

FORMULARY FOR COMMONLY USED DRUGS IN RESEARCH ANIMALS

This formulary serves as a quick reference for individuals seeking doses of commonly used drugs in research animals. We recommend referring to more detailed resources in the scientific literature on each agent before any use to ensure minimal adverse effects and interactions with experimental parameters. A consultation with a research animal veterinarian is recommended prior to the use of such substances. Please read the drug label before use and ensure that these drugs are administered to research animals only.

S4D and S8 drugs must be stored apart from all other goods (other than drugs of addiction) in a separate room, safe, cupboard or other receptacle securely attached to a part of the premises and kept securely locked when not in immediate use. S4D drugs in this formulary are coloured **purple** and S8 drugs are coloured **brown**. A comprehensive list of S4D and S8 drugs can be found at the following NSW Health websites:

[Schedule 4 Appendix D drugs - Prescribed restricted substances](#)

[Schedule 8 drugs - Drugs of addiction](#)

The use of restricted substances and drugs of addiction in research animals for research and teaching purposes is regulated by the following NSW legislation:

[Poisons and Therapeutic Goods Act 1966 No 31](#)

[Poisons and Therapeutic Goods Regulation 2008](#)

THERAPEUTIC DRUGS

Antimicrobial Agents

Agent	Mice	Rats	Rabbits	Guinea Pigs	Sheep	Pigs
Amikacin (administer with fluid support) ¹	5-16 mg/kg SC, IM q8-12h ^{1,2}	5-16 mg/kg SC, IM q8-12h ^{1,2}	2-10 mg/kg SC, IM, IV divided q8-24h ^{1,2}	5-16 mg/kg SC, IM, IV divided q8-24h ^{1,2}	N/A	N/A
Amoxicillin	20 mg/kg PO q12h ¹	20 mg/kg PO q12h ²	Do not use ¹	Do not use ¹	10 mg/kg IM q8-12h ^{3,4}	7 mg/kg SC q24h ²⁷
Amoxicillin clavulanate	20 mg/kg PO q12h ²	20 mg/kg PO q12h ²	Do not use ¹	Do not use ¹	20 mg/kg IV q8-12h ^{5,6}	-
Ampicillin	20-100 mg/kg PO, SC, IM q8h ¹	20-100 mg/kg PO, SC, IM q8h ¹	Do not use ¹	Do not use ¹	10 mg/kg IV q6-8h ⁷	2-5 mg/kg IM q12h ²⁸
Azithromycin	30-50 mg/kg PO q12-24h ¹	30-50 mg/kg PO q12-24h ¹	5 mg/kg IM q48h; 15-30 mg/kg PO q24h ^{1,8}	15-30 mg/kg PO q24h ¹	20 mg/kg IV or IM ⁹	N/A

Agent	Mice	Rats	Rabbits	Guinea Pigs	Sheep	Pigs
Cephalexin	60 mg/kg PO q12h ¹	15 mg/kg SC q12-24h ¹	15-20 mg/kg SC q12-24h ^{1,2,8}	Do not use ¹	N/A	10 mg/kg SC q24h ²⁷
Chloramphenicol	30-50 mg/kg PO, SC, IM q8-12h ¹	30-50 mg/kg PO, SC, IM q8-12h ¹	25-50 mg/kg PO, SC, IM q12h ¹	30-50 mg/kg PO, SC, IM q8-12h ¹	N/A	N/A
Ciprofloxacin	10 mg/kg PO q12h ¹	10 mg/kg PO q12h ¹	5-20 mg/kg PO q12-24h ^{1,2}	5-25 mg/kg PO q12-24h ^{1,2}	N/A	N/A
Clindamycin	7.5 mg/kg SC q12h; Do not use PO ¹	7.5 mg/kg SC q12h; Do not use PO ¹	Do not use ¹	7.5 mg/kg SC q12h Do not use PO ¹	N/A	N/A
Doxycycline	2.5-5.0 mg/kg PO q12h ¹	2.5-5.0 mg/kg PO q12h ¹	2.5 mg/kg PO q12h ¹	2.5-5.0 mg/kg PO q12h ¹	N/A	N/A
Enrofloxacin (can cause tissue necrosis when administered SC or IM undiluted)¹	5-20 mg/kg PO, SC, IM q12h; 0.05-0.2 mg/mL drinking water ¹	5-20 mg/kg PO, SC, IM q12h; 0.05-0.2 mg/mL drinking water ¹	5-20 mg/kg PO, SC, IM, IV q12h ^{1,2,8}	5-20 mg/kg PO, SC, IM q12h ¹	5 mg/kg IV, IM, or SC q24h ^{10,11}	2.5-5 mg/kg IM or PO q24h ²⁹
Erythromycin	20 mg/kg PO q12h ²	20 mg/kg PO q12h ²	N/A	N/A	10 mg/kg IM q12-24h ^{12,13}	2-5 mg/kg IM or IV q12h ²⁸
Marbofloxacin	4 mg/kg PO, SC q24h ¹	4 mg/kg PO, SC q24h ¹	2-5 mg/kg PO, SC, IM q24h ^{1,8}	4 mg/kg PO, SC q24h ¹	N/A	N/A
Metronidazole	10-40 mg/kg PO q24h ^{1,2}	10-40 mg/kg PO q24h ^{1,2}	10-20 mg/kg PO q12h ^{1,2,8}	10-20 mg/kg PO q12h ^{1,2}	N/A	66 mg/kg PO q24h ²⁸
Neomycin	25 mg/kg PO q12h ²	25 mg/kg PO q12h ²	30 mg/kg PO q12h ²	15 mg/kg PO q12h ²	22 mg/kg PO q12h for maximum of 14 days ¹⁴	N/A
Procaine Penicillin	22,000 IU/kg SC, IM q24h ¹	22,000 IU/kg SC, IM q24h ¹	40,000 IU/kg SC q24h ⁸ 60,000 IU/kg SC, IM q8h (use with caution) ¹	Do not use ¹	10,000 IU/kg IM q24h ^{15,16} 50,000 IU/kg SC q24h for 7-14 days ¹⁷	10,000 – 40,000 IU/kg IM q72hr ³⁰
Tetracycline	10-20 mg/kg PO q8-12h ¹	10-20 mg/kg PO q8-12h ¹	50 mg/kg PO q8-12hr ¹	10 mg/kg PO q8-12hr (use with caution) ¹	N/A	10-25 mg/kg PO q12h or 2-5 mg/kg IM q24h ²⁸

