

FORMULARY FOR LABORATORY ANIMALS

SECOND EDITION

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DOSE ESTIMATION AMONG SPECIES

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VETERINARIANS TREATING common farm and companion species can use a wide range of drugs with regulatory approval. These drugs are specifically formulated and supplied with information on indications, dose, dose frequency, routes of administration, and safety. In many clinical situations, laboratory animal veterinarians do not have available approved drugs with this information. In addition, they may be asked to assist investigators in the dose selection of experimental drugs. This need for “off-label” drugs is recognized in legislation (European Commission, 1990; Federal Register, 1996). Even with clinical experience and information such as supplied in this formulary, knowledge of the principles of dose extrapolation among species is needed both to assess published doses and to estimate doses when no information is available. A simple introduction to dose extrapolation is presented, with relevant citations to aid further understanding.

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Although it may be possible to predict drug dosage on a milligram/kilogram basis in closely related species of similar body size, when there are large differences in size, this assumption has quite literally been described as an “elephantine fallacy” (Harwood, 1963). This comment was prompted by the dramatic and tragic consequences in a behavioral study (West and Pierce, 1962) that estimated the dose for an elephant of the psychotomimetic drug LSD, using the milligram/kilogram dose from a study in cats. The error was to fail to appreciate that the much slower metabolic rate of the elephant would result in gross overdosage. The scientific and animal welfare concerns that such errors raise are clear, and by more accurately calculating clinical doses, laboratory animal veterinarians can also assist investigators in planning effective studies.

Understanding dose estimation across species first requires knowledge of how doses are calculated and how species differ.

In producing a commercially available drug, the mechanism of action is investigated, the pharmacokinetics are measured, the mechanisms of disposition, metabolism and excretion (ADME) are understood, it is safety tested, and its efficacy is assessed in clinical trials (Martinez, 1998a,b,c,d,e). For a particular species, the calculated milligram/kilogram dose is influenced by all these factors and also by drug formulation.

Differences among species relative to drugs can be size independent or size dependent. Differences in biotransformation are size independent: for example, dogs are deficient acetylators, pigs are deficient in sulfation capacity, only birds and reptiles form ornithurate conjugates, and cats are deficient in glucuronidation (Van Miert, 1989; Riviere et al., 1997).

To understand the effect of size some background is required. Studies have shown that many anatomical and physiological factors are mathematical functions of body weight. The history of such studies has

been described by Calabrese (1991), Adolph (1949), and Soviet scientists after him in an even wider manner, found that in species spanning a wide weight range over a hundred diverse biological parameters are linearly related to body weight. The equation that describes this relationship is $\log P = \log a + b \log W$, where P is the parameter of interest, W is the body weight, a is the intercept fixing P when body weight equals 1 kg, and b is the exponents (the slope of the line) (illustrated by Kirkwood, 1983). This equation can be simplified to $P = aW^b$ (Morris, 1995). The exponent varies with the parameter, but Lindstedt and Calder (1981) provided a useful classification. The exponent for volumes of organs (heart, lung, etc.) is about 1, because relative to each other and the body as a whole they are indispensable; thus, they increase in proportion directly to increased size. The skeleton, by contrast, is required to be stronger in larger animals; thus the exponent is greater than 1. However, returning to the issue of drug dosage, the principle sized-dependent species difference is metabolic rate, of which the exponent is 0.75. To understand this, one first accepts the generalization that as anatomical features and biochemical reactions are similar across the same order such as mammals (Davidson et al., 1986), there are consequences as organisms increase in size. The body surface area in relation to body weight falls as animals get larger, and thus the ability to lose heat also falls. Metabolic processes are optimized for a particular temperature. Evolutionary pressure, with increasing size, is to choose between controlling this inability to lose heat by a fundamental change in metabolic processes, or reducing metabolic rate. The selected adaptation, reducing metabolic rate, explains the observations made by Huxley (1932) and Adolph (1949), and has been confirmed by many studies since then (e.g., Bartels, 1982; Riviere et al., 1997), that in species spanning a wide weight range, physiological parameters such as oxygen consumption, ventilation rate, renal clearance, and nitrogen output only correlate linearly when plotted across body weight on a log:log scale with an exponent of about 0.75. Hence, as body size increases, these physiological para-

meters are relatively reduced; for example, 1g of shrew tissue has a metabolic rate 1000 times greater than 1g of blue whale tissue (Kirkwood, 1983). Durations of processes such as cardiac cycle, life span, and drug half-life, when plotted against body weight, also correlate linearly when a log:log scale is used, with the exponent being 0.25. As body size increases durations increase; for example, compare the life span of the shrew and blue whale. A general model for the origin of scaling in biology has recently been proposed and suggests that these adaptations are based on fractal geometry (Willis, 1997; West et al., 1997).

A simple summary would be that since time parameters are related to weight to the power of about 0.25, and volumes are related linearly to the power of about 1.0, volume-rates (volume divided by time, e.g., cardiac output) must be related to weight to the power of about 0.75 (see Lindstedt and Calder, 1981, equation 7):

$$\frac{\text{Volume}}{\text{Time}} \propto \frac{M^{1.0}}{M^{0.25}} = M^{0.75}$$

With an understanding of the effect of size on metabolic rate, dose estimation across species can then be considered. It is actually less accurate to compare the actual doses across species because doses are derived from pharmacokinetic modeling (Riviere, 1997). It is better to compare a drug's pharmacokinetic parameters, since these depend on physiological parameters that vary according to $P = aW^b$ (Ritschel et al., 1992). This can be demonstrated using the straightforward explanation of pharmacokinetics from Riviere (1997), which explains the importance of knowing the clearance and half-life of a drug. Clearance is calculated as follows:

$$Cl = K \times V_d$$

Where clearance Cl = slope of the semi-log drug concentration/time plot (K) \times volume of distribution (V_d). Thus, as the slope of the semi-log drug concentration/time plot (K) depends on the ADME of the particular drug, and as described previously these metabolic processes

scale to $W^{0.75}$, and volumes scale to W^1 , it follows that drug clearance scales to $W^{0.75}$. (A broader mathematical explanation is given by Weiss et al., [1977], equations 2–7.)

By contrast, for half-life ($T_{1/2}$):

$$T_{1/2} = \frac{\ln 2}{K} \text{ and as } K = \frac{Cl}{V_d} \text{ thus } T_{1/2} = \ln 2 \times \frac{V_d}{Cl}$$

($\ln 2$ is the natural logarithm of 2.) This explains why (as noted previously) the half-life scales to $W^{0.25}$, as it is related to the reciprocal of Cl (which scales to $W^{0.75}$). (A broader mathematical explanation is given by Boxenbaum [1984], equation 17.)

Thus, a major source of error in extrapolation of dose across species on a milligram/kilogram basis is that it fails to take into account the effect of differences in metabolic rate on drug pharmacokinetics.

How can metabolic rate be taken into consideration? Dose can be solely extrapolated on a milligram/kilogram^{0.75} basis (Kirkwood, 1983; Morris, 1995; Mahmood and Balian, 1996a). Reports that assess this approach have shown variable efficacy (Mizen and Woodnutt, 1988; Mahmood and Balian, 1996a; Riviere et al., 1997), supporting anecdotal concerns of clinicians that use this method regularly. What detailed methods have been used, and what are their accuracy and limitations?

Scaling describes methods used to increase or decrease the size of any operation. It has its roots in engineering, and an example would be moving synthesis of a chemical from the laboratory to an industrial plant. When used in engineering, four generic types of scaling are recognized: (1) increasing the numbers of units working in parallel, (2) maintaining design and function while increasing size, (3) altering the flow scheme of the basic system, (4) choosing another type of equipment (Boxenbaum, 1984). From a biological perspective, the kidneys can be used as an example of scaling. When body size increases, they increase in size (type 2), glomerular capillary length remains similar

(type 1), blood supply per unit time decreases (type 3), and although methothrexate is excreted via the kidney in most species, the biliary system is used in the rat (type 4).

Allometry is the study of size and its consequences (Boxenbaum, 1984); thus, it concentrates on scaling factors related to the influence of size on metabolism, and excludes type 4 factors such as different metabolic routes. The basic allometric principle is expressed in the equation $P = aW^b$ (described previously), and has been used to extrapolate pharmacokinetic parameters across a wide range of species (Weiss et al., 1977; Mordenti, 1986; Travis and Bowers, 1991; Riviere et al., 1997a). Variable applicability has already been noted above and in other studies (Van Miert 1989), and most recently when 44 compounds were assessed, only 11 showed significant allometric correlations (many of these were antibiotics) and 13 less robust correlation (Riviere et al., 1997a).

The principal reason for this lack of universal applicability is that allometry deals only with size; specifically, it does not address metabolic differences among species. As well as the qualitative differences among species described above in general, those drugs with hepatic metabolism, especially those with low extraction (Riviere et al., 1997) rather than renal clearance; those drugs in which protein binding varies among species; and those drugs that do not have first-order pharmacokinetics are less applicable to allometric scaling. The accuracy of allometric scaling for compounds with hepatic metabolism has been improved by incorporating in vitro data from liver microsomes and hepatocytes (Lave et al., 1995).

There have been a number of variations to this basic allometric approach. Although dosage based on body surface area can be inaccurate, the formulae can be modified to incorporate a scaled size factor (Van Miert, 1989). More complex allometric equations that incorporate brain weight or maximum life span have shown promise in increasing the range of drugs in which clearance can be predicted across

species (Mahmood and Balian, 1996a and b). Another approach is to normalize the time in pharmacokinetic calculations to equivalent pharmacokinetic time or “biological time” as compared to “chronological time” (Lindstedt and Calder, 1981; Mordenti, 1986).

A fundamentally different approach to pharmacokinetic scaling, and thus dose prediction, across species is physiological modeling (Mordenti and Chappel, 1989). A flow scheme of body compartments and their associated processes (e.g., protein binding, enzyme kinetics, etc.) is drawn up for each drug on a particular species and described mathematically. Then physiological data from another species are substituted to obtain the drug information for that species. These methods can be quite accurate, account for metabolic differences, and are well within the capabilities of modern computers. The two main limitations are the need for much physiological data and a detailed understanding of pharmacokinetics, even with a powerful computer and user-friendly interface.

What are the consequences of all this information for the laboratory animal veterinarian?

1. When determining dose extrapolations among species of widely varying body weights, metabolic rate should be taken into account; hence, calculations based on milligram/kilogram dose may be less accurate than those based on milligram/kilogram^{0.75}.
2. If a drug is formulated for a large species, the dose volume will be relatively much larger when this formulation is used in a smaller species.
3. Dose frequency will increase in smaller species, even becoming impractical in very small species.
4. Simple allometric scaling does not account for metabolic differences, which can override the effects of size on metabolic rate. In vitro hepatic metabolism data may aid analysis.

In practical terms, if the literature suggests that metabolic differences will not confound your estimation, it is prudent to calculate drug dosages with a consideration of metabolic rate. This method has been illustrated (Morris, 1995; Timm et al., 1994) and is used in a commercially available electronic formulary (Vetbase, Hajeka Informatie & Advies, Graafschap 7, 3524 TL Utrecht, The Netherlands, <http://vetinfo.demon.nl>). It can be calculated from the worksheet in Figure 1.1 (worked example is shown in Fig. 1.2), or the calculations can be transferred to a computer spreadsheet. In some cases, it may be best to alter the dose; in other cases, it may be best to alter the dose frequency; and, in still other cases, if the dose frequency or dose volume is too high, it may be best to compromise, by estimation, between both changes.

Figure 1.1. Allometric dose and interval scaling worksheet

- 1) Convert reference drug dose into **total dose** and **interval** format

(use a calculator or computer for x^y/x^{-y}):

Control animal species name _{cont} _____ Body weight _{cont} _____ kg

Dosage rate _{cont} _____ mg/kg (Route: PO SC IM IV)

Frequency _____ times/day

Treatment dose _{cont} ($W_{\text{kg}} \times \text{dosage rate}$) = _____ mg

Dosing interval _{cont} (24 h/frequency) = _____ h

- 2) Now calculate parameters that express metabolic size (MEC) and metabolic rate (SMEC) in a format that can be compared among animals of very different body sizes using allometric scaling to compare dose quantity.

Minimum energy cost _{cont} (MEC_{cont}) = $k(W_{\text{kg}}^{0.75})$ = _____
or dose frequency

Specific minimum energy cost _{cont} ($\text{SMEC}_{\text{cont}}$) = $k(W_{\text{kg}}^{-0.25})$ = _____

W = body weight, k = factors: passerines 129, nonpasserines 78, placentals 70, marsupials 49, reptiles (at 37°C ambient) 10 (It is preferable to only scale *within* groups.)

- 3) Then calculate the dose and interval in terms that can be used for conversion between species, using the data from (1) and (2) above:

MEC DOSE (Treatment dose _{cont} / MEC_{cont}) = _____

SMEC INTERVAL ($\text{SMEC}_{\text{cont}} \times \text{dosing interval}_{\text{cont}}$) = _____

- 4) Now you can use this *MEC dose* and *SMEC interval* for this drug to derive an allometrically scaled dose for subject animal species, with a very different body weight.

Species of subject animal (_{subj}) _____ Body weight _{subj} = _____ kg

Minimum energy cost _{subj} (MEC_{subj}) = $k(W_{\text{kg}}^{0.75})$ = _____

Specific minimum energy cost _{subj} ($\text{SMEC}_{\text{subj}}$) = $k(W_{\text{kg}}^{-0.25})$ = _____

- 5) Treatment dose _{subj} = (*MEC DOSE* × MEC_{subj}) = _____ mg

mg/kg dose = treatment dose/subject weight = _____ mg/kg

Treatment interval _{subj} = (*SMEC INTERVAL* / $\text{SMEC}_{\text{subj}}$) = _____ h

Frequency (24 h/interval) = _____

Source: Developed from a worksheet, produced by Charles Sedgwick, and modified by Karen Timm, Oregon State University.

Figure 1.2. Example of use of allometric dose and interval scaling worksheet for dose or dose frequency for oxytetracycline injection administration to a rat, using data from cattle dosage

- 1) Convert reference drug dose into **total dose** and **interval** format
 Control animal species name_(cont): cow Body weight_{cont}: 500 kg
 Dosage rate_{cont}: 10 mg/kg (Route: IM) Frequency: 1 time/day
 Treatment dose_{cont} ($W_{kg} \times \text{dosage rate}$) = 5000 mg
 Dosing interval_{cont} (24h/frequency) = 24 h
- 2) Minimum energy cost_{cont} ($MEC_{cont} = k(W_{kg}^{0.75})$) = 7402
 Specific minimum energy cost_{cont} ($SMEC_{cont} = k(W_{kg}^{-0.25})$) = 14.8
w = body weight, *k* = factors: placentals 70
- 3) Dose and interval in terms for conversion between species
 $MEC \text{ DOSE}$ (Treatment dose_{cont}/MEC_{cont}) = 0.675
 $SMEC \text{ INTERVAL}$ ($SMEC_{cont} \times \text{dosing interval}_{cont}$) = 355
- 4) Subject animal species
 Species of subject animal_{subj}: rat Body weight_{subj}: 0.3 kg
 Minimum energy cost_{subj} ($MEC_{subj} = k(W_{kg}^{0.75})$) = 28.4
 Specific minimum energy cost_{subj} ($SMEC_{subj} = k(W_{kg}^{-0.25})$) = 94
- 5) Treatment dose_{subj} = ($MEC \text{ DOSE} \times MEC_{subj}$) = 19.17 mg
 mg/kg dose = treatment dose/subject weight = 63.9 mg/kg
 Treatment interval_{subj} = ($SMEC \text{ INTERVAL}/SMEC_{subj}$) = 3.7 h
 Frequency (24 h/interval) = 6

Note: Either the relative dose needs to be increased from 10 mg/kg in the cow to 63.9 mg/kg in the rat, or the cow dose needs to be given 6 times a day to the rat. Note also that the dose volume, using a 100 mg/ml presentation, is 0.19 ml/rat (0.63 ml/kg), relatively much higher than for the cow: 50 ml/cow, 0.1 ml/kg.

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ANALGESICS AND SEDATIVES

Acepromazine

- C** 0.1-0.2 mg/kg BW IM, SC (Kinsell, 1986)
0.5-1.0 mg/lb BW PO prn (Kinsell, 1986)
- Ch** 0.5 mg/kg BW IM (Johnson-Delaney, 1996)
- D** 0.1-0.5 mg/kg BW IV, IM, SC (Kinsell, 1986)
0.25-1.0 mg/lb BW PO prn (Kinsell, 1986)
- F** 0.2 mg/kg BW IM (Flecknell, 1987)
0.2-0.5 mg/kg BW IM, SC (Morrisey et al., 1996)
- G** May precipitate seizures (Harkness and Wagner, 1983)
- Go** 0.05-0.5 mg/kg BW IM (Swindle and Adams, 1988)
0.55 mg/kg BW IV (Swindle and Adams, 1988)
0.05-0.1 mg/kg BW IM (NCSU, 1987)
- M** 1-2 mg/kg BW IM (Harkness and Wagner, 1983)
2-5 mg/kg BW IP (Flecknell, 1987)
- N** 0.5-1.0 mg/kg BW IM, SC (Melby and Altman, 1976)
0.2 mg/kg BW IM (Flecknell, 1987)
- R** 1-2 mg/kg BW IM (Harkness and Wagner, 1983)
- Rb** 1-2 mg/kg BW IM (Harkness and Wagner, 1983)
5 mg/kg BW IM (Flecknell, 1987)
2 mg/kg BW IM (Bauck, 1989)
- Rc** 2-2.5 mg/kg BW (Evans and Evans, 1986)

- Re** 0.125-0.5 mg/kg BW IM (Frye, 1981)
Sh 0.05-0.5 mg/kg BW IM (Swindle and Adams, 1988)
0.55 mg/kg BW IV (Swindle and Adams, 1988)
Sw 0.11-0.22 mg/kg BW SC, IM, IV (Swindle and Adams, 1988)
0.05-0.1 mg/kg BW IM (NCSU, 1987)
0.03-0.22 mg/kg BW IM not to exceed 15 mg total (NCSU, 1987)

Acepromazine and buprenorphine (respectively)

- D** 0.07 mg/kg BW IM and 0.009 mg/kg BW IM (Flecknell, 1996)

Acetaminophen

- C** Toxic
D 15 mg/kg BW PO q8h (Jenkins, 1987)
M 300 mg/kg BW PO (Jenkins, 1987)
N 5-10 mg/kg BW PO (Johnson et al., 1981)
R 110-300 mg/kg BW PO (Jenkins, 1987)
100-300 mg/kg BW PO q4h (Flecknell, 1991)

Acetaminophen/codeine

- Rb** 1 ml elixer/100 ml drinking water (Wixson, 1994)

Alphaxalone/alphadolone

- C** 9 mg/kg BW IM (Flecknell, 1987)
Gp 40 mg/kg BW IM (Flecknell, 1987)
N 12-18 mg/kg BW IM (Flecknell, 1987)
R 9-12 mg/kg BW IP (Flecknell, 1987)
Rb 9-12 mg/kg BW IM (Flecknell, 1987)
Sw 6 mg/kg BW IM (Flecknell, 1987)

Aminopyrine

- D 265 mg total PO (Borchard et al., 1990)
- Gp 130 mg/kg BW PO (Jenkins, 1987)
- H 130 mg/kg BW PO (Jenkins, 1987)
- M 150 mg/kg BW IP (Borchard et al., 1990)
300 mg/kg BW PO (Borchard et al., 1990)
- R 200 mg/kg BW SC (Borchard et al., 1990)
650 mg total PO (Borchard et al., 1990)
- Rb 50 mg/kg BW PO (Jenkins, 1987)

Antipyrine

- C 100 mg/kg BW IM, IP, SC (Borchard et al., 1990)
500 mg/kg BW PO (Borchard et al., 1990)
- D 1000 mg total PO (Borchard et al., 1990)
- M 197 mg/kg BW IP (Borchard et al., 1990)
- R 600 mg/kg BW SC (Borchard et al., 1990)
220 mg/kg BW SC (Borchard et al., 1990)
- Rb 100 mg/kg BW PO (Jenkins, 1987)
100 mg/kg BW IM, IP, SC (Borchard et al., 1990)
500 mg/kg BW PO (Borchard et al., 1990)

Aspirin

- Bi 5 mg/kg BW PO tid (Ritchie and Harrison, 1997)
- C 10 mg/kg BW PO q48h (Jenkins, 1987)
1 children's aspirin (1.25 g) PO q36h (Kinsell, 1986)
- Ch 100-200 mg/kg BW PO q6-8h (Johnson-Delaney, 1996)
- D 10-20 mg/kg BW PO q12h (Jenkins, 1987)

Note: Use buffered tabs: analgesic dosage 10 mg/kg BW PO q12h (Kinsell, 1986)

Antirheumatic maximum dosage 40 mg/kg BW q18h (Kinsell, 1986)

- F 10-20 mg/kg BW PO sid (Johnson-Delaney, 1996)

- Go** 10-20 mg/kg BW PO (Swindle and Adams, 1988)
- Gp** 270 mg/kg BW IP sid (CCAC, 1984)
86 mg/kg BW PO, try q4h (Flecknell, 1987)
- H** 240 mg/kg BW IP sid (CCAC, 1984)
- M** 120-300 mg/kg BW PO (Jenkins, 1987)
120 mg/kg BW PO q4h (Flecknell, 1987)
400 mg/kg BW SC sid (CCAC, 1984)
25 mg/kg BW IP (Borchard et al., 1990)
- N** 100 mg/kg BW PO sid (CCAC, 1984)
20 mg/kg BW PO q6-8h (Flecknell, 1987)
- R** 100 mg/kg BW PO q4h (Flecknell, 1987; Jenkins, 1987)
400 mg/kg BW SC, PO (Harkness and Wagner, 1983)
- Rb** 400 mg/kg BW SC, PO sid (Harkness and Wagner, 1983)
100 mg/kg BW PO, try q4h (Flecknell, 1991)
20 mg/kg BW PO sid (equivalent to 600-mg dose in humans) (Marangos et al., 1994)
- Sh** 10-20 mg/kg BW PO (Swindle and Adams, 1988)
- Sw** 10-20 mg/kg BW PO q4h (Swindle and Adams, 1988)

Bupivacaine

- D** 1 ml/4.5 kg BW of 0.25% or 0.5% solution given epidurally (Carroll, 1996)

Buprenorphine

- Bi** 0.01-0.05 mg/kg BW IM (Bennett, 1997)
- C** 0.005-0.01 mg/kg BW SC, IM q12h (Flecknell, 1985; Jenkins, 1987)
0.005-0.01 mg/kg BW IV, SC q8-12h (Flecknell, 1996)
- D** 0.01-0.02 mg/kg BW SC q12h (Flecknell, 1985; Jenkins, 1987)
0.003-0.005 mg/kg of preservative-free solution (in 0.9%

- saline) given epidurally; give 0.3 ml/kg BW not to exceed 6 ml (Carroll, 1996)
- 0.005-0.02 mg/kg BW IM, IV, SC q6-12h (Flecknell, 1996)
- F** 0.01-0.03 mg/kg BW IM, IV, SC q8-12h (Flecknell, 1996)
0.01-0.5 mg/kg BW IV, SC q8-12h (Johnson-Delaney, 1996)
- G** 0.1-0.2 mg/kg BW SC q8h (Flecknell, 1987)
- Gp** 0.05 mg/kg BW SC q8-12h (Flecknell, 1985; Jenkins, 1987)
0.05 mg/kg BW SC q6-12h (Flecknell, 1991)
- H** 0.05 mg/kg BW SC q8-12h (Jenkins, 1987)
0.5 mg/kg BW SC q8h (Flecknell, 1987)
- M** 2 mg/kg BW SC q12h (Flecknell, 1985; Jenkins, 1987)
2.5 mg/kg BW IP q6-8h (Jenkins, 1987)
0.05-0.1 mg/kg BW SC q6-12h (Flecknell, 1991)
0.05-0.1 mg/kg BW SC bid (Flecknell, 1996)
- N** 0.01 mg/kg BW IM, IV q12h (Flecknell, 1985; Jenkins, 1987)
0.005-0.01 mg/kg BW IM, IV q6-12h (Flecknell, 1996)
- R** 0.1-0.5 mg/kg BW SC, IV q12h (Jenkins, 1987; Flecknell, 1985; Flecknell, 1987)
0.006 mg/ml drinking water (Deeb et al., 1989)
0.01-0.05 mg/kg BW IV, SC q8-12h (Flecknell, 1996)
0.1-0.25 mg/kg BW PO q8-12h (Flecknell, 1996)
- Rb** 0.02-0.05 mg/kg BW SC, IM, IV q8-12h (Flecknell, 1985; Jenkins, 1987)
0.02-0.1 mg/kg BW IV, SC q12h (Carpenter et al., 1995)
0.01-0.05 mg/kg BW SC, IV q6-12h (Flecknell, 1991)
- Sh** 0.005-0.01 mg/kg BW IM q4-6h (Flecknell, 1989)
- Sw** 0.005-0.01 mg/kg BW IM, IV (Swindle and Adams, 1988)
0.005-0.02 mg/kg BW IM, IV q6-12h (Flecknell, 1996)
Up to 0.1 mg/kg BW can be used for major surgical procedures (Farris, 1990)

Butorphanol

- Bi** 1-4 mg/kg BW IV, PO prn not to exceed q4h (Ritchie and Harrison, 1997)
- C** 0.4 mg/kg BW SC q6h (Jenkins, 1987)
0.22 mg/kg BW IM (Short, 1997)
0.4-1.5 mg/kg BW PO q4-8h (Hansen, 1996)
0.4 mg/kg BW SC q3-4h (Flecknell, 1996)
- D** 0.2-0.4 mg/kg BW SC, IM, IV q2-5h (Jenkins, 1987)
0.2-0.4 mg/kg BW IM, SC q3-4h (Flecknell, 1996)
1-3 mg/kg BW PO (Raffe, 1995)
- F** 0.4 mg/kg BW IM q4-6h (Flecknell, 1996)
0.05-0.1 mg/kg BW SC q8-12h (Johnson-Delaney, 1996)
- M** 0.05-5.0 mg/kg BW SC q4h (Jenkins, 1987)
5.4 mg/kg BW SC (Wright et al., 1985)
1-5 mg/kg BW SC q4h (Flecknell, 1991)
- N** 0.01 mg/kg BW IV q3-4h(?) (Flecknell, 1996)
- R** 0.05-2.0 mg/kg BW SC q4h (Jenkins, 1987)
2 mg/kg BW SC q4h (Flecknell, 1991)
- Rb** 0.1-0.5 mg/kg BW IV q4h (Flecknell, 1989)
0.1-0.5 mg/kg BW IM, IV, SC q4h (Carpenter et al., 1995)
- Sh** 0.5 mg/kg BW SC q2-3h (Flecknell, 1989)
- Sw** 0.1-0.3 mg/kg BW IM (Swindle and Adams, 1988)

Butorphanol and acepromazine (respectively)

- C** 0.1-0.4 mg/kg BW IM, IV and 0.02-0.05 mg/kg BW IM, IV (Raffe, 1995)
- D** 0.2-0.4 mg/kg BW IM, IV and 0.02-0.05 mg/kg BW IM, IV (Raffe, 1995)
- Rb** 1 mg/kg BW IM and 1 mg/kg BW IM (Flecknell, 1996)

Butorphanol and diazepam (respectively)

- D** 0.05-0.25 mg/lb BW IM and 0.1-0.2 mg/lb (maximum 10 mg) BW IM for induction (Ko et al., 1994)

Carprofen

- C** 4 mg/kg BW IV, SC (Flecknell, 1996)
- D** 2.2 mg/kg BW PO bid (Michels and Carr, 1997)
4 mg/kg BW IV, SC sid (Flecknell, 1996)
1-2 mg/kg BW PO bid for 7 days (Flecknell, 1996)
- R** 5 mg/kg BW SC (Flecknell, 1996)
- Rb** 1.5 mg/kg BW PO bid (Flecknell, 1996)
- Sw** 2-4 mg/kg BW IV, SC sid (Flecknell, 1996)

