

ZOO AND WILD MAMMAL FORMULARY

ALICIA HAHN



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Contents

Preface *vii*

Acknowledgments *ix*

List of Reviewers *xi*

List of Abbreviations *xiii*

- 1 Platypus and Echidnas *1*
- 2 Marsupials *5*
- 3 Xenarthra: Anteaters, Armadillos, and Sloths *31*
- 4 Pangolins *47*
- 5 Aardvarks *53*
- 6 Bats *59*
- 7 Rodents *69*
- 8 Primates *81*
- 9 Nondomestic Canids *119*
- 10 Bears *131*
- 11 Small Omnivores and Carnivores: Red Pandas, Fossa, Skunks, Meerkats, Mustelids, Procyonids, and Viverrids *145*
- 12 Hyenas *165*
- 13 Nondomestic Felids *169*
- 14 Whales and Dolphins *195*
- 15 Seals, Sea Lions, and Walruses *211*

16	Manatees and Dugongs	237
17	Elephants	243
18	Hyraxes	259
19	Nondomestic Equids	263
20	Tapirs	273
21	Rhinoceroses	279
22	Nondomestic Pigs	293
23	Hippopotamuses	305
24	Camelids: Alpacas, Camels, Guanacos, and Llamas	311
25	Giraffes and Okapis	331
26	Deer	349
27	Nondomestic Cattle and Antelope	365
28	Nondomestic Goats and Sheep	405
	Index	417

Preface

This book was born out of a clinical need voiced by myself and my many colleagues in Zoo, Exotic, and Wildlife medicine. For a number of years, I have been needing a resource similar to the *Exotic Animal Formulary* by Dr Carpenter, but for Zoo and Wild mammals. I hoped “someone” would write such a book, but eventually out of frustration elected to pursue it myself. In all honesty this was a naïve undertaking, as I had no idea how many hundreds of hours would be required to compile all this data. However, it has all been worth it, since it has already come in handy for treating many of my own institution’s cases.

I find as a busy zoo clinician that I often don’t have the time or access to find drug doses used in every species or track down the original paper citing such a dose. As such, like many of you, I have to extrapolate from domestic animals.

To answer this need, I compiled data from textbooks, peer-reviewed literature, relevant proceedings and personal communications. Wherever able I indicated how many animals and in what capacity the drug was used. I wanted to provide you as a clinician with as much confidence as possible when treating your cases. This is with the acknowledgement, however, that the literature available for some species is limited to $n = 1$ case reports. In addition, I prevailed upon the generosity of my esteemed colleagues for editing data and contributing doses that have been successful for them. Average weights for relevant species are also listed at the end of each chapter.

I included images of White-bellied tree pangolins on the cover of this formulary. This was an effort to highlight that pangolins are the most trafficked species in the world. Over one million have been killed in recent years for their scales and meat, and they are thus critically endangered. I am thankful to be a part of the US Pangolin Consortium and for the opportunity to work with this amazing species. I hope that increased awareness of their plight and the hard work of many people with in-situ research and rehabilitation, combined with research and support in captive collections, will help this imperiled animal.

I hope to continue with further editions of this formulary and welcome any constructive criticism for improvement or ideas for including additional data in the future.

In the end, I hope this formulary will be helpful for you and your patients!

Acknowledgments

This book would not have been possible without the support of my husband, family, friends and colleagues. Jennifer Hicks, you are a creative genius, and I so appreciate all of your help and ideas! I want to thank Paul Selvaggio for the use of his amazing pangolin photographs. Also, thank you very much to my co-editors and contributors. I really appreciate you devoting your precious time to these chapters! And finally, thank you to Wiley-Blackwell and my publishing team for your support and having faith in me and my idea.