Agent	Mice	Rats	Rabbits	Guinea Pigs	Sheep	Pigs
Trimethoprim/sulfa	15-30 mg/kg PO, SC q12h ¹	15-30 mg/kg PO, SC q12h ¹	30-40 mg/kg PO, SC q12h ^{1,2,8}	15-30 mg/kg PO, SC q12h ¹	30 mg/kg IM q24h ¹⁸	5 mg/kg IM q24h or 25-50 mg/kg PO q24h ²⁸
Tylosin	10 mg/kg PO, SC q12h ^{1,2}	10 mg/kg PO, SC q12h ^{1,2}	10 mg/kg PO, SC q12h ¹	10 mg/kg PO, SC q12hr (use with caution) ¹	20 mg/kg IM q12-24h ¹⁴	2-10 mg/kg IM q24hr ²⁷

Antifungal Agents

Agent	Mice	Rats	Rabbits	Guinea Pigs	Sheep	Pigs
Amphotericin B	0.11 mg/kg SC; 0.43 mg/kg PO ¹	N/A	1 mg/kg IV q24h (desoxycholate form) or 5 mg/kg IV q24h (liposomal form) ²	1.25–2.5 mg/kg SC q24h ²	N/A	N/A
Fluconazole	N/A	N/A	38 mg/kg PO q12h ¹	16 mg/kg PO q24h for 14 days ¹	N/A	N/A
Griseofulvin	N/A	N/A	15-25 mg/kg PO q12-24h for 30 days ¹	N/A	7.5 mg/kg PO for 7 days ¹⁹	N/A
Itraconazole	50 mg/kg PO q24h ^{1,2}	2.5-10 mg/kg PO q24h ^{1,2}	10-40 mg/kg PO q24h ^{1,2}	2.5-10 mg/kg PO q24h ¹	N/A	N/A
Ketoconazole	10-40 mg/kg PO q24h ¹	10-40 mg/kg PO q24h ¹	10-40 mg/kg PO q24h ¹	10-40 mg/kg PO q24h ¹	N/A	N/A
Lime sulfur dip (2.5%)	Apply topically q7d ¹	Apply topically q7d ¹	Dip q7d for 4 weeks ¹	Dip q7d ¹	N/A	N/A
Terbinafine	10-30 mg/kg PO q24h for 4-6 weeks ^{1,2}	10-30 mg/kg PO q24h for 4-6 weeks ^{1,2}	10-30 mg/kg PO q24h ¹	10-30 mg/kg PO q24h for 4-6 weeks ¹	N/A	N/A

Antiparasitic Agents

Agent	Mice	Rats	Rabbits	Guinea Pigs	Sheep	Pigs
Albendazole	N/A	N/A	N/A	N/A	7.5 - 10 mg/kg PO ^{20,21}	N/A
Amitraz	1.4 mL/L topically q7d ²	1.4 mL/L topically q7d ²	N/A	0.3% solution topically q14d for 3-6 treatments ²	N/A	N/A
Carbaryl powder (5%)	Apply topically q7d ¹	Apply topically q7d ¹	Apply topically q7d ¹	Apply topically q7d for 3 treatments ¹	N/A	N/A

Agent	Mice	Rats	Rabbits	Guinea Pigs	Sheep	Pigs
Fenbendazole	20-50 mg/kg PO q24h for 5 days ¹	20-50 mg/kg PO q24h for 5 days ¹	20 mg/kg PO q24h for 9 or 28 days ^{22,23}	20-50 mg/kg PO q24h for 5 days ¹	5-20 mg/kg PO ¹⁴	5 mg/kg PO ³⁰
Fipronil	7.5 mg/kg topically q30-60d ^{1,2}	7.5 mg/kg topically q30-60d ^{1,2}	Toxic; do not use¹	3 mL /kg topically (use with caution)¹	N/A	N/A
Imidacloprid	20 mg/kg topically q30d ^{1,2}	20 mg/kg topically q30d ^{1,2}	10-16 mg/kg q30d ^{1,24}	20 mg/kg topically q30d ¹	N/A	N/A
Ivermectin	0.2-0.4 mg/kg SC q7-14d ¹	0.2-0.4 mg/kg SC q7-14d ¹	0.2-0.4 mg/kg SC q7-14d ¹	0.2-0.4 mg/kg SC q7-14d ¹	200-300 µg/kg PO ¹⁴	200 µg/kg IM ²⁸ or 300 µg/kg SC ³⁰
Lime sulfur dip (2.5%)	Dip q7d for 6 weeks ¹	Dip q7d for 6 weeks ¹	Dip q7d for 4-6 weeks ¹	Dip q7d for 6 weeks ¹	N/A	N/A
Lufenuron	N/A	N/A	30 mg/kg PO q30d ¹	N/A	N/A	N/A
Metronidazole	20-40 mg/kg PO q12-24h ¹	20-40 mg/kg PO q12-24h ¹	20 mg/kg PO q12h ¹	10-20 mg/kg PO q12-24h ¹	N/A	66 mg/kg PO q24h ²⁸
Piperazine	4-5 mg/mL in drinking water (7 days on, 7 days off) ²	4-5 mg/mL in drinking water (7 days on, 7 days off) ²	200 mg/kg PO, repeat in 2-3 weeks	10 mg/mL in drinking water (7 days on, 7 days off) ²	110 mg/kg PO ³⁰	110 mg/kg PO ³⁰
Praziquantel	6-10 mg/kg PO, SC, repeat in 10 days ¹	6-10 mg/kg PO, SC, repeat in 10 days ¹	5-10 mg/kg PO, SC, IM, repeat in 10 days ¹	6-10 mg/kg PO, SC, repeat in 10 days ¹	N/A	N/A
Pyrantel pamoate	50 mg/kg PO ¹	50 mg/kg PO ¹	5-10 mg/kg PO, SC repeat in 14 days ¹	50 mg/kg PO ¹	N/A	N/A
Pyrethrin products	Topical powder 3 times per week; shampoo q7d ¹	Topical powder 3 times per week; shampoo q7d ¹	Topically as directed q7d ¹	Topical powder q7d x 3 treatments ¹	N/A	N/A
Selamectin	15-30 mg/kg topically ¹	15-30 mg/kg topically ¹	20 mg/kg topically q7d ¹	20 mg/kg topically ¹	N/A	N/A
Sulfadimethoxine	10-15 mg/kg PO q12h ¹	10-15 mg/kg PO q12h ¹	50 mg/kg PO once, then 25 mg/kg q24h for 10-20 days ¹	25-50 mg/kg PO q24h for 10 days ¹	50 mg/kg PO for 5 days to reduce coccidial oocyst shedding ¹⁴	N/A
Sulfaquinoxaline	1 mg/mL in drinking water ¹	1 mg/mL in drinking water ¹	1 mg/mL in drinking water ¹	1 mg/mL in drinking water ¹	1 tsp of 24% powder/125 lb body weight in	N/A