Chlorpromazine

- C** 1-2 mg/kg BW IV, IM q12h (Kinsell, 1986)
- D** 0.55-4.4 mg/kg BW IV q6-24h (Kinsell, 1986)
1.1-6.6 mg/kg BW IM q6-24h (Kinsell, 1986)
- Gp** 0.2 mg/kg BW SC (Lumb and Jones, 1984)
- H** 0.5 mg/kg BW IM (Hofing, 1989)
- M** 5-10 mg/kg BW SC (Taber and Irwin, 1969)
25-50 mg/kg BW IM (Dolowy et al., 1960)
- N** 3-6 mg/kg BW IM (Cramlet and Jones, 1976)
- R** 1-2 mg/kg BW IM (Clifford, 1984)
- Rb** 25 mg/kg BW IM (produces myositis) (CCAC, 1984)

Codeine

- D** 2.2 mg/kg BW SC (Jenkins, 1987)
- M** 20 mg/kg BW SC (Jenkins, 1987)
60-90 mg/kg BW PO (Jenkins, 1987)
20 mg/kg BW SC q4h (Flecknell, 1987)
- R** 25-60 mg/kg BW SC q4h (Jenkins, 1987)
60-90 mg/kg BW SC q4h (Flecknell, 1991)

Diazepam

- Bi** 0.5-1 mg/kg BW IM, IV q8-12h (Ritchie and Harrison, 1997)

- 1-1.5 mg/kg IV, IM (McDonald, 1989)
- 2.5-4 mg/kg BW PO prn (Ritchie and Harrison, 1997)
- 2-5 mg/kg BW IM (Cooper, 1984)
- C** 1 mg/kg BW IV to a maximum of 5 mg (Kinsell, 1986)
- Ch** 2.5 mg/kg BW IP (Green, 1982)
- D** 1 mg/kg BW IV to a maximum of 20 mg (Kinsell, 1986)
- F** 2 mg/kg BW IM (CCAC, 1984; Flecknell, 1987)
- G** 5 mg/kg BW IP (CCAC, 1984; Flecknell, 1987)
- Go** 0.5-1.5 mg/kg BW IM, IV (Swindle and Adams, 1988)
15 mg/kg BW PO mixed in feed (NCSU, 1987)
- Gp** 5 mg/kg BW IP (Flecknell, 1987)
2.5 mg/kg BW IP, IM (Green, 1982)
- H** 5 mg/kg BW IP (CCAC, 1984; Flecknell, 1987)
- M** 5 mg/kg BW IP (Flecknell, 1987)
- N** 1 mg/kg BW IM (Flecknell, 1987)
1 mg/kg BW IV (Green, 1982)
- R** 2 mg/kg BW IV (Flecknell, 1987)
4 mg/kg BW IM, IP (Flecknell, 1987)
2.5 mg/kg BW IM, IP (Weihe, 1987)
- Rb** 2 mg/kg BW IV (Flecknell, 1987)
4 mg/kg BW IM, IP (Flecknell, 1987)
5-10 mg/kg BW IM (Harkness and Wagner, 1983)
5-10 mg/kg BW IM, IP (Green, 1982)
- Rc** 66-110 mg/kg BW PO (Balser, 1965)
- Sh** 0.5-1.5 mg/kg BW IM, IV (Swindle and Adams, 1988)
15 mg/kg BW mixed in feed (NCSU, 1987)
- Sw** 0.5-10 mg/kg BW IM (Swindle and Adams, 1988)
0.5-1.5 mg/kg BW IV (Swindle and Adams, 1988)

Diazepam and xylazine (respectively)

- Rb** 1 mg/kg BW IV and 3 mg/kg BW IV as a bolus for induction (Hatch and Wilson, 1988)

Diazepam, xylazine, and atropine (respectively)

- D 1 mg/kg BW IV, 1.1 mg/kg BW IV, and 0.05 mg/kg BW IV
as a bolus for induction (Hatch and Wilson, 1988)

Diclofenac

- Gp 2.1 mg/kg BW PO (Albengres et al., 1988)
M 8 mg/kg BW PO (Liles and Flecknell, 1992)
R 10 mg/kg BW PO (Liles and Flecknell, 1992)

Fenoprofen

- D 0.5-1 mg/kg BW PO q24h (Jenkins, 1987)

Fentanyl

- C 25- μ g patch for cats >7 lb (Hansen, 1996)
D 0.04-0.08 mg/kg BW SC, IM, IV q1-2h (Jenkins, 1987)
0.001-0.003 mg/lb BW IM or slow IV (Kinsell, 1986)
25- μ g patch for dogs <15 lb; 50- μ g patch for dogs 15-40 lb;
75- μ g patch for dogs 40-60 lb, and 100- μ g patch for dogs
>60 lb (Hansen, 1996)
N 0.05-0.10 mg/kg BW SC, IM (Jenkins, 1987)
Sw 0.02-0.05 mg/kg BW IM, IV (Swindle and Adams, 1988)

Fentanyl/droperidol (Innovar-Vet) (a preanesthetic dose of atropine may be necessary)

- D 1 ml/7-10 kg BW IM (Kinsell, 1986)
1 ml/12-30 kg BW IV (Kinsell, 1986)
F 0.15 ml/kg BW IM (Flecknell, 1987)
Gp 0.5-1.0 ml/kg BW IM (CCAC, 1984)
0.08-0.66 ml/kg BW IM (Hughes, 1981)
0.22 ml/kg BW IM (Sander, 1992)

- H** 0.01 ml/kg BW IP (CCAC, 1984) (central nervous system stimulation may occur) (Hughes, 1981)
- M** 0.005 ml/kg BW IM (Jenkins, 1987)
0.02-0.03 ml/g BW IM (Hughes, 1981)
0.5 ml/kg BW IM (Flecknell, 1996)
- N** 0.1-0.2 ml/kg BW IM (CCAC, 1984)
0.3 ml/kg BW IM (Flecknell, 1987)
- R** 0.13 ml/kg BW IM (Jenkins, 1987)
0.5 ml/kg BW IM (Flecknell, 1996)
- Rb** 0.17 ml/kg BW IM (CCAC, 1984)
0.15-0.17 ml/kg BW IM (Lewis and Jennings, 1972)
- Sw** 0.07 ml/kg BW IM (Swindle and Adams, 1988)

Fentanyl/fluanisone

- F** 0.5 ml/kg BW IM (Flecknell, 1987)
- G** 1 ml/kg BW IM, IP (Jenkins, 1987)
- Gp** 1 ml/kg BW IM (Flecknell, 1987; Jenkins, 1987)
- H** 1 ml/kg BW IM, IP (Jenkins, 1987)
- M** 0.01 ml/30 g BW IP (Jenkins, 1987)
0.1-0.3 ml/kg BW IP (Flecknell, 1996)
- N** 0.3 ml/kg BW IM (Flecknell, 1996)
- R** 0.4 ml/kg BW IM, IP (Jenkins, 1987)
0.2-0.5 ml/kg BW IM or 0.3-0.6 mg/kg BW IP (Flecknell, 1987)
0.3-0.6 ml/kg BW IP (Flecknell, 1996)
- Rb** 0.5 ml/kg BW IM (Jenkins, 1987)

Flunixin

- Bi** 1-10 mg/kg IM; can be repeated (Harrison and Harrison, 1986)
1-10 mg/kg BW IM, IV (Ritchie and Harrison, 1997)

- C** 1 mg/kg BW PO, IV q24h (Haskins, 1987)
0.3 mg/kg BW IM (Kinsell, 1986)
- D** 0.5-2.2 mg/kg BW IM, IV; no repeat (Jenkins, 1987)
1 mg/kg BW PO, IV q24h (Haskins, 1987)
1 mg/kg BW IV sid for 3 days maximum (Boulay et al., 1995)
- F** 0.03 mg/kg BW IM tid prn (Johnson-Delaney, 1996)
0.3 mg/kg BW PO, SC sid (Johnson-Delaney, 1996)
- M** 2.5 mg/kg BW SC, IM, try q12h (Flecknell, 1991)
- N** 0.5 mg/kg BW IM sid (Feeser and White, 1992)
1 mg/kg BW IV bid (Fraser, 1991)
Prosimians—0.5 mg/kg BW IM sid (Feeser and White, 1992)
10 mg/kg BW IM (Borchard et al., 1990)
- R** 1.1 mg/kg BW SC, IM q12h (Flecknell, 1991)
2.5 mg/kg BW SC, IM (Liles and Flecknell, 1992)
- Rb** 1.1 mg/kg BW SC, IM, try q12h (Liles and Flecknell, 1992)
- Sw** 2-2.2 mg/kg BW IV, SC up to bid (Laval, 1992)

Haloperidol

- Rb** 0.2-0.4 mg/kg BW IM bid (Iglauer et al., 1995)

Hypnorm—See Fentanyl/fluanisone

Ibuprofen

- C** 5 mg/kg BW PO q24h (Haskins, 1987)
- D** 10 mg/kg BW PO q24-48h (Jenkins, 1987)
5 mg/kg BW PO q24h (Haskins, 1987)
- Gp** 10 mg/kg BW IM, try q4h (Flecknell, 1991)
- M** 7.5 mg/kg BW PO (Jenkins, 1987)

- 7.5 mg/kg BW PO, try q4h (Flecknell, 1991)
- 30 mg/kg BW PO (Liles and Flecknell, 1992)
- R** 10-30 mg/kg BW PO (Jenkins, 1987)
- 10-30 mg/kg BW PO, try q4h (Flecknell, 1991)
- 15 mg/kg BW PO (Flecknell, 1996)
- Rb** 10-20 mg/kg BW IV, try q4h (Flecknell, 1991)

Indomethacin

- Gp** 8.8 mg/kg BW PO (Albengres et al., 1988)
- M** 1 mg/kg BW PO (Liles and Flecknell, 1992)
- R** 2 mg/kg BW PO (Liles and Flecknell, 1992)
- Rb** 12.5 mg/kg BW PO (Keller et al., 1988)

Ketamine

- Bi** *See under Anesthetics*
- C** 10-30 mg/kg BW IM, IV (Kinsell, 1986)
- F** 10-20 mg/kg BW IM (Morrisey et al., 1996)
- 20-30 mg/kg BW IM (Flecknell, 1996)
- Gp** 25-30 mg/kg BW IM (Bauck, 1989)
- 22-64 mg/kg BW IP (Sander, 1992)
- H** 60 mg/kg BW IM (Bauck, 1989)
- N** 5-40 mg/kg BW IM (Holmes, 1984)
- Rb** 30 mg/kg BW IM (Bauck, 1989)

Ketoprofen

- C** 1-2 mg/kg BW IM, IV, SC sid (Hellyer and Gaynor, 1998)
- 1 mg/kg BW PO after first 24 h following injection (Hellyer and Gaynor, 1998)
- D** 2 mg/kg BW IM (Pibarot et al., 1997)
- Rb** 1 mg/kg BW IM (Perrin et al., 1990)
- 3 mg/kg BW IM (Flecknell, 1996)

Ketoprofen and oxymorphone (respectively)

- D** 2 mg/kg BW IM and 0.05 mg/kg BW IM (Pibarot et al., 1997)

Meclofenamic acid

- C** 2.2 mg/kg BW PO q24h (Haskins, 1987)
D 0.5-1 mg/kg BW PO sid in food, then qod for maintenance (Boulay et al., 1995)
 2.2 mg/kg BW PO q24h (Haskins, 1987)

Note: Test dosage—0.5 mg/lb sid for 5 days. If therapeutic results achieved, wait till signs exacerbate. Then drop dosage to 0.5 mg/lb qod till achieve signs of remission. Then drop to 0.5 mg/lb every third day for 1 week. If signs still remitted, drop dosage to 0.5 mg/lb every fourth day. If signs still remitted, drop dosage to 0.5 mg/lb every fifth day. When signs show exacerbation, back up one step and maintain that dosage level (Kinsell, 1986).

Medetomidine

- C** 10-40 µg/kg BW IV (Ko et al., 1997)
 40-80 µg/kg BW IM (Ko et al., 1997)
D 10-20 µg/kg BW IV (Ko et al., 1997)
 30-40 µg/kg BW IM (Ko et al., 1997)
 0.1-0.8 mg/kg BW IM, IV, SC (Flecknell, 1996)
F 80 µg/kg BW IM (Ko et al., 1997)
Go 25 µg/kg BW IM (Flecknell, 1996)
M 30-100 µg/kg BW SC (Flecknell, 1996)
R 30-100 µg/kg BW IP, SC (Flecknell, 1996)
Rb 0.1-0.5 mg/kg BW IM, SC (Flecknell, 1996)
 0.3-0.5 mg/kg BW SC (Aeschbacher, 1995)
 0.25 mg/kg BW IM (Ko et al., 1992)
Sh 25 µg/kg BW IM (Flecknell, 1996)

Meperidine

- C** 2-10 mg/kg BW SC, IM q2h (Jenkins, 1987)
2-4 mg/kg BW IM, SC (Kinsell, 1986)
- Ch** 1-2 mg/kg BW IM, SC (Johnson-Delaney, 1996)
- D** 2-10 mg/kg BW SC, IM q2-3h (Jenkins, 1987)
6-10 mg/kg BW IM, SC (Kinsell, 1986)
- F** 5-10 mg/kg BW IM, SC q2-4h (Flecknell, 1996)
- Go** 2-10 mg/kg BW SC, IM (Swindle and Adams, 1988)
- Gp** 20 mg/kg BW SC, IM q2-3h (Jenkins, 1987)
10-20 mg/kg BW SC, IM q2-3h (Flecknell, 1991)
- H** 20 mg/kg BW SC, IM q2-3h (Jenkins, 1987)
- M** 20 mg/kg BW SC, IM q2-3h (Jenkins, 1987)
10-20 mg/kg BW SC, IM q2-3h (Flecknell, 1991)
20-40 mg/kg BW IP (Clifford, 1984)
60 mg/kg BW IM (Hughes, 1981)
- N** 2-4 mg/kg BW IM q3-4h (Jenkins, 1987)
11 mg/kg BW IM (CCAC, 1984)
- R** 20 mg/kg BW SC, IM q2-3h (Jenkins, 1987)
10-20 mg/kg BW SC, IM q2-3h (Flecknell, 1991)
- Rb** 10 mg/kg BW SC, IM q2-3h (Jenkins, 1987)
10-20 mg/kg BW SC, IM q2-3h (Flecknell, 1991)
- Sh** 2-10 mg/kg BW SC, IM (Swindle and Adams, 1988)
2 mg/kg BW IM, IV q2-4h (Flecknell, 1996)
- Sw** 2 mg/kg BW IM, IV q2-4h (Flecknell, 1996)
4-10 mg/kg BW IM (Swindle and Adams, 1988)

Methadone

- Gp** 3-6 mg/kg BW SC (Jenkins, 1987)
- H** 3-6 mg/kg BW SC (Jenkins, 1987)

Midazolam

- Bi** Quail: 6 mg/kg BW IM (Day and Boge, 1996)

- Go** 0.5 mg/kg BW IV (Flecknell, 1996)
- M** 5 mg/kg BW IM, IP (Flecknell, 1996)
- R** 2 mg/kg BW IV (Flecknell, 1987)
4 mg/kg BW IM, IP (Flecknell, 1987)
5 mg/kg BW IP (Flecknell, 1996)
- Rb** 2 mg/kg BW IV (Flecknell, 1987)
2 mg/kg BW intranasally (Robertson and Eberhart, 1994)
4 mg/kg BW IM, IP (Flecknell, 1987)
0.5-2 mg/kg BW IM, IP, IV (Flecknell, 1996)

Midazolam and ketamine (respectively)

- C** 5-10 mg/kg BW IM and 0.2 mg/kg BW IM (Mama, 1998)

Midazolam and oxymorphone (respectively)

- D** 0.05 mg/lb BW IM and 0.025-0.1 mg/lb BW IM for induction (Ko et al., 1994)

Morphine

- C** 0.1 mg/kg BW SC, IM q4-6h (Flecknell, 1985; Jenkins, 1987)
0.1 mg/kg BW IM, SC q6-7h; use with caution (Kinsell, 1986)
- D** 0.25-5.0 mg/kg BW IM, SC q4-6h (Flecknell, 1985; Jenkins, 1987)
0.1 mg/kg BW of preservative-free solution (in 0.9% saline) given epidurally; give 0.3 ml/kg BW not to exceed 6 ml (Carroll, 1996)
- F** 0.5-5 mg/kg BW IM, SC qid (Flecknell, 1996)
- Gp** 10 mg/kg BW SC, IM q2-4h (Flecknell, 1985; Jenkins, 1987)
2-5 mg/kg BW SC, IM q4h (Flecknell, 1991)
- H** 10 mg/kg BW SC, IM q2-4h (Jenkins, 1987)

- M** 10 mg/kg BW SC q2-4h (Flecknell, 1985; Jenkins, 1987)
2-5 mg/kg BW SC, hourly (Flecknell, 1991)
- N** 1-2 mg/kg BW SC q4h (Flecknell, 1985; Jenkins, 1987)
3 mg/kg BW SC (Domino et al., 1969)
- R** 10 mg/kg BW SC q2-4h (Flecknell, 1985; Jenkins, 1987)
2-5 mg/kg BW SC, hourly (Flecknell, 1991)
- Rb** 5 mg/kg BW SC, IM q2-4h (Flecknell, 1985; Jenkins, 1987)
2-5 mg/kg BW SC, IM q2-4h (Flecknell, 1991)
- Sh** 0.2-0.5 mg/kg BW IM q4h (Flecknell, 1996)
- Sw** 0.2-0.9 mg/kg BW SC (Swindle and Adams, 1988)

Morphine and acepromazine (respectively)

- C** 0.2-0.5 mg/kg BW IM and 0.02-0.05 mg/kg BW IM, IV
(Raffe, 1995)
- D** 0.05-1 mg/lb BW IM and 0.025-0.1 mg/lb (maximum 3 mg)
BW IM for induction (Ko et al., 1994)
0.5-1.5 mg/kg BW IM and 0.02-0.1 mg/kg BW IM, IV
(Raffe, 1995)

Nalbuphine

- C** 1.5-3 mg/kg BW IV q3h (Flecknell, 1996)
- D** 0.5-2.0 mg/kg BW SC, IM, IV q3-8h (Jenkins, 1987)
- Gp** 1-2 mg/kg BW IM, IP, IV (Flecknell, 1996)
- M** 4-8 mg/kg BW IM q4h (Flecknell, 1989)
- R** 2-5 mg/kg BW IM q4h (Flecknell, 1989)
1-2 mg/kg BW IM q3h (Flecknell, 1991)
- Rb** 1-2 mg/kg BW IV q4-5h (Flecknell, 1989)
- Sh** 1 mg/kg SC q2-3h (Flecknell, 1989)

Naproxen

- D** 5 mg/kg BW loading dose, then 1.2-2.8 mg/kg BW PO q24h
(Jenkins, 1987)

5 mg/kg BW PO sid, then 2 mg/kg BW PO qod are common but not recommended (high ulcerogenic potential and narrow margin of safety) (Boulay et al., 1995)

- Gp 14.9 mg/kg BW PO (Albengres et al., 1988)
- N 10 mg/kg BW PO q12h (Junge et al., 1992)
- R 14.5 mg/kg BW PO (Borchard et al., 1990)

Oxymorphone

- C 0.4-1.5 mg/kg BW SC, IM, IV (Jenkins, 1987)
0.2 mg/kg BW IM, IV, SC (Short, 1997)
- D 0.22 mg/kg BW SC, IM, IV (Jenkins, 1987)
0.1 mg/kg of preservative-free solution (in 0.9% saline) given epidurally; give 0.3 ml/kg BW not to exceed 6 ml (Carroll, 1996)
- G 0.15 mg/kg BW IM (Trim et al., 1987)
- H 0.15 mg/kg BW IM (Trim et al., 1987)
- M 0.15 mg/kg BW IM (Trim et al., 1987)
- N 0.15 mg/kg BW SC, IM, IV in Old World monkeys (Rosenberg, 1991)
0.075 mg/kg BW SC, IM, IV in New World monkeys (Rosenberg, 1991)
- R 0.15 mg/kg BW IM (Trim et al., 1987)
- Sw 0.15 mg/kg BW IM (Swindle and Adams, 1988)

Oxymorphone and acepromazine (respectively)

- C 0.05-0.15 mg/kg BW IM, IV and 0.02-0.05 mg/kg BW IM, IV (Raffe, 1995)
- D 0.1-0.2 mg/kg BW IM, IV and 0.02-0.1 mg/kg BW IM, IV (Raffe, 1995)

Pentazocine

- C 2-3 mg/kg BW SC, IM, IV q4h (Jenkins, 1987)

- 8 mg/kg BW IP q4h (Flecknell, 1985)
1-3 mg/kg BW SC, IM, IV; IV duration 2-4 h (Kinsell, 1986)
- D** 2-3 mg/kg BW IM q4h (Flecknell, 1985; Jenkins, 1987)
15 mg/kg BW PO q8h (Jenkins, 1987)
1-3 mg/kg BW SC, IM, IV; IV duration 2-4 h (Kinsell, 1986)
- M** 10 mg/kg BW SC q3-4h (Flecknell, 1985; Jenkins, 1987)
10 mg/kg BW SC, hourly (Flecknell, 1991)
- N** 2-5 mg/kg BW IM q4h (Flecknell, 1985; Jenkins, 1987)
- R** 10 mg/kg BW SC q4h (Flecknell, 1985; Jenkins, 1987)
10 mg/kg BW SC, hourly (Flecknell, 1991)
- Rb** 10-20 mg/kg BW SC, IM q4h (Flecknell, 1985; Jenkins, 1987)
5 mg/kg BW IV q2-4h (Flecknell, 1991)
- Sw** 2-5 mg/kg BW IM q4h (Swindle and Adams, 1988)

Pentobarbital sodium

- C** 2-4 mg/kg BW IV for sedation (Kinsell, 1986)
D 2-4 mg/kg BW IV for sedation (Kinsell, 1986)

Pethidine

- Gp** 20 mg/kg BW SC, IM q2-3h (Flecknell, 1987)
M 20 mg/kg BW SC, IM q2-3h (Flecknell, 1987)
N 2-4 mg/kg BW IM q3-4h (Flecknell, 1987)
R 20 mg/kg BW SC, IM q2-3h (Flecknell, 1987)
Rb 10 mg/kg BW SC, IM q2-3h (Flecknell, 1987)

Phenacetin

- M** 200 mg/kg BW PO q4h (Flecknell, 1987)
R 100 mg/kg BW PO q4h (Flecknell, 1987)

Phenylbutazone

- C** 15 mg/kg BW IV q8h (Haskins, 1987)
10-14 mg/kg BW PO q12h (Kinsell, 1986)
- D** 15 mg/kg BW IV q8h (Haskins, 1987)
22 mg/kg BW PO q8h (Haskins, 1987)
6-7 mg/lb BW PO q8h with maximum dosage of 800 mg per day, regardless of weight (Kinsell, 1986)
- Gp** 40 mg/kg BW PO (Wilhelmi, 1974)
- M** 30 mg/kg BW PO (Liles and Flecknell, 1992)
- R** 20 mg/kg BW PO (Liles and Flecknell, 1992)

Piroxicam

- D** 0.3 mg/kg BW PO sid in food, then qod for maintenance (Boulay et al., 1995)
- Gp** 5.7 mg/kg BW PO (Albengres et al., 1988)
- M** 3 mg/kg BW PO (Liles and Flecknell, 1992)
- R** 3 mg/kg BW PO (Liles and Flecknell, 1992)
- Rb** 0.3 mg/kg BW PO q48h (Flecknell, 1996)

Telazol—See Tiletamine/zolazepam

Tiletamine/zolazepam (Telazol)

Note: We recommend that users obtain the reference by Schobert, 1987, for the use of Telazol in 52 primate species, 21 cat species, 10 bear species, 8 dog species, 13 members of the Vierridae family, 9 reptile species, 10 species of the Bovidae family, 33 species of the Cervidae family, 36 bird species, and a table of various miscellaneous species. Not recommended in rabbits.

- F** 12 mg/kg BW IM (Morrisey et al., 1996)

Tiletamine/zolazepam and xylazine (respectively)

- H** 20 mg/kg BW IP and 10 mg/kg BW IP (Forsythe et al., 1992)

Xylazine

- Bi** Used in combination with ketamine
- C** 0.5 mg/lb BW IV (Kinsell, 1986)
1 mg/lb BW IM, SC (Kinsell, 1986)
- D** 0.5 mg/lb BW IV (Kinsell, 1986)
1 mg/lb BW IM, SC (Kinsell, 1986)
- Go** 0.05-1 mg/kg BW IM (Swindle and Adams, 1988); however,
this is considered unpredictable when given IM
0.01 mg/kg BW IV (NCSU, 1987)
- Gp** 3-5 mg/kg BW IM (Harkness and Wagner, 1983)
- H** 4 mg/kg BW IM (Bauck, 1989)
- M** 4-8 mg/kg BW IM (Harkness and Wagner, 1983)
10 mg/kg BW IP (Flecknell, 1987)
- N** 1-2 mg/kg BW IM (Green, 1982; CCAC, 1984)
- R** 4-8 mg/kg BW IM (Harkness and Wagner, 1983)
1-3 mg/kg BW IM (Flecknell, 1987)
- Rb** 3-5 mg/kg BW IM (Harkness and Wagner, 1983)
5 mg/kg BW IM (Hughes, 1981)
1-3 mg/kg BW IM (Flecknell, 1987)
- Sh** 0.05-1 mg/kg BW IM (Swindle and Adams, 1988)
0.1-0.15 mg/kg BW slow IV (NCSU, 1987)
- Sw** 10 mg/kg BW IM (Swindle and Adams, 1988)

Xylazine and butorphanol (respectively)

- D** 0.25-0.5 mg/lb BW IM and 0.05-0.25 mg/lb BW IM for induction (Ko et al., 1994)

Xylazine and morphine (respectively)

- D 0.25-0.5 mg/lb BW IM and 0.05-1 mg/lb BW IM for induction (Ko et al., 1994)

Xylazine and oxymorphone (respectively)

- D 0.25-0.5 mg/lb BW IM and 0.025-0.1 mg/lb BW IM for induction (Ko et al., 1994)

Alphadolone/alphaxalone—See Saffan

Avertin—See Tribromoethanol/amylen hydrate

Azaperone and ketamine (respectively)

- M** 75 mg/kg BW IM and 100 mg/kg BW IM (duration of anesthesia approximately 1½ h) (Olson and Renchko, 1988)
- R** 50 mg/kg BW IM and 87 mg/kg BW IM; give ¼ to 1½ times this dose depending on the length of anesthesia required (approximately 1-6 h) (Olson and Renchko, 1988)

Benzocaine

- Am** Larvae: 50 mg/l bath (dissolve in ethanol first) (Crawshaw, 1993)
Frogs and salamanders: 200-300 mg/l bath (Crawshaw, 1993)
- Fi** 20-50 ppm in water (Green, 1982)

Chloral hydrate

- Am** 1-2 ml of a 10% solution injected into dorsal lymph sac (Kaplan, 1969)
- C** 300 mg/kg BW IV (Borchard et al., 1990)
- D** 125 mg/kg BW IV (Borchard et al., 1990)
- Go** 50-300 mg/kg BW IV (Swindle and Adams, 1988)
- Gp** 200-300 mg/kg BW IP of 10% solution (Green, 1982)
- H** 270-360 mg/kg BW IP (Hughes, 1981)
- M** 400 mg/kg BW IP (Borchard et al., 1990)
- R** 200-300 mg/kg BW IP of 10% solution (Green, 1982)
- Sh** 50-300 mg/kg BW IV (Swindle and Adams, 1988)
- Sw** 100-300 mg/kg BW IV (Swindle and Adams, 1988)

Chloralose

- C** 75 mg/kg IV (Borchard et al., 1990)
- D** 80 mg/kg BW IV with 5 mg/kg BW IV thiopental sodium initially, then maintain anesthesia with additional chloralose (1 ml/s IV); respirator required at this dose of chloralose (Grad et al., 1988)
- Go** 45-62 mg/kg BW IV (Swindle and Adams, 1988)
- M** 114 mg/kg BW IP (Hughes, 1981)
- R** 55 mg/kg BW IP (Borchard et al., 1990)
- Rb** 80-100 mg/kg BW IV of 1% solution (Green, 1982)
- Sh** 45-62 mg/kg BW IV (Swindle and Adams, 1988)
- Sw** 55-86 mg/kg BW IV (Swindle and Adams, 1988)

Equithesin

Note: Combine 0.85 g chloral hydrate with 0.21 g sodium pentobarbital (4.2 ml Nembutal), 8.6 ml propylene glycol (4.2 ml Nembutal provides 1.68 ml of this amount), 2.2 ml 100% ethanol, and 6.7 ml water (for a total of 20 ml). Add ethanol and propylene glycol together, then add chloral hydrate, and last Nembutal.