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List of Abbreviations

BID	twice daily or every 12 hours
EOD	every other day or every 48 hours
d	days, i.e. 8d is 8 days
IC	intracoelomic
IM	intramuscular
IV	intravenous
PO	per os or by mouth
q	every, i.e. q8d is every 8 days
QID	four times daily or every six hours
SID	once daily
TID	three times daily, or every eight hours
TO	topical administration

1

Platypus and Echidnas

Drug name	Drug dose	Species	Comments
Antimicrobials and Antifungals			
Amoxicillin/ clavulanic acid	20 mg/kg IM SID or PO BID [1]	Echidnas	
Amphotericin B	12.5 mg/kg IM SID [2]	Platypus	For ulcerative mycosis of <i>Mucor amphibiorum</i> .
	0.5 mg/kg injected intralesionally twice weekly [3]	Platypus	
Ceftazidime	65 mg/kg IM SID [1]	Echidnas	
Doxycycline	5 mg/kg PO SID [1]	Echidnas	
Enrofloxacin	5 mg/kg SC or PO SID [1]	Echidnas	
	5 mg/kg IM SID [1]	Platypus	
Itraconazole	5 mg/kg PO SID [1]	Echidnas	
Metronidazole	20 mg/kg IV SC PO SID [1]	Echidnas	
Nystatin	10000 IU/kg BID [1]	Echidnas	
	Ointment applied topically [1]	Echidnas	
Oxytetracycline	20 mg/kg IM SID [1]	Echidnas	
Penicillin with benzathine	10 mg/kg IM SC SID [1]	Echidnas	
Procaine penicillin	15 mg/kg IM, SC SID [1]	Echidnas	
Trimethoprim sulfadiazine	5 mg/kg IM SID [1, 2]	Echidnas and Platypus	
Analgesic			
Buprenorphine	1 mg/kg IV IM SID [1]	Echidnas	Analgesia
Butorphanol	0.1 mg/kg IV IM BID [1]	Echidnas	
Flunixin meglumine	0.5 mg/kg IM SC IV SID [1]	Echidnas	
Ketoprofen	1 mg/kg IV IM SC SID [1]	Echidnas	
Meloxicam	0.2 mg/kg SC or PO SID [1]	Echidnas	
	0.5 IV mg/kg SC SID [1]	Echidnas	

(Continued)

Drug name	Drug dose	Species	Comments
Anesthetic			
Atipamezole HCl	0.5 mg/kg IM [1]	Echidnas	
Diazepam	1–5 mg/kg IM [1]	Echidnas	Sedation
	0.5–1.0 mg/kg IM [2]	Platypus	Sedation for minor procedures.
Ether	Mask induction [4]	Platypus	n = 2 wild caught animals briefly anesthetized for transponder placement and blood draw to analyze blood sample appeared to induce leukocytosis.
Isoflurane	Mask induction [2]	Platypus	Rarely have injectables been used, rather induction with a face mask via isoflurane is usually employed.
Ketamine + medetomidine	K: 5 mg/kg + M: 0.5 mg/kg IM, antagonize with 2.5 mg/kg atipamezole [1, 3, 5]	Echidnas	
	K: 5 mg/kg + M: 0.3 mg/kg IM [1]	Echidnas	
Ketamine + xylazine	K: 5–10 mg/kg + X: 1–2 mg/kg IM, antagonize with 0.1 mg/kg yohimbine IV [1, 3, 5]	Echidnas	
Pentobarbitol	200 mg/kg IV [6]	Echidnas	Euthanasia.
Telazol	3–10 mg/kg IM [1]	Echidnas	
Antiparasitic			
Fipronil	10 mg/kg Topical, once [1]	Echidnas	
Ivermectin	0.2 mg/kg SC [1, 2]	Echidnas and Platypus	To treat acariasis.
Moxidectin	0.2 mg/kg IM SC q7d[1]	Echidnas	
Praziquantel	5 mg/kg IM PO once [1]	Echidnas	
Selamectin	Topical application [3]	Echidnas	To treat acariasis.
Toltrazuril	20 mg/kg PO SID × 2d [1, 3]	Echidnas	To treat coccidiosis.
Other			
Bromhexine HCl	1 mg/kg PO TID [1]	Echidnas	To use as a mucolytic.
Dexamethasone	0.2 mg/kg IM SC SID [1]	Echidnas	
Formic acid	2% in food at 2% [1]	Echidnas	
Phytomenadione	0.1 mg/kg PO [1]	Echidnas	

Species	Weights
Echidna (<i>Tachyglossus aculeatus</i>)	2.5–6 kg
Duck-billed platypus (<i>Ornithorhynchus anatinus</i>)	0.2–2 kg

