

GUIDELINES FOR THE USE OF TRANQUILIZERS, ANALGESICS AND ANESTHETICS IN RODENTS AND LAGOMORPHS

June 2004

All doses in mg/kg

DRUG GENERIC (TRADE)	MOUSE	RAT	HAMSTER	GUINEA PIG	RABBIT
ANTICHOLINERGICS Atropine	0.04 SC (1)	0.05 SC, IP (1)	0.04 SC (1)	0.05 SC (1)	0.05 SC (2), IM (1)
Glycopyrrolate (Robinul-V)		0.5 IM (1,3)			0.1 SC (1), IM (1,3) 0.01 IV (1)
MINOR TRANQUILIZERS Diazepam (Valium)	5 IM, IP (1) Light sedation	2.5-5 IM, IP (1) Light sedation	5 IM, IP (1) Light to moderate sedation	5 IM, IP (1) Heavy sedation	0.5-2 IV, IM, IP (1) Light to moderate sedation
Midazolam (Versed)	5 IM, IP (1) Light to moderate sedation	5 IP (1) Light sedation	5 IM, IP (1) Light to moderate sedation	5 IM, IP (1) Heavy sedation	0.5-2 IV, IM, I (1) Light to moderate sedation
MAJOR TRANQUILIZERS Acepromazine Maleate	2-5 IP, SC (1) Light sedation	2.5 IM, IP (1) Light sedation	5 IP (1) Light sedation	2.5-5 IM (1) Light to moderate sedation	1 IM (1) Moderate sedation
ALPHA 2 AGONISTS Xylazine HCl (Rompun)	5-10 IP (1) Light sedation, some analgesia	1-5 IM, IP (1) Light to heavy sedation, some analgesia	5 IM (1) Light sedation, some analgesia	5 SC, IP (2)	2-5 SC (4), IM (1) Light to moderate sedation, some analgesia
Medetomidine (Domitor)	0.03-0.1 SC (1) Light to deep sedation, some analgesia	0.03-0.1 SC, IP (1) Light to deep sedation, some analgesia	0.1 SC, IP (1) Moderate sedation, some analgesia		0.1-0.5 IM, SC (1) Light to deep sedation, some analgesia
REVERSALS FOR ALPHA 2 AGONISTS Atipamezole (Antesedan) (A) Specific antagonist	0.1-1 IM, IP, SC, IV (1)	0.1-1 IM, IP, SC, IV (1)	0.1-1 IM, IP, SC, IV (1)	0.1-1 IM, IP, SC, IV (1)	0.1-1 IM, IP, SC, IV (1)
Yohimbine (Yobine) Non-specific antagonist	0.5 IM (1) 0.2 IV (1)	0.5 IM (1) 0.2 IV (1)	0.5 IM (1) 0.2 IV (1)	0.5 IM (1) 0.2 IV (1)	0.5 IM (1) 0.2 IV (1)
OPIOID ANALGESICS Meperidine HCl (Demerol)	10-20 SC, IM q 2-3 hrs (5)	10-20 SC, IM q 2-3 hrs (5)	20 SC, IM q 2-3 hrs (6)	10 IM q 2-4 hrs (5)	5-10 SC, IM q 2-3 hrs (5)
Morphine SO4	2-5 SC, IM q 4 hrs (5)	2-5 SC, IM q 4 hrs (5)	10 SC, IM q 2-4 hrs (6)	2-5 SC, IM q 4 hrs (5)	2-5 SC, IM q 4 hrs (5)
OPIOID AGONIST- ANTAGONIST ANALGESICS Buprenorphine HCl (Buprenex) (B)	0.05-0.1 SC q 8-12 hrs (5)	0.1-0.25 PO q 8-12 hrs (5) 0.01-0.05 SC, IV q 8-12 hrs (5)	0.05 SC q 8-12 hrs (6)	0.05 SC q 8-12 hrs (5)	0.01- 0.05 IM, SC, IV q 6-12 hrs (5)
Butorphanol Tartrate (Torbugesic)	1-2 SC, IM q 4 hrs (5)	1-2 SC, IM q 2-4 hrs (5)			0.1-0.5 SC, IM, IV q 4 hrs (5)
Nalbuphine HCl (Nubain) (C)	2-4 IM q 4 hrs (5)	1-2 IM q 4 hrs (5)		1-2 IM q 4 hrs (5)	1-2 IM, IV q 4 hrs (5)