Ethyl alcohol

Am Frogs and toads: immerse in 10% solution (Kaplan, 1969)

Etomidate

M 30 mg/kg BW IP (Green et al., 1981)

Etorphine (M-99)

Re Turtles: 0.5-5.0 mg total dose (for approximately 1.8-kg animal) (Marcus, 1981)

Snakes: 2-15 mg total dose IPP (Marcus, 1981)

Fentanyl and medetomidine (respectively)

R 300 µg/kg BW IP and 300 µg/kg BW IP (Flecknell, 1996)

Rb 8 µg/kg BW IV and 330 µg/kg BW IV (Flecknell, 1996)

Fentanyl and metomidate (respectively)

C 0.02 mg/kg BW IM and 20 mg/kg BW IM (Flecknell, 1996)

G 0.05 mg/kg BW SC and 50 mg/kg BW SC (Flecknell, 1996)

M 0.002-0.006 mg/kg BW SC and 60 mg/kg BW SC (Green et al., 1981)

Fentanyl/droperidol (Innovar-Vet)

Ch 0.20 ml/kg BW IM (Green, 1982)

F 0.5 ml/kg BW IM (Green, 1982)

Gp 0.66-0.88 ml/kg BW IM (Hughes, 1981)

0.5-1.0 ml/kg BW IM (CCAC, 1984)

H Not recommended (Thayer et al., 1972)

M 0.05 ml/g BW IM (Hughes, 1981)

N 1.0 ml/9 kg BW IM (Melby and Altman, 1976)

R 0.02-0.06 ml/100 g BW IP (Wixson et al., 1987)

0.3 ml/kg BW IM (Hughes, 1981)

- Rb** 0.10-0.50 ml/kg BW IM (Green, 1982)
Sw 0.10 ml/kg BW IM (Swindle and Adams, 1988)

Fentanyl/droperidol (Innovar-Vet) and diazepam (respectively)

- H** 1 ml/kg BW IP and 5 mg/kg BW IP (Green, 1982)

Fentanyl/fluanisone (Hypnorm)

- Gp** 0.5 ml/kg BW IM

Note: Addition of 1-2 mg/kg BW IP or IM diazepam is advisable (Cooper, 1984).

- M** 0.5 ml/kg BW IM

Note: Addition of 1-2 mg/kg BW IP or IM diazepam is advisable (Cooper, 1984).

- R** 0.5 ml/kg BW IM (Cooper, 1984)

Fentanyl/fluanisone and diazepam (respectively)

- G** 0.3 ml/kg BW IM, IP and 5 mg/kg BW IP (Flecknell, 1996)
Gp 1 ml/kg BW IM, IP and 2.5 mg/kg BW IP (Flecknell, 1996)
H 1 ml/kg BW IM, IP and 5 mg/kg BW IP (Flecknell, 1996)
M 0.4 ml/kg BW IP and 5 mg/kg BW IP (Flecknell, 1996)
R 0.6 ml/kg BW IP and 2.5 mg/kg BW IP (Flecknell, 1996)
Rb 0.3 ml/kg BW IM and 1-2 mg/kg BW IM, IP, IV (Flecknell, 1996)

Fentanyl/fluanisone and midazolam (respectively)

- Rb** 0.3 ml/kg IM and 1-2 mg/kg BW IP, IV (Flecknell, 1996)

Halothane

Am Terrestrial species: 4-5% in anesthetic chamber to effect
(Crawshaw, 1993)

Hexobarbital

Am 120 mg/kg BW intravascularly (Kaplan, 1969)

M 100 mg/kg BW IP (Taber and Irwin, 1969)

R 100 mg/kg BW IP (Ben et al., 1969)

Hypnorm–See Fentanyl/fluanisone

Inactin

R 80 mg/kg BW IP (Flecknell, 1987)

100-110 mg/kg BW IP (Ellison et al., 1987)

Isoflurane

Am Terrestrial species: 4-5% in anesthetic chamber to effect
(Crawshaw, 1993)

Ketamine (Used alone in mammals, we have found that ketamine is not usually adequate for deep anesthesia, Eds.)

Am 50-150 mg/kg SC, IM (Crawshaw, 1993)

Bi 10-50 mg/kg BW IM (Fowler, 1978; Cooper, 1984)

Note: Rarely used alone (Sinn, 1997).

Ch 44 mg/kg BW IM (Johnson-Delaney, 1996)

F 20-30 mg/kg BW IM (Green, 1982)

20-30 mg/kg BW IM for immobilization (Flecknell, 1987)

20-35 mg/kg BW IM (Andrews and Illman, 1987)

- G** 200 mg/kg BW IM for immobilization (Flecknell, 1987)
- Go** 22-44 mg/kg BW IM (Swindle and Adams, 1988)
- Gp** 44 mg/kg BW IM, atropine recommended (Weisbroth and Fudens, 1972)
100-200 mg/kg BW IM for immobilization (Flecknell, 1987)
- H** 10-30 mg/100 g BW IP (Strittmatter, 1972)
200 mg/kg BW IP for immobilization (Flecknell, 1987)
- M** 44 mg/kg BW IM for sedation (Weisbroth and Fudens, 1972)
100-200 mg/kg BW IP (Hughes, 1981)
200 mg/kg BW IM for immobilization (Flecknell, 1987)
50 mg/kg BW IV (Hughes, 1981)
- N** 10-30 mg/kg BW IM (Welshman, 1985)
African green (*Cercopithecus* spp.): 25-30 mg/kg BW IM (Cramlet and Jones, 1976)
Baboon (*Papio* spp.): 7.5-10 mg/kg BW IM (Cramlet and Jones, 1976)
Chimpanzee (*Pan troglodytes*): 10-15 mg/kg BW IM (Cramlet and Jones, 1976)
Cynomolgus macaque (*Macaca fascicularis*): 20-25 mg/kg BW IM (Cramlet and Jones, 1976)
Gorilla (*Gorilla gorilla*): 12-15 mg/kg BW IM (Cramlet and Jones, 1976)
Patas (*Erythrocebus patas*): 5-7.5 mg/kg BW IM (Cramlet and Jones, 1976)
Rhesus macaque (*Macaca mulatta*): 20-25 mg/kg BW IM (Cramlet and Jones, 1976)
Squirrel monkey (*Saimiri sciureus*): 25-30 mg/kg BW IM (Cramlet and Jones, 1976)
- R** 44 mg/kg BW IM (Weisbroth and Fudens, 1972)
100 mg/kg BW IM for immobilization (Flecknell, 1987)
75 mg/kg BW IP (Waterman and Livingston, 1978)
- Rb** 44 mg/kg BW IM (Weisbroth and Fudens, 1972)
50 mg/kg BW IM for immobilization (Flecknell, 1987)

- 25 mg/kg BW intranasally for light surgical anesthesia (Robertson and Eberhart, 1994)
- Rc** 5-27 mg/kg BW IM (use higher doses for longer anesthetic duration) (Evans and Evans, 1986)
- Re** Snakes: 88-110 mg/kg BW IM (for 3.6- to 4.5-kg animals) (Marcus, 1981)
 Snakes: 22-44 mg/kg BW IM (for <0.9-kg animals) (Marcus, 1981)
 50-130 mg/kg BW IM (Page, 1993)
 Tortoises and turtles: 15-60 mg/kg BW IM (Fowler, 1978)
 Tortoises: 20-80 mg/kg BW IM (Page and Mautino, 1990)
 Chelonians: 20-60 mg/kg BW IM (Page, 1993)
- Sh** 22-44 mg/kg BW IM (Swindle and Adams, 1988)
- Sw** 15-25 mg/kg BW IM (Swindle and Adams, 1988)
 15-20 mg/kg BW IV (Swindle and Adams, 1988)

Ketamine and acepromazine (respectively)

- Bi** 10-25 mg/kg BW IM and 0.5-1 mg/kg BW IM (high-end dose for <250-g bird) (Curro, 1998)
- C** 20 mg/kg BW IM and 0.11 mg/kg BW IM (Flecknell, 1996)
- Ch** 40 mg/kg BW IM and 0.5 mg/kg BW IM (Morgan et al., 1981)
- F** 20-35 mg/kg BW IM, SC and 0.2-0.35 mg/kg BW IM, SC (Morrisey et al., 1996)
- G** 75 mg/kg BW IM and 3 mg/kg BW IM (Flecknell, 1987)
- Gp** 125 mg/kg BW IM and 5 mg/kg BW IM (Flecknell, 1987)
- H** 150 mg/kg BW IM and 5 mg/kg BW IM (Flecknell, 1987)
- M** 100 mg/kg BW IM and 2.5 mg/kg BW IM (Flecknell, 1987)
- N** *Varecia* and *Propithecus* (not *Lemur*): 4 mg/kg BW IM and 0.4 mg/kg BW IM (Feeser and White, 1992)
- R** 75 mg/kg BW IM and 2.5 mg/kg BW IM (Flecknell, 1987)
 30 mg/kg BW IM and 3 mg/kg BW IM (Roman and Osborn, 1987)

- Rb** 75 mg/kg BW IM and 5 mg/kg BW IM (Flecknell, 1987)
50 mg/kg BW IM and 1 mg/kg BW IM (Flecknell, 1996)
- Rc** 8-10 mg/kg BW IM and 2.2 mg/kg BW IM (Evans and Evans, 1986)

Ketamine and azaperone—See Azaperone and ketamine

Ketamine and detomidine (respectively)

- R** 60 mg/kg BW IM and 10 mg/kg BW IM in males (Cox et al., 1994)
40 mg/kg BW IM and 5 mg/kg BW IM in females (Cox et al., 1994)

Ketamine and diazepam (respectively)

- Bi** 10-50 mg/kg BW IM and 0.5-2 mg/kg BW IM (high-end dose for <250-g bird) (Curro, 1998)
5-30 mg/kg BW IM and 0.5-2 mg/kg BW IM, IV (Sinn, 1997)
2.5-5 mg/kg BW IV and 0.5-2 mg/kg BW IM, IV (Sinn, 1997)
- Ch** 20 mg/kg BW IM, IP and 5 mg/kg BW IM, IP (Flecknell, 1987)
20-40 mg/kg BW IM and 1-2 mg/kg BW IM (Johnson-De-laney, 1996)
- F** 25 mg/kg BW IM and 2 mg/kg BW IM (Flecknell, 1987)
25-35 mg/kg BW IM and 2-3 mg/kg BW IM (Morrissey et al., 1996)
- G** 50 mg/kg BW IM and 5 mg/kg BW IP (Flecknell, 1987)
- Gp** 100 mg/kg BW IM and 5 mg/kg BW IM (Flecknell, 1987)
- H** 70 mg/kg BW IP and 2 mg/kg BW IP (Flecknell, 1996)
- M** 200 mg/kg BW IM and 5 mg/kg BW IP (Flecknell, 1987)
- N** 15 mg/kg BW IM and 1 mg/kg BW IM (Flecknell, 1996)

- R 40-80 mg/kg BW IP and 5-10 mg/kg BW IP (Wixson et al., 1987)
- Rb 25 mg/kg BW IM and 5 mg/kg BW IM (Flecknell, 1987)
30-40 mg/kg BW IM and 2-5 mg/kg BW IM (Carpenter et al., 1995)
20-30 mg/kg BW IM and 1-3 mg/kg BW IM when used with isoflurane (Carpenter et al., 1995)

Ketamine and medetomidine (respectively) (not for major surgical procedures)

- C 7 mg/kg BW IM and 80 µg/kg BW IM (Flecknell, 1996)
2-3 mg/kg BW IV and 30-50 µg/kg BW IV (Ko et al., 1997)
3-5 mg/kg BW IM and 40-80 µg/kg BW IM (Ko et al., 1997)
- D 1-3 mg/kg BW IV and 10-20 µg/kg BW IV (Ko et al., 1997)
3-5 mg/kg BW IM and 30-40 µg/kg BW IM (Ko et al., 1997)
2.5-7.5 mg/kg BW IM and 40 µg/kg BW IM (Flecknell, 1996)
- F 5 mg/kg BW IM and 80 µg/kg BW IM (Ko et al., 1997)
4-8 mg/kg BW IM and 50-100 µg/kg BW IM (Wolfensohn and Lloyd, 1994)
- G 75 mg/kg BW IP and 0.5 mg/kg BW IP (Flecknell, 1996)
- Go 1 mg/kg BW IM and 25 µg/kg BW IM (Flecknell, 1996)
- Gp 40 mg/kg BW IP and 0.5 mg/kg BW IP (Flecknell, 1996)
- H 100 mg/kg BW IP and 250 µg/kg BW IP (Flecknell, 1996)
- M 50 mg/kg BW IP and 1 mg/kg BW IP in males (Cruz et al., 1998)
75 mg/kg BW IP and 1 mg/kg BW IP in females (Cruz et al., 1998)
- N Callithricidae: 5-7.5 mg/kg BW IM and 100-150 µg/kg BW IM (Jalanka, 1993)
Pongidae: 3-5 mg/kg BW IM and 70 µg/kg BW IM (Jalanka, 1993)

- R** 75 mg/kg BW IP and 0.5 mg/kg BW IP (Flecknell, 1996)
Rb 5 mg/kg BW IV and 0.35 mg/kg BW IM; use with supplemental oxygen (Hellebrekers et al., 1996)
25 mg/kg BW IM and 0.5 mg/kg BW IM (Flecknell, 1996)
Sh 1 mg/kg BW IM and 25 µg/kg BW IM (Flecknell, 1996)
Sw 10 mg/kg BW IM and 0.08 mg/kg BW IM (Flecknell, 1996)

Ketamine and midazolam (respectively)

- Bi** 10-40 mg/kg BW IM and 0.5-1.5 mg/kg BW IM (high-end dose for <250-g bird) (Curro, 1998)
C 10 mg/kg BW IM and 0.2 mg/kg BW IM (Flecknell, 1996)
Mi 50 mg/kg BW/h IV and 2 mg/kg BW/h IV (4 mmol/(kg·h) sodium bicarbonate also required) (Wamberg et al., 1996)
R 75 mg/kg BW IP and 5 mg/kg BW IP (Flecknell, 1996)
Sw 10-15 mg/kg BW IM and 0.5-2 mg/kg BW IM (Flecknell, 1996)

Ketamine and xylazine (respectively)

- Bi** 10-50 mg/kg BW IM and 1-10 mg/kg BW IM (high-end dose for <250-g bird) (Curro, 1998)
40 mg/kg BW IM and 10 mg/kg BW IM (Heaton and Brauth, 1992)
5-30 mg/kg BW IM and 1-4 mg/kg BW IM (Sinn, 1997)
2.5-5 mg/kg BW IV and 0.25-0.5 mg/kg BW IV (Sinn, 1997)
Ch 35 mg/kg BW IP and 5 mg/kg BW IP (Johnson-Delaney, 1996)
F 25 mg/kg BW IM and 2 mg/kg BW IM (Moreland and Glaser, 1985)
G 50 mg/kg BW IM and 2 mg/kg BW IM (Flecknell, 1987)
Gp 40 mg/kg BW IM and 5 mg/kg BW SC (Flecknell, 1987)
50 mg/kg BW IP and 5 mg/kg BW IP (Strother and Stokes, 1989)

- H 200 mg/kg BW IP and 10 mg/kg BW IP (Flecknell, 1987)
 M 200 mg/kg BW IM and 10 mg/kg BW IP (Flecknell, 1987)

Note: High mortality possible.

- 90-120 mg/kg BW IM and 10 mg/kg BW IM (Harkness and Wagner, 1989)
 N 10 mg/kg BW IM and 0.5 mg/kg BW IM (Flecknell, 1996)
 R 40-80 mg/kg BW IP and 5-10 mg/kg BW IP (Wixson et al., 1987)
 37 mg/kg BW IM and 7 mg/kg BW IM followed by 1-1½ mg/kg BW/min IV and 32-40 µg/kg BW/min IV for up to 12 h (Simpson, 1997)
 90 mg/kg BW IM and 10 mg/kg BW IM (Flecknell, 1987)
 Rb 50 mg/kg BW IM and 10 mg/kg BW IM (Lipman et al., 1987)
 10 mg/kg BW IV and 3 mg/kg BW IV (Flecknell, 1987)
 10 mg/kg BW intranasally and 3 mg/kg BW intranasally (Robertson and Eberhart, 1994)
 35 mg/kg BW IM and 5 mg/kg BW IM (Flecknell, 1996)
 Rc 5-8 mg/kg BW IM and 1.5-3 mg/kg BW IM (Evans and Evans, 1986)
 5.5 mg/kg BW IM and 5.5 mg/kg BW IM (Evans and Evans, 1986)

Ketamine, medetomidine, and diazepam (respectively)

- Rb 20 mg/kg BW IM, 300 µg/kg BW IM, and 0.75-1.5 mg/kg BW IM (Ko et al., 1997)

Ketamine, tiletamine/lorazepam, and xylazine (respectively)

- Sw 2.2 mg/kg BW IM, 4.4 mg/kg BW IM, and 2.2 mg/kg BW IM (Ko et al., 1993)

Ketamine, xylazine, and acepromazine (respectively)

- M** 30 mg/kg BW IM, 6 mg/kg BW IM, and 1 mg/kg BW IM (O'Rourke et al., 1994)
- Rb** 35 mg/kg BW IM, 5 mg/kg BW IM, and 0.75 mg/kg BW IM (Marini et al., 1989).

Note: This provides approximately 30% longer anesthesia and recovery than ketamine-xylazine alone.

35 mg/kg BW IM, 5 mg/kg BW IM, and 1 mg/kg BW IM, SC (Flecknell, 1996)

Ketamine, xylazine, and butorphanol (respectively)

- Rb** 35 mg/kg BW IM, 5 mg/kg BW IM, and 0.1 mg/kg BW IM (Marini et al., 1992)

Ketamine, xylazine, and guaifenesin (respectively)

- Sh** 1 mg/ml, 0.1 mg/ml, and 50 mg/ml in 5% dextrose IV; induction use 1.2 ml/kg; maintenance use 2.6 ml/(kg·h) (Lin et al., 1993)

Ketamine, xylazine, and oxymorphone (respectively)

- Sw** 2 mg/kg BW IV, 2 mg/kg BW IV, and 0.075 mg/kg BW IV for minor surgery (Breese and Dodman, 1984)

M-99—See Etorphine**Medetomidine and butorphanol (respectively) (not for major surgical procedures)**

- C** 30-50 µg/kg BW IV and 0.1-0.2 mg/kg BW IV (Ko et al., 1997)

- 40-80 µg/kg BW IM and 0.1-0.2 mg/kg BW IM (Ko et al., 1997)
- D** 10-20 µg/kg BW IV and 0.1-0.2 mg/kg BW IV (Ko et al., 1997)
- 30-40 µg/kg BW IM and 0.1-0.2 mg/kg BW IM (Ko et al., 1997)
- F** 80 µg/kg BW IM and 0.1-0.2 mg/kg BW IM (Ko et al., 1997)

Medetomidine and morphine (respectively) (not for major surgical procedures)

- D** 10-20 µg/kg BW IV and 0.07-0.1 mg/kg BW IV (Ko et al., 1997)
- 30-40 µg/kg BW IM and 0.2-0.3 mg/kg BW IM (Ko et al., 1997)

Medetomidine and oxymorphone (respectively)(not for major surgical procedures)

- D** 10-20 µg/kg BW IV and 0.01-0.02 mg/kg BW IV (Ko et al., 1997)
- 30-40 µg/kg BW IM and 0.05-0.1 mg/kg BW IM (Ko et al., 1997)

Medetomidine and propofol (respectively)

- Rb** 0.35 mg/kg BW IM and 3 mg/kg BW IV (Hellebrekers et al., 1996)
- 0.25 mg/kg BW IM and 4 mg/kg BW IV (Ko et al., 1992)

Medetomidine, midazolam, and propofol (respectively)

- Rb** 0.25 mg/kg BW IM, 0.5 mg/kg BW IM, and 2 mg/kg BW IV (Ko et al., 1992)

Methohexital

- Gp** 31 mg/kg BW IP (Flecknell, 1987)
- M** 6 mg/kg BW IV (Flecknell, 1987)
- N** 10 mg/kg BW IV (Flecknell, 1987)
- R** 7-10 mg/kg BW IV (Flecknell, 1987)
10-15 mg/kg BW IV (Flecknell, 1996)
- Rb** 10 mg/kg BW IV (Flecknell, 1987)

Methoxyflurane

- C** 3% for induction; 0.5% by inhalation for maintenance (Kinsell, 1986)
- D** 3% for induction; 0.5% by inhalation for maintenance (Kinsell, 1986)

Metomidate

- M** 30-50 mg/kg BW IP (Green et al., 1981)

Pentobarbital and chlorpromazine (respectively)

- M** 40-60 mg/kg BW IP and 25-50 mg/kg IM (Harkness and Wagner, 1989)

Pentobarbital sodium

- Am** Frogs and toads: 60 mg/kg in dorsal lymph sac (Kaplan, 1969; Marcus, 1981)
- Bo** 12-28 mg/kg BW IV (Schultz, 1989)
- C** 30 mg/kg IV to effect for anesthesia (Kinsell, 1986)
- Ch** 40 mg/kg BW IP (Mason, 1997)
30 mg/kg BW IV (Mason, 1997)
- D** 30 mg/kg IV to effect for anesthesia (Kinsell, 1986)

- F** 36 mg/kg BW IP (Andrews and Illman, 1987)
30 mg/kg BW IV (Green, 1982)
- G** 6 mg/100 g BW IP up to 6 mg maximum (Norris, 1987)
- Go** 25-30 mg/kg BW IV (Swindle and Adams, 1988)
- Gp** 28 mg/kg BW IP (Croft, 1964)
- H** 9 mg/100 g BW IP, boost with 1.2 mg/100 g BW (Whitney, 1963)
- M** 40-85 mg/kg BW IP (Cunliffe-Beamer, 1981)
50 mg/kg BW IP followed by a dose of 25 mg/kg BW SC for longer procedures (45-50 min) (Taber and Irwin, 1969)
Neonates (1-4 days): 5 mg/kg BW IP (Taber and Irwin, 1969)
- N** 5-15 mg/kg BW IV (Flecknell, 1987)
- R** 30-40 mg/kg BW IP (Wixson et al., 1987)
40-50 mg/kg BW IP (Flecknell, 1996)
- Rb** 28 mg/kg BW IV, IP (Croft, 1964)
- Rc** 30 mg/kg BW IP (Evans and Evans, 1986)
- Re** Turtles: 16 mg/kg BW IC, IP (Marcus, 1981)
Snakes: 15-30 mg/kg BW IPP (Marcus, 1981)
- Sh** 25-30 mg/kg BW IV (Swindle and Adams, 1988)
15-30 mg/kg BW IV, lower dose for castrated animals (NCSU, 1987)
- Sw** 25-35 mg/kg BW PO (Swindle and Adams, 1988)
30 mg/kg BW IP (Swindle and Adams, 1988)
20-30 mg/kg BW IV (Swindle and Adams, 1988)

Propofol

- M** 20-30 mg/kg BW IV (Mason, 1997)
- N** 7.5-12.5 mg/kg BW IV (Flecknell, 1996)
- R** 10 mg/kg BW IV (Flecknell, 1996)
- Rb** 7.5-15 mg/kg BW IV (Adam et al., 1990)
1.5 mg/kg BW IV bolus followed by 0.2-0.6 mg/(kg·min) continuous infusion (Blake et al., 1988)

Saffan (alphadolone and alphaxalone)

- Bi** 8.0 mg/kg BW IV, with incremental doses up to 25 mg/kg BW maximum (Cooper, 1984)
- C** 9 mg/kg BW IV initially, followed by multiple 3 mg/kg BW IV doses as needed to maintain anesthesia (from product information)
 - 18 mg/kg BW IM initially, followed by multiple 3 mg/kg BW IV doses as needed to maintain anesthesia (from product information)
- Ch** 20-30 mg/kg BW IM (Green, 1982)
- D** Not suitable for use in dogs (Glaxovet guide to Saffan)
- F** 12-15 mg/kg BW IM initially, followed by multiple 6-8 mg/kg BW IV doses as needed to maintain anesthesia (Green, 1982)
- G** 80-120 mg/kg BW IP (Flecknell, 1987)
- Gp** 10-20 mg/kg BW IV (Green, 1982)
 - 40 mg/kg BW IP (Flecknell, 1987)
- H** 150 mg/kg BW IP (Flecknell, 1987)
- M** 5 mg/kg BW IV, with incremental doses up to 20 mg/kg maximum (Cooper, 1984)
 - 90 mg/kg BW IP (Green, 1982)
- N** 6-9 mg/kg BW IV initially, followed by supplemental doses to effect as needed to maintain anesthesia (from product information)
 - 12-18 mg/kg BW IM initially, followed by multiple 6-9 mg/kg BW IV doses as needed to maintain anesthesia from product information)
- R** 5 mg/kg BW IV, with incremental doses up to 20 mg/kg maximum (Cooper, 1984); has been given by slow IV drip for periods up to 10 h without tolerance or cumulation developing (Green, 1982)
 - 10-12 mg/kg BW IV (Flecknell, 1996)
- Rb** 6-9 mg/kg BW IV (Green, 1982); high mortality possible (Flecknell, 1987)

- Re** 9 mg/kg BW IV (Frye, 1981)
12-18 mg/kg BW IM (Cooper, 1984)
Chelonians: 9-18 mg/kg BW IM (Page, 1993)
Lizards: 9-18 mg/kg BW IM (Page, 1993)
- Sw** 12 mg/kg BW IM, then 6-8 mg/kg BW IV every 30 min
(Tong et al., 1995)

Telazol—See Tiletamine and zolazepam

Thiamylal

- N** 25 mg/kg BW IV (Hughes et al., 1975)

Thiopental

- D** 6-12 mg/lb BW IV; lower dose with preanesthetic tranquilization (Kinsell, 1986)
- Go** 20-25 mg/kg BW IV (Swindle and Adams, 1988)
- M** 25-50 mg/kg BW IV (Taber and Irwin, 1969)
25 mg/kg BW IV (Hughes, 1981)
50 mg/kg BW IP (Williams, 1976)
- N** 15-20 mg/kg BW IV (Flecknell, 1987)
22-25 mg/kg BW (Hatch, 1966)
- R** 30 mg/kg BW IV (Flecknell, 1987)
- Rb** 28 mg/kg BW IV, IP (Croft, 1964)
- Re** Snakes: 15-25 mg/kg BW IPP (Marcus, 1981)
- Sh** 20-25 mg/kg BW IV (Swindle and Adams, 1988)
- Sw** 24-30 mg/kg BW IP (Swindle and Adams, 1988)
5-19 mg/kg BW IV (Swindle and Adams, 1988)

Tiletamine

- Rc** 10-12 mg/kg BW IM (Evans and Evans, 1986)

Tiletamine/zolazepam (Telazol)

Note: We recommend that users obtain the reference by Schobert, 1987, for the use of Telazol in 52 primate species, 21 cat species, 10 bear species, 8 dog species, 13 members of the Vierridae family, 9 reptile species, 10 species of the Bovidae family, 33 species of the Cervidae family, 36 bird species, and a table of various miscellaneous species.