Agent	Mice	Rats	Rabbits	Guinea Pigs	Sheep	Pigs
					drinking water for 3-5 days (approximately 125 mg/kg) ¹⁴	
Thiabendazole	N/A	N/A	N/A	N/A	44 mg/kg PO ¹⁴	N/A
Toltrazuril	10 mg/kg PO q24h for 3 days ¹	10 mg/kg PO q24h for 3 days ¹	2.5–10 mg/kg PO q24h for 3 days, repeat in 7-10 days ¹	10 mg/kg q24h PO for 3 days, repeat after 3 days ^{25,26}	20 mg/kg PO once ¹⁴	N/A

ANAESTHETIC AND ANALGESIC DRUGS

Non-steroidal anti-inflammatories (NSAIDs)

Drug	Mice	Rats	Rabbits	Guinea Pigs	Sheep	Pigs
Carprofen	2–5 mg/kg PO, SC, IM q12–24h ¹	2–5 mg/kg PO, SC, IM q12–24h ¹	1.5 mg/kg PO q24h; 4 mg/kg SC q24h ²⁷	4 mg/kg SC q24h ²⁷	2–4 mg/kg SC or IV q24h for 2–3 days ²⁷	2–4 mg/kg SC or IV q24h ²⁷
Flunixin	2.5 mg/kg SC or IM q12h ²⁷	2.5 mg/kg SC or IM q12h ²⁷	0.5–2 mg/kg SC q12–24h ²⁷	1–2 mg/kg SC or IM q12h ²⁷	2 mg/kg IV or SC q24h ²⁷	1-2 mg/kg IV or SC q24h ²⁷
Ketoprofen	2–5 mg/kg PO, SC or IM q12–24h ¹	2–5 mg/kg PO, SC, or IM q12–24h ¹	1-3 mg/kg IM q12-24h ¹	1–2 mg/kg SC or IM q12–24h ¹	N/A	1–3 mg/kg IV, IM, SC or PO q12h ²⁷
Meloxicam	1-5 mg/kg SC or PO q24h ¹	1-2 mg/kg SC or PO q24h ¹	0.3–0.6 mg/kg SC or PO q12–24h ²	0.2 mg/kg SC or PO q24h on day 1, then 0.1-0.5 mg/kg q24h based on animals' needs ²	0.5 mg/kg IV or SC q12-24h for first day, then 0.5 mg/kg PO q24h for 5 days ²⁷	0.4 mg/kg SC q24h ²⁷
Paracetamol (not recommended for use as a sole analgesic)	200 mg/kg PO or 30–100 mg/kg IP ²⁷	200 mg/kg PO ²⁷	N/A	N/A	N/A	N/A

Opioids

Drug	Mice	Rats	Rabbits	Guinea Pigs	Sheep	Pigs
Buprenorphine	0.05–0.1 mg/kg SC q12h ²⁷	0.01–0.05 mg/kg SC or IV q8–12h; 0.1–0.25 mg/kg PO q8–12h ²⁷	0.01–0.05 mg/kg SC or IV q8–12h ²⁷	0.05 mg/kg SC q8–12h ²⁷	0.005–0.01 mg/kg IM or IV q4h ²⁷	0.01–0.05 mg/kg IM or IV q6–12h ²⁷
Butorphanol	1–2 mg/kg SC q1–2h ²⁷	1–2 mg/kg SC q1–2h ²⁷	0.1–0.5 mg/kg IV q1–2h ²⁷	1–2 mg/kg SC q1–2h ²⁷	0.5 mg/kg IM or IV q1–2h ²⁷	0.1–0.3 mg/kg IM or IV q1–2h ²⁷
Hydromorphone	N/A	0.4 mg/kg SC q2h ¹	0.1–0.2 mg/kg SC, IM or IV q6–8h ¹	N/A	N/A	N/A
Methadone	N/A	N/A	0.3–0.7 mg/kg slow IV or IM ²	N/A	N/A	N/A
Morphine	2.5 mg/kg SC q2–4h ²⁷	2.5 mg/kg SC q2–4h ²⁷	2–5 mg/kg SC or IM q2–4h ²⁷	2–5 mg/kg SC or IM q4h ²⁷	0.2–0.5 mg/kg IM q4h ²⁷	0.2–1 mg/kg IM q4h ²⁷
Oxymorphone	0.2–0.5 mg/kg SC q4h ²⁷	0.2–0.5 mg/kg SC q4h ²⁷	0.05–0.2 mg/kg SC q6–8h ²⁷	0.2–0.5 mg/kg SC q4h ²⁷	N/A	0.15 mg/kg IM q4h ²⁷
Pethidine	10–20 mg/kg SC or IM q2–3h ²⁷	10–20 mg/kg SC or IM q2–3h ²⁷	5–10 mg/kg SC or IM q2–3h ²⁷	10–20 mg/kg SC or IM q2–3h ²⁷	2 mg/kg IM or IV q2–4h ²⁷	2 mg/kg IM or IV q2–4h ²⁷
Tramadol (not recommended for use as a sole analgesic)	10–40 mg/kg SC q12h ²	10–20 mg/kg PO or SC q8–12h ²	N/A	N/A	N/A	N/A