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2

Marsupials

Drug name	Drug dose	Species	Comments
Antimicrobials and Antifungals			
Macropods			In macropods dysbiosis has been reported after oral administration of antibiotics, particularly penicillins [1].
Amoxicillin (long-acting)	20 mg/kg IM q48 hrs [2]	Macropods	Intractable animals with severe dental disease.
Amoxicillin trihydrate	10 mg/kg IM [3]	Tammar wallabies	n = 5 pharmacokinetic evaluation showed minimum inhibitory concentration breakpoint (0.25 µg/ml) for <i>Staph</i> and <i>Strep</i> species for 8 hr and only exceeded 2 µg/ml for 2 hr, but the MIC breakpoint for <i>Enterobacteria</i> and <i>Enterococci</i> was not reached.
Azithromycin	15 mg/kg PO SID × 10d [4]	Eastern gray kangaroos	Oral necrobacillosis treatment.
Atovaquone	100 mg/kg PO SID [2]	Macropods	For treatment of toxoplasmosis, combine with canola oil to enhance absorption.
Ceftiofur	2 mg/kg IM SID 7–10d [2]	Macropods	For the empiric treatment/suspicion of salmonellosis if susceptibility results are not available.
Ceftiofur sodium	1–2 mg/kg IM or IV SID [2]	Macropods	To treat bacterial pneumonia of susceptible infections.
Ceftiofur crystalline free acid (Excede)	4.3 mg/kg IV intraoperatively, IV BID postoperatively [5]	Bennett's wallabies	n = 1. 4 yr old male wallaby who suffered traumatic cervical spinal fracture and received intraoperative antibiotics.

(Continued)

Drug name	Drug dose	Species	Comments
Clindamycin	11 mg/kg PO BID [2]	Macropods	Necrobacillosis, toxoplasmosis, and for severe periodontal disease, alone or in combination with metronidazole 20 mg/kg PO BID or oxytetracycline 40 mg/kg IM q48 hr, continued until complete resolution of lesions. Up to 30 days treatment for toxoplasmosis. May result in a dysbiosis (author's experience in one animal).
	17–21 mg/kg IV BID for 40–55d [6]	Red-necked wallabies	n = 1 captive-born Red-necked wallaby, treated with clindamycin and benzathine penicillin G long term for mandibular osteomyelitis.
Enilconazole	Weekly topical baths [2]	Macropods, tractable or readily anesthetized	For the treatment of dermatophytosis.
Enrofloxacin	5 mg/kg SC or PO SID [2]	Macropods	For susceptible infections.
Fluconazole	10–20 mg/kg PO BID [2]	Macropods	For the treatment of cryptococcosis until serum testing is negative.
Gentamicin + amoxicillin	G: 4–7 mg/kg IM BID + A: 10 mg/kg IM TID [2]	Macropods	For severe cases of pneumonia in pouch young.
Griseofulvin	5–10 mg/kg PO BID administered until 2 wks after the cessation of clinical signs [2]	Macropods	For the treatment of dermatophytosis. At the higher end of dosing, diarrhea, and neurological signs have been seen after only 1 wk of treatment.
Itraconazole	5 mg/kg PO SID administered until 2 wks after resolution of signs [2]	Macropods	For the treatment of dermatophytosis and candidiasis in pouch young. Pulse therapy of 5 mg/kg PO SID for 1 wk then off for 2 wks for a total of 12 weeks has also been successful.
	20–40 mg/kg PO SID [2]	Macropods	For the treatment of cryptococcosis until serum testing is negative.
Metronidazole	20 mg/kg PO BID [2]	Wallaroos, Macropods	For the treatment/suspicion of gastric amoebiasis. Also for anaerobic infections. Often unpalatable.
Miconazole	Topical SID to BID [2]	Macropods	For the treatment of dermatophytosis.
Nystatin cream	Topical [2]	Macropods	For the treatment of candidiasis.