- Bi** 7.7-26 mg/kg BW IM (Curro, 1998)
- C** 7.5 mg/kg BW IM and 7.5 mg/kg BW IM (Flecknell, 1996)
- F** 22 mg/kg BW IM (Payton and Pick, 1989)
12-22 mg/kg BW IM (Morrisey et al., 1996)
- G** 60 mg/kg BW IM (Hrapkiewicz et al., 1989)
- Gp** 10-30 mg/kg IM (Fowler, 1978)
- H** Not recommended (Silverman et al., 1983)
- M** Not recommended (Silverman et al., 1983)
- N** 2-6 mg/kg BW IM (Ialeggio, 1989)
Lemurs: 20 mg/kg BW IM (immobilization by dart) (Glander et al., 1992)
- R** 20-40 mg/kg BW IP (Silverman et al., 1983)
- Rb** Not generally recommended (except intranasally); nephrotoxicity (Doerning et al., 1990, 1992)
10-25 mg/kg BW IM (Fowler, 1978)
10 mg/kg BW intranasally (no renal compromise) (Robertson and Eberhart, 1994)
- Re** Chelonians: 10-20 mg/kg BW IM (Page, 1993)
Snakes: 22 mg/kg BW IM (Marcus, 1981)
Snakes: 10-20 mg/kg BW IM (Page, 1993)
Lizards: 30 mg/kg BW IM (Page, 1993)
- Sh** 2.2 mg/kg BW IM (Schultz, 1989)
- Sw** 6.6-11 mg/kg BW IM following xylazine 2 mg/kg BW IM (Schultz, 1989)
6-8 mg/kg BW IM (Flecknell, 1996)

Tiletamine/zolazepam and xylazine (respectively)

- H 30 mg/kg BW IP and 10 mg/kg BW IP (Forsythe et al., 1992)
- Rb 15 mg/kg BW IM and 5 mg/kg BW IM (Popilskis et al., 1991)
- Sw 4.4 mg/kg BW IM and 2.2 mg/kg BW IM (Ko et al., 1993)
6 mg/kg BW IM and 2.2 mg/kg BW IM (Braun, 1993)
2-7 mg/kg BW IM and 0.2-1 mg/kg BW IM (Flecknell, 1996)

Tribromoethanol

- G 250-300 mg/kg BW IP (1.25% solution) (Flecknell, 1987)
- M 125 mg/kg BW IP (0.25% solution) (Flecknell, 1987)
250 mg/kg BW IP (Taber and Irwin, 1969)
0.2 ml/10 g BW IP (1.2% solution) (Papaioannou and Fox, 1993)
- R 300 mg/kg BW IP (Flecknell, 1987)

Tribromoethanol/amylen hydrate (Avertin)

Note: No longer available commercially but can be made. For concentrated solution (66 $\frac{2}{3}$ %), dissolve 1 g 2,2,2-tribromoethanol in 0.5 g amylen hydrate. Take 0.5 ml concentrate and mix with 39.5 ml sterile saline (this is now a 1.25% solution). If solution falls below pH 5.0, discard. **Warning:** Stored solutions are known to be unstable and potentially hepatotoxic. Frequent use may induce chemical peritonitis.

- G 250-300 mg/kg BW IP of 1.25% solution (Flecknell, 1987)
- M 0.2 ml/10 g BW IP of 1.25% solution (The Jackson Laboratory)
- R 300 mg/kg BW IP (Flecknell, 1987)

Tricaine methanesulfonate (MS 222)

- Am** Immerse in 0.1% solution (Kaplan, 1969)
50-150 mg/kg BW SC, IM (Crawshaw, 1993)
Tadpoles and newts: 200-500 mg/l bath to effect (Crawshaw, 1993)
Frogs, salamanders: 500-2000 mg/l bath (buffer with NaHCO₃) (Crawshaw, 1993)
Toads: 1-3 g/l bath (buffer with NaHCO₃) (Crawshaw, 1993)
- Fi** Immerse in 25-100 mg/l water (Klontz, 1964)
- Re** Snakes: 200-300 mg/kg BW IPP (Marcus, 1981)

Urethane

- Am** Frogs and toads: Immerse in 1-2% solution (Kaplan, 1969)
Frogs and toads: Inject 0.04-0.12 ml/g BW of 5% solution into dorsal lymph sac (Kaplan, 1969)
- F** 1500 mg/kg BW IP for acute use only (Andrews and Illman, 1987)
- Fi** Immerse in 5-40 mg/l water (Klontz, 1964)
- Gp** 1500 mg/kg BW IV, IP (Flecknell, 1987)
- H** 1-2 g/kg BW IP (Flecknell, 1996)
- R** 1000 mg/kg BW IP (Flecknell, 1987)
- Rb** 1000 mg/kg BW IV, IP (Flecknell, 1987)
- Re** Turtles: 2.8 g/kg PO (Marcus, 1981)
2.4 g/kg IV (Marcus, 1981)
1.7 g/kg IC (Marcus, 1981)
2.8 g/kg IP (Marcus, 1981)

Acyclovir

- Bi** 80 mg/kg BW IM, IV, PO tid (Ritchie and Harrison, 1997)
20 mg/kg BW PO bid for 7 days (Ritchie and Harrison, 1997)

Amantadine

- F** 6 mg/kg BW as an aerosol bid (Cross, 1995)

Amikacin

- Bi** 40 mg/kg BW IM sid or bid (Burke, 1986)
22 mg/kg BW q12h (Schultz, 1989)
10-15 mg/kg BW IM, IV, SC q8-12h (Ritchie and Harrison, 1997)
Cockatiels: 15-20 mg/kg BW IM, IV, SC q8-12h (Ritchie and Harrison, 1997)
Psittacines: 30 mg/kg BW total daily dose (Van der Heyden, 1994)
Pigeons: 15-20 mg/kg BW IM, IV bid (Johnson-Delaney, 1996)
Ratites: 10 mg/kg BW PO bid (Welsh et al., 1997)

- C** 5-7 mg/kg BW IM, IV bid (Boothe, 1996)
15 mg/kg BW IM, IV sid (Boothe, 1996)
- Ch** 2 mg/kg BW IM, IV, SC tid (Jenkins, 1992)
- D** 7-10 mg/kg BW IM, IV bid (Boothe, 1996)
20 mg/kg BW IM, IV sid (Boothe, 1996)
- N** 2.3 mg/kg BW IM sid (Wissman and Parsons, 1992)
- Rb** 10 mg/kg BW IM, SC q8-12h (Carpenter et al., 1995)
- Re** Tortoises: 5 mg/kg BW IM q48h for 7-14 days (Page and Mautino, 1990)

Amoxicillin

- Bi** 150 mg/kg BW IM q6-8h (Ritchie and Harrison, 1997)
Canaries: 300-500 mg/kg BW PO in soft food (Ritchie and Harrison, 1997)
Ratites: 20 mg/kg BW PO bid (Welsh et al., 1997)
- Bo** 10 mg/kg BW PO q8-12h (Schultz, 1989)
3-5 mg/lb BW IM, SC sid (Kinsell, 1986)
400 mg/100 lb BW PO bid (Sundlof et al., 1991)
62.5 mg (contents of one prepackaged syringe) into each affected quarter q12h for a maximum of 3 treatments (Sundlof et al., 1991)
- C** 5-10 mg/lb BW PO q12h (Kinsell, 1986)
5 mg/lb BW IM, SC sid (Kinsell, 1986)
11-22 mg/kg BW IM, PO, SC q8-12h (Boothe, 1996)
7 mg/kg BW SC sid (Flecknell, 1996)
- D** 5 mg/lb BW PO q12h (Kinsell, 1986)
5 mg/lb BW SC, IM sid (Kinsell, 1986)
20 mg/kg BW PO bid (Carr, 1997)
7 mg/kg BW SC sid (Flecknell, 1996)
- F** 11-22 mg/kg BW PO, SC (Messonnier, 1996)
7 mg/kg BW SC sid (Flecknell, 1996)
25-35 mg/kg BW PO bid (Johnson-Delaney, 1996)
- Gp** Toxic (Flecknell, 1987)

- H** Toxic (Flecknell, 1987)
- M** 100 mg/kg BW SC, IM bid (Flecknell, 1987)
50 mg/kg BW/day in water for 14 days (Russell et al., 1995)
- N** 7 mg/kg BW SC (Flecknell, 1987)
10 mg/kg BW PO (Flecknell, 1987)
11 mg/kg BW PO bid (Fraser, 1991)
11 mg/kg BW SC, IM sid (Fraser, 1991)
- R** 150 mg/kg BW SC, IM bid (Flecknell, 1987)
- Sh** 7 mg/kg BW SC sid (Flecknell, 1996)
- Sw** 7 mg/kg BW SC sid (Flecknell, 1996)

Amoxicillin/clavulanate

- Bi** 125 mg/kg BW PO bid (Ritchie and Harrison, 1997)
Ratites: 10 mg/kg BW PO bid (Welsh et al., 1997)
- C** 13.75-20 mg/kg BW PO bid, tid (Boothe, 1996)
- D** 13.75-20 mg/kg BW PO bid, tid (Boothe, 1996)
- F** 12.5 mg/kg BW PO bid for 10-14 days (Johnson-Delaney, 1996)

Amphotericin B

- Bi** 1.5 mg/kg BW IV q8-12h for 3-7 days (Ritchie and Harrison, 1997)
1 mg/ml in sterile water to nebulize 15 min bid (Ritchie and Harrison, 1997)
- C** 0.25-0.5 mg/kg BW 2-3 times/week on alternate days, slow IV, IP with 5% dextrose and water (Kinsell, 1986)
- D** 0.25-0.5 mg/kg BW 2-3 times/week on alternate days, slow IV, IP with 5% dextrose and water (Kinsell, 1986)
0.25-1.0 mg/kg BW IV sid (Johnson et al., 1981)
- N** 0.25-1.0 mg/kg BW IV sid (Johnson et al., 1981)

Ampicillin

- Bi** 250 mg/8 oz drinking water (change daily) (Burke, 1986)
100-200 mg/kg BW IM, PO q6-8h (Ritchie and Harrison, 1997)
Emus: 15-20 mg/kg BW IM, PO tid (Ritchie and Harrison, 1997)
Ratites: 5 mg/kg BW IM tid (Welsh et al., 1997)
- Bo** Ampicillin trihydrate: 5-10 mg/lb BW IM q8h for up to 7 days (Kinsell, 1986)
- C** Ampicillin sodium: 3 mg/lb BW IV, IM q8-12h (Kinsell, 1986)
Ampicillin trihydrate: 3-8 mg/lb BW IM, SC q8-12h or 10-30 mg/lb BW PO q8-12h (Kinsell, 1986)
22 mg/kg BW IV, PO, SC tid (Hawkins, 1996)
5-10 mg/kg BW IM, IV, SC tid (Boothe, 1996)
10-50 mg/kg BW PO tid (Boothe, 1996)
- D** Ampicillin sodium: 3 mg/lb BW IV, IM q8-12h (Kinsell, 1986)
Ampicillin trihydrate: 3-8 mg/lb BW IM, SC q8-12h or 5-10 mg/lb BW PO q6-8h (Kinsell, 1986)
20 mg/kg BW PO tid (Carr, 1997)
5-10 mg/kg BW IM, IV, SC tid (Boothe, 1996)
10-50 mg/kg BW PO tid (Boothe, 1996)
22 mg/kg BW IV, PO, SC tid (Hawkins, 1996)
- F** 5 mg/kg BW SC sid (McKellar, 1989)
10-30 mg/kg BW SC bid (Johnson-Delaney, 1996)
- Gp** May cause enterocolitis (Bartlett et al., 1978)
6 mg/kg BW SC tid for 5 days (Young et al., 1987)
- H** Toxic (Flecknell, 1987)
- M** 2-10 mg/100 g BW PO bid (Russell et al., 1981)
50-150 mg/kg BW SC bid (Flecknell, 1987)
- N** 30 mg/kg BW IM sid for 5 days (Welshman, 1985)
5 mg/kg BW IM bid (Flecknell, 1987)

- 20 mg/kg BW IM, IV, PO tid (Johnson et al., 1981)
- R** 50-150 mg/kg BW SC bid (Flecknell, 1987)
50 mg/adult rat IP sid for 10 days (Rettig et al., 1989)
- Rb** 22-44 mg/kg BW PO in divided doses (Bowman and Lang, 1986)
10-25 mg/kg BW IM sid for 5-7 days (Bowman and Lang, 1986)
- Re** 3-6 mg/kg BW IM, SC sid until 48 h beyond recovery (Marcus, 1981)
20 mg/kg BW IC bid for 7-9 days (Snipes, 1984)
Tortoises: 20 mg/kg BW IM sid for 7-14 days (Page and Mautino, 1990)

Amprolium

- Bi** 2-4 ml/gal water of 9.6% solution for 5 days (Ritchie and Harrison, 1997)
- Bo** 10 mg/kg BW daily in feed for 5 days (Schultz, 1989)
- D** 100-200 mg/kg BW/day PO in food or water for 7-10 days (Kinsell, 1986)

Apramycin

- Sw** 150 g/ton of food; use for 14 days (Sundlof et al., 1991)
12.5 mg/kg BW PO sid for 7 days (Mortensen et al., 1996)

Carbenicillin

- Bi** 200 mg/kg BW PO bid (Burke, 1986)
100-200 mg/kg BW IM, IV q6-12h (Ritchie and Harrison, 1997)
200 mg/kg BW PO bid (Ritchie and Harrison, 1997)
- D** 10-15 mg/lb BW PO q8h or 5-10 mg/lb BW IV q8h (Kinsell, 1986)

- Re** 100 mg/kg BW initially, then 75 mg/kg IM sid or IV bid (Frye, 1981)
Tortoises: 200-400 mg/kg BW IM q48h for 7-14 days (Page and Mautino, 1990)

Carnidazole

- Bi** 30-50 mg/kg BW once; may repeat in 10-14 days (Ritchie and Harrison, 1997)

Cefadroxil

- Bi** Ratites: 20 mg/kg BW PO bid (Welsh et al., 1997)

Cefazolin

- Bi** 25-50 mg/kg BW IM, IV bid (Ritchie and Harrison, 1997)
C 15-25 mg/kg BW IM, IV, SC q4-8h (Boothe, 1996)
D 15-25 mg/kg BW IM, IV, SC q4-8h (Boothe, 1996)
Gp 100 mg/kg BW IM bid (Fritz et al., 1987)
N 25 mg/kg BW IM, IV bid for 7-10 days (Univ. of Washington, 1987)

Cefotaxime

- Bi** 75-100 mg/kg BW IM, IV q4-8h (Ritchie and Harrison, 1997)
50-100 mg/kg BW IM, IV tid (Ritchie and Harrison, 1997)
C 20-80 mg/kg BW IM, IV qid (Boothe, 1996)
D 20-80 mg/kg BW IM, IV qid (Boothe, 1996)
N 100-200 mg/kg BW IM tid-qid (Pernikoff and Orkin, 1991)
Re Tortoises: 20-40 mg/kg BW IM sid for 7-14 days (Page and Mautino, 1990)

Cefoxitin

- Bi** 50-100 mg/kg BW IM, IV bid, tid (Ritchie and Harrison, 1997)
- C** 10-30 mg/kg BW IM, IV, SC qid (Boothe, 1996)
- D** 10-30 mg/kg BW IM, IV, SC qid (Boothe, 1996)

Ceftazidime

- N** Propithecus: 50 mg/kg BW IM, IV tid (Feeser and White, 1992)
50 mg/kg BW IM tid (Feeser and White, 1992)
- Re** 20 mg/kg BW q72h (Lawrence et al., 1984)

Ceftiofur

- Bi** Ratites: 20 mg/kg BW IM bid (Welsh et al., 1997)
- Bo** 1.1 mg/kg BW IM sid for up to 5 days (Schultz, 1989)
- D** 2.2-4.4 mg/kg BW SC bid (Hoskins, 1997)

Ceftizoxime

- N** 75-100 mg/kg BW IM bid for 7 days (Univ. of Washington, 1987)

Cephalexin

- Bi** 50 mg/kg BW PO qid (Burke, 1986)
Psittacines: 50-100 mg/kg BW PO tid (Ritchie and Harrison, 1997)
Emus: 35-50 mg/kg BW PO qid (Ritchie and Harrison, 1997)
Quail and ducks: 35-50 mg/kg BW PO q2-3h (Ritchie and Harrison, 1997)
- C** 35 mg/kg BW PO q12h (Kinsell, 1986)

- 20-40 mg/kg BW PO tid (Hawkins, 1996)
- 10-30 mg/kg BW PO q6-8h (Boothe, 1996)
- 10 mg/kg BW SC sid (Flecknell, 1996)
- D** 35 mg/kg BW PO q12h (Kinsell, 1986)
- 20-40 mg/kg BW PO tid (Carr, 1997)
- 10-30 mg/kg BW PO q6-8h (Boothe, 1996)
- 10 mg/kg BW SC sid (Flecknell, 1996)
- F** 10 mg/kg BW SC sid (Flecknell, 1996)
- 10-15 mg/kg BW PO bid for 10 days (Johnson-Delaney, 1996)
- G** 25 mg/kg BW SC sid (Flecknell, 1996)
- Gp** 50 mg/kg BW IM sid for 14 days (Richardson, 1992)
- 15 mg/kg BW SC sid (Flecknell, 1996)
- M** 60 mg/kg BW PO bid (Flecknell, 1987)
- 15 mg/kg BW IM bid (Flecknell, 1996)
- N** 20 mg/kg BW PO bid (Flecknell, 1987)
- R** 60 mg/kg BW PO bid (Flecknell, 1987)
- 15 mg/kg BW SC bid (Flecknell, 1996)
- Rb** 15-20 mg/kg BW PO bid (Flecknell, 1987)
- 15 mg/kg BW SC bid (Flecknell, 1996)
- Sh** 10 mg/kg BW SC sid (Flecknell, 1996)
- Sw** 10 mg/kg BW SC sid (Flecknell, 1996)

Cephaloridine

- F** 15 mg/kg BW IM sid (McKellar, 1989)
- G** 30 mg/kg BW IM bid (Flecknell, 1987)
- Gp** 10-25 mg/kg BW IM sid for 5-7 days (Harkness and Wagner, 1977)
- 15-25 mg/kg BW SC sid (Bauck, 1989)
- 12.5 mg/kg BW IM sid for 14 days (Dixon, 1986)
- H** May cause enterocolitis (Bartlett et al., 1978)
- 10 mg/kg BW IM bid (Holmes, 1984)
- 30 mg/kg BW IM bid (Flecknell, 1987)

- M** 30 mg/kg BW IM bid (Flecknell, 1987)
N 11 mg/kg BW IM bid (Melby and Altman, 1976)
 20 mg/kg BW IM bid (Flecknell, 1987)
R 30 mg/kg BW IM bid (Flecknell, 1987)
Rb 10-25 mg/kg BW IM, SC sid for 5 days (Bowman and Lang, 1986)
Re 10 mg/kg BW IM, SC bid (Frye, 1981)

Cephalothin

- Bi** 100 mg/kg BW IM qid (Burke, 1986)
 100 mg/kg BW IM, IV, PO qid (Ritchie and Harrison, 1997)
 Quail and ducks: 100 mg/kg BW IM, IV, PO q2-3h (Ritchie and Harrison, 1997)
C 40-80 mg/kg BW/day IM, IV q8-12h (Kinsell, 1986)
 20-40 mg/kg BW IM, IV, SC tid (Hawkins, 1996)
 15-35 mg/kg BW IM, IV, SC q6-8h (Boothe, 1996)
D 40-80 mg/kg BW/day IM, IV q8-12h (Kinsell, 1986)
 20-40 mg/kg BW IM, IV, SC tid (Hawkins, 1996)
 15-35 mg/kg BW IM, IV, SC q6-8h (Boothe, 1996)
Rb 13 mg/kg BW IM qid for 6 days (Bowman and Lang, 1986)
Re 20-40 mg/kg BW IM bid (Frye, 1981)

Chloramphenicol palmitate (not for use in food animals)

- Bi** 30-50 mg/kg BW PO tid, qid (Ritchie and Harrison, 1997)
C 15-20 mg/lb BW PO q8-12h (Kinsell, 1986)
 25-50 mg/kg BW PO bid (Carr, 1997)
 50 mg/cat PO q4-6h (Boothe, 1996)
Ch 30-50 mg/kg BW PO bid (Jenkins, 1992)
D 20-25 mg/lb BW PO q6-8h (Kinsell, 1986)
 25-50 mg/kg BW PO tid (Carr, 1997)
 50 mg/kg BW PO q4-6h (Boothe, 1996)
F 40 mg/kg BW PO tid for 14 days (Krueger et al., 1989)

- 50 mg/kg BW PO bid for 10 days (Krueger et al., 1989)
- G** 50 mg/kg BW PO bid (Bauck, 1989)
- Gp** 50 mg/kg BW PO bid (Bauck, 1989)
50 mg/kg BW PO tid (Russell et al., 1981)
- H** 20 mg/100 g BW PO tid (Russell et al., 1981)
50 mg/kg BW PO bid (Bauck, 1989)
- M** 20 mg/100 g BW PO tid (oral suspension) (Russell et al., 1981)
100 mg/200 ml drinking water for 3-5 days (Williams, 1976)
50 mg/kg BW PO bid (Bauck, 1989)
- N** 50 mg/kg BW PO bid (Flecknell, 1987)
- R** 20 mg/100 g BW PO tid (Russell et al., 1981)
50 mg/kg BW PO bid (Bauck, 1989)
- Rb** 50 mg/kg BW PO sid for 5-7 days (Harkness and Wagner, 1983)
50 mg/kg BW PO bid (Bauck, 1989)
30-50 mg/kg BW PO bid for 5-7 days (Carpenter et al., 1995)
- Re** Tortoises: 20 mg/kg BW PO bid for 7-14 days (Page and Mautino, 1990)

Chloramphenicol succinate (not for use in food animals)

- Bi** 80 mg/kg BW IM bid or tid (Burke, 1986)
80 mg/kg BW IM, IV, SC bid, tid (Ritchie and Harrison, 1997)
- C** 10 mg/kg BW IM, IV q12h (Kinsell, 1986)
50 mg/cat IM, IV, SC q4-6h (Boothe, 1996)
- D** 10 mg/kg BW IM, IV q12h (Kinsell, 1986)
50 mg/kg BW IM, IV, SC q4-6h (Boothe, 1996)
50 mg/kg BW SC sid (Flecknell, 1996)
- F** 25 mg/kg BW SC sid (Flecknell, 1996)
30-50 mg/kg BW IM, IV bid (Johnson-Delaney, 1996)
- Fi** 75 mg/kg BW PO sid in feed for 14 days (CCAC, 1984)

- G** 30 mg/kg BW IM bid (Flecknell, 1987)
50 mg/60 ml drinking water for 2 weeks (Williams, 1976)
50 mg/kg BW SC bid (Bauck, 1989)
30 mg/kg BW SC bid (Flecknell, 1996)
- Gp** 20 mg/kg BW IM bid (Flecknell, 1987)
50 mg/kg BW SC bid (Bauck, 1989)
- H** 30 mg/kg BM IM bid (Flecknell, 1987)
50 mg/kg BW SC bid (Bauck, 1989)
30 mg/kg BW SC bid (Flecknell, 1996)
- M** 50 mg/kg BW IM bid (Flecknell, 1987)
50 mg/kg BW SC bid (Bauck, 1989)
- N** 25 mg/kg BW IV bid for 10 days (DaRif and Rush, 1983)
50 mg/kg BW IM bid for 10 days (DaRif and Rush, 1983)
110 mg/kg BW IM qid for 5-10 days for pneumococcal
meningoencephalitis (Ialeggio, 1989)
20 mg/kg BW IM bid (Flecknell, 1996)
- R** 50 mg/kg BW IM bid (Flecknell, 1987)
50 mg/kg BW SC bid (Bauck, 1989)
10 mg/kg BW IM bid (Flecknell, 1996)
- Rb** 30 mg/kg BW IM sid for 5-7 days (Harkness and Wagner,
1983)
50 mg/kg BW SC bid (Bauck, 1989)
50 mg/kg BW SC, IM, IV tid (Russell et al., 1981)
30 mg/kg BW IM, IV tid for 5-7 days (Carpenter et al.,
1995)
15 mg/kg BW IM bid (Flecknell, 1996)
- Re** Toads: 5 mg/100 g BW initially, then 3 mg/100 g BW PO
bid for 5 days (Marcus, 1981)
Turtles: 40 mg/kg BW IM, IP bid for 7 days (Marcus, 1981)
Tortoises: 20 mg/kg BW IM bid for 7-14 days (Page and
Mautino, 1990)
- Sw** 11 mg/kg BW IM sid (Flecknell, 1996)

Chlorhexidine

- Bi** 10-25 ml of 2% solution/gal water PO; do not use in finches (Ritchie and Harrison, 1997)
10 ml of 2% solution/gal water PO for 10-14 days (Ritchie and Harrison, 1997)
5-10 mg/kg BW PO (Ritchie and Harrison, 1997)

Chlortetracycline

- Bi** 5000 ppm in food for 30-45 days (Burke, 1986)
Canaries: 1-1.5 g/l drinking water (Ritchie and Harrison, 1997)
Ratites: 20 mg/kg BW PO tid (Welsh et al., 1997)
- Ch** 400 mg/gal drinking water for 4 days (Jenkins, 1992)

Ciprofloxacin

- Bi** Psittacines: 80 mg/kg BW total daily dose (Van der Heyden, 1994)
Pigeons: 5-20 mg/kg BW PO bid for 5-7 days (Johnson-Delaney, 1996)
Ratites: 5 mg/kg BW PO bid (Welsh et al., 1997)
20-40 mg/kg BW IV, PO bid (Ritchie and Harrison, 1997)
- C** 5.2 mg/kg BW PO bid (McKellar, 1996)
5-15 mg/kg BW IV, PO bid (Boothe, 1996)
- D** 5.2 mg/kg BW PO bid (McKellar, 1996)
5-15 mg/kg BW IV, PO bid (Boothe, 1996)
- F** 10-15 mg/kg BW PO bid (Johnson-Delaney, 1996)
- N** 16-20 mg/kg BW PO q12h in sterile water (Kelly et al., 1992)
- Rb** 50 mg/kg BW IM tid for 4 days (Strunk et al., 1985)
40 mg/kg BW IM tid for 28 days (Norden and Shinnors, 1985)

40 mg/kg BW IM bid for 17 days (Bayer et al., 1985)
12-20 mg/kg BW PO (Göbel, 1996)

Clindamycin

- C 11 mg/kg BW PO bid (Boothe, 1996)
- D 11 mg/kg BW PO bid (Boothe, 1996)
- F 10 mg/kg BW PO bid (Johnson-Delaney, 1996)
- Gp May cause enterotoxic cecitis (Bartlett, 1979)

Clofazimine

- Bi Psittacines: 6 mg/kg BW total daily dose (Van der Heyden, 1994)

Clotrimazole

- Bi 30-45 min sid for 3 days of 1% solution, off 2 days; for up to 4 months (Ritchie and Harrison, 1997)

Danofloxacin

- Bi 50 ppm for 3 days (for day-old chicks) (Ritchie and Harrison, 1997)

Dimetridazole

- H 500 mg/l drinking water (La Regina et al., 1980)
- Rb 0.025% solution prepared using 45 g active ingredient/50 gal drinking water (Williams, 1979)

Doxycycline

- Bi 18-26 mg/kg BW oral syrup PO bid in psittacines (Burke, 1986)

- 22-44 mg/kg BW IV sid or bid (Burke, 1986)
25-50 mg/kg BW IV once; used to get peak dose in critical case (Ritchie and Harrison, 1997)
Amazons, cockatoos, and African greys: 0.1% in diet (Ritchie and Harrison, 1997)
Green-winged macaws, Amazons, and cockatiels: 25-50 mg/kg BW PO q24-48h (Ritchie and Harrison, 1997)
African greys, Goffin cockatoos, blue and gold macaws, and pigeons: 25 mg/kg BW sid (Ritchie and Harrison, 1997)
Senegal parrots: 25 mg/kg BW PO bid (Ritchie and Harrison, 1997)
Canaries: 250 mg/l water; 1000 mg/kg in soft food (Ritchie and Harrison, 1997)
Nectar eaters: 8 mg/kg BW PO q12-24h (Ritchie and Harrison, 1997)
C 5-10 mg/kg BW PO bid (Hawkins, 1996)
D 10 mg/kg BW PO bid (Carr, 1997)
5-10 mg/kg BW PO bid (Hawkins, 1996)
N 5 mg/kg BW PO divided bid day 1; 2.5 mg/kg BW the following days (Wolff, 1990)
Rb 2.5 mg/kg BW PO bid (Carpenter et al., 1995)
Re 5-10 mg/kg BW PO sid for 10-45 days (Messonnier, 1996)

