoethanol), Aldrich T4, 840-2
- 10ml tertiary amyl alcohol (2 methyl-2-butanol), Aldrich 24, 048-6

Mix:

- Add tribromoethanol to tertiary amyl alcohol and dissolve by heating and stirring.
- Add distilled water and continue until the solution is well mixed.
- Store at 4**° C** in wrapped in foil (light sensitive solution, ok to use brown glass bottle)
- Solution may have to be warmed to dissolve. Mixture should be clear.
- Stir on magnetic stirrer until the Avertin is dissolved (about 12 hours).
- Avertin stock is light sensitive and hydroscopic
- Keep in dark bottle at room temperature: If the solution is kept at 4 deg. F. the TBE will "freeze" out, necessitating re-dissolving the TBE.
- Keep away from light and tightly sealed. Do not leave the bottle open longer than necessary.
- Stock solution is stable for 6 months. If the solution develops a yellow discoloration, it must be discarded, even before the use-by date.

Diluent:

- 0.8% NaCl
- 1mM Tris (pH 7.4)
- 0.25mM EDTA
- Check the pH. Adjust to pH 7.4

1.2% Working solution:

- Mix 0.5 ml TBE stock solution and 39.5 ml Diluent, water or isotonic saline in glass vessel (graduate cylinder works great).
- Seal container with parafilm, wrap in foil to exclude light and stir on magnetic stirrer for about 12 hours or until dissolved.
- Filter sterilize through 0.2 micron filter and store at 4deg C.
- It can be aliquoted into ~5 ml lots in foil wrapped, sterile serum vials or kept in a dark, capped bottle at 4 deg. C.

2.5% Working solution (50ml):

- Mix 1.25 ml TBE stock solution and 48.75 ml Diluent, water or isotonic saline in glass vessel (graduate cylinder works great).
- Seal container with parafilm, wrap in foil to exclude light and stir on magnetic stirrer for about 12 hours or until dissolved.
- Filter sterilize through 0.2 micron filter and store at 4deg C.
- It can be aliquoted into ~5 ml lots in foil wrapped, sterile serum vials or kept in a dark, capped bottle at 4 deg. C.

Comments:

It will take about 5 min. for the animal to become fully anesthetized (lack of toe pinch reflex). An additional 0.1-0.2 ml can be given to effect. The animal will remain anesthetized for approximately 15–20 minutes and recover within 30-60 minutes. Keep animal warm during recovery. Note: that the effective dosage is dependent upon the weight of the animal. Older, fatter or lactating animals will need more TBE to become fully anesthetized. It is difficult to over-anesthetize (kill) the animal even at higher dosages.

* This information is provided from a number of different sources, therefore it is not accountable.

WARNING: Decomposition can result from improper storage. Potentially hepatotoxic and frequent use may induce chemical peritonitis.

APPENDIX 2. Ketamine Cocktail for Mice.

Components:	**Comments:**
In Sterile Vial, mix: Acepromazine Maleate (10mg/mL): 1.2 mg, 0.12mL + Ketamine HCI (100mg/mL): 41 mg, 0.41mL + Xylazine HCL (20mg/mL): 4.2 mg, 0.21mL + Sterile Water for Injection: 4.26ml **Dosage:** 0.30mL/25g BW , IP **LABEL THE BOTTLE AS SUCH**: "KAX" Mouse Mix Ketamine (8.25mg/mL) Acepromazine (0.25mg/mL) Xylazine (0.83mg/mL) Made: __/__/__ *Expires: __/__/__* *Ketamine Cocktail expires 6 months after Made Date, or the earliest expiration date of any drug in the cocktail if sooner than 6 months.	Individual dosages for a mouse: 100mg/kg ketamine (100mg/ml) 20mg/kg xylazine (20mg/ml) 3mg/kg acepromazine (10mg/ml) References: Arras M et al. 2001. Optimization of intraperitoneal injection anesthesia in mice: drugs, dosages, adverse effects, and anesthesia depth. Comp Med 51(5):443-56. UCSF IACUC Mouse Formulary & Calculator: www.IACUC.UCSF.edu

APPENDIX 3. Ketamine Cocktail for Rats, Guinea Pigs, Rabbits.

Components:	**Comments:**
In Sterile Vial, mix: Acepromazine Maleate 20 mg (2cc of 10 mg/ml) + Ketamine HCl* 500 mg (5 cc of 100 mg/ml) + Xylazine HCL 160 mg (8 cc of 20 mg/ml) **Dosage:** As an Induction agent: ½ cc/kg, IM For use as the Full anesthetic: 1cc/kg, IM	Used primarily for Guinea Pigs Rabbits, Rats.

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