Dilution of analgesics for rodents

Rodents such as mice and rats can be difficult to dose as almost all commercial drug formulations follow a concentration suited for cats, dogs and livestock. As such, it is recommended to dilute analgesics for accurate dosing and ease of administration.

Examples of drug dilution:

1. Injectable meloxicam (5 mg/ml)

- Draw up 1 ml of 5 mg/ml meloxicam.
- Add enough 0.9% sterile saline to create a total volume of 10 ml (i.e. 9 ml).
- As you now have 5 mg of meloxicam in a total volume of 10ml, the concentration is now 0.5mg/ml.
- Using this concentration, a 5 mg/kg dose for a 25 g mouse would be 0.25 ml and a 1 mg/kg dose for a 250 g rat would be 0.5 ml.

2. Injectable buprenorphine (0.3mg/ml)

- Break open the glass vial and draw up 1 ml of 0.3 mg/ml buprenorphine.
- Add enough 0.9% sterile saline to create a total volume of 10 ml (i.e. 9 ml).

- As you now have 0.3 mg of buprenorphine in a total volume of 10ml, the concentration is now 0.03 mg/ml.
- Using this concentration, a 0.1 mg/kg dose for a 25 g mouse would be 0.083 ml and a 0.05 mg/kg dose for a 250 g rat would be 0.42 ml.

Local Anaesthetics²⁷

Drug	Mice	Rats	Rabbits	Guinea pigs	Sheep	Pigs
Lidocaine	2-10 mg/kg	2-10 mg/kg	2-4 mg/kg	2-4 mg/kg	2-4 mg/kg	2-4 mg/kg
Bupivacaine	1-3 mg/kg	1-3 mg/kg	1-2 mg/kg	1-2 mg/kg	1-2 mg/kg	1-2 mg/kg
Lidocaine/ bupivacaine combination	10mg/kg lidocaine and 3 mg/kg bupivacaine mixed together (maximum dose)	50:50 mixture using the recommended doses above	50:50 mixture using the recommended doses above	50:50 mixture using the recommended doses above	50:50 mixture using the recommended doses above	50:50 mixture using the recommended doses above

For rodents, local anaesthetics can be diluted to enable lower doses, minimise toxicity and achieve a better injectate spread for nerve blocks.

Recommended dilutions of local anaesthetics for rodent surgery

1. Lidocaine 2% (20 mg/ml) – Mix 1 part 2% lidocaine to 3 parts 0.9% sterile saline for a final concentration of 0.5% (5 mg/ml)
2. Bupivacaine 0.5% (5 mg/ml) – Mix 1 part 0.5% bupivacaine to 1 part 0.9% sterile saline for a final concentration of 0.25% (2.5 mg/ml)

Calculating drug volume (ml) for administration of local anaesthetics

1. Convert animal's weight from grams into kilograms
 - Divide animal's weight in grams by 1000
 - E.g. 300g rat/1000 = 0.3 kg
2. Calculate the volume to give in millilitres
 - $Volume = \frac{dose(mg/kg) \times weight\ of\ animal(kg)}{concentration\ of\ drug\ (mg/ml)}$
 - E.g. Volume of diluted bupivacaine for a 300g rat = $\frac{3\ mg/kg \times 0.3kg}{2.5\ mg/ml}$
= 0.36 ml

Injectable anaesthetics for mice²⁷

Drug	Dose rate	Effect	Duration of anaesthesia (minutes)	Sleep time (minutes)
Alfaxalone	10 mg/kg IV	Surgical anaesthesia	5	10
Alfaxalone + Dexmedetomidine	30 mg/kg + 0.3 mg/kg IP	Surgical anaesthesia	30	40
Ketamine + acepromazine	100 mg/kg + 5 mg/kg IP	Immobilization/anaesthesia	20–30	40–120
Ketamine + dexmedetomidine	75 mg/kg + 1.0 mg/kg IP	Surgical anaesthesia	20–30	60–120
Ketamine + diazepam	100 mg/kg + 5 mg/kg IP	Immobilization/anaesthesia	20–30	60–120
Ketamine + medetomidine	75 mg/kg + 1.0 mg/kg IP	Surgical anaesthesia	20–30	60–120
Ketamine + midazolam	100 mg/kg + 5 mg/kg IP	Immobilization/anaesthesia	20–30	60–120
Ketamine + xylazine	80–100 mg/kg + 10 mg/kg IP	Surgical anaesthesia	20–30	60–120

Drug	Dose rate	Effect	Duration of anesthesia (minutes)	Sleep time (minutes)
Ketamine + xylazine + acepromazine	80–100 mg/kg + 10 mg/kg + 3 mg/kg IP	Surgical anaesthesia	30–40	60–120
Medetomidine + midazolam + butorphanol	0.2 mg/kg + 6.0 mg/kg + 10 mg/kg IP	Surgical anaesthesia	40	50–60
Medetomidine + midazolam + fentanyl	0.5 mg/kg + 5 mg/kg + 50 µg/kg SC	Surgical anaesthesia	25–30	30–35
Pentobarbital	40–50 mg/kg IP	Immobilization/anaesthesia	20–40	120–180
Propofol	26 mg/kg IV	Surgical anaesthesia	5–10	10–15
Propofol + medetomidine + fentanyl	75 mg/kg + 1 mg/kg + 0.2 mg/kg IP	Surgical anaesthesia	15	30
Thiopental	30–40 mg/kg IV	Surgical anaesthesia	5–10	10–15
Tiletamine/zolazepam	80 mg/kg IP	Immobilization	N/A	60–120
Tribromoethanol	240 mg/kg IP	Surgical anaesthesia	15–45	60–120