Enrofloxacin

- Am** 1.5-10 mg/kg BW IM, SC sid (Göbel, 1996)
Bi 7.5-15 mg/kg BW IM, PO bid (Ritchie and Harrison, 1997)
2.5-5 mg/kg BW IM bid (Roskopf, 1989)
Poultry: 50 ppm in water (McKellar, 1996)
Ratites: 1-2 mg/kg BW IM, PO bid (Welsh et al., 1997)
C 2.5-5 mg/kg BW PO q12-24h (McKellar, 1996)
2.5-5 mg/kg BW IM, SC as a loading dose (McKellar, 1996)
5 mg/kg BW SC sid (Flecknell, 1996)
5 mg/kg BW IV bid (Hardie, 1995)

- Ch** 10 mg/kg BW IM, PO, SC bid (Jenkins, 1992)
2.5-5 mg/kg BW IM, SC, PO bid (Göbel, 1996)
- D** 2.5-5 mg/kg BW PO q12-24h (McKellar, 1996)
2.5-5 mg/kg BW IM, SC as a loading dose (McKellar, 1996)
5 mg/kg BW SC sid (Flecknell, 1996)
5 mg/kg BW IV bid (Hardie, 1995)
- F** 2.5-5 mg/kg BW IM, PO, SC bid (Göbel, 1996)
5-10 mg/kg BW IM, PO, SC bid (Johnson-Delaney, 1996)
- G** 2.5-5 mg/kg BW IM, PO, SC bid (Göbel, 1996)
10 mg/kg BW SC bid (Flecknell, 1996)
- Go** 2.5-5 mg/kg BW IM, SC sid (McKellar, 1996)
- Gp** 5-10 mg/kg BW PO (Dorrestein, 1992)
2.5-5 mg/kg BW IM, PO, SC bid (Göbel, 1996)
5-10 mg/kg BW SC bid (Flecknell, 1996)
100 mg/l water (Dorrestein, 1992)
- H** 5-10 mg/kg BW PO (Dorrestein, 1992)
100 mg/l water (Dorrestein, 1992)
2.5-5 mg/kg BW IM, PO, SC bid (Göbel, 1996)
10 mg/kg BW SC bid (Flecknell, 1996)
- M** 2.5-5 mg/kg BW IM, PO, SC bid (Göbel, 1996)
85 mg/kg BW SC bid for 14 days (Goelz et al., 1994)
85 mg/(kg-d) PO in deionized water for 14 days (Goelz et al., 1994)
- N** 5 mg/kg BW IM, PO q24h for 5 days (Line, 1993)
5 mg/kg BW by gastric intubation sid for 10 days (Line et al., 1992)
50 mg/kg BW SC bid (Flecknell, 1996)
- R** 2.5-5 mg/kg BW IM, PO, SC bid (Göbel, 1996)
10 mg/kg BW SC bid (Flecknell, 1996)
- Rb** 5-10 mg/kg BW IM, SC bid (repeated injections may lead to necrosis, abscesses) (Carpenter et al., 1995)
10 mg/kg BW bid (Mladinich, 1989)
5 mg/kg BW PO bid (Broome et al., 1991)

- 5-10 mg/kg BW PO (Dorrestein, 1992)
100 mg/l water (Dorrestein, 1992)
- Re** 10 mg/kg BW IM, SC sid for 10-14 days (Messonnier, 1996)
2.5-5 mg/kg BW IM, PO bid for 10-14 days (Messonnier, 1996)
- Sh** 2.5-5 mg/kg BW IM, SC sid (McKellar, 1996)
- Sw** 2.5-5 mg/kg IM, PO sid (McKellar, 1996)

Erythromycin

- Bi** 200 mg/10 ml saline for nebulization tid (15 min) (Ritchie and Harrison, 1997)

Note: Do not inject IM; severe muscle necrosis.

- 45-90 mg/kg BW PO bid for 5-10 days (Ritchie and Harrison, 1997)
- C** 5-10 mg/lb BW PO q8h (Kinsell, 1986)
- D** 5-10 mg/lb BW PO q8h (Kinsell, 1986)
- F** 10-15 mg/kg BW PO qid (Johnson-Delaney, 1996)
- Fi** 100 mg/kg BW in feed for 21 days (CCAC, 1984)
- Gp** May cause enterocolitis (Bartlett et al., 1978)
- H** May cause enterocolitis (Bartlett et al., 1978)
- N** 40 mg/kg BW IM sid (Welshman, 1985)
75 mg/kg BW PO bid for 10 days (Univ. of Washington, 1987)

Ethambutol

- Bi** 15 mg/kg BW PO for up to 1 year (Roskopf, 1989)
Psittacines: 30 mg/kg BW total daily dose (Van der Heyden, 1994)
- N** 22.5 mg/kg BW PO sid in grape juice (reduce dose by $\frac{1}{2}$ after 6 weeks) (Wolf et al., 1988)

Fluconazole

N 2-3 mg/kg BW PO (Graybill et al., 1990)

Flucytosine

Bi Psittacines: 150-250 mg/kg BW PO bid for 2-4 weeks
(Ritchie and Harrison, 1997)
Psittacines: 50-250 mg/kg feed (Ritchie and Harrison, 1997)

Furazolidone

Bi 100-200 mg/l water (Ritchie and Harrison, 1997)
200 mg/kg soft food (Ritchie and Harrison, 1997)
N 10-15 mg/kg BW PO sid (Melby and Altman, 1976)
Re 25-40 mg/kg BW PO sid (Frye, 1981)

Gentamicin

Bi Cockatiels: 5-10 mg/kg BW IM q8-12h (Ritchie and Harrison, 1997)
Ratites: 1-2 mg/kg BW IM tid (Welsh et al., 1997)
Most large: 5 mg/kg BW IM bid or tid (Burke, 1986)
Most small: 10 mg/kg BW IM bid or tid (Burke, 1986)
Raptors: 2.5 mg/kg BW IM tid (Burke, 1986)
40 mg/kg BW PO sid or bid (Burke, 1986)
C 2 mg/lb BW IM, SC q12h the first day, then sid (Kinsell, 1986)
2.2 mg/kg BW SC tid (Senior, 1996)
6 mg/kg BW IV sid (Hardie, 1995)
D 2 mg/lb BW IM, SC q12h the first day, then sid (Kinsell, 1986)
2.2 mg/kg BW SC tid (Senior, 1996)
6 mg/kg BW IV sid (Hardie, 1995)
F 5 mg/kg BW IM, SC sid for 5 days (Johnson-Delaney, 1996)

- G** 0.5 mg/100 g BW IM sid (Russell et al., 1981)
5-8 mg/kg BW SC sid (Bauck, 1989)
- Gp** 5-8 mg/kg BW SC sid (Bauck, 1989)
- H** May cause enterocolitis (Bartlett et al., 1978)
0.5 mg/100 g BW IM sid (Russell et al., 1981)
5-8 mg/kg BW SC sid (Bauck, 1989)
- M** 0.5 mg/100 g BW IM sid (Russell et al., 1981)
1.2 g/l drinking water for 3 days (Russell et al., 1981)
5-8 mg/kg BW SC sid (Bauck, 1989)
- N** 2 mg/kg BW IM, IV bid for 10 days (DaRif and Rush, 1983)
2 mg/kg BW IM tid for 7-10 days (Ialeggio, 1989)
Baboons: 3 mg/kg BW IM bid (Ralph et al., 1989)
- R** 0.5 mg/100 g BW IM sid (Russell et al., 1981)
5-8 mg/kg BW SC sid (Bauck, 1989)
- Rb** 4 mg/kg BW IM sid (Russell et al., 1981)
5-8 mg/kg BW SC sid (Bauck, 1989)
2.5 mg/kg BW IM, SC tid for 5 days (Carpenter et al., 1995)
- Re** Nonchelonians: 2.5 mg/kg BW q72h supplemented with
parenteral fluids (Frye, 1981)
Chelonians: 10 mg/kg q48h supplemented with parenteral
fluids (Frye, 1981)
Chelonians: 10-20 mg/15 ml normal saline bid nebulized for
30 min (Snipes, 1984)
Tortoises: 5 mg/kg BW IM q72h for 7-14 days (Page and
Mautino, 1990)

Griseofulvin

- C** 20 mg/kg BW/day PO sid for 6 weeks, or 140 mg/(kg-week)
once each week for 6 weeks (see note) (Kinsell, 1986)
- D** 20 mg/kg BW/day PO sid for 6 weeks, or 140 mg/(kg-week)
once each week for 6 weeks (see note) (Kinsell, 1986)

Note: For C and D, qualified individuals have found that the above dosages may not be adequate and suggest the dosage

of 65 mg/(kg·day). One should consider treatment for at least 6 weeks' duration. The once-a-week treatment is to be discouraged (Kinsell, 1986). One should also consider immune deficiency diseases if treatment appears ineffective (Eds.).

- F** 25 mg/kg BW PO (Ryland and Gorham, 1978)
- Gp** 75 mg/kg BW PO sid for 2 weeks (Harkness and Wagner, 1983)
1.5% in dimethyl sulfoxide applied topically bid for 14 days (Post and Saunders, 1979)
- M** 25 mg/100 g BW PO every 10 days (Russell et al., 1981)
- N** 20 mg/kg BW PO sid (Johnson et al., 1981)
200 mg/kg BW PO once every 10 days (Johnson et al., 1981)
- R** 25 mg/100 g BW PO every 10 days (Russell et al., 1981)
- Rb** 25 mg/100 g BW PO every 10 days (Russell et al., 1981)
2.5 mg/100 g BW PO for 14 days (Russell et al., 1981)
12.5-25 mg/kg BW PO bid for 30 days (Carpenter et al., 1995)

Hetacillin

- C** 25 mg/kg BW PO tid (Senior, 1996)
- D** 25 mg/kg BW PO tid (Senior, 1996)

Imipenem/cilastatin (Primaxin)

- C** 3-10 mg/kg BW IM, IV q6-8h (Boothe, 1996)
2-7.5 mg/kg BW IM, IV tid (Boothe, 1996)
- D** 3-10 mg/kg BW IM, IV q6-8h (Boothe, 1996)
2-7.5 mg/kg BW IM, IV tid (Boothe, 1996)

Isoniazid

- Bi** Psittacines: 30 mg/kg BW total daily dose (Van der Heyden, 1994)

- N** 5 mg/kg BW PO in divided doses (Johnson et al., 1981)
Chimpanzees: 15-25 mg/kg BW PO bid (Fineg et al., 1966)
25 mg/kg BW PO sid in grape juice (reduce dose by $\frac{1}{2}$ after
6 weeks) (Wolf et al., 1988)

Kanamycin

- Bi** 10-20 mg/kg BW IM bid (Burke, 1986)
10-50 mg/l drinking water (change daily) for 3-5 days
(Burke, 1986)
- C** 5-7.5 mg/kg BW IM, IV, SC tid (Boothe, 1996)
2.5 mg/lb BW SC q12h (Kinsell, 1986)
- D** 2.5 mg/lb BW SC q12h (Kinsell, 1986)
5-7.5 mg/kg BW IM, IV, SC tid (Boothe, 1996)
- N** 7.5 mg/kg BW IM bid (Johnson et al., 1981)
- Re** 10-15 mg/(kg·d) in divided doses IV, IM, IP (Frye, 1981)

Ketoconazole

- Bi** Psittacines: 30 mg/kg BW PO q12h (Ritchie and Harrison,
1997)
- C** 10-20 mg/kg BW PO q8-12h (Kinsell, 1986)
- D** 10-20 mg/kg BW PO q8-12h (Kinsell, 1986)
- Re** Tortoises: 30 mg/kg BW PO sid for 2-4 weeks (Page and
Mautino, 1990)

Lincomycin

- Bi** Raptors: 100 mg/kg BW PO sid (Burke, 1986)
100-200 mg/l water PO (Ritchie and Harrison, 1997)
- C** 10 mg/lb BW PO q12h or 7 mg/lb BW PO q8h (Kinsell,
1986)
10 mg/kg BW IM q12h (Kinsell, 1986)
5-10 mg/lb BW slow IV in 5% glucose or normal saline (Kin-
sell, 1986)

Note: Do not continue therapy longer than 12 days; may cause pseudomembranous colitis.

- D** 10 mg/lb BW PO q12h or 7 mg/lb BW PO q8h (Kinsell, 1986)
 10 mg/kg BW IM q12h (Kinsell, 1986)
 5-10 mg/lb BW slow IV in 5% glucose or normal saline (Kinsell, 1986)

Note: Do not continue therapy longer than 12 days; may cause pseudomembranous colitis.

- N** 5-10 mg/kg BW IM bid (Williams, 1976)
Re 6 mg/kg BW IM bid, sid (Frye, 1981)

Marbofloxacin

- C** 2 mg/kg BW PO, SC sid (McKellar, 1996)
D 2 mg/kg BW PO, SC sid (McKellar, 1996)

Methicillin

- N** 50 mg/kg BW IM bid for 7 days (Univ. of Washington, 1987)

Metronidazole

- Bi** Pigeons: 50 mg/kg BW PO bid for 5 days (Johnson-Delaney, 1996)
 Pigeons: 200-250 mg/kg BW PO sid for 3-7 days (Johnson-Delaney, 1996)
 Pigeons: 10-20 mg/kg BW IM sid for 2 days (Johnson-Delaney, 1996)
 Pigeons: 4 g/gal drinking water for 3-7 days (Johnson-Delaney, 1996)
C 10 mg/kg BW PO tid (Boothe, 1996)
D 60 mg/kg BW PO sid for 5 days (Kinsell, 1986)

- 10 mg/kg BW PO tid (Boothe, 1996)
- F** 35 mg/kg BW PO sid for 5 days (Bell, 1994)
- Fi** 50 mg/kg BW PO sid for 5 days (Harms, 1996)
5-10 ppm continuous bath (Harms, 1996)
- Gp** 20 mg/kg BW PO, SC sid (Richardson, 1992)
- M** 2.5 mg/ml drinking water for 5 days (Roach et al., 1988)
- N** 35-50 mg/(kg·day) BW PO bid for 10 days (Holmes, 1984)
- Rb** 20 mg/kg BW PO bid (Carpenter et al., 1995)
- Re** 125-275 mg/kg BW PO once; may be repeated at 7- to 10-day intervals for 1-2 more treatments (Frye, 1981)
Tortoises: 250 mg/kg BW PO once; repeat in 2 weeks (Page and Mautino, 1990)

Minocycline

- C** 5-12.5 mg/kg BW PO bid (Boothe, 1996)
- D** 5-12.5 mg/kg BW PO bid (Boothe, 1996)
- N** 4 mg/kg BW PO (Whitney et al., 1977)
15 mg/kg BW PO q12h for 7 days (Junge et al., 1992)
- Rb** 6 mg/kg BW IV q8h (Nicolau et al., 1993)

Neomycin

- Bi** 10 mg/kg BW PO bid or tid (Burke, 1986)
80-100 mg/l drinking water (Ritchie and Harrison, 1997)
- C** 5-7 mg/lb BW PO q6-24h (Kinsell, 1986)
- D** 5-7 mg/lb BW PO q6-24h (Kinsell, 1986)
- F** 10-20 mg/kg BW PO (Ryland and Gorham, 1978)
10 mg/kg BW PO in divided doses (Flecknell, 1996)
- G** 100 mg/kg BW PO sid (Flecknell, 1987)
10 g/gal drinking water for 5 days, then 5 g/gal for an additional 5 days (Russell et al., 1981)
- Gp** 5 mg/300- to 400-g animal PO bid for 5 days (Farrar and Kent, 1965)
10 mg/kg BW PO sid (Flecknell, 1987; McKellar, 1989)

- 30 mg/kg SC (Flecknell, 1987)
 5 mg/kg BW PO bid (Richardson, 1992)
- H** 5 ml Biosol/100 ml drinking water for 5 days, then give $\frac{1}{2}$ dose for an additional 5 days (Russell et al., 1981)
 125 mg/l drinking water (La Regina et al., 1980)
 10 mg in 0.25 ml water/40-g animal sid via intragastric administration (Sheffield and Beveridge, 1962)
 10 mg/kg BW PO sid (Flecknell, 1987)
- M** 2 mg/ml drinking water for 14 days; prepare fresh daily (Barthold, 1980)
 10 g/gal drinking water for 5 days, then 5 g/gal for an additional 5 days (Russell et al., 1981)
 50 mg/kg BW SC sid (McKellar, 1989)
- N** 10 mg/kg BW PO bid (Flecknell, 1987)
- R** 50 mg/kg BW IM bid (Flecknell, 1987)
 10 g/gal drinking water for 5 days, then 5 g/gal for an additional 5 days (Russell et al., 1981)
 2 mg/ml drinking water (Flecknell, 1996)
- Rb** 30 mg/kg BW PO bid for 5 days (Carpenter et al., 1995)
 0.2-0.8 mg/ml drinking water (Flecknell, 1996)
- Sh** 11 mg/kg BW PO bid (Flecknell, 1996)
- Sw** 11 mg/kg BW PO bid (Flecknell, 1996)

Nitrofurantoin

- C** 1-2 mg/lb BW PO q8h with food (Kinsell, 1986)
- D** 1-2 mg/lb BW PO q8h with food (Kinsell, 1986)
- Gp** 50 mg/kg BW sid for 3 days (Richardson, 1992)
- N** 2-4 mg/kg BW IM, IV tid (Johnson et al., 1981)
- R** 0.2% in feed for 6-8 weeks (Russell et al., 1981)

Nitrofurazone

- Bi** $\frac{1}{8}$ to $\frac{1}{4}$ tsp of 9.3% soluble powder/l of water (change daily) (Burke, 1986)

N 11 mg/kg BW PO sid (Melby and Altman, 1976)

Rb 11 mg/kg BW PO sid (Melby and Altman, 1976)

Norfloxacin

Bi Ratites: 3-5 mg/kg BW PO bid (Welsh et al., 1997)

C 22 mg/kg BW PO bid (McKellar, 1996)

D 22 mg/kg BW PO bid (McKellar, 1996)

M 200 mg/kg BW IM bid (our interpretation of Fromtling et al., 1985, Eds.)

Nystatin

Bi Psittacines: 300,000 IU/kg BW q8-12h for 7-14 days
(Ritchie and Harrison, 1997)

Passerines: 100 IU/l water (Ritchie and Harrison, 1997)

N 200,000 U PO qid until 2 days following recovery (Fraser, 1991)

Re 100,000 IU/kg BW PO sid (Messonnier, 1996)

Orbifloxacin

C 2.5-5 mg/kg BW IM sid (McKellar, 1996)

D 2.5-5 mg/kg BW IM sid (McKellar, 1996)

Go 2.5-5 mg/kg BW IM sid (McKellar, 1996)

Sh 2.5-5 mg/kg BW IM sid (McKellar, 1996)

Sw 2.5-5 mg/kg BW IM sid (McKellar, 1996)

Oxytetracycline

Bi 200 mg/kg BW IM sid (one dose) (Burke, 1986)

Ratites: 5 mg/kg BW IM bid (Welsh et al., 1997)

Bo 7-11 mg/kg BW/day not to exceed 4 consecutive days
(Schultz, 1989)

- C** 20 mg/kg BW PO tid (Carr, 1997)
- D** 20 mg/kg BW PO tid (Carr, 1997)
- G** 800 mg/l drinking water (Williams, 1976)
20 mg/kg BW SC sid (McKellar, 1989)
- H** 20 mg/kg BW SC sid (McKellar, 1989)
- M** 400 mg/l drinking water given continuously (Williams, 1976)
100 mg/kg BW SC bid (Flecknell, 1987)
- N** 10 mg/kg BW SC, IM (Flecknell, 1987)
- R** 60 mg/kg BW SC q72h of long-acting drug (Liquimycin LA-200) (Curl et al., 1988)
- Rb** 30-100 mg/kg BW in divided doses PO (Bowman and Lang, 1986)
400-1000 mg/l drinking water (Bowman and Lang, 1986)
15 mg/kg BW SC, IM (Flecknell, 1987)
15 mg/kg BW IM tid for 7 days (Carpenter et al., 1995)
- Re** 6-10 mg/kg BW IV, IM sid (Frye, 1981)
- Sh** 7-11 mg/kg BW/day not to exceed 4 consecutive days (Schultz, 1989)

Penicillin

- Bi** Penicillin G, benzathine: 100 mg/kg BW IM sid, qod (Ritchie and Harrison, 1997)
- Note:** May cause death if given IV (Ritchie and Harrison, 1997).
- Penicillin G, procaine: 100 mg/kg BW IM q24-48h (Ritchie and Harrison, 1997)
- Note:** Never use procaine in parrots or passerines (Ritchie and Harrison, 1997).
- Bo** Penicillin G, procaine: 20,000-40,000 U/kg BW IM q12h (Schultz, 1989)

- Penicillin G, procaine and penicillin G, benzathine: 20,000-40,000 U/kg BW SC q48h (Schultz, 1989)
- C** Penicillin G, procaine: 40,000 U/kg BW IM q24h (Kinsell, 1986)
- D** Penicillin G, potassium: 20,000 U/kg BW IM, IV (drip) q4-6h (Kinsell, 1986)
Penicillin G, procaine: 40,000 U/kg BW IM sid (Kinsell, 1986)
Penicillin G, procaine and penicillin G, benzathine: 1 ml/10-25 lb BW IM, SC repeat in 48 h (Kinsell, 1986)
- Gp** May cause enterotoxic cecitis (Bartlett, 1979)
- M** Penicillin, potassium: 100,000 IU/kg BW IM bid (do not use procaine penicillin) (Russell et al., 1981)
Penicillin, potassium: 60,000 U/mouse IM (Taber and Irwin, 1969)
- N** Penicillin G, procaine: 20,000 U/kg BW IM bid (Johnson et al., 1981)
Penicillin G, benzathine: 40,000 U/kg BW IM every 3 days (Johnson et al., 1981)
- R** Penicillin, potassium: 100,000 IU/kg BW IM bid (Russell et al., 1981)
Penicillin, oral: 15,000 IU/20 ml drinking water (Williams, 1976)
- Rb** Penicillin G, procaine and penicillin G, benzathine: 42,000 or 84,000 IU/kg BW SC once each week for 3 weeks (Cunliffe-Beamer and Fox, 1981)
Penicillin G, procaine and penicillin G, benzathine: "FloCillin"—2 ml/10 lb BW IM, SC qod (Russell et al., 1981)
Penicillin G, procaine: 60,000 U/kg BW IM sid for 10 days (Jaslow et al., 1981; Welch et al., 1987)
Penicillin G, procaine: 50,000 IU/kg BW sid (Bauck, 1989)
- Re** Penicillin G, procaine and penicillin G, benzathine: 10,000 U

- total penicillin activity/kg BW IM at 24- to 72-h intervals (Frye, 1981)
- Penicillin G, potassium: 10,000-20,000 U/kg BW IM, SC tid or qid (Frye, 1981)
- Sh** Penicillin G, procaine and penicillin G, benzathine: 10,000 or 20,000 U/kg BW IM every 3 or 6 days, respectively (Schultz, 1989)
- Sw** Penicillin G, procaine and penicillin G, benzathine: 10,000-40,000 U/kg BW IM every 3 days (Schultz, 1989)

Piperacillin

- Bi** 100-200 mg/kg BW IM, IV q6-8h (Ritchie and Harrison, 1997)
- Budgerigars: 200 mg/kg BW IM, IV q8h (Ritchie and Harrison, 1997)
- N** 100-150 mg/kg BW IM, IV bid for 7-10 days (Univ. of Washington, 1987)
- 80-100 mg/kg BW IM, IV tid for 7-10 days (Univ. of Washington, 1987)
- Re** 100-400 mg/kg BW IM sid (Messonnier, 1996)

Polymyxin B

- Bi** Canaries: 50,000 IU/l water (Ritchie and Harrison, 1997)
- Rb** 3 mg/300- to 400-g animal PO bid for 5 days (Farrar and Kent, 1965)

Rifampin

- Bi** 10-20 mg/kg BW PO bid (Roskopf, 1989)
- Psittacines: 45 mg/kg BW total daily dose (Van der Heyden, 1994)
- N** 22.5 mg/kg BW PO sid in grape juice (reduce by $\frac{1}{2}$ after 6 weeks) (Wolf et al., 1988)

Spectinomycin

- Bi** Canaries: 200-400 mg/l water (Ritchie and Harrison, 1997)
- D** 2.5-5 mg/lb BW IM q12h (Kinsell, 1986)

Streptomycin sulfate

- Bi** Not for use in psittacines or passerines (Ritchie and Harrison, 1997)
 - 10-15 mg/kg BW IM bid (Burke, 1986)
 - 10-30 mg/kg BW IM q8h (Ritchie and Harrison, 1997)
 - 10-20 mg/kg BW IM bid for 7 days (Roskopf, 1989)
- Fi** 30-40 mg/kg BW IP sid (CCAC, 1984)
- M** 4-5 mg/adult mouse SC sid (McDougall et al., 1967)
- Rb** 10 mg/kg BW IM q4h (CCAC, 1984)
- Re** 10 mg/kg BW IM bid (Frye, 1981)

Succinylsulfathiazole

- Gp** 0.1% in drinking water (Williams, 1976)

Sulfachlorpyridine

- Bi** 0.25 tsp/l water for 5-10 days (Schultz, 1989)
 - Canaries: 150-300 mg/l drinking water (Ritchie and Harrison, 1997)

Sulfadiazine and pyrimethamine (respectively)

- Mi** Toxic

Sulfadimethoxine

- Bi** 20 mg/kg BW PO bid (Burke, 1986)
 - 50 mg/kg BW PO sid for 5 days, off for 3 days, repeat for 5 days (Ritchie and Harrison, 1997)

- Ratites: 0.05% concentration in drinking water (Welsh et al., 1997)
- C** 25 mg/lb BW IM, IP, PO, SC the first day, then 12.5 mg/lb BW q24h for 6 days (Kinsell, 1986)
- Ch** 12.5 mg/kg BW PO bid (Hoefer, 1994)
- D** 25 mg/lb BW IM, IP, PO, SC the first day, then 12.5 mg/lb BW q24h for 6 days (Kinsell, 1986)
- F** 300 mg/kg BW daily in drinking water for 2 weeks (Bell, 1994)
- Mi** Toxic
- Rb** 75-100 mg/kg BW PO sid for 7 days (Rossoff, 1974)
12.5 mg/kg BW PO bid (Carpenter et al., 1995)
- Re** 90 mg/kg BW IV, IM sid first day, then 45 mg/kg BW sid days 2-6 (Frye, 1981)

Sulfamerazine

- Fi** 240 mg/kg BW sid in feed for 14 days (CCAC, 1984)
- Gp** 40 ml 12.5% solution/gal drinking water (Russell et al., 1981)
- M** 0.02% in drinking water (Flecknell, 1987)
- Mi** Toxic
- R** 0.02% in drinking water (Flecknell, 1987)

Sulfamethazine

- Bi** 30 mg/oz drinking water (Ritchie and Harrison, 1997)
Chickens: for coccidia, 128-187 mg/kg BW sid for 2 days, then ½ dose for 4 days (Ritchie and Harrison, 1997)
30 mg/oz solution PO full strength instead of drinking water for 5-7 days (Burke, 1986)
- C** 50 mg/kg BW PO, IV q12h of 12.5% solution (Kinsell, 1986)
- D** 50 mg/kg BW PO, IV q12h of 12.5% solution (Kinsell, 1986)