Drug name	Drug dose	Species	Comments
Nystatin	5000–5010 000 IU/kg PO TID for 3–5d [2]	Hand reared Macropods	For the treatment of candidiasis in milk for oral cavity, esophageal and gastric lesions. Higher doses may result in diarrhea. itraconazole 5 mg/kg PO SID × 5d has also been used.
Oxytetracycline	40 mg/kg IM, IV q48 h [2, 7, 8]	Macropods	For susceptible infections. Pharmacokinetic parameters in Tammar wallabies comparable to those reported for eutherians of equivalent size; allometric scaling for marsupials may not be valid. In Red-necked wallabies (n = 3), elimination half-life is 11.4h.
Oxytetracycline (long-acting, LA 200)	20 mg/kg IM, IV q72 hrs for 7–21d [2, 8]	Macropods	For the treatment of dermatophilosis. Topical povidone iodine solution is an alternative. Also helpful with intractable animals with severe periodontal disease. Pharmacokinetic parameters of oxytetracycline in Tammar wallabies comparable to those reported for eutherians of equivalent size; allometric scaling for marsupials may not be valid; questionable therapeutic efficacy based on plasma concentrations.
Procaine penicillin/ Benzathine penicillin G	25–30 mg/kg IM q48 hrs [2, 8]	Macropods	For bacterial infections. Also for the treatment of tetanus in addition to boosting tetanus toxoid.
Procaine penicillin/ Benzathine penicillin	80 000 U/kg SC BID × 150d [6]	Red-necked wallabies	n = 1 captive born Red-necked wallaby, Treated with clindamycin and benzathine penicillin G long term for mandibular osteomyelitis.
Penicillin G procaine	20 000 U/kg SC SID [9]	Red kangaroos	n = 1 case of an 8 yr old male red kangaroo with 2 wk history of vomiting, mesenteric volvulus diagnosis.
Sodium penicillin G	30 mg/kg IV [8]	Tammar wallabies	Pharmacokinetic parameters in Tammar wallabies comparable to those reported for eutherians of equivalent size; allometric scaling for marsupials may not be valid.
Terbinafine	Topical SID to BID [2]	Macropods	For the treatment of dermatophytosis.

(Continued)

Drug name	Drug dose	Species	Comments
Tulathromycin	2.5 mg/kg SC, IM q7d [2]	Macropods	Registered for respiratory infections in pigs and cattle. Has been used in macropods without adverse effects.
<i>Koalas and Wombats</i>			Parenteral oxytetracycline and oral erythromycin have resulted in wasting and death within 2–6 weeks in Koalas. Nystatin may induce diarrhea at higher doses [1].
Amoxicillin	10 mg/kg PO, SC, IM BID [2]	Koalas	For susceptible infections.
Amoxicillin/ clavulanic acid (Clavamox)	12.5 mg/kg PO, SC, IM BID [2]	Koalas	Some clinicians avoid PO route.
Amphotericin B + an oral triazole	A: 0.5 mg/kg in 300 ml 2.5% dextrose and 0.45% NaCl, given SC twice weekly + itraconazole 100 mg/ day PO or fluconazole 50–100 mg PO BID [2]	Koalas	Treatment of cryptococcal lesions (nasal, lower respiratory, and central nervous system disease).
Ampicillin	5–10 mg/kg IV TID- QID [2]	Koalas	For the treatment of septicemia in combination with gentamicin.
Ceftazidime	15 mg/kg SC IM BID [2]	Koalas	Bacterial infections, particularly useful for <i>Pseudomonas aeruginosa</i> .
Chloramine 0.3–0.6%	Daily topical application [2]	Koalas	For treatment of dermatophytosis.
Chloramphenicol	30 mg/kg SC BID × 10–14d beyond resolution of clinical signs [2]	Koalas	For treatment of chlamydiosis.
	60 mg/kg SC SID [2, 10, 11]	Koalas	For anti-chlamydial therapy, for 45 days. In study with 9 koalas, controlled mild chlamydial infection and prevented shedding, but severe urogenital disease did not respond to this chloramphenicol regimen [11]. In study of 19 koalas, pharmacokinetics data do not support current dosing regimen for chlamydiosis [10].
Chloramphenicol 10 mg/g with Hydrocortisone acetate 5 mg/g	topical ocular instillation [2]	Koalas	For chlamydial keratoconjunctivitis.