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OPIOID ANTAGONIST Naloxone (Narcan) (D)	0.01-0.1 SC, IM, IV (1)	0.01-0.1 SC, IM, IV (1,5)	0.01-0.1 SC, IM, IV (1)	0.01-0.1 SC, IM, IV (1)	0.01-0.1 SC, IM, IV (1)
NSAIDS Acetaminophen (Tylenol)	200 PO ? daily (5)	200 PO ? daily (5)			
Aspirin	120 PO ? once (5)	100 PO ? once (5)		80-90 PO ? once (5)	100 PO ? once (5)
Carprofen (Rimadyl)	5 SC, PO daily (5)	5 SC, PO daily (5)			1.5 PO q 12 hrs (5) 4 SC daily (5)
Flunixin (Banamine)	2.5 SC q 12-24 hrs (5)	2.5 SC q 12-24 hrs (5)			1.0 SC q 12-24 hrs (5)
Ibuprofen (Advil)	30 PO daily (5)	15 PO daily (5)			
Ketoprofen (Toradol)		5 PO, SC daily (5)			3 SC daily (5)
INJECTABLE ANESTHETICS Ketamine HCl (Ketaset, Ketalar) (E,F)	100-200 IM (1) IP (2) Deep sedation, mild analgesia	50-100 IM, IP (1) Deep sedation, immobilization; mild analgesia	100-200 IM (1) Deep sedation, mild analgesia	100 IM (1) Heavy sedation, light analgesia	25-50 IM (1) Moderate to heavy sedation, mild analgesia
Pentobarbital (Nembutal) (G,H)	40-50 IP (J,1)Immobilization, light anesthesia for 20-40 mins	40-50 IP (K,1) Light anesthesia for 15-60 mins	50-90 IP (1) Immobilization, light anesthesia for 30-60 mins	37 IP (1) Surgical anesthesia for 60-90 mins	30-45 IV (1) Light to moderate anesthesia for 20- 30 mins
Propofol (Diprivan, Rapinovet)	26 IV (1) Surgical anesthesia for 5-10 mins	10 IV (1) Surgical anesthesia for 5 mins			10 IV (1) Light anesthesia for 5-10 mins
Thiopental (Pentothal)	30-40 IV (1) Surgical anesthesia for 5-10 mins	30 IV (1) Surgical anesthesia for 10 mins		20 IV (7) Surgical anesthesia	30 IV (1) Surgical anesthesia for 5- 10 mins
INJECTABLE ANESTHETIC COMBINATIONS Fentanyl/Medetomi- dine		0.3/0.3 IP (1) Surgical anesthesia for 60-70 mins			
Ketamine/Acepro- mazine (E)	100 / 5 IP (1) Immobilization, light anesthesia for 20-30 mins	75 / 2.5 IP (1) Light anesthesia for 20-30 mins	150 / 5 IP (1) Immobilization, light anesthesia for 45- 120 mins	125 / 5 IM (1) Immobilization, light anesthesia for 45- 120 mins	50 / 1 IM (1) Surgical anesthesia for 20- 30 mins
Ketamine/Acepro- mazine/Xylazine (E, M)	22-44 / 0.75 / 2-5 IM (8), SC, IP Surgical anesthesia	22-44 / 0.75 / 2-5 IM (8), SC, IP Surgical anesthesia		22-55 / 0.75 / 2-5 IM (8), SC Surgical anesthesia	35 / 1 / 5 SC, IM (1) Surgical anesthesia for 45- 75 mins
Ketamine/Diaze- pam (E)	100 / 5 IP (1) Immobilization, light anesthesia for 20-30 mins	75 / 5 IP (1) Light anesthesia for 20-30 mins	70 / 2 IP (1) Immobilization, light anesthesia for 30-45 mins	100 / 5 IM (1) Immobilization, light anesthesia for 30-45 mins	25 / 5 IM (1) Surgical anesthesia for 20- 30 mins

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Ketamine/Medetomidine (E)	75 / 1 IP (1) Surgical anesthesia for 20-30 mins	75 / 0.5 IP (1) Surgical anesthesia for 20-30 mins	100 / 0.25 IP (1) Surgical anesthesia for 30-60 mins	40 / 0.5 IP (1) Moderate anesthesia for 30-40 mins	25 / 0.5 IM (1) Surgical anesthesia for 30-40 mins
Ketamine/Midazolam (E)	100 / 5 IP (1) Immobilization, light anesthesia for 20-30 mins	75 / 5 IP (1) Light anesthesia for 20-30 mins			
Ketamine/Xylazine (E)	80-100 / 10 IP (1) Surgical anesthesia for 20-30 mins	75-100 / 10 IP (1) Surgical anesthesia for 20-30 mins	200 / 10 IP (1) Surgical anesthesia for 30-60 mins	40 / 5 IP (1) Surgical anesthesia for 30 mins	35 / 5 IM (1) 10 / 3 IV (1) Surgical anesthesia for 25-40 mins IM, 20-30 mins IV
Ketamine/Xylazine Butorphanol (E)					35 / 5 / 0.1 IM (1) Surgical anesthesia for 60-90 mins
Tiletamine/Zolazepam (Telazol)	80 IP (1) Immobilization	40 IP (1) Light anesthesia for 15-25 mins	50-80 IP (1) Immobilization, light anesthesia for 20-30 mins	40-60 IM (1) Immobilization	
Tiletamine/Zolazepam/Xylazine			30 / 10 IP (1) Surgical anesthesia for 30 mins		
INHALANT ANESTHETICS: MAC VALUES LISTED					
Halothane (Halothane USP, Fluothane)	0.95 Swiss Webster (9)	1.03 Sprague Dawley (9)		1.01 Hartley (N,10)	1.39 NZW (11)
Isoflurane (Forane, Aerrane)	1.34 Swiss Webster (9)	1.46 Sprague Dawley (9)		1.15 Hartley (10)	2.05 NZW (11)
Methoxyflurane (Metofane, Penthrane)	0.22 (P,12)	0.22 (P,12)			