- Gp** 12.5%: add 4 ml/500 ml drinking water for 1-2 weeks (Williams, 1976)
12.5%: add 1.33-4.14 ml/l drinking water (Melby and Altman, 1976)
166-517 mg/l drinking water (CCAC, 1984)
- H** 665-800 mg/l drinking water (CCAC, 1984)
- M** 12.5%: dilute 1 ml with 49 ml water and give 0.5 ml diluted solution to 30-g mouse bid (Russell et al., 1981)
12.5%: add 5 ml/pt in drinking water (100 mg/kg BW PO) (Russell et al., 1981)
450-1200 mg/l drinking water (CCAC, 1984)
- Mi** Toxic
- N** 66 mg/kg BW PO bid (CCAC, 1984)
- R** 12.5%: add 5 ml/pt drinking water (100 mg/kg BW PO) (Russell et al., 1981)
665-950 mg/l drinking water (CCAC, 1984)
- Rb** 12.5%: add 5 ml/pt drinking water (100 mg/kg BW PO) (Russell et al., 1981)
900-1350 mg/l drinking water (CCAC, 1984)
- Re** 0.5 g/kg BW PO sid first day, then 0.25 g/kg BW days 2-4 (Frye, 1981)

Sulfaquinoxaline

- Bi** Poultry: 0.0125-0.025% in drinking water (Schultz, 1989)
- Bo** 10 g/100 lb BW PO daily for 3-5 days (Schultz, 1989)
- Gp** 0.25-1.0 g/l drinking water for 30 days (Schuchman, 1977)
- Mi** Toxic
- Rb** 0.05% in drinking water (Patton, 1979)
6 mg/lb BW PO for 5-7 days (Russell et al., 1981)
- Re** 0.04% in drinking water for 3-5 days (Frye, 1981)
- Sh** 10 g/100 lb BW PO daily for 3-5 days (Schultz, 1989)
- Sw** 0.0125-0.025% in drinking water (Schultz, 1989)

Sulfasalazine

N 30 mg/kg BW PO bid (Isaza et al., 1992)

Sulfisoxazole

N 50 mg/kg BW PO sid (Johnson et al., 1981)

Tetracycline

Am 1 mg/6 g BW PO (stomach tube) bid for 7 days (mix in small volume of distilled water) (Marcus, 1981)

Bi 250 mg/kg BW of oral suspension bid (Burke, 1986)
50 mg/kg BW PO tid (Ritchie and Harrison, 1997)

C 10-25 mg/lb BW PO q8-12h (Kinsell, 1986)
22 mg/kg BW PO tid (Carr, 1997)

D 10-25 mg/lb BW PO q8-12h (Kinsell, 1986)
22 mg/kg BW PO tid (Carr, 1997)

G 250 mg/100 ml drinking water for 14 days (Williams, 1976)
2 mg/100 g BW PO or IM (Clifford, 1973)
20 mg/kg BW PO bid (Bauck, 1989)

Gp 112-350 mg/l drinking water (CCAC, 1984)
20 mg/kg BW PO bid (Bauck, 1989)
50 mg/kg BW PO by dropper divided into 3 doses (Richardson, 1992)
5 mg/kg BW IM bid (Richardson, 1992)

H 400 mg/l drinking water (La Regina et al., 1980)
20 mg/kg BW PO bid (Bauck, 1989)

M 3-5 mg/ml drinking water for 5-7 days (Harkness and Wagner, 1983)
1 mg/ml drinking water for 7 days (Barthold, 1980)

20 mg/kg BW PO bid (Bauck, 1989)
100 mg/kg BW SC sid (McKellar, 1989)

N 20-25 mg/kg BW PO bid to tid for 7-10 days (Johnson et al., 1981; Univ. of Washington, 1987)

- 25 mg/kg BW IM, IV bid (Univ. of Washington, 1987)
- R** 450-643 mg/l drinking water (CCAC, 1984)
20 mg/kg BW PO bid (Bauck, 1989)
100 mg/kg BW SC (McKellar, 1989)
- Rb** 30-100 mg/kg BW in divided doses PO (Bowman and Lang, 1986)
20 mg/kg BW PO bid (Bauck, 1989)
500-900 mg tetracycline powder in dextrose/l drinking water; fresh twice daily and protect from light (Bauck, 1989)
- Re** 25-50 mg/kg BW PO bid until 48 h past recovery (Marcus, 1981)

Ticarcillin

- Bi** 200 mg/kg BW IM, IV bid to qid (Burke, 1986)
- C** 75-100 mg/kg BW IV q6-8h (Boothe, 1996)
- D** 75-100 mg/kg BW IV q6-8h (Boothe, 1996)

Tilmicosin

- Rb** 25 mg/kg BW SC once (McKay et al., 1996)

Tobramycin

- Bi** 2.5-5 mg/kg BW IM bid (Ritchie and Harrison, 1997)
- C** 2 mg/kg BW IM, IV, SC tid (Boothe, 1996)
- D** 2 mg/kg BW IM, IV, SC tid (Boothe, 1996)
- Gp** 30 mg/kg BW q24h (Kapusnik et al., 1988)

Trimethoprim/sulfadiazine

- C** 5 mg/lb BW sid (Kinsell, 1986)
15 mg/kg BW IM, PO bid (Hawkins, 1996)
- Ch** 30 mg/kg BW IM, PO, SC bid (Jenkins, 1992)

- D** 15 mg/kg BW IM, PO bid (Hawkins, 1996)
 30 mg/kg BW/day PO; in severe infections use ½ daily dose q12h; administer 2-3 days after signs subside but not more than 14 consecutive days (Kinsell, 1986)
 1 ml/5 lb BW of oral suspension (Kinsell, 1986)
 1 ml/20 lb SC sid of 24% injectable (Kinsell, 1986)
- F** 30 mg/kg BW PO or oral suspension (Bell, 1994)
- G** 30 mg/kg BW SC sid (Bauck, 1989)
- Gp** 0.5 ml/kg BW SC of 240 mg/ml solution (Flecknell, 1987)
 30 mg/kg BW SC sid (Bauck, 1989)
- H** 30 mg/kg BW SC sid (Bauck, 1989)
- M** 0.5 ml/kg BW SC of 240 mg/ml solution (Flecknell, 1987)
- N** 0.2 ml/kg BW SC of 240 mg/ml solution (Flecknell, 1987)
 0.1 ml/kg BW SC of 240 mg/ml solution for 7-10 days (Ialleggio, 1989)
 Prosimians: 25 mg/kg BW SC, IM sid (Feeser and White, 1992)
- R** 0.5 ml/kg BW SC of 240 mg/ml solution (Flecknell, 1987)
- Rb** 0.2 ml/kg BW SC bid of 240 mg/ml solution (Flecknell, 1987)
 30 mg/kg BW SC sid (Bauck, 1989)
- Re** Tortoises: 30 mg/kg BW IM, PO q48h for 7-14 days (Page and Mautino, 1990)
 30 mg/kg BW IM, SC sid (Messonnier, 1996)

Trimethoprim and sulfamethoxazole (dosed on sulfa concentration)

- Bi** 100 mg/kg BW PO bid (Burke, 1986)
 25 mg/kg BW PO q12h (Ritchie and Harrison, 1997)
 50 mg/kg BW PO sid (Ritchie and Harrison, 1997)
- G** 15 mg/kg BW PO bid (Bauck, 1989)
- Gp** 15 mg/kg BW PO bid (Bauck, 1989)

- H** 15 mg/kg BW PO bid (Bauck, 1989)
N *Lemur* and *Varecia*: 50 mg/kg BW PO sid (Feeser and White, 1992)
Rb 15 mg/kg BW PO bid (Bauck, 1989)
Re Tortoises: 30 mg/kg BW IM, PO q48h for 7-14 days (Page and Mautino, 1990)

Tylosin

- Bi** 10-40 mg/kg BW IM bid or tid (Burke, 1986)
Bo 17.6 mg/kg BW/day IM not to exceed 5 days (Schultz, 1989)
C 1-5 mg/lb BW IM q12-24h (do not mix with any other solution) (Kinsell, 1986)
10-20 mg/lb BW/day PO divided q6-8h (Kinsell, 1986)
D 1-5 mg/lb BW IM q12-24h (do not mix with any other solution) (Kinsell, 1986)
10-20 mg/lb BW/day PO divided q6-8h (Kinsell, 1986)
G 10 mg/100 g BW PO for 21 days (Russell et al., 1981)
10 mg/kg BW IM, SC sid (McKellar, 1989)
H 100 mg/kg BW PO sid (Flecknell, 1987)
10 mg/100 g BW PO for 21 days (Russell et al., 1981)
10 mg/kg BW IM, SC sid (McKellar, 1989)
M 0.2-0.8 mg/100 g BW IM bid (Russell et al., 1981)
10 mg/kg BW SC bid (Flecknell, 1987)
10 mg/100 g BW PO for 21 days (Russell et al., 1981)
N 10 mg/kg BW IM bid (Welshman, 1985)
R 10 mg/kg BW SC sid (Flecknell, 1996)
5 g/l in drinking water mixed with dextrose; give 100 ml treated water to each rat daily (Carter et al., 1987)
10 mg/kg BW SC bid (Flecknell, 1987)
10 mg/100 g BW PO for 21 days (Russell et al., 1981)
Rb 10 mg/kg BW IM, SC, PO bid (Carpenter et al., 1995)
Re 25 mg/kg BW IM, PO sid for 7 days (Marcus, 1981)

- Sw** 8.8 mg/kg BW IM q12h not to exceed 3 days (Schultz, 1989)
2-10 mg/kg BW IM sid (Flecknell, 1996)

Vancomycin

- H** 20 mg/kg BW PO by gavage (Boss et al., 1994)
Rb 50 mg/kg BW IV q8h (Nicolau et al., 1993)

Acetic acid

- Fi 1-2 g/l water for 1-10 min (Klesius and Rogers, 1995)
- 500 ppm 30-s dip (protozoa, crustacea) (Harms, 1996)

Albendazole

- D 25 mg/kg BW PO q12h for 4 days (Barr et al., 1993)
- N 25 mg/kg BW PO for 5 days (Wolff, 1990)

Amprolium

- Bi 2-4 ml of 9.6% solution/gal water for 5 days (Ritchie and Harrison, 1997)
- Bo 5 mg/kg BW daily in feed for 21 days prophylaxis (Schultz, 1989)
- 10 mg/kg BW daily in feed for 5 days for treatment (Schultz, 1989)
- D 100-200 mg/kg BW PO sid in food or water for 7-10 days (Kinsell, 1986)
- F 19 mg/kg BW daily PO sid or in drinking water (Bell, 1994)
- Fi 10 ppm bath for 7-10 days (Harms, 1996)

- Rb** 9.6% solution: 1 ml/15 lb BW PO for 5 days (Williams, 1979)
1 ml/7 kg BW of 9.6% solution sid for 5 days (Carpenter et al., 1995)
5 ml/gal of 9.6% solution in drinking water for 5 days (Carpenter et al., 1995)

Bunamidine

- C** 25-50 mg/kg BW PO; single dose given on an empty stomach (after 3- to 4-h fast) (Kinsell, 1986)
D 25-50 mg/kg BW PO; single dose given on an empty stomach (after 3- to 4-h fast) (Kinsell, 1986)
N 25 mg/kg BW PO (Williams, 1976)
Re 25-50 mg/kg BW PO, not more often than once every 2-3 weeks (Frye, 1981)

Carbaryl

- Bi** Dust lightly with 5% powder or add to nest box; remove after 24 h (Ritchie and Harrison, 1997)
M Dust with 5% powder or dilute 1:1 with talc (Harkness and Wagner, 1983)
R Dust with 5% powder or dilute 1:1 with talc (Harkness and Wagner, 1983)
Rb Dust with 5% powder or dilute 1:1 with talc (Harkness and Wagner, 1983)

Carnidazole

- Bi** 30-50 mg/kg BW PO once, repeat in 10-14 days if necessary (Ritchie and Harrison, 1997)

Clazuril

- Bi** Pigeons: 2.5 mg/kg BW PO once (Coussement et al., 1988)

Copper sulfate

- Fi** Alkalinity of water divided by 100 = mg/l dose (Klesius and Rogers, 1995)

Decoquate

- F** 0.5 mg/kg BW daily mixed in moist food (Bell, 1994)

Dichlorvos—See Vapona pest strip (DDVP)

- C** 5 mg/lb BW PO (Kinsell, 1986)
D 12-15 mg/lb BW PO in adults (Kinsell, 1986)
 5 mg/lb BW PO in puppies (Kinsell, 1986)
Fi 0.2 ppm continuous in water, repeated weekly for 4 weeks (Harms, 1996)
M 500 mg/kg food for 24 h; repeat in 12 and 24 days (Wagner, 1970)
N 10-15 mg/kg BW PO for 2-3 days (Russell et al., 1981)
 30 mg/kg BW PO once (Melby and Altman, 1976)
R 0.5 mg/g food for 1 day (Wagner, 1970)
Rc 30 mg/kg BW PO (Evans and Evans, 1986)
Re 12.5 mg/kg BW PO daily for 2 doses (Frye, 1981)

Diethylcarbamazine

- C** 25-50 mg/lb BW PO once, repeat in 10-20 days for ascarids (Kinsell, 1986)
D 3-5 mg/lb BW PO sid daily for heartworm prevention (Kinsell, 1986)
 25-50 mg/lb BW PO once; repeat in 10-20 days for ascarids (Kinsell, 1986)
N 50 mg/kg sid for 10 days in orange juice (Eberhard, 1982)

Diiodohydroxyquin

- N 20 mg/kg BW PO bid for 3 weeks (Russell et al., 1981)
- 30 mg/kg BW PO for 10 days (Cummins et al., 1973)
- 630 mg/chimpanzee PO tid for 3 weeks (Van Riper et al., 1966)
- 650 mg daily/animal PO for 10-20 days (Ialeggio, 1989)

Dimetridazole (no longer available)

- H 1 g/l drinking water for 2 weeks (La Regina et al., 1980)
- M 1 g/l drinking water for 2 weeks (Frost, 1977)
- 10 mg/ml drinking water for 5 days (Roach et al., 1988)

Dithiazanine iodide

- M 0.1 mg/g food for 7 days (Williams, 1976)
- N 10-20 mg/kg BW PO sid for 3-10 days (Russell et al., 1981)
- 100 mg/12-20 lb BW bid for 2 weeks (maple syrup acts as vehicle) (Van Riper et al., 1966)
- Re 20 mg/kg BW PO sid for 10 days (Frye, 1981)

Emetine hydrochloride

- Re 0.5 mg/kg BW/day IM, SC sid, bid for 10 days (Frye, 1981)

Fenbendazole

- Am 10 mg/kg BW PO (Cooper, 1985)
- Bi Low margin of safety; see Ritchie and Harrison, 1997, for doses
- Bo 7.5 mg/kg BW PO (Schultz, 1989)
- C 33 mg/kg BW PO sid for 5-7 days (Kinsell, 1986)
- D 50 mg/kg BW PO sid for 3 days (Kinsell, 1986)
- Fi 11 mg/kg BW PO sid for 2 treatments (Harms, 1996)
- 20 mg/kg BW PO once; repeat in 7 days (Harms, 1996)

- 2.5 g/kg feed daily for 3 days; repeat in 14-21 days (Harms, 1996)
- Go** 5 mg/kg BW PO (Schultz, 1989)
- M** 100 ppm in food for 14 days (Reiss et al., 1987)
20 mg/kg BW PO for 5 days (McKellar, 1989)
- N** *Lemur, Varecia*: 50 mg/kg BW PO sid for 3 days (Feeser and White, 1992)
- R** 8-12 mg/kg BW/day in feed daily (150 ppm) on alternating weeks (Coghlan et al., 1993)
20 mg/kg BW PO for 5 days (McKellar, 1989)
- Rb** 50 ppm in food for 5 days (Duwel and Brech, 1981)
20 mg/kg BW PO for 5 days (McKellar, 1989)
- Rc** 50 mg/kg BW PO sid for 3 days (Evans and Evans, 1986)
- Re** Tortoises: 50-100 mg/kg BW PO once; repeat in 2 weeks (Page and Mautino, 1990)
- Sh** 5 mg/kg BW PO (Schultz, 1989)
- Sw** 5 mg/kg BW PO (Schultz, 1989)

Formalin

- Fi** 25 mg/l water in ponds; <250 mg/l water for 1 h in tanks and raceways (Klesius and Rogers, 1995)
10 ppm in bath indefinitely (hybrid striped bass and other sensitive species) (Harms, 1996)
15-25 ppm in bath indefinitely or repeated every 3 days with 70-90% water changes (Harms, 1996)
250 ppm in 5-10 min dip (Harms, 1996)
400 ppm in soft water up to 1-h bath every 3 days for 3 treatments (Harms, 1996)
500 ppm in hard water up to 1-h bath every 3 days for 3 treatments (Harms, 1996)

Furadantin—See Nitrofurantoin

Hydrogen peroxide (3%)

Fi 17.5 ml/l water for 4- to 10-min dip once (Harms, 1996)

Iodoquinol—See Diiodohydroxyquin

Ivermectin

Am *Rana pipiens*: 2 mg/kg BW SC (Letcher and Glade, 1992)

Bi 200-400 µg/kg BW PO or topically in birds <500 g (Clyde, 1996a)

200-400 µg/kg BW IM, SC, PO in birds >500 g (Clyde, 1996a)

Bo 0.2 mg/kg BW SC (Schultz, 1989)

C 400 µg/kg BW SC (Clyde, 1996a)

Ch 200 µg/kg BW PO, SC every 1-2 weeks prn (Hoefer, 1994)

F 1 mg/kg BW SC total dose (Egerton et al., 1980)

200-400 µg/kg BW SC, PO (Messonnier, 1994)

1:20 dilution with propylene glycol for topical treatment of ear mites; repeat in 14 days (Clyde, 1996a)

Gp 500 µg/kg BW SC (McKellar et al., 1992)

400 µg/kg BW SC; repeat in 14 days (Clyde, 1996a)

M 2 mg/kg BW by gavage; repeat in 10 days (Huerkamp, 1990)

1 part 1% ivermectin with 10 parts tap water; mist 1-2 ml over entire cage (Le Blanc et al., 1993)

N 200 µg/kg BW IM; repeat in 10 days (Battles et al., 1988)

200 µg/kg BW SC (Ialeggio, 1989)

200 µg/kg BW PO (Feeser and White, 1992)

R 200 µg/kg BW sid for 5 days by gastric intubation (Battles et al., 1987)

200 µg/kg BW SC once (Findon and Miller, 1987)

3 mg/kg BW PO once (Summa et al., 1992)

2 mg/kg BW PO for 3 treatments at 7- to 9-day intervals (Huerkamp, 1993)

- 2 mg/kg BW topical as a spot method every 14 days for 3 treatments (Kondo et al., 1998)
- Rb** 200-400 µg/kg BW SC, PO (Messonnier, 1994)
200-400 µg/kg BW SC, repeat in 10-14 days (Carpenter et al., 1995)
400 µg/kg BW SC (McKellar et al., 1992)
- Re** Snakes: 200 µg/kg BW SC, IM, PO; repeat in 14 days (Messonnier, 1994)
Snakes and lizards: 200-400 µg/kg BW IM, SC (Clyde, 1996a)
Turtles and tortoises: TOXIC—Do Not Use (Clyde, 1996a)
- Sw** 0.3 mg/kg BW SC (Schultz, 1989)

Levamisole

- Am** 10 mg/kg BW IM (Cooper, 1985)
Xenopus: 12 mg/l water with no more than 1 frog/5 l water (60 mg drug/animal minimum, up to 75 mg/frog) (Iglauer et al., 1997)
- Bi** Australian parakeets: 15 mg/kg BW by gavage; repeat in 10 days (Ritchie and Harrison, 1997)
Anseriformes: 20-50 mg/kg BW by gavage (Ritchie and Harrison, 1997)
Ratites: 30 mg/kg BW by gavage; repeat in 10 days (Ritchie and Harrison, 1997)
Immune modulators: 2 mg/kg BW IM q14 days for 3 treatments (Ritchie and Harrison, 1997)
4-8 mg/kg BW IM once; repeat in 10-14 days (Harrison and Harrison, 1986)
- Bo** 8 mg/kg BW SC, PO (Schultz, 1989)
- Fi** 10 mg/kg BW PO once every 7 days for 3 treatments (Harms, 1996)
11 mg/kg BW IM once every 7 days for 2 treatments (Harms, 1996)

- 50 ppm in 2-h bath for external trematodes (Harms, 1996)
- N** 7.5 mg/kg BW SC; repeat in 2 weeks (Welshman, 1985)
- Rc** 4-10 mg/kg BW PO (Evans and Evans, 1986)
- Re** 5 mg/kg BW intracoelomic once; may be repeated in 2-3 weeks (Frye, 1981)
- Sh** 8 mg/kg BW SC, PO (Schultz, 1989)
- Sw** 8 mg/kg BW SC, PO (Schultz, 1989)

Lime sulfur

- Gp** 1:40 sponged over body weekly for 6 weeks (Russell et al., 1981)

Lindane

- Gp** 1% used as dip (Zajac et al., 1980)

Malachite green

- Fi** 0.1 ppm in continuous bath (Harms, 1996)
2 ppm in 30-min bath (Harms, 1996)

Malathion

- Gp** 0.5% used as dip (Russell et al., 1981)
- M** 5 ml of 1% suspension in bedding (Russell et al., 1981)
- R** 5 ml of 1% suspension in bedding (Russell et al., 1981)
- Rb** 0.5% sponged twice weekly (Russell et al., 1981)

Mebendazole

- Bi** 25 mg/kg BW bid for 5 days (Harrison and Harrison, 1986)
- D** 10 mg active ingredient/lb BW PO sid sprinkled on food for 5 days; may repeat in 3 weeks (Kinsell, 1986)

- Fi** 50 mg/kg BW PO once every 3 weeks for 3 treatments (nematodes) (Harms, 1996)
100 ppm in 10-min to 2-h dip (monogenean trematodes) (Harms, 1996)
- G** 2.2 mg/ml tap water/animal sid for 5 days, by gavage (Smith and Snider, 1988)
- M** 40 mg/kg BW as a drench; repeat in 7 days (Russell et al., 1981)
- N** 3-5 mg/kg BW PO (Russell et al., 1981)
15 mg/kg BW PO for 3 days (Wolff, 1990)
- R** 10 mg/kg BW PO for 5 days (McKellar, 1989)
- Rb** 10 mg/kg BW PO for 5 days (McKellar, 1989)
- Rc** 25-40 mg/kg BW PO sid for 3-5 days (Evans and Evans, 1986)

Methyridine

- R** 125 mg/kg BW SC once (Weisbroth and Scher, 1971)
125 mg/kg BW IP once (Weisbroth and Scher, 1971)
200 mg/kg BW IP once (Peardon et al., 1966)

Metronidazole

- Bi** Pigeons: 50 mg/kg BW PO bid for 5 days (Johnson-Delaney, 1996)
Pigeons: 200-250 mg/kg BW PO sid for 3-7 days (Johnson-Delaney, 1996)
Pigeons: 10-20 mg/kg BW IM sid for 2 days (Johnson-Delaney, 1996)
Pigeons: 4 g/gal drinking water for 3-7 days (Johnson-Delaney, 1996)
- C** 10 mg/kg BW PO tid (Boothe, 1996)
- D** 60 mg/kg BW PO sid for 5 days (Kinsell, 1986)
10 mg/kg BW PO tid (Boothe, 1996)

- F** 35 mg/kg BW PO sid for 5 days (Bell, 1994)
Fi 50 mg/kg BW PO sid for 5 days (Harms, 1996)
5-10 ppm in continuous bath (Harms, 1996)
Gp 20 mg/kg BW PO, SC sid (Richardson, 1992)
M 2.5 mg/ml drinking water for 5 days (Roach et al., 1988)
N 35-50 mg/(kg·day) BW PO bid for 10 days (Holmes, 1984)
Rb 20 mg/kg BW PO bid (Carpenter et al., 1995)
Re 125-275 mg/kg BW PO once, may be repeated at 7- to 10-day intervals for 1-2 more treatments (Frye, 1981)
Tortoises: 250 mg/kg BW PO once; repeat in 2 weeks (Page and Mautino, 1990)

Niclosamide

- Bi** 220 mg/kg BW PO once; repeat in 10-14 days (Harrison and Harrison, 1986)
Finches: 500 mg/kg BW PO once a week for 4 weeks (Harrison and Harrison, 1986)
G 1 mg/10 g BW PO (Burke, 1979)
H 500 mg in 150 g food (Burke, 1979)
10 mg/100 g BW PO as a drench, repeat in 2 weeks (Russell et al., 1981)
M 100 mg/kg BW once PO (Harkness and Wagner, 1983)
500 mg/150 g ground feed for 1 week (Williams, 1976)
N 30 mg/kg BW PO; repeat in 2-3 weeks (Russell et al., 1981)
140 mg/kg BW PO (Williams, 1976)
R 100 mg/kg BW once PO (Harkness and Wagner, 1983)
10 mg/100 g BW as a drench; repeat in 2 weeks (Russell et al., 1981)
1 mg/g feed for 2 weeks separated by 1 week (Russell et al., 1981)
Rb 150 mg/kg BW PO (Williams, 1976)
Re 150 mg/kg BW PO; not more often than once each month (Frye, 1981)

Nitrofurantoin

R 0.2% in feed for 6-8 weeks (Russell et al., 1981)

Nitrofurazone

Fi 75-100 mg/kg BW PO sid for 5-15 days (Harms, 1996)

Paromomycin

N 50 mg/kg BW PO in 3 divided doses sid for 10 days (Williams, 1976)

Phenothiazine

Rb 1 g/50 g molasses-treated feed (Siegmund, 1979)

Piperazine (adipate and citrate)

Bi 100-500 mg/kg BW PO once; repeat in 10-14 days (Ritchie and Harrison, 1997)

Psittacines: not effective (Ritchie and Harrison, 1997)

Bo 110 mg/kg BW PO (Schultz, 1989)

C 0.86 g/lb BW PO; repeat in 10-21 days (Kinsell, 1986)

D 0.86 g/lb BW PO; repeat in 10-21 days (Kinsell, 1986)

G 20-60 mg/100 g BW PO (Russell et al., 1981)

3-5 mg/ml drinking water for 7 days, off 7 days, repeat for 7 days (Russell et al., 1981)

Go 110 mg/kg BW PO (Schultz, 1989)

Gp Piperazine adipate: 4-7 mg/ml drinking water (Williams, 1976)

H 3-5 mg/ml drinking water for 7 days, off 7 days, repeat for 7 days (Russell et al., 1981)

Piperazine citrate: 10 mg/ml drinking water for 7 days, off 5 days, repeat for 7 days (Unay and Davis, 1980)

- Piperazine citrate: 2 ml of 10 mg/ml given once by gavage (Unay and Davis, 1980)
- M** 500 mg/100 ml drinking water for 14 days (Reiss et al., 1987)
- Piperazine adipate: 4-7 mg/ml drinking water for 3-10 days (Williams, 1976)
- Piperazine citrate: 200 mg/kg BW daily in drinking water for 7 days, off 7 days, repeat for 7 days (Hoag, 1961)
- N** 65 mg/kg BW PO sid for 10 days (Russell et al., 1981)
100 mg/kg BW PO (Ialeggio, 1989)
- R** 200 mg/100 ml drinking water (Rossoff, 1974)
- Piperazine adipate: 250 mg/50-60 g BW in drinking water for 3 days (Habermann and Williams, 1957)
- Rb** Piperazine adipate: 0.5 mg/kg BW PO for 2 days (Brooks, 1979)
- Piperazine citrate: 100 mg/ml drinking water for 1 day (USDA, 1976)
- Piperazine powder: 200 mg/kg BW PO (Harkness and Wagner, 1983)
- Rc** 75-150 mg/kg PO (Evans and Evans, 1986)
- Re** Piperazine citrate: 40-60 mg/kg BW PO; not more often than once every 2 weeks (Frye, 1981)
- Sh** 110 mg/kg BW PO (Schultz, 1989)
- Sw** 110 mg/kg BW PO (Schultz, 1989)