Calculating dilutions of anaesthetic drugs for administration in mice

1. Look up the desired dose of each drug in **mg/kg**
2. Draw up a dose of each drug that is enough for **1 kg of bodyweight** (approximately 20-40 mice)
3. Mix the drawn doses together in a suitable vial or container and add enough diluent to form a **total volume of 10 ml** using 0.9% sterile saline solution or another isotonic solution such as LRS or Hartmann's solution.
4. Double check your doses, volume and concentration and confirm that the volume for administration is **0.1ml per 10g of body weight**. If in doubt, discard the solution and start again.
5. Dosing errors are a very common occurrence in anaesthesia and can be easily avoided. Please check with a senior colleague or a veterinarian if there is any uncertainty about drug calculations.

Examples of anaesthetic drug dilutions in mice:

1. Ketamine and xylazine

Drug	Drug Concentration	Dose	10 ml dilution (10 mg/ml ketamine, 1 mg/ml xylazine)
Ketamine	100 mg/ml	100 mg/kg	1.0 ml
Xylazine	20 mg/ml	10 mg/kg	0.5 ml
0.9% Sterile saline			8.5 ml
Dose = 0.1ml per 10g body weight IP			

2. Ketamine and medetomidine

Drug	Drug Concentration	Dose	10 ml dilution (7.5 mg/ml ketamine, 0.1mg/ml medetomidine)
Ketamine	100 mg/ml	75 mg/kg	0.75 ml

Medetomidine	1 mg/ml	1 mg/kg	1 ml
0.9% Sterile saline			9.2 ml
Dose = 0.1ml per 10g body weight IP			

Inhalational anaesthetic agents for mice (at sea level or near sea level conditions)²⁷

Anaesthetic	Concentration for induction (%)	Concentration for maintenance (%)	Minimum alveolar concentration (%)*
Desflurane	18	11	6.5-8.8
Enflurane	3-5	3	1.95
Ether	10-20	4-5	3.2
Halothane	4	1-2	0.95
Isoflurane	5	1.5-3	1.41
Nitrous oxide	N/A	N/A	275
Sevoflurane	8	3.5-4.0	2.5

**Minimum alveolar concentration is a measure of relative potency for inhalational anaesthetic agents*

Injectable anaesthetics for rats²⁷

Drug	Dose rate	Effect	Duration of anaesthesia (minutes)	Sleep time (minutes)
Alfaxalone	2–5 mg/kg IV	Surgical anaesthesia	5	10
Alfaxalone/dexmedetomidine	30 mg/kg + 0.05 mg/kg IP	Surgical anaesthesia	45-60	50-70
Fentanyl + medetomidine	300 µg/kg + 300 µg/kg IP	Surgical anaesthesia	60-70	240-360
Ketamine + acepromazine	75 mg/kg + 2.5 mg/kg IP	Light anaesthesia	20-30	120
Ketamine + dexmedetomidine	75 mg/kg + 0.25 mg/kg IP	Surgical anaesthesia	20-30	120-240
Ketamine + diazepam	75 mg/kg + 5 mg/kg IP	Light anaesthesia	20-30	120
Ketamine + medetomidine	75 mg/kg + 0.5 mg/kg IP	Surgical anaesthesia	20-30	120-240
Ketamine + midazolam	75 mg/kg + 5 mg/kg IP	Light anaesthesia	20-30	120
Ketamine + xylazine	75–100 mg/kg + 10 mg/kg IP	Surgical anaesthesia	20-30	120-240
Ketamine + xylazine + acepromazine	40–50 mg/kg + 2.5 mg/kg + 0.75 mg/kg IM	Surgical anaesthesia	60-70	120-160
Medetomidine + midazolam + butorphanol	0.15 mg/kg + 2.0 mg/kg + 2.5 mg/kg SC	Surgical anaesthesia	40-60	50-70
Medetomidine + Midazolam + Fentanyl	0.15 mg/kg + 2 mg/kg + 5 µg/kg SC	Surgical anaesthesia	25-30	10-15
Pentobarbital	40–50 mg/kg IP	Light anaesthesia	15-60	120-240
Propofol	10 mg/kg IV	Surgical anaesthesia	5	10
Propofol/medetomidine /fentanyl	100 mg/kg + 0.1 mg/kg + 100 µg/kg IP	Surgical anaesthesia	30	30
Thiopental	30 mg/kg IV	Surgical anaesthesia	10	15
Tiletamine/zolazepam	40 mg/kg IP	Light anaesthesia	15-25	60-120
Urethane	1000 mg/kg IP	Surgical anaesthesia	360-480	Non-recovery only

Calculating dilutions of anaesthetic drugs for administration in rats

1. Look up the desired dose of each drug in **mg/kg**
2. Draw up a dose of each drug that is enough for **5 kg of bodyweight** (approximately 10-25 rats)
3. Mix the drawn doses together in a suitable vial or container and add enough diluent to form a **total volume of 10 ml** using 0.9% sterile saline solution or another isotonic solution such as LRS or Hartmann's solution.
4. Double check your doses, volume and concentration and confirm that the volume for administration is **0.2ml per 100g of body weight**. If in doubt, discard the solution and start again.
5. Dosing errors are a very common occurrence and can be easily avoided. Please check with a senior colleague or a veterinarian if there is any uncertainty about drug calculations.