Drug name	Drug dose	Species	Comments
Ciprofloxacin	10 mg/kg PO BID [2]	Koalas	For anti-chlamydial therapy.
Enrofloxacin	6 mg/kg IV SID-BID [2]	Koalas	For susceptible infections. Increased frequency of dosing for serious infections. Can be given in combination with metronidazole and cephalosporin for broad antibacterial coverage.
	5–10 mg/kg PO or SC SID [2, 12]	Koalas	For anti-chlamydial therapy. A pharmacokinetics study (n = 43) indicates that Enrofloxacin doses of 10 mg/kg SC, 5 mg/kg SC, or 20 mg/kg PO and marbofloxacin doses 1–3.3 mg/kg PO, 10 mg/kg PO, or 5 mg/kg SC are unlikely to inhibit growth of chlamydial pathogens <i>in vivo</i> .
Fluconazole	6 mg/kg loading dose then 3 mg/kg PO SID × 14d [2]	Koalas	n = 1 with diarrhea due to <i>Candida</i> infection, treated for 14 days and resolved.
Fluconazole	50–100 mg per koala PO BID [2]	Koalas	Nasopharyngeal cryptococcosis.
Gentamicin sulfate + ampicillin	2–4 mg/kg IV + A: 5–10 mg/kg IV [2]	Koalas	After this initial dose gentamicin at 2–4 mg/kg IM or SC q8 hr, and ampicillin at 5–10 mg/kg IV q6 hr. Stagger IV administration of the two drugs.
Gentamicin sulfate	2 mg/kg to 2–3 ml saline nebulization [2]	Koalas	Respiratory tract infection treatment.
Griseofulvin	100 mg PO SID for 4 months [2]	Koalas	n = 1 animal with a fungal paronychia infection that resolved.
Hexamine (methenamine) hippurate	250 mg/koala PO SID [2]	Adult Queensland koalas	For the treatment of cystitis.
Itraconazole (10 mg/ml oral solution)	Pulse therapy of 5 mg/kg PO SID for 1 wk, stop for 2 weeks then repeat for 12 weeks [2]	Koalas	For treatment of dermatophytosis.
	100 mg/koala PO SID [2]	Koalas	Cryptococcosis.
Ketoconazole	10 mg/kg PO × 7d [2]	Koalas	Antifungal.
Metronidazole	20–25 mg/kg IV slowly BID [2]	Koalas	Anaerobic infections.
Nystatin	5000–10 000 IU/kg PO TID [2]	Koalas	Oral candidiasis.

(Continued)

Drug name	Drug dose	Species	Comments
	10 000–20 000 IU/kg PO TID × 7 d [2]	Koalas	To treat mycotic diarrhea.
Ofloxacin (3 mg/ml)	Topical ocular instillation [2]	Koalas	Chlamydial conjunctivitis.
Oxytetracycline HCl 18.5 mg/ml + oleandomycin phosphate 10 mg/ml + neomycin sulfate 10 mg/ml	Topical ocular instillation [2]	Koalas	Chlamydial conjunctivitis.
Oxytetracycline 5 mg/g + polymixin B 10 000 U/g	Topical ocular instillation [2]	Koalas	Chlamydial conjunctivitis.
Procaine penicillin/ Benzathine penicillin G	26.5 mg/kg SC IM q72 hrs [2]	Koalas	Bacterial infections.
Terbinafine cream	Topically on lesion SID [2]	Koalas	Dermatophytosis.
Ticarcillin sodium	45–50 mg/kg IV q4–6 hr [2]	Koalas	Serious infection.
Trimethoprim sulfadiazine	30 mg/kg PO BID [2]	Koalas	
Trimethoprim sulfamethoxazole	15 mg/kg PO BID [2]	Koalas	
<i>Dasyurids and Numbats</i>			
Amikacin	3 mg/kg BID [2]	Dasyurids	For treatment of granulomatous dermatitis.
	7.5 mg/kg IM BID × 6d, then 7.5 mg/kg IM BID × 10d, 6 wks later [2]	Numbats	Bacterial dermatitis.
Amoxicillin/ clavulanic acid (Clavamox)	12.5 mg/kg PO BID added to food, 8.75 mg/ kg SC SID for 3–5d [2]	Numbats	Salmonella enteritis treatment.
Azithromycin	20 mg/kg SID [2]	Dasyurids	Mycobacteriosis; treatment is difficult, prolonged, and usually unsuccessful.
Enrofloxacin	2.5 mg/kg BID [2]	Dasyurids	For treatment of granulomatous dermatitis.
Ethambutol	20 mg/kg SID [2]	Dasyurids	Mycobacteriosis; treatment is difficult, prolonged, and usually unsuccessful.
Myambutol	20 mg/kg SID [2]	Dasyurids	Mycobacteriosis; treatment is difficult, prolonged, and usually unsuccessful.
Rifabutin	20 mg/kg SID [2]	Dasyurids	For treatment of granulomatous dermatitis.