Potassium permanganate

- Fi** 2 mg/l water in ponds for an indefinite period; 10 mg/l water for 10 min (Klesius and Rogers, 1995)
1 ppt for 30- to 40-s dip (Harms, 1996)
20 ppm for 1-h bath (Harms, 1996)
2-5 ppm for indefinite bath (Harms, 1996)

Praziquantel

- Bi** Toxic in finches (Ritchie and Harrison, 1997)
 10-20 mg/kg BW PO; repeat in 10 days (Ritchie and Harrison, 1997)
 Toucans for flukes: 10 mg/kg BW PO sid for 14 days, then 6 mg/kg BW PO sid for 14 days (Ritchie and Harrison, 1997)
 For flukes: 9 mg/kg BW IM sid for 3 days, then PO for 11 days (Ritchie and Harrison, 1997)
 For tapeworms: 9 mg/kg BW IM once; repeat in 10 days (Ritchie and Harrison, 1997)
- Fi** 2 ppm in 24-h bath (Harms, 1996)
 1 ppm for >90-h bath or 2 ppm for 4-h bath (*Diplostomum* eye flukes) (Harms, 1996)
 330 mg/kg BW PO once (*Diplostomum* eye flukes) (Harms, 1996)
 500 mg/kg BW PO once (internal cestodes *Bothriocephalus* sp.) (Harms, 1996)
 50 mg/kg BW PO once (internal cestodes *Eubothrium* sp.) (Harms, 1996)
 5 mg/kg BW IP once; repeat in 14-21 days (Harms, 1996)
- M** 5 mg/kg BW SC or 10 mg/kg BW PO (McKellar, 1989)
- N** 0.1 ml/kg BW IM (Droncit injectable) (Welshman, 1985)
 40 mg/kg BW PO, IM once (Wolff, 1990)
- R** 5 mg/kg BW SC or 10 mg/kg BW PO (McKellar, 1989)
- Rb** 5-10 mg/kg BW IM, SC, PO once; repeat in 10 days (Carpenter et al., 1995)
 5 mg/kg BW SC or 10 mg/kg BW PO (McKellar, 1989)
- Rc** 5-10 mg/kg BW IM, PO (Evans and Evans, 1986)
 10-15 mg/kg BW SC; up to 100 mg/kg BW for some trematodes (Evans and Evans, 1986)
- Re** 8-20 mg/kg BW IM, PO once; repeat in 14 days (Messonnier, 1996)

10 mg/kg BW IM, PO; up to 30 mg/kg BW PO for trematodes (Clyde, 1996b)

Pyrantel pamoate

- Bi** 4.5 mg/kg BW PO once; repeat in 10-14 days (Ritchie and Harrison, 1997)
- D** 1 ml/5-20 lb BW PO (Kinsell, 1986)
- N** Lemur: 6 mg/kg BW PO (Feeser and White, 1992)
- Rc** 10-20 mg/kg BW PO (Evans and Evans, 1986)

Pyrethrin

- Rb** 0.5% applied as a dust (Russell et al., 1981)

Pyrivinium pamoate

- H** 0.8 mg/l drinking water for 30 days (Frost, 1977)
- M** 0.8 mg/l drinking water for 28 days (Russell et al., 1981)
- N** 5 mg/kg BW PO every 6 months (more often if needed) (Cummins et al., 1973)
- R** 0.003% in drinking water for 30 days (Blair and Thompson, 1969)
0.012% in food for 30 days (Blair and Thompson, 1969)

Quinacrine hydrochloride

- Bi** 5-10 mg/kg BW PO sid for 7 days (Harrison and Harrison, 1986)
- N** 10 mg/kg BW PO tid every 10 days (Russell et al., 1981)
- R** 75 mg/kg BW PO total dose (Balazs et al., 1962)

Ronnel

- N** 55 mg/kg BW PO qod for 4 treatments, then once weekly for

3 months; a total of 16 treatments (Finegold et al., 1968)

Rotenone

- N** One part rotenone in 3 parts mineral oil applied topically once a week for 2 weeks (Bowman and Griffith, 1987)
- Rb** Mix with mineral oil and apply in ear for 3 days off and on for 3 weeks (Russell et al., 1981)

Sodium chloride

- Fi** 0.5-1% in water for indefinite period; 3% in water for 30 s to 10 min (dip); 1% for 10 min to 2 h (dip) (Klesius and Rogers, 1995)

Tetrachlorethylene

- Re** 0.2 ml/kg BW PO; not more often than once each month (Frye, 1981)

Thiabendazole

- Bi** 250-500 mg/kg BW PO once; repeat in 10-14 days for ascarids (Ritchie and Harrison, 1997)
100 mg/kg BW PO sid for 7-10 days (Ritchie and Harrison, 1997)
- Bo** 66 mg/kg BW PO; 110 mg/kg BW PO for severe parasitism and *Cooperia* (Schultz, 1989)
- M** 100-200 mg/kg BW PO (Harkness and Wagner, 1983)
- N** 50-100 mg/kg BW PO; repeat in 2 weeks (Van Riper et al., 1966)
100 mg/kg BW PO; repeat in 2 weeks, then once every 6 months (Cummins et al., 1973; Ialeggio, 1989)
100 mg/kg BW PO sid for 3 days (Welshman, 1985)

- R** 200 mg/kg BW PO for 5 days (Rossoff, 1974)
0.1% in feed (Harkness and Wagner, 1983)
- Rb** 50 mg/kg BW PO; repeat in 3 weeks (Carpenter et al., 1995)
25 mg/kg BW PO (Williams, 1976)
100 mg/kg BW PO for 5 days (McKellar, 1989)
- Re** 50 mg/kg BW PO as a drench; use as often as necessary (Frye, 1981)
- Sw** 75 mg/kg BW PO (Schultz, 1989)

Thiabendazole and piperazine hydrate (respectively)

- H** 0.1% in diet for 6 weeks, and 0.6% in drinking water starting 2 weeks before the thiabendazole (Taylor, 1992)

Tinidazole

- M** 2.5 mg/ml drinking water for 5 days (Roach et al., 1988)

Trichlorfon

- Fi** 0.25-0.5 ppm in 1-h bath for 5 days (Harms, 1996)
2 ppm in 1-h bath once (Harms, 1996)
5 ppm in 30-min bath once (Harms, 1996)
- M** 1.75 g/l drinking water with 1 g sugar, for 14 days, assuming a mouse consumes 2.2-3.2 ml water daily (Simmons et al., 1965)
175 mg/100 ml drinking water for 14 days (Reiss et al., 1987)

Vapona pest strip (DDVP)

- M** Place a 1 × 1 in. strip on each cage (for 24 h) on each cage-change day for four changings (our interpretation of French, 1987, Eds.)
- Re** 1 strip/1000 cu ft room space; use continuously (Frye, 1981)

MISCELLANEOUS DRUGS

Acetylcysteine

- C 140 mg/kg BW IV once, then repeat q6h with 70 mg/kg BW IV or PO for 7 treatments (Kore, 1997)
- D 140 mg/kg BW IV once, then repeat q6h with 70 mg/kg BW IV or PO for 7 treatments (Kore, 1997)
- M 653 mg/kg PO IP (Borchard et al., 1990)
1200 mg/kg BW PO (Borchard et al., 1990)
- R 400 mg/kg BW IP (Borchard et al., 1990)

Alcuronium

- C 0.1 mg/kg BW IV (Flecknell, 1996)
- D 0.1 mg/kg BW IV (Flecknell, 1996)
- Sw 0.25 mg/kg BW IV (Flecknell, 1996)

Allopurinol

- Bi Budgerigars: 100 mg in 10 ml water, then dilute 1 ml of solution in 30 ml water; give fresh several times daily (Ritchie and Harrison, 1997)
- D 10 mg/kg BW PO q8h, then reduce to 10 mg/kg BW PO sid (Kinsell, 1986)

Alloxan

- C 1 ml 10% solution in citrate-phosphate buffer (pH 3.5-4.0)
given IA at a rate of 0.5 ml/min (Reiser et al., 1987)
750 mg/kg BW PO (Borchard et al., 1990)
- M 75 mg/kg BW IV (Borchard et al., 1990)
- R 40 mg/kg BW IV (Borchard et al., 1990)
200 mg/kg BW IP, SC (Borchard et al., 1990)

Alprazolam

- C 0.1 mg/kg BW tid or prn (Dodman, 1995)

Aminophylline

- Bi 10 mg/kg BW IV q3h; after initial response give PO (Ritchie and Harrison, 1997)
- C 10 mg/kg BW IM, IV q8-12h: for IV use, dilute in 10-20 ml normal saline or 5% dextrose in water and inject slowly (Kinsell, 1986)
- D 10 mg/kg BW IM, IV q8-12h: for IV use, dilute in 10-20 ml normal saline or 5% dextrose in water and inject slowly (Kinsell, 1986)
- N 25-100 mg/animal PO bid (Johnson et al., 1981)
Lemur: 10 mg/kg BW IV (Feeser and White, 1992)
- Re 2-4 mg/kg BW IM as needed (Frye, 1981)

Amitriptyline

- C 5-10 mg total dose PO (Borchard et al., 1990)
2-4 mg/kg BW sid-tid (Dodman, 1995)
0.5-1 mg/kg BW PO sid, bid (Shanley and Overall, 1995)
- D 1-2 mg/kg BW PO (Borchard et al., 1990)
1-2 mg/kg BW PO bid to start (Shanley and Overall, 1995)
- M 1 mg/kg BW IP, PO (Borchard et al., 1990)

- R 20 mg/kg BW IP (Borchard et al., 1990)
- 10 mg/kg BW SC (Borchard et al., 1990)
- 30 mg/kg BW PO (Borchard et al., 1990)

Amphetamine

- M 5 mg/kg BW IP (Taber and Irwin, 1969)

Atenolol

- C 6.25-12.5 mg/kg BW PO q12-24h (Anonymous, 1994)
- D 1 mg/kg BW PO sid (Jacobs, 1996)
- F 6.25 mg/kg BW PO sid (Johnson-Delaney, 1996)

Atipamezole

- C 0.3-0.5 mg/kg BW IV, SC (Flecknell, 1996)
- D 50-400 µg/kg BW IM, IV (Flecknell, 1996)
- G 1 mg/kg BW IP, SC (Flecknell, 1996)
- H 1 mg/kg BW SC (Flecknell, 1996)
- M 1-2.5 mg/kg BW IP (Cruz et al., 1998)
- 1 mg/kg BW IM, IP, SC, IV (Flecknell, 1993)
- R 1 mg/kg BW IP, SC (Flecknell, 1996)
- Rb 0.2 mg/kg BW IV (Flecknell, 1996)
- 1 mg/kg BW IV, SC (Flecknell, 1996)

Atracurionium

- Bi Chickens: 0.25-0.46 mg/kg BW IV (Lukasik, 1995)
- C 0.2 mg/kg BW IV (Flecknell, 1996)
- 0.2-0.25 mg/kg BW IV initial bolus; 0.1-0.15 mg/kg BW IV repeat boluses (Lukasik, 1995)
- 0.25 mg/kg BW IV loading dose followed by 3-8 µg/kg BW/min IV infusion (Lukasik, 1995)

- D** 0.5 mg/kg BW IV (Flecknell, 1996)
0.2-0.25 mg/kg BW IV initial bolus; 0.1-0.15 mg/kg BW IV repeat boluses (Lukasik, 1995)
0.25 mg/kg BW IV loading dose followed by 3-8 µg/kg BW/min IV infusion (Lukasik, 1995)

Atropine

- Bi** 0.01-0.04 mg/kg BW IM, SC (Ritchie and Harrison, 1997)
0.01-0.04 mg/kg BW IM, SC (Harrison and Harrison, 1986)
Organophosphate toxicity: 0.1-0.5 mg/kg BW IM, SC repeated as needed (Ritchie and Harrison, 1997)
- Bo** 0.6-0.12 mg/kg BW IV (Schultz, 1989)
For organophosphate poisoning: 0.5-1.0 mg/kg BW IV; may repeat in 1-2h (Schultz, 1989)
- C** 0.05 mg/kg BW IM, IV, SC q6h (Kinsell, 1986)
- Ch** 0.15 mg SC, IM, IV (Rossoff, 1974)
- D** 0.05 mg/kg BW IM, IV, SC q6h (Kinsell, 1986)
- F** 0.05 mg/kg BW IM, SC (Andrews and Illman, 1987)
- G** 0.02-0.05 mg/kg BW SC, IM, IV (CCAC, 1984)
- Go** 0.04-0.80 mg/kg BW IM (Swindle and Adams, 1988)
0.13 mg/kg BW IV (Swindle and Adams, 1988)
- Gp** 0.02-0.05 mg/kg SC, IM, IV (CCAC, 1984)
- H** 0.02-0.05 mg/kg BW SC, IM, IV (CCAC, 1984)
- M** 0.05 mg/kg BW IM, SC, IV (Green, 1982)
0.02-0.05 mg/kg BW SC, IM, IV (CCAC, 1984)
- N** 0.10 mg/kg BW SC (Domino et al., 1969)
0.05 mg/kg BW SC, IM, IV (CCAC, 1984)
- R** 0.04 mg/kg BW IM (Weisbroth and Fudens, 1972)
0.02-0.05 mg/kg BW SC, IM, IV (CCAC, 1984)
- Rb** 0.20 mg/kg BW IM, IV, SC (Green, 1982)
For organophosphate overdose: 10 mg/kg BW SC every 20 min (Harkness and Wagner, 1983)
1-3 mg/kg BW IM, SC 30 min before surgery (Green, 1982)

- Re** 0.04 mg/kg BW IM, IV, SC, PO as needed (Frye, 1981)
Sh 0.04-0.80 mg/kg BW IM (Swindle and Adams, 1988)
0.13 mg/kg BW IV (Swindle and Adams, 1988)
Sw 0.05-0.5 mg/kg BW SC (Swindle and Adams, 1988)
0.044-0.4 mg/kg BW IM (Swindle and Adams, 1988)

Benazepril

- D** 0.25 mg/kg BW PO sid (Martin, 1996)

Betamethasone

- Gp** 0.1-0.2 ml IM, SC (Richardson, 1992)

Bretylum

- C** 15 mg/kg BW IV (Borchard et al., 1990)
D 5 mg/kg BW IV (Borchard et al., 1990)
M 12.5 mg/kg BW IV (Borchard et al., 1990)
N 200 mg/kg BW PO (Borchard et al., 1990)
R 5 mg/kg BW IV (Borchard et al., 1990)
400 mg/kg BW PO (Borchard et al., 1990)
Rb 10 mg/kg BW IV (Borchard et al., 1990)
Sw 5 mg/kg BW IV (Schumann et al., 1993)

Bromhexine

- Bi** 0.15 mg/100 g BW IM bid, sid (Harrison and Harrison, 1986)

Buspirone

- C** 2-4 mg/kg BW PO bid (Dodman, 1995)
0.5-1 mg/kg BW PO sid (Shanley and Overall, 1995)
D 1 mg/kg BW PO sid (Shanley and Overall, 1995)

Calcitonin—See Neo-Calgluon

- Re** 50 IU/kg BW IM; use in conjunction with oral calcium supplementation (Messonnier, 1996)

Calcium EDTA

- Bi** 35 mg/kg BW bid for 5 days; repeat in 3-4 days if necessary (Ritchie and Harrison, 1997)
- Bo** 110 mg/kg BW IP, IM in 1-2% solution in 5% glucose; skip 2 days and repeat for 2 days for up to 10-14 days (Schultz, 1989)

Calcium gluconate

- Bi** 5 ml/30 ml water PO (Ritchie and Harrison, 1997)
50-500 mg/kg BW IV slowly to effect (Ritchie and Harrison, 1997)
- Re** 500 mg/kg BW once each week for 4-6 weeks (Messonnier, 1996)

Calcium gluconate/calcium lactate

- Bi** 5-10 mg/kg BW IM bid prn (Ritchie and Harrison, 1997)

Calcium glycerophosphate (Calphosan)

- Bi** 0.5-1 ml/kg BW IM once; may repeat weekly (Harrison and Harrison, 1986)

Captopril

- C** 0.5-2 mg/kg BW PO tid (Anonymous, 1994)
- D** 0.5-2 mg/kg BW PO tid (Jacobs, 1996)

Chloroquine phosphate

- N 150 mg/kg adult rhesus monkey PO days 1 and 3 (Schofield et al., 1985)

Chlorpheniramine

- Gp 5 mg/kg BW SC (Borchard et al., 1990)
M 1 mg/kg BW IP (Borchard et al., 1990)
N 0.5 mg/kg BW/day PO in divided doses (Johnson et al., 1981)

Chlorpromazine

- C 1-2 mg/kg BW IV, IM q12h (Kinsell, 1986)
D 0.5 mg/kg BW IM tid (Hoskins, 1997)
1.1-6.6 mg/kg BW IM q6-24h (Kinsell, 1986)
0.55-4.4 mg/kg BW IV q6-12h (Kinsell, 1986)
G 0.5 mg/kg BW IM (CCAC, 1984)
Go 2.2 mg/kg BW PO (Swindle and Adams, 1988)
1.0-4.4 mg/kg BW IM (Swindle and Adams, 1988)
0.22-1.10 mg/kg BW IV (Swindle and Adams, 1988)
Gp 0.5 mg/kg BW IM (CCAC, 1984)
H 0.5 mg/kg BW IM (Melby and Altman, 1976)
M 3-5 mg/kg BW IV or 3-35 mg/kg BW IM (Harkness and Wagner, 1983)
N 1-3 mg/kg BW IM (Melby and Altman, 1976)
2-5 mg/kg BW PO (CCAC, 1984)
R 3-5 mg/kg BW IV or 3-35 mg/kg BW IM (Harkness and Wagner, 1983)
Rb 1-10 mg/kg BW IM (Carpenter et al., 1995)
Sh 2.2 mg/kg BW PO (Swindle and Adams, 1988)
1-4.4 mg/kg BW IM (Swindle and Adams, 1988)
0.22-1.10 mg/kg BW IV (Swindle and Adams, 1988)

- Sw** 0.5-4.0 mg/kg BW IM (Swindle and Adams, 1988)
0.55-3.3 mg/kg BW IV (Swindle and Adams, 1988)

Cholestyramine (for reversal of antibiotic-induced enterocolitis)

- Rb** Cholestyramine (2 g active ingredient, which is equivalent to 4 g Questran™) in 20 ml drinking water for 21 days (Lipman et al., 1989)

Cimetidine

- Bi** 2.5-5 mg/kg BW IV q6-12h slow injection over 30-40 min (Ritchie and Harrison, 1997)
D 5-10 mg/kg BW IM, IV bid, tid (Hoskins, 1997)
5-10 mg/kg BW IV, PO tid, qid (Washabau and Hall, 1997)
F 10 mg/kg BW IV, PO tid (Harrenstien, 1994)
Rb 5-10 mg/kg BW q6-12h (Carpenter et al., 1995)

Cisapride

- Bi** 0.5-1.5 mg/kg BW PO tid (Ritchie and Harrison, 1997)
C 0.1-1 mg/kg BW PO bid, tid (Washabau and Hall, 1997)
D 0.1-1 mg/kg BW PO bid, tid (Washabau and Hall, 1997)

Clomipramine

- C** 1-1.5 mg/kg BW PO sid (Dodman, 1995)
0.5 mg/kg BW PO sid (Shanley and Overall, 1995)
D 1 mg/kg BW PO bid for 2 weeks, then 2 mg/kg BW PO bid for 2 weeks, then 3 mg/kg BW PO bid for 4 weeks (maintenance) (Shanley and Overall, 1995)

Cortisone

- R** 0.25-1.25 mg/day SC, IM, PO (Rossoff, 1974)

Cyclosporine

- R 100 mg/kg BW/day SC (Thliveris et al., 1991)
- 25 mg/kg BW/day IP (Thliveris et al., 1991)
- 15 mg/kg BW/day SC (Sonnino et al., 1990)

Cyproterone

- D 1.25-2.5 mg/kg BW/day for 10 days (Cotard, 1996)

Delmadinone acetate

- D 3 mg/kg BW SC once (Cotard, 1996)

Deoxycorticosterone pivalate

- D 2.2 mg/kg BW IM every 25 days (Sullivan and Graziani, 1996)

Dexamethasone

- Bi 0.5-2 mg/kg BW IM, IV sid (Ritchie and Harrison, 1997)
- Bo 5-20 mg IV, IM, PO (Schultz, 1989)
- C 0.125-0.5 mg sid or divided doses IV, IM, PO (Kinsell, 1986)
- D 0.25-1.25 mg sid or divided bid PO (Kinsell, 1986)
- 0.25-1.0 mg sid IM, IV (Kinsell, 1986)
- F 0.5-1 mg/kg BW IM, SC (Johnson-Delaney, 1996)
- 2-4 mg/kg BW IM, IV once (Johnson-Delaney, 1996)
- Gp 0.1 ml SC (Richardson, 1992)
- N 0.25-1.0 mg/kg BW PO, IM total dose (Melby and Altman, 1976)
- Re 0.125-0.625 mg/kg BW IV, IM as needed (Frye, 1981)

Dexamethasone sodium phosphate

- Bo 1-2 mg/kg BW slow IV (Schultz, 1989)

- C 1-5 mg/kg BW slow IV (Schultz, 1989)
- D 1-5 mg/kg BW slow IV (Schultz, 1989)
- Sh 1-2 mg/kg BW slow IV (Schultz, 1989)

Dextrose

- Bi 50-100 mg/kg BW slow IV (Ritchie and Harrison, 1997)

Diethylstilbestrol

- Bi 0.03-0.1 ml of 0.25 mg/ml stock/30 g BW IM (Harrison and Harrison, 1986)
1 drop of 0.25 mg/ml stock/30 ml drinking water (Harrison and Harrison, 1986)
- C 0.05-0.1 mg/day PO (Kinsell, 1986)
- D 0.1-1 mg/day PO (Kinsell, 1986)

Digoxin

- D 0.006-0.009 mg/kg BW PO bid to achieve 1-2 ng/ml serum concentration (Jacobs, 1996)

Diltiazem

- C 7.5 mg/kg BW PO tid (Anonymous, 1994)
- D 0.5-1.5 mg/kg BW PO tid (Jacobs, 1996)
- F 3.75-7.5 mg/animal PO bid (Johnson-Delaney, 1996)

Dimethyl sulfoxide

- Bi 1 ml/kg BW topically every 4-5 days or weekly (Ritchie and Harrison, 1997)
- D Apply topically; do not exceed 20 ml/day for 14 days (Kinsell, 1986)

Diphenhydramine

- Bi** 2-4 mg/kg BW q12h IM, IV, PO (Ritchie and Harrison, 1997)
- C** 4 mg/kg BW PO q8h (Kinsell, 1986)
0.5 mg/lb BW IV (considered a high dose by Kinsell, 1986)
- D** 4 mg/kg BW PO q8h (Kinsell, 1986)
0.5 mg/lb BW IV (considered a high dose by Kinsell, 1986)
- F** 0.5-2 mg/kg BW IM, IV, PO bid or tid prn (Johnson-Delaney, 1996)
- Gp** 5 mg/kg BW SC (Melby and Altman, 1976)
12.5 mg/kg BW IP (Borchard et al., 1990)
- N** *Lemur*: 5 mg/kg BW IM (Feeser and White, 1992)
- R** 10 mg/kg BW SC (Borchard et al., 1990)

Diphenoxylate/atropine sulfate

- N** 1 ml/animal PO tid (Holmes, 1984)

Doxapram

- Bi** 5-10 mg/kg BW IV, IM once (Harrison and Harrison, 1986)
- C** 5-10 mg/kg BW IV; may repeat in 15-20 min (Kinsell, 1986)
- D** 5-10 mg/kg BW IV; may repeat in 15-20 min (Kinsell, 1986)
- F** 5-11 mg/kg BW IV (Johnson-Delaney, 1996)
1-2 mg/kg BW IV (Flecknell, 1987)
- G** 5-10 mg/kg BW IV (Flecknell, 1987)
- Go** 2-10 mg/kg BW IV (Swindle and Adams, 1988)
- Gp** 5 mg/kg BW IV (Flecknell, 1987)
10-15 mg/kg BW IM, SC (Richardson, 1992)
- H** 5-10 mg/kg BW IV (Flecknell, 1987)
- M** 5-10 mg/kg BW IV (Flecknell, 1987)
- N** 2 mg/kg BW IV (Flecknell, 1987)
- R** 5-10 mg/kg BW IV (Flecknell, 1987)

- Rb 2-5 mg/kg BW IV (Flecknell, 1987)
- Sh 2-10 mg/kg BW IV (Swindle and Adams, 1988)
- Sw 2-10 mg/kg BW IV (Swindle and Adams, 1988)

Doxepin

- Bi 0.5-1 mg/kg BW PO bid (Ritchie and Harrison, 1997)
- D 3-5 mg/kg BW PO bid (Shanley and Overall, 1995)

Edrophonium

- C 0.5 mg/kg BW IV (Lukasik, 1995)
- D 0.5 mg/kg BW IV (Lukasik, 1995)

Enalapril

- D 0.5 mg/kg BW PO sid, bid (Jacobs, 1996)
0.5 mg/kg BW PO sid (package insert)
- F 0.5 mg/kg BW PO q48h (Johnson-Delaney, 1996)

Esmolol

- C 0.25-0.5 mg/kg BW IV slow bolus; 50-200 $\mu\text{g}/(\text{kg}\cdot\text{min})$ infusion (Anonymous, 1994)
- D 0.25-0.5 mg/kg BW IV slow bolus; 50-200 $\mu\text{g}/(\text{kg}\cdot\text{min})$ infusion (Anonymous, 1994)

Flumazenil

- Bi Quail: 0.1 mg/kg BW IM (Day and Boge, 1996)

Fluoxetine

- Bi 2.3-3 mg/kg BW PO sid (Dodman, 1997)
- C 0.5 mg/kg BW PO sid (Shanley and Overall, 1995)
- D 1 mg/kg BW PO sid (Shanley and Overall, 1995)

Flutamide

D 5 mg/kg BW/day PO for 7 days (Cotard, 1996)

Furosemide

Bi 0.15-2 mg/kg BW IM, IV q12-24h (Ritchie and Harrison, 1997)

0.05 mg/300 g BW IM bid (Harrison and Harrison, 1986)

C 2 mg/kg BW IV q12h to a maximum total dose of 5 mg (Kinsell, 1986)

2-4 mg/kg PO q8-12h (Kinsell, 1986)

D 2 mg/kg BW IV q12h to a maximum total dose of 40 mg (Kinsell, 1986)

2-4 mg/kg PO q8-12h (Kinsell, 1986)

N 2 mg/kg BW PO (Johnson et al., 1981)

Re 5 mg/kg BW IM, IV sid or bid (Frye, 1981)

Gallamine

Am 6 mg/kg BW in ventral lymph sac (Lumb and Jones, 1984)

C 1 mg/kg BW IV (Flecknell, 1996)

D 1 mg/kg BW IV (Flecknell, 1996)

Go 4 mg/kg BW IV (Flecknell, 1996)

Gp 0.1-0.2 mg/kg BW IV (Flecknell, 1996)

M 1.2 mg/kg BW IV (Lumb and Jones, 1984)

R 1 mg/kg BW IV (Flecknell, 1996)

0.01 mg/kg BW IV (Borchard et al., 1990)

Rb 1 mg/kg BW IV (Flecknell, 1996)

0.2-0.3 mg/kg BW IV (Lumb and Jones, 1984)

Sh 1 mg/kg BW IV (Flecknell, 1996)

Sw 2 mg/kg BW IV (Flecknell, 1996)

Glycopyrrolate

C 5 µg/lb or 0.25 ml/10 lb BW IM (package insert)