Example of anaesthetic drug dilutions in rats:

1. Ketamine and xylazine

Drug	Drug Concentration	Dose	10 ml dilution (37.5 mg/ml ketamine, 5 mg/ml xylazine)
Ketamine	100 mg/ml	75 mg/kg	3.75 ml
Xylazine	20 mg/ml	10 mg/kg	2.5 ml
0.9% Sterile saline			3.75 ml
Dose = 0.2ml per 100g body weight IP			

2. Ketamine and medetomidine

Drug	Drug Concentration	Dose	10 ml dilution (37.5 mg/ml ketamine, 0.25 mg/ml medetomidine)
Ketamine	100 mg/ml	75 mg/kg	3.75 ml
Medetomidine	1 mg/ml	0.5 mg/kg	2.5 ml
0.9% Sterile saline			3.75 ml
Dose = 0.2ml per 100g body weight IP			

Inhalational anaesthetic agents for rats (at sea level or near sea level conditions)²⁷

Anaesthetic	Concentration for induction (%)	Concentration for maintenance (%)	Minimum alveolar concentration (%)*
Desflurane	18	11	6.5-8.8
Enflurane	3-5	3	2.2
Ether	10-20	4-5	3.2
Halothane	4	1-2	0.95

Isoflurane	5	1.5-3	1.38
Nitrous oxide	N/A	N/A	250
Sevoflurane	8	3.5-4.0	2.7

**Minimum alveolar concentration (MAC) is a measure of relative potency for inhalational anaesthetic agents*

Injectable anaesthetics for rabbits²⁷

Drug	Dose rate	Effect	Duration of anaesthesia (minutes)	Sleep time (minutes)
Alfaxalone	4 mg/kg IV	Light anaesthesia	5–10	10–20
Fentanyl + medetomidine	8 µg/kg + 330 µg/kg IV	Surgical anaesthesia	30–40	60–120
Fentanyl + medetomidine + midazolam	20 µg/kg + 0.2 mg/kg + 1.0 mg/kg IM	Surgical anaesthesia	30–40	60–120
Ketamine/acepromazine	50 mg/kg + 1 mg/kg IM	Surgical anaesthesia	20–30	60–90
Ketamine/dexmedetomidine	15 mg/kg + 0.125 mg/kg IM or SC	Surgical anaesthesia	20–30	60–90
Ketamine/diazepam	25 mg/kg + 5 mg/kg IM	Surgical anaesthesia	20–30	60–90
Ketamine/medetomidine	15 mg/kg + 0.25 mg/kg SC	Surgical anaesthesia	20–30	60–90
Ketamine/xylazine	35 mg/kg + 5 mg/kg IM	Surgical anaesthesia	25–40	60–120
Ketamine/xylazine/acepromazine	35 mg/kg + 5 mg/kg + 1.0 mg/kg IM or SC	Surgical anaesthesia	45–75	100–150
Ketamine/xylazine/butorphanol	35 mg/kg + 5 mg/kg + 0.1 mg/kg IM	Surgical anaesthesia	60–90	120–180
Pentobarbital	30–45 mg/kg IV	Light to medium anaesthesia	20–30	60–120
Propofol	10 mg/kg IV	Light anaesthesia	5–10	10–15
Thiopental	30 mg/kg IV	Surgical anaesthesia	5–10	10–15
Urethane	1000–2000 mg/kg IV	Surgical anaesthesia	360–480	Non-recovery only

Inhalational anaesthetic agents for rabbits (at sea level or near sea level conditions)²⁷

Anaesthetic	Concentration for induction (%)	Concentration for maintenance (%)	Minimum alveolar concentration (%) [*]
Desflurane	18	11	8.9
Enflurane	3-5	3	2.86
Ether	10-20	4-5	N/A
Halothane	4	1-2	1.39
Isoflurane	5	1.5-3	2.05
Nitrous oxide	N/A	N/A	N/A
Sevoflurane	8	3.5-4.0	3.7

**Minimum alveolar concentration is a measure of relative potency for inhalational anaesthetic agents*

Injectable anaesthetics for guinea pigs²⁷

Drug	Dose rate	Effect	Duration of anaesthesia (minutes)	Sleep time (minutes)
Alfaxalone	40 mg/kg IP	Immobilization	N/A	90–120
Ketamine/acepromazine	100 mg/kg + 5 mg/kg IM	Immobilization/anaesthesia	45–120	90–180
Ketamine/dexmedetomidine	40 mg/kg + 0.25 mg/kg IP	Moderate anaesthesia	30–40	90–120
Ketamine/diazepam	100 mg/kg + 5 mg/kg IM	Immobilization/anaesthesia	30–45	90–120
Ketamine/medetomidine	40 mg/kg + 0.5 mg/kg IP	Moderate anaesthesia	30–40	90–120
Ketamine/xylazine	40 mg/kg + 5 mg/kg IP	Surgical anaesthesia	30	90–120
Medetomidine + midazolam + butorphanol	0.2 mg/kg + 1.0 mg/kg + 2 mg/kg IM	Surgical anaesthesia	40	50–60
Medetomidine + midazolam + fentanyl	0.2 mg/kg + 1 mg/kg + 25 µg/kg SC	Surgical anaesthesia	40	45–50
Pentobarbital	37 mg/kg IP	Surgical anaesthesia	60–90	240–300
Tiletamine/zolazepam	40–60 mg/kg IM	Immobilization	N/A	70–160
Urethane	1500 mg/kg IV or IP	Surgical anaesthesia	300–480	Non-recovery only

Inhalational anaesthetic agents for guinea pigs (at sea level or near sea level conditions)²⁷

Anaesthetic	Concentration for induction (%)	Concentration for maintenance (%)	Minimum alveolar concentration (%) [*]
Desflurane	18	11	6.8 ³¹
Enflurane	3-5	3	2.17 ³²
Ether	10-20	4-5	N/A
Halothane	4	1-2	1.0-1.01 ^{32,33}
Isoflurane	5	1.5-3	1.15-1.3 ^{31,32,33}
Nitrous oxide	N/A	N/A	N/A
Sevoflurane	8	3.5-4.0	2 ³³