Drug name	Drug dose	Species	Comments
Trimethoprim sulfamethoxazole	10 mg/kg of trimethoprim PO BID × 14d [2]	Numbats	Salmonella enteritis treatment.
<i>Possums, Gliders, and American opossums</i>			Subadult Ringtail possums (<i>Pseudocheirus peregrinus</i>) appear to be particularly sensitive to antibiotics, with dysbiosis, wasting and death seen [1, 2].
Amoxicillin/ clavulanic acid	20 mg/kg SC, IM SID to BID up to 4 weeks [2]	Possums, Common brush-tails	Exudative dermatitis.
	12.5–20 mg/kg SC BID for 3–5d [2]	Common ringtails and Common brush-tails	
Clindamycin	11 mg/kg BID for 2–3 wks [2]	Possums	Treating dental disease.
	10–15 mg/kg PO BID up to 4 weeks [2]	Possums	Toxoplasmosis.
	10 mg/kg PO BID for 7–10d [2]	Yellow-bellied gliders	
Doxycycline	5 mg/kg initially then 2.5 mg/kg PO SID for 3–5d [2]	Common ringtails	
Enrofloxacin	5 mg/kg SC SID × 5d [2]	Common ringtails	
Nystatin	5000–10 000 U/kg TID × 5d [2]		To prevent secondary fungal or yeast overgrowth during antibiotic therapy.
	10 000 U/kg PO TID × 7d [2]		To treat oral candidiasis.
Procaine penicillin with benzathine penicillin	Procaine 150 mg/ml and benzathene 112.5 mg/ml used a 1 ml/10 kg q48 hr repeated 2–3 times [2]	Common brush-tails	
<i>Bandicoots and Bilbies</i>			
Amoxicillin	20 mg/kg IM or SC SID or PO BID [2]		Rarely used since amoxicillin/ clavulanic acid is available.
Amoxicillin/ clavulanic acid (Clavamox)	12.5 mg/kg SC SID or PO BID [2]		Commonly used as first choice for minor wounds.
Ceftazidime	15 mg/kg IM BID [2]	Bandicoots	Used for complicated toe infections.
Cephalexin	20–30 mg/kg PO BID [2]		
Clindamycin	11 mg/kg PO BID [2]		Periodontal disease and toe infections.

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Drug name	Drug dose	Species	Comments
Doxycycline	5 mg/kg PO loading dose, 2.5 mg/kg PO BID × 2 doses, then SID [2]		Likely to be useful.
Enrofloxacin	5 mg/kg PO or IM BID [2]		
Metronidazole	50 mg/kg PO SID [2]		
Trimethoprim/ sulfamethoxazole	15 mg/kg PO BID [2]		
Analgesia			
<i>Macropods</i>			
Buprenorphine	0.01–0.05 mg/kg SC or IM TID [2]	Macropods	
Butorphanol	0.4 mg/kg SC or IM [2]	Macropods	
Carprofen	2–4 mg/kg SC SID [2]	Macropods	
Flunixin meglumine	0.5–1 mg/kg IM or IV SID × 3d [2, 9]	Macropods	
Ketoprofen	2 mg/kg SC SID [2]	Macropods	
Meloxicam	0.2 mg/kg SC or PO SID [2]	Macropods	
Tolfenamic acid	4 mg/kg SC q48 hrs [2]	Macropods	Good for intractable animals due to dosing interval.
<i>Koalas and Wombats</i>			
Buprenorphine hydrochloride	0.01 mg/kg SC or IM BID [2, 13]	Koalas	n = 5 institutions responding to a survey about analgesics used in koalas in Australia (dosage range 0.01–0.05 mg/kg with 0.01 mg/kg the most common dosage).
Acetaminophen (paracetamol) ± codeine	15 mg/kg PO SID to BID [2, 13]	Koalas	n = 4 institutions responding to a survey about analgesics used in koalas in Australia (dosage range reported 10–15 mg/kg acetaminophen) to provide interim analgesia in washout period between different NSAIDs or when switching between corticosteroid and NSAID.
Butorphanol tartrate	0.2 mg/kg IM, SC, IV [2, 13]	Koalas	n = 3 institutions responding to a survey about analgesics used in koalas in Australia. Dosage range reported as 0.1–0.4 mg/kg.
Carprofen	4 mg/kg PO SID to BID for 24 hr then 2 mg/kg PO SID after [2, 13]	Koalas	Some advise maximum 4d duration to reduce risk of gastrointestinal tract ulceration. Do not give with corticosteroids.