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LEGEND:

- A. Highly specific antagonist. Dose required varies depending on dose of xylazine or medetomidine administered.
- B. Slower onset than naloxone and nalbuphine, but longer acting
- C. Almost as rapid acting as naloxone, maintains post operative analgesia
- D. Reverses analgesia and respiratory depression
- E. The use of atropine or glycopyrrolate prior to ketamine is advised
- F. Ketamine when used alone provides poor muscle relaxation and little to no deep analgesia during abdominal surgery. It's recommended to combine ketamine with a tranquilizer. See injectable anesthetic combinations.
- G. Narrow safety margin; poor analgesia (2)
- H. Dilute commercial preparation 1:10 if necessary
- I. N/A
- J. Male mice are more susceptible to IP pentobarbital and sleep longer than females (1)
- K. The female rat is less capable of metabolizing pentobarbital than the male and may require a lower dose (1)
- M. Blood pressure with this combination is severely reduced but most healthy animals recover (8)
- N. Halothane has been shown to act as a hepatotoxin in guinea pigs following repeated doses (13)
- O. N/A
- P. Methoxyflurane is no longer commercially available in the US. It can produce a diabetes insipidus like syndrome in F344 rats (14)

REFERENCES: RODENTS/RABBITS

1. Flecknell PA. Laboratory Animal Anesthesia 2nd Edition. London: Academic Press,1996.
2. Flecknell PA. Anesthesia and post operative care of small mammals. In Practice 1991: 180-189.
3. Olson ME, Vizzutti D, Morck DW, Cox AK. The parasympatholytic effects of atropine sulfate and glycopyrrolate in rats and rabbits. Can J Vet Res 1993; 57: 254-258.
4. Eisele P. Detection and alleviation of animal pain: the challenge to the research community. Harlan Sprague Dawley Continuing Education , San Diego June 1992.
5. Flecknell PA, Waterman-Pearson A. Pain Management in Animals. London: WB Saunders, 2000.
6. Jenkins WL. Pharmacologic aspects of analgesic drugs in animals: an overview. The Journal of the American Veterinary Medical Association 1987; 191: 1231-1240.
7. Hughes HC, White WJ, Lang CM. Guidelines for the use of tranquilizers, anesthetics and analgesics in laboratory animals. Veterinary Anesthesia II 1975; 2: 19-23.
8. Sedgewick CJ. Anesthesia for rabbits and rodents. In: Kirk RW,ed. Current Veterinary Therapy VII. Philadelphia: WB Saunders Co., 1980; 706-710.
9. Mazze RI, Rice SA, Baden JM. Halothane, isoflurane, and enflurane MAC in pregnant and non pregnant female and male mice and rats. Anesthesiology 1985; 62: 339-341.
10. Seifen AB, Kennedy RH, Bray JP, Seifen E. Estimation of minimum alveolar concentration (MAC) for halothane, enflurane, and isoflurane in spontaneously breathing guinea pigs. Laboratory Animal Science 1989; 39: 579-581.
11. Drummond JC. MAC for halothane, enflurane, and isoflurane in the new zealand white rabbit: and a test for the validity of MAC determinations. Anesthesiology 1985; 62: 336-338.
12. Eger EI II. In: Eger EI II, ed. Anesthetic uptake and action. Baltimore: The Williams and Wilkins Co., 1974; 1-25.
13. Hughes HC, Lang CM. Hepatic necrosis produced by repeated administration of halothane to guinea pigs Anesthesiology 1972; 36: 466-471.
14. Mazze RI, Cousins MJ, Kosek JC. Dose related methoxyflurane nephrotoxicity in rats: a biochemical and pathologic correlation. Anesthesiology 1972; 36: 571-587.