**Minimum alveolar concentration is a measure of relative potency for inhalational anaesthetic agents*

Injectable anaesthetics for sheep²⁷

Drug	Dose rate	Effect	Duration of anaesthesia (minutes)	Sleep time (minutes)
Alfaxalone	2–3 mg/kg IV	Surgical anaesthesia	5–10	10–20
Ketamine/diazepam	4 mg/kg + 0.5–1 mg/kg IV	Surgical anaesthesia	20–30	45–90
Ketamine/dexmedetomidine	1 mg/kg + 12.5 µg/kg IV	Surgical anaesthesia	30–60	60–90
Ketamine/medetomidine	1 mg/kg + 25 µg/kg IV	Surgical anaesthesia	30–60	60–90
Ketamine/xylazine	4 mg/kg + 0.2 mg/kg IV	Surgical anaesthesia	15–20	30–90
Methohexital	4 mg/kg IV	Surgical anaesthesia	4–5	5–10
Pentobarbital	30 mg/kg IV	Immobilization, anaesthesia	15–30	30–60
Propofol	4–5 mg/kg IV	Light anaesthesia	5–10	10–15
Thiopental	10–15 mg/kg IV	Surgical anaesthesia	5–10	10–20
Urethane	1000 mg/kg IV	Surgical anaesthesia	360–480	Non-recovery only

Inhalational anaesthetic agents for sheep (at sea level or near sea level conditions)²⁷

Anaesthetic	Concentration for induction (%)	Concentration for maintenance (%)	Minimum alveolar concentration (%)*
Desflurane	18	11	9.5 ³⁴
Enflurane	3-5	3	2.2 ³⁴
Ether	10-20	4-5	N/A
Halothane	4	1-2	0.97 ³⁵
Isoflurane	5	1.5-3	1.58 ³⁵
Nitrous oxide	N/A	N/A	204 ³⁴
Sevoflurane	8	3.5-4.0	2.74-3.3 ^{36,37}

**Minimum alveolar concentration is a measure of relative potency for inhalational anaesthetic agents*

Injectable anaesthetics for pigs²⁷

Drug	Dose rate	Effect	Duration of anaesthesia (minutes)	Sleep time (minutes)
Alfaxalone	5 mg/kg IM then 1–2 mg/kg IV	Surgical anaesthesia	5–10	15–20
Ketamine	10–15 mg/kg IM	Sedation, immobilization	20–30	60–120
Ketamine/acepromazine	22 mg/kg + 1.1 mg/kg IM	Light anaesthesia	20–30	60–120
Ketamine/diazepam	10–15 mg/kg + 0.5–2 mg/kg IM	Immobilization/light anaesthesia	20–30	60–90
Ketamine/medetomidine	10 mg/kg + 0.08 mg/kg IM	Immobilization/light anaesthesia	40–90	120–240
Ketamine/midazolam	10–15 mg/kg + 0.5–2 mg/kg IM	Immobilization/light anaesthesia	20–30	60–90
Methohexital	5 mg/kg IV	Surgical anaesthesia	4–5	5–10
Pentobarbital	20–30 mg/kg IV	Light to surgical anaesthesia	15–60	60–120
Propofol	2.5–3.5 mg/kg IV (6–8 mg/kg if no premed given)	Surgical anaesthesia	5–10	10–20
Thiopental	6–9 mg/kg IV	Surgical anaesthesia	5–10	10–20
Tiletamine/zolazepam	2–4 mg/kg IM	Immobilization	20–30	60–120
Tiletamine/zolazepam + xylazine	2–7 mg/kg + 0.2–1 mg/kg IM	Light to medium anaesthesia	30–40	60–120

Inhalational anaesthetic agents for pigs (at sea level or near sea level conditions)²⁷

Anaesthetic	Concentration for induction (%)	Concentration for maintenance (%)	Minimum alveolar concentration (%)*
Desflurane	18	11	8.3
Enflurane	3–5	3	N/A
Ether	10–20	4–5	N/A
Halothane	4	1–2	1.25
Isoflurane	5	1.5–3	1.45
Nitrous oxide	N/A	N/A	277
Sevoflurane	8	3.5–4.0	3.5

**Minimum alveolar concentration is a measure of relative potency for inhalational anaesthetic agents*

References:

1. Quesenberry K, Carpenter JW. *Ferrets, Rabbits and Rodents: Clinical Medicine and Surgery*, Fourth Edition, Elsevier Health Sciences; 2021.
2. Meredith A, BSAVA Small Animal formulary - Part B: Exotic Pets, 10th Edition, British Small Animal Veterinary Association; 2020.
3. Elsheikh H, Taha A, Khalafalla A, Osman I, Wasfi I. Pharmacokinetics of amoxicillin trihydrate in Desert sheep and Nubian goats. *Veterinary research communications* 1999; 23(8): 507-14.
4. Fernandez C, Modamio P, Mestorino N, Errecalde J, Marino E. Pharmacokinetics of sodium and trihydrate amoxicillin in sheep after intravenous and intramuscular administration. *Journal of veterinary pharmacology and therapeutics* 2007; 30(3): 263-6.
5. Carceles C, Escudero E, Vicente M, Serrano J, Carli S. Pharmacokinetics of amoxicillin/clavulanic acid combination after intravenous and oral administration in goats. *Veterinary Quarterly* 1995; 17(4): 134-8.
6. Escudero E, Carceles C, Vicente S. Pharmacokinetics of amoxicillin/clavulanic acid combination and of both drugs alone after intravenous administration to goats. *British Veterinary Journal* 1996; 152(5): 551-9.
7. Elsheikh H, Osman I, Ali B. Comparative pharmacokinetics of ampicillin trihydrate, gentamicin sulphate and oxytetracycline hydrochloride in Nubian goats and desert sheep. *Journal of veterinary pharmacology and therapeutics* 1997; 20(4): 262-6.
8. Harcourt-Brown F, Chitty J. *BSAVA manual of rabbit surgery, dentistry and imaging*. BSAVA manual of rabbit surgery, dentistry and imaging 2013.
9. Carceles C, Font A, Escudero E, Espuny A, Marín P, Fernandez-Varon E. Pharmacokinetics of azithromycin after iv and im administration to sheep. *Journal of veterinary pharmacology and therapeutics* 2005; 28(5): 475-9.
10. Elsheikh H, Taha A, Khalafallah A, Osman I. Disposition kinetics of enrofloxacin (Baytril 5%) in sheep and goats following intravenous and intramuscular injection using a microbiological assay. *Research in veterinary science* 2002; 73(2): 125-9.
11. Rahal A, Kumar A, Ahmad A, Malik J, Ahuja V. Pharmacokinetics of enrofloxacin in sheep following intravenous and subcutaneous administration. *Journal of veterinary pharmacology and therapeutics* 2006; 29(4): 321-4.
12. Piriz S, Pobel T, Jiménez R, et al. Comparison of erythromycin and oxytetracycline for the treatment of ovine footrot. *Acta veterinaria Hungarica* 2001; 49(2): 131-9.
13. Rendell D, Callinan A. Comparison of erythromycin and oxytetracycline for the treatment of virulent footrot in grazing sheep. *Australian veterinary journal* 1997; 75(5).
14. Pugh DG, Baird NN. *Sheep & Goat Medicine*. 2nd ed: Elsevier Health Sciences; 2012.
15. Oukessou M, Benlamlih S, Toutain P. Benzylpenicillin kinetics in the ewe: influence of pregnancy and lactation. *Research in Veterinary Science* 1990; 49(2): 190-3.
16. McCarthy F, Lindsey J, Gore M, Notter D. Incidence and control of subclinical mastitis in intensively managed ewes. *Journal of Animal Science* 1988; 66(11): 2715-21.
17. Kümper H. Therapy of central nervous system listeriosis in sheep. *Tierärztliche Praxis* 1991; 19(4): 369-72.
18. Batzias G, Delis G, Koutsoviti-Papadopoulou M. Bioavailability and Pharmacokinetics of Sulphadiazine, N 4-acetylsulphadiazine and Trimethoprim following Intravenous and Intramuscular Administration of a Sulphadiazine/Trimethoprim Combination in Sheep. *Veterinary research communications* 2005; 29(8): 699.
19. Power S, Malone A. An outbreak of ringworm in sheep in Ireland caused by *Trichophyton verrucosum*. *The Veterinary record* 1987; 121(10): 218-20.

20. Moreno L, Echevarria F, Muñoz F, Alvarez L, Bruni SS, Lanusse C. Dose-dependent activity of albendazole against benzimidazole-resistant nematodes in sheep: relationship between pharmacokinetics and efficacy. *Experimental parasitology* 2004; 106(3-4): 150-7.
21. Morris D, Richards K, Clarkson M, Taylor D. Comparison of albendazole® and praziquantel® therapy of *Echinococcus granulosus* in naturally infected sheep. *Veterinary parasitology* 1990; 36(1-2): 83-90.
22. Suter C, Müller-Doblies U, Deplazes P, Hatt J. Prevention and treatment of *Encephalitozoon cuniculi* infection in rabbits with fenbendazole. *Veterinary Record* 2001; 148(15): 478-80.
23. Keeble E. Encephalitozoonosis in rabbits—what we do and don't know. *In Practice* 2011; 33(9): 426-35.
24. Harcourt-Brown F, Harcourt-Brown NH. *Textbook of rabbit medicine*: Butterworth-Heinemann; 2002.
25. Ewringmann A, Glöckner B. *Leitsymptome bei Meerschweinchen, Chinchilla und Degu: Diagnostischer Leitfaden und Therapie*: Georg Thieme Verlag; 2012.
26. ESCCAP. *Control of Parasites and Fungal Infections in Small Pet Mammals (First edition)*. Malvern, Worcestershire; 2017.
27. Flecknell, PA. *Laboratory Animal Anaesthesia*: 2nd Edition, Academic Press, London; 1996
28. Swindle, MM, Smith, AC. *Swine in the laboratory*: 3rd Edition, CRC press, New York; 2016.
29. McKellar, QA. Clinical relevance of the pharmacological properties of fluoroquinolones. *The Compendium on continuing education for the practicing veterinarian*; 1996.
30. Schultz, CS *Formulary*. Veterinary Hospital Pharmacy, Washington State University, Washington State University Press, Pulman; 1989.
31. Boban M, Stowe DF, Buljubasic N, Kampine JP, Bosnjak ZJ. Direct comparative effects of isoflurane and desflurane in isolated guinea pig hearts. *Anesthesiology*. 1992 May 1;76(5):775-80.
32. 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 Nov 1;39(6):579-81.
33. Kowalski C, Zahler S, Becker BF, Flaucher A, Conzen PF, Gerlach E, Peter K. Halothane, isoflurane, and sevoflurane reduce postischemic adhesion of neutrophils in the coronary system. *The Journal of the American Society of Anesthesiologists*. 1997 Jan 1;86(1):188-95.
34. Natalini CC. Sevoflurane, Desflurane, and Xenon new inhaled anesthetics in veterinary medicine. *Ciência Rural*. 2001;31:177-83.
35. Palahniuk RJ, Shnider SM. Maternal and fetal cardiovascular and acid–base changes during halothane and isoflurane anesthesia in the pregnant ewe. *The Journal of the American Society of Anesthesiologists*. 1974 Nov 1;41(5):462-71.
36. Columbano N, Scanu A, Duffee L, Melosu V, Sotgiu G, Driessen B. Determination of the minimum alveolar concentration (MAC) and cardiopulmonary effects of sevoflurane in sheep. *Veterinary anaesthesia and analgesia*. 2018 Jul 1;45(4):487-95.
37. Lukasik VM, Nogami WM, Morgan SE. Minimum alveolar concentration and cardiovascular effects of sevoflurane in sheep. *Veterinary Surgery*. 1998;27(2):168.