Drug name	Drug dose	Species	Comments
Fentanyl	5ug/kg IV bolus then 3ug/kg/hr IV infusion [2, 13]	Koalas	Intraoperative and postoperative pain management. n = 1 institution responding to a survey about analgesics used in koalas in Australia.
Flunixin meglumine	1 mg/kg SC IM IV SID for 1–3d [2]	Koalas	
Lidocaine	<1 mg/kg as regional infusion [13]	Koalas	Local anesthetic. n = 2 institutions responding to a survey about analgesics used in koalas in Australia. Variable efficacy reported.
Meloxicam	0.1–0.2 mg/kg PO, SC, IV SID [2, 14]	Koalas	Oral bioavailability is negligible. Parenteral route recommended. Pharmacokinetics study indicates SID dosing may be insufficient, but this requires further investigation regarding safety.
	0.075–0.4 mg/kg (suggested 0.1–0.2 mg/kg IM SC PO) [13, 14]	Koalas	n = 11 institutions responding to a survey about analgesics used in koalas in Australia. Oral bioavailability is negligible. Parenteral route recommended. Higher end of dosage range may be more effective.
Meperidine	1 mg/kg q4–8h IM [13]	Koalas	n = 1 institution responding to a survey about analgesics used in koalas in Australia. Less potent than morphine, but faster onset. Give IM as SC route can cause local tissue irritation/pain. IV route can cause histamine release.
Methadone	0.25–0.5 mg/kg SC or IM q4–6 hrs [2, 13]	Koalas	n = 5 institutions responding to a survey about analgesics used in koalas in Australia. Moderate to severe pain. Titrate dose according to response.
Pethidine (aka meperidine)	1 mg/kg SC IM or IV q4–8 hrs [2, 13]	Koalas	Mild to moderate pain.
Tramadol	0.2–4 mg/kg PO [13]	Koala	n = 3 institutions responding to a survey about analgesics used in koalas in Australia.
<i>Dasyurids, Possums, Gliders, and American opossums</i>			
Buprenorphine	0.005–0.01 mg/kg SC or IV BID [2]	Possums and Gliders	

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Drug name	Drug dose	Species	Comments
	0.01 mg/kg SC once [15]	Opossums	n = 1 North American opossum undergoing scrotal ablation given as premedication with midazolam 10 minutes prior to chamber induction with isoflurane.
Butorphanol	0.4 mg/kg SC or IM [2]	Possoms and Gliders	
Butorphanol tartrate	0.5 mg/kg IM once [15]	Sugar gliders	n = 5 sugar gliders undergoing scrotal ablation. Dose given 5–10 minutes prior to chamber induction with isoflurane.
Carprofen	4 mg/kg SC once [2]	Possoms and Gliders	
	3 mg/kg SC SID × 3d [2]	Numbats	
Ketoprofen	1 mg/kg SC SID × 5d [2]	Numbats	
Meloxicam	0.2 mg/kg PO or SC followed by 0.1 mg/kg PO SID × 5d [2]	Possoms and Gliders	
	0.2 mg/kg SC once, then 0.1–0.2 mg/kg PO SID × 6d [2]	Numbats	
	0.2 mg/kg SC once, then PO × 3d [15]	Sugar gliders, Opossums	n = 5 sugar gliders and n = 1 opossum undergoing scrotal ablation treated for postoperative pain.
Tolfenamic acid	4 mg/kg SC SID × 5d [2]	Possoms and Gliders	
<i>Bandicoots and Bilbies</i>			
Buprenorphine	0.01 mg/kg SC or IM BID [2]	Bandicoots and Bilbies	Has been used intra-and postoperatively.
Carprofen	2 mg/kg SC/PO BID [2]	Bandicoots and Bilbies	
Meloxicam	0.3 mg/kg PO followed by 0.1 mg/kg PO SID × 5d [2]	Bandicoots and Bilbies	
Anesthesia and Sedation			
<i>Macropods</i>			
Alfaxalone (alphaxalone)	5–8 mg/kg IM or 1.5–3 mg/kg IV [1, 2, 16]	Macropods	Sedation, very short duration of action. Useful for induction prior to inhalant anesthetic use. Better in tame animals.