- D 0.01 mg/kg BW IM (Ko et al., 1997)
0.01 mg/kg BW IV (Flecknell, 1996)
- F 0.01 mg/kg BW IM, SC (Mason, 1997)
0.01-0.02 mg/kg BW IM, SC (Mason, 1997)
- G 0.01-0.02 mg/kg BW IM, SC (Mason, 1997)
- Gp 0.01-0.02 mg/kg BW IM, SC (Mason, 1997)
- N 13-17 µg/kg IM (Sanders et al., 1991)
- R 0.5 mg/kg BW IM (Flecknell, 1996)
0.01-0.02 mg/kg BW IM, SC (Mason, 1997)
- Rb 0.1 mg/kg BW IM, SC (Flecknell, 1996)
0.011 mg/kg BW IV (Aeschbacher, 1995)
0.01 mg/kg BW IV (Flecknell, 1996)

Gonadotropin-releasing hormone

- F 20 µg IM; repeat in 12 days if necessary (Kolmstetter et al., 1996)

Heparin

- C 1 mg/kg BW IV (Kinsell, 1986)
- D 1 mg/kg BW IV (Kinsell, 1986)
- Gp 5 mg/kg BW IV (Melby and Altman, 1976)
- M 10 mg/kg BW IV (Melby and Altman, 1976)
- N 2 mg/kg BW IV (Melby and Altman, 1976)
- R 10 mg/kg BW IV (Borchard et al., 1990)
- Rb 5 mg/kg BW IV (Melby and Altman, 1976)

Human chorionic gonadotropin (hCG)

- F 100 IU IM; repeat in 12 days if necessary (Kolmstetter et al., 1996)
100 IU IM, SC; may repeat in 2 weeks (Johnson-Delaney, 1996)

Hydralazine

D 0.5-2 mg/kg BW PO bid (Jacobs, 1996)

Indapamide

R 3 mg/kg BW IP (Delbarre and Delbarre, 1988)

Insulin

N Start NPH insulin at 0.25-0.5 U/kg BW/day SC (Schultz, 1989)

Iodine (Lugol's)

Bi 2 ml/30 ml water stock; dose at 1 drop in each 250 ml water given daily for goiter (Harrison and Harrison, 1986)

Iron dextran

Bi 10 mg/kg BW IM; repeat weekly (Harrison and Harrison, 1986)

Kaolin

Gp 0.2 ml given 3-4 times daily (Kaopectate V) (Richardson, 1992)

Kaolin/pectin

N 0.5-1 ml/kg BW PO q2-6h (Johnson et al., 1981)

Levallorphan

Any species: give 1 mg levallorphan (up to a maximum of 0.5 mg/kg BW) for every 50 mg of morphine that was given (Green, 1982)

Levonorgestrel

N 1 mg/kg BW PO q24h (Mann et al., 1986)

Levothyroxine

Bi 20 µg/kg BW PO q12-24h (Ritchie and Harrison, 1997)

Loperamide

D 0.08 mg/kg BW PO qid (Chiapella, 1988)

Rb 0.1 mg/kg BW PO tid for 3 days, then sid for 2 days (Banerjee et al., 1987)

Medroxyprogesterone acetate

Bi 5-25 mg/kg BW IM, SC q4-6h (Ritchie and Harrison, 1997)

Megestrol acetate

D 0.55 mg/kg PO for 4 weeks (Cotard, 1996)

F Not recommended (Kolmstetter et al., 1996)

Meprobamate

Gp 100 mg/kg BW IM (Melby and Altman, 1976)

H 100 mg/kg BW IM (Melby and Altman, 1976)

M 100 mg/kg BW IM (Melby and Altman, 1976)

N 100-400 mg/kg BW PO (Melby and Altman, 1976)

R 150 mg/kg BW IM (Melby and Altman, 1976)

Rb 50-150 mg/kg BW IM (Melby and Altman, 1976)

Methylprednisolone

C 1 mg/kg BW IM/week (Kinsell, 1986)

- D 20 mg or less intrasynovially (Kinsell, 1986)
1 mg/kg BW IM/week (Kinsell, 1986)
- Gp 2 mg/kg BW IM every 30 days (Bauck, 1989)

Metoclopramide

- C 0.2-0.5 mg/kg BW PO tid (Washabau and Hall, 1997)
- Ch 0.5 mg/kg BW SC tid (Johnson-Delaney, 1996)
- D 0.2-0.4 mg/kg BW SC tid (Hoskins, 1997)
0.2-0.5 mg/kg BW PO tid (Washabau and Hall, 1997)
1-2 mg/kg BW/day IV over 24 h (Hoskins, 1997)
- Rb 0.2-0.5 mg/kg BW PO, SC (Carpenter et al., 1995)
0.2-0.4 mg/kg BW SC sid-tid (Messonnier, 1996)

Metocurine

- Am 0.94 mg/kg BW in ventral lymph sac (Lumb and Jones, 1984)
- M 0.08-0.1 mg/kg BW IV (Lumb and Jones, 1984)
- R 0.009 mg/kg BW IV (Lumb and Jones, 1984)
- Rb 0.01-0.015 mg/kg BW IV (Lumb and Jones, 1984)

Mineral oil

- Bi 1-3 drops/30 g BW PO once (Harrison and Harrison, 1986)
5 ml/kg BW PO once (Harrison and Harrison, 1986)
- C 2-6 ml PO (Kinsell, 1986)
- D 5-30 ml PO (Kinsell, 1986)

Misoprostol

- C Not recommended (Kore, 1997)
- D 2-5 µg/kg BW PO tid (Kore, 1997)

Nalbuphine

- G** 4 mg/kg BW IP, SC (Flecknell, 1996)
- Gp** 1 mg/kg BW IP, SC (Flecknell, 1996)
- H** 2 mg/kg BW SC (Flecknell, 1996)
- M** 4 mg/kg BW IP, SC (Flecknell, 1996)
- R** 0.1 mg/kg BW IV (Flecknell, 1996)
1 mg/kg BW IP, SC (Flecknell, 1996)
- Rb** 1 mg/kg BW IP, SC (Flecknell, 1996)
0.1 mg/kg BW IV (Flecknell, 1996)

Nalorphine

Note: Any species: give 1 mg nalorphine (up to a maximum of 2 mg/kg BW) for every 10 mg of morphine that was given (Green, 1982)

- C** 1 mg/kg BW IM, IV, SC; no more than 5 mg per dose (Kinsell, 1986)
- D** 5 mg/kg BW IM, IV, SC; no more than 5 mg per dose (Kinsell, 1986)
- M** 2 mg/kg BW IV (Harkness and Wagner, 1983)
- R** 2 mg/kg BW IV (Harkness and Wagner, 1983)
- Rb** 2 mg/kg BW IV (Harkness and Wagner, 1983)

Naloxone

- C** 0.04 mg/kg BW IM, IV, SC (Short, 1997)
- D** 0.04 mg/kg BW IM, IV, SC (Short, 1997)
Dose to effect, usually 0.2-0.4 mg total dose IM, SC, IV (Kinsell, 1986)
- G** 0.01-0.1 mg/kg BW IP, IV (Flecknell, 1987)
- Gp** 0.01-0.1 mg/kg BW IP, IV (Flecknell, 1987)
- H** 0.01-0.1 mg/kg BW IP, IV (Flecknell, 1987)

- M** 0.05-0.1 mg/kg BW IM, IP, IV (Flecknell, 1993)
0.01-0.1 mg/kg BW IP, IV (Flecknell, 1987)
- N** 0.01-0.05 mg/kg BW IM, IV (Flecknell, 1987)
2-3 ml SC, IM, IV (Rosenberg, 1991)
- R** 0.01-0.1 mg/kg BW IP, IV (Flecknell, 1987)
- Rb** 0.01-0.1 mg/kg BW IM, IV (Flecknell, 1987)

Naltrexone

- C** 2-4 mg/kg BW sid (Dodman, 1995)

Neo-Calglucon

- Re** 1 ml/kg BW PO bid, prn (used with calcitonin) (Messonnier, 1996)

Neostigmine

- C** 40-60 µg/kg BW IV (Lukasik, 1995)
- D** 40-60 µg/kg BW IV (Lukasik, 1995)

Omeprazole

- C** 0.7 mg/kg BW PO sid (Washabau and Hall, 1997)
Not recommended (Kore, 1997)
- D** 0.7 mg/kg BW PO sid (Washabau and Hall, 1997)

Oxytocin

- Bi** 5 U/kg BW IM, IV, SC once (Ritchie and Harrison, 1997)
- Bo** 75-100 U IM, IV (Schultz, 1989)
- C** 5-10 U IM, IV, SC (Kinsell, 1986)
- D** 5-30 U IM, IV, SC (Kinsell, 1986)
- Gp** 0.2-0.3 U/kg BW IM (Harrenstien, 1994)
1-2 U IM (Richardson, 1992)

- N** 5-20 U IM, IV total dose (Melby and Altman, 1976)
- R** 1 U SC, IM total dose (Rossoff, 1974)
- Rb** 1-2 U IM, SC total dose (Melby and Altman, 1976)
- Sh** 30-50 U IM, IV, SC (Kinsell, 1986)
- Sw** 30-50 U IM, IV, SC (Kinsell, 1986)

Pancuronium

- C** 0.06 mg/kg BW IV (Flecknell, 1996)
0.03-0.1 mg/kg BW IV initial bolus; 0.015-0.05 mg/kg BW
IV repeat boluses (Lukasik, 1995)
0.1 mg/kg BW IV (Borchard et al., 1990)
- D** 0.06 mg/kg BW IV (Flecknell, 1996)
0.03-0.1 mg/kg BW IV initial bolus; 0.015-0.05 mg/kg BW
IV repeat boluses (Lukasik, 1995)
0.1 mg/kg BW IV (Borchard et al., 1990)
- Go** 0.06 mg/kg BW IV (Flecknell, 1996)
- Gp** 0.06 mg/kg BW IV (Flecknell, 1996)
- M** 0.03 mg/kg BW IV (Lumb and Jones, 1984)
- R** 2 mg/kg BW IV (Flecknell, 1996)
- Rb** 0.1 mg/kg BW IV (Flecknell, 1996)
0.008 mg/kg BW IV (Lumb and Jones, 1984)
- Sh** 0.06 mg/kg BW IV (Flecknell, 1996)
- Sw** 0.06 mg/kg BW IV (Flecknell, 1996)

Parachloramphetamine

- R** 2 mg/kg BW IP once (Saito et al., 1996)

Note: Used for chemically induced ejaculation in rats.

Pindolol

- D** 0.125-0.25 mg/kg BW PO bid (Dodman and Shuster, 1994)

Prednisolone

- C For prolonged use, 2-4 mg/kg BW PO qod (Kinsell, 1986)
For immune suppression, 3 mg/kg BW IM, PO q12h (Kinsell, 1986)
For allergy, 1 mg/kg BW IM, PO q12h (Kinsell, 1986)
- D For prolonged use, 0.5-2 mg/kg BW PO qod (Kinsell, 1986)
For immune suppression, 2 mg/kg BW IM, PO q12h (Kinsell, 1986)
For allergy, 0.5 mg/kg BW IM, PO q12h (Kinsell, 1986)

Prednisolone sodium succinate

- Bi 10-20 mg/kg BW IV, IM every 15 min to effect (Harrison and Harrison, 1986)
- D 5.5-11 mg/kg BW IV, then repeat at 1, 3, 6, or 10 h prn (Kinsell, 1986)
- N 1-15 mg/kg BW PO total dose (Melby and Altman, 1976)
1-5 mg/kg BW/day PO (Rosenberg et al., 1987)
10 mg/kg BW IV (Feaser and White, 1992)
Lemur: 10 mg/kg BW IV (Feaser and White, 1992)
- Re 5-10 mg/kg BW IM, IV as needed (Frye, 1981)

Prednisone

- N 0.5-1 mg/kg BW PO bid for 3-5 days, then sid for 3-5 days, then q48h for 10 days, then ½ dose q48h (Isaza et al., 1992)

Prednisone and azathioprine (respectively)

- D 2-4 mg/kg BW IV, IM, PO for 2-3 weeks (then reduce) and 50 mg/m² PO sid for 2-6 weeks (then reduce) (Michels and Carr, 1997)

Prednisone and chlorambucil (respectively)

- D 2-4 mg/kg BW IV, IM, PO for 2-3 weeks (then reduce) and 2 mg/m² PO sid or qod (use lowest effective dose for maintenance) (Michels and Carr, 1997)

Prednisone and cyclophosphamide (respectively)

- D 2-4 mg/kg BW IV, IM, PO for 2-3 weeks (then reduce) and 50 mg/m² PO qod for 1 week, or sid for 4 days then skip 3 days; repeat cycle for 3-4 weeks (Michels and Carr, 1997)

Prochlorperazine

- D 0.1 mg/kg BW IM tid, qid (Hoskins, 1997)

Propranolol

- C 0.5-1 mg/kg BW PO tid (Jacobs, 1996)
- D 0.5-1 mg/kg BW PO tid (Jacobs, 1996)

Ranitidine

- C 1-2 mg/kg BW IV, PO bid, tid (Washabau and Hall, 1997)
1-2 mg/kg BW IM, PO bid, tid (Hall and Washabau, 1997)
2.5 mg/kg BW IV bid (Kore, 1997)
3.5 mg/kg BW PO bid (Kore, 1997)
- D 2-4 mg/kg BW IV, SC bid, tid (Hoskins, 1997)
1-2 mg/kg BW IV, PO bid, tid (Washabau and Hall, 1997)
1-2 mg/kg BW IM, PO bid, tid (Hall and Washabau, 1997)

Scopolamine

- N 0.01 mg/kg BW SC (Domino et al., 1969)

Stanozolol—See Winstrol-V

Streptokinase

- D** 20,000-500,000 U/h diluted in saline, continuous central vein infusion over 4-5 h (Dennis, 1993)
- Rb** 4000 U/kg BW/h IV (Agnelli et al., 1985)

Streptozotocin

- M** 200 mg/kg BW IV once (Fromtling et al., 1985)
- N** 45-55 mg/kg BW IV once (Takimoto et al., 1988)
- R** 55 mg/kg BW IV (Borchard et al., 1990)
60 mg/kg BW IP (Borchard et al., 1990)
22 mg/kg BW IM (Borchard et al., 1990)
50 mg/kg BW IP (Alder et al., 1992)

Succinylcholine

- Am** 2.5 mg/kg BW in ventral lymph sac (Lumb and Jones, 1984)
- C** 0.06 mg/kg BW via continuous IV infusion (Kinsell, 1986)
- D** 0.07 mg/kg BW via continuous IV infusion (Kinsell, 1986)
- M** 0.05-0.1 mg/kg BW IV (Lumb and Jones, 1984)
- N** 2 mg/kg BW IV (Cramlet and Jones, 1976)
- Rb** 0.5 mg/kg BW IV (Green, 1982)
- Re** Chelonians: 0.25-1.5 mg/kg BW IM (Page, 1993)
- Sh** 0.02 mg/kg BW via continuous IV infusion (Kinsell, 1986)
- Sw** 0.12-0.18 mg/kg BW via continuous IV infusion (Kinsell, 1986)

Sucralfate

- C** 250 mg/animal PO bid, tid (Kore, 1997)
- D** 500-1000 mg/animal PO bid, tid (Kore, 1997)
- F** 125 mg/animal PO qid (Harrenstien, 1994)

Suxamethonium

- C 0.2 mg/kg BW IV (Flecknell, 1996)
- D 0.4 mg/kg BW IV (Flecknell, 1996)
- Rb 0.5 mg/kg BW IV (Flecknell, 1996)
- Sh 0.02 mg/kg BW IV (Flecknell, 1996)
- Sw 2 mg/kg BW IV (Flecknell, 1996)

Testosterone

- Bi 8 mg/kg BW IM, PO once, then weekly as needed (Ritchie and Harrison, 1997)

Tissue plasminogen activator

- D 1 mg/kg BW IV over 15-90 min (Dennis, 1993)
1 mg/kg BW IV bolus every hour for 10 doses (Clare and Kraje, 1998)

Tolazoline

- Bi 15 mg/kg BW IV (Sinn, 1997)
- Bo 0.2 mg/kg BW IV (Schultz, 1989)
0.5 mg/kg BW SC (Schultz, 1989)
- Go 2-5 mg/kg BW IV slowly over 1 min (NCSU, 1987)
- Sh 2-5 mg/kg BW IV slowly over 1 min (NCSU, 1987)

Tripelennamine

- Gp 5 mg/kg BW PO, IM (Melby and Altman, 1976)

Tubocurarine

- Am 1.4-7.5 mg/kg BW in ventral lymph sac (Lumb and Jones, 1984)
- C 0.4 mg/kg BW IV (Flecknell, 1996)

- D** 0.4 mg/kg BW IV (Flecknell, 1996)
Go 0.3 mg/kg BW IV (Flecknell, 1996)
Gp 0.1-0.2 mg/kg BW IV (Flecknell, 1996)
M 1 mg/kg BW IV (Flecknell, 1996)
 0.06-0.09 mg/kg BW IV (Lumb and Jones, 1984)
N 0.09 mg/kg BW IV (Cramlet and Jones, 1976)
R 0.4 mg/kg BW IV (Flecknell, 1996)
 0.04-0.06 mg/kg BW IV (Lumb and Jones, 1984)
Rb 0.4 mg/kg BW IV (Flecknell, 1996)
 0.09-0.15 mg/kg BW IV (Lumb and Jones, 1984)
Sh 0.4 mg/kg BW IV (Flecknell, 1996)

Vecuronium

- C** 0.1 mg/kg BW IV (Flecknell, 1996)
 0.01-0.1 mg/kg BW IV initial bolus; 0.005-0.04 mg/kg BW
 IV repeat boluses (Lukasik, 1995)
D 0.1 mg/kg BW IV (Flecknell, 1996)
 0.01-0.1 mg/kg BW IV initial bolus; 0.005-0.04 mg/kg BW
 IV repeat boluses (Lukasik, 1995)
 0.1 mg/kg BW IV initial bolus followed by 1.6-1.7 µg/kg
 BW/min IV infusion (Lukasik, 1995)
Go 0.15 mg/kg BW IV (Flecknell, 1996)
Sh 0.05 mg/kg BW IV (Flecknell, 1996)
Sw 0.15 mg/kg BW IV (Flecknell, 1996)

Verapamil

- D** 0.05 mg/kg BW IV slowly over 2-3 min; repeat to total dose
 of 0.15 mg/kg over 10-15 min (Anonymous, 1994)

Vitamin A

- Re** 50,000 IU every 2 weeks IM (Snipes, 1984)
 Tortoises: 11,000 IU/kg BW IM once (Page and Mautino,
 1990)

Vitamin B complex

- Bi** 10-30 mg/kg thiamine IM every 7 days (Ritchie and Harrison, 1997)
1-2 g/kg food (Ritchie and Harrison, 1997)
Raptors, cranes, and penguins: 1-2 mg/kg sid (Ritchie and Harrison, 1997)
- C** 1-2 ml IM, IV, 1-2 times/week prn (Kinsell, 1986)
- D** 1-2 ml IM, IV, 1-2 times/week prn (Kinsell, 1986)

Vitamin B₁₂

- Bi** 200-500 g/kg BW IM every 7 days (Ritchie and Harrison, 1997)

Vitamin C

- Bi** 20-40 mg/kg BW IM daily to weekly (Ritchie and Harrison, 1997)
- C** 100 mg/day PO (Kinsell, 1986)
25-75 mg IM, IV, SC (Kinsell, 1986)
100 mg PO q8h as urinary acidifier (Kinsell, 1986)
- D** 100-500 mg/day PO (Kinsell, 1986)
25-75 mg IM, IV, SC (Kinsell, 1986)
100-500 mg PO q8h as urinary acidifier (Kinsell, 1986)
- Gp** 10-30 mg/kg BW IM, PO sid (Harrenstien, 1994)
50 mg/day PO or parenterally (Williams, 1976)
200 mg/l drinking water (Harkness and Wagner, 1977)
10 mg/kg BW IM followed by oral supplementation (Bauck, 1989)
- Re** 100-250 mg/kg BW IM sid (Messonnier, 1996)
Tortoises: 10-20 mg/kg BW IM sid (Page and Mautino, 1990)

Vitamin D₃

- D** 1-2 rounded tsp/10 lb BW PO sid; mix with feed or water (as a drench) (Kinsell, 1986)
- N** 2000 IU/kg BW in diet (Whitney et al., 1973)
- Re** 7500 IU every 2 weeks IM (Snipes, 1984)
Tortoises: 1650 IU/kg BW IM once (Page and Mautino, 1990)

Vitamin E/selenium (1 mg Se and 50 mg vitamin E/ml)

- Bi** 0.05-0.1 ml/kg BW IM, SC every 14 days (Ritchie and Harrison, 1997)

Vitamin K₁

- Bi** 0.2-2.5 mg/kg BW IM prn (Ritchie and Harrison, 1997)
0.2-2.5 mg/kg BW IM for 1-2 injections (Harrison and Harrison, 1986)
Warfarin poisoning: 0.2-2.5 mg/kg BW IM bid for 7 days (Ritchie and Harrison, 1997)

Winstrol-V (stanozolol)

- Bi** 0.5-1 mg/kg BW IM every 3-7 days (Ritchie and Harrison, 1997)
0.5-1 mg/kg BW IM (Harrison and Harrison, 1986)
- C** 10-25 mg IM weekly (Kinsell, 1986)
- D** 10-50 mg IM weekly (Kinsell, 1986)

Yohimbine

- Bi** 0.1 mg/kg BW IV (Sinn, 1997)
- Ch** 2.1 mg/kg BW IP (Hargett et al., 1989)
- Go** 0.2 mg/kg BW IV slowly over 1 min (NCSU, 1987)

- Gp** 1.0 mg/kg BW IP (Strother and Stokes, 1989)
M 2.1 mg/kg BW IP (Flecknell, 1993)
R 2.1 mg/kg BW IP (Hsu et al., 1986)
Rb 0.2 mg/kg BW IV (Keller et al., 1988)
Sh 0.2 mg/kg BW IV slowly over 1 min (NCSU, 1987)

Table A.1. Bleeding sites

Bird	1) Brachial vein ^a	4) Cardiac puncture ^b
	2) Cutaneous ulnar vein (NAS, 1977)	5) Medial metatarsal vein (NAS, 1977)
	3) Right jugular vein (NAS, 1977)	
Cat	1) Cephalic vein ^a	
	2) Jugular vein ^a	
Dog	1) Cephalic vein ^a	
	2) Jugular vein ^a	
Ferret	1) Cephalic vein	4) Tarsal vein
	2) Retro-orbital sinus ^b	5) Cardiac puncture ^b
	3) Tail artery	6) Jugular vein ^a
Gerbil	1) Lateral tail vein	4) Abdominal aorta ^b
	2) Retro-orbital plexus ^b	5) Tail tip amputation ^b
	3) Cardiac puncture ^b	
Guinea pig	1) Middle ear vein	3) Cardiac puncture ^{a,b}
	2) Metatarsal vein	4) Jugular vein (for exsanguination) ^b
Hamster	1) Retro-orbital plexus ^b	4) Tail vein
	2) Jugular vein	5) Femoral vein
	3) Cardiac puncture ^b	
Mouse	1) Tail veins	5) Cardiac puncture
	2) Carotid artery	6) Ear vein
	3) Retro-orbital plexus	7) Tail tip amputation ^{a,b}
	4) Jugular vein	

Table A.1. Bleeding sites (continued)**Nonhuman primates**

- | | |
|------------------------------|-------------------------------|
| 1) Femoral vein ^a | 4) Saphenous vein |
| 2) Tail vein | 5) Cephalic vein ^a |
| 3) Jugular vein | |

Pig

- | | |
|-----------------------------------|-----------------------------------|
| 1) Ear vein
(nick or puncture) | 3) Cranial vena cava ^a |
| 2) External jugular vein | 4) Brachiocephalic vein |

Rabbit

- | | |
|-----------------------------------|--------------------------------------|
| 1) Marginal ear vein ^a | 3) Retro-orbital plexus ^b |
| 2) Cardiac puncture ^b | (not recommended by
some authors) |

Rat

- | | |
|----------------------------|--------------------------------------|
| 1) Tail veins ^a | 3) Retro-orbital plexus ^b |
| 2) Sublingual vein | 4) Cardiac puncture ^b |
| | (not recommended by
some authors) |

^aPreferred site.^bRequires anesthesia or analgesia.

Source: Adapted from *UFAW Handbook*, 1987, and Joint Working Group, 1993.

Table A.2. Plasma and blood volume

Species	Plasma volume mean (range)	Blood volume mean (range)
	<i>ml/kg</i>	<i>ml/kg</i>
Cat	41 (35–52)	55 (47–66)
Cattle	38.8 (36.3–40.6)	57 (52–61)
Chicken	—	60
Dog	50.0	86 (79–90)
European rabbit	39 (28–51)	56 (44–70)
Ferret	—	75
Frog	80	95
Gerbil	—	67
Goat	56	70 (57–89)
Guinea pig	39 (35–48)	75 (67–92)
Hamster	—	78
Marmot	51	100
Mouse	—	79
Opossum	38 (30–52)	57 (45–70)
Pig	—	65 (61–68)
Rat	40 (36–45)	64 (58–70)
Rhesus macaque	36 (30–48)	54 (44–67)
Sheep	47 (44–45)	66 (60–74)

Source: Adapted from Altman and Dittmer, 1974, and Joint Working Group, 1993.

Table A.3. Endotracheal tube sizes, laryngoscopic design, and blade size for laboratory animals

Species	Body weight	Tube diameter	Laryngoscope
Bird	<500 g	8–12 French feeding tube	
	>500 g	4–6 mm O/D (noncuffed)	
Canine	0.5–5 kg	2–5 mm O/D	MacIntosh size 1–4
	5 kg	4–15 mm O/D	
Feline	0.5–1.5 kg	2–3 mm O/D	MacIntosh size 1
	>1.5 kg	3–4.5 mm O/D	
Gerbil	70–120 g	Not reported	
Goat	10–90 kg	5–15 mm O/D	MacIntosh size 2–4
Guinea pig	400–1000 g	1.5–2.5 mm O/D	
Hamster	70–120 g	1.5 mm	Purpose-made
Mouse	25–35 g	1.0 mm	Purpose-made
Pig	1–10 kg	2–6 mm O/D	Soper or
	10–200 kg	6–15 mm O/D	Wisconsin size 1–4
Primate	0.5 kg	Not reported	
	0.5–20 kg	2–8 mm O/D	MacIntosh size 1–3
Rabbit	1–3 kg	2–3 mm O/D	Wisconsin size 0–1
	3–7 kg	3–6 mm O/D	
Rat	200–400 g	16–21 gauge plastic cannula	
Sheep	10–90 kg	5–15 mm O/D	MacIntosh size 2–4

Source: From Flecknell, 1987 (reprinted by permission) and 1996; except “Bird” from Ritchie and Harrison, 1997.

Table A.4. Needle sizes, sites, and recommended volumes for injection

Species	Injection site			
	SC	IM	IP	IV
Feline	Scruff, back, 50-100 ml, <20G	Quadriceps/caudal thigh, 1 ml, <20G	50-100 ml, <20G	Cephalic vein, 2-5 ml (slowly), <21G
Canine	Scruff, back, 100-200 ml, <20G	Quadriceps/caudal thigh, 2-5 ml, <20G	200-500 ml, <20G	Cephalic vein, 10-15 ml (slowly), <20G
Ferret	Scruff, 20-30 ml, <20G	Quadriceps/caudal thigh, 0.5-1 ml, <20G	50-100 ml, <20G	Cephalic vein, 2-5 ml (slowly), <21G
Guinea pig	Scruff, back, 5-10 ml, <20G	Quadriceps/caudal thigh, 0.3 ml, <21G	10-15 ml, <21G 0.5 ml, <23G	Ear vein, saphenous vein
Hamster	Scruff, 3-4 ml, <20G	Quadriceps/caudal thigh, 0.1 ml, <21G	3-4 ml, <21G	Femoral or jugular vein (cut down), 0.3 ml, <25G
Mouse	Scruff, 2-3 ml, <20G	Quadriceps/caudal thigh, 0.05 ml, <23G	2-3 ml, <21G	Lateral tail vein, 0.2 ml, <25G
Primate (marmoset)	Scruff, 5-10 ml, <20G	Quadriceps/caudal thigh, 0.3-0.5 ml, <21G	10-15 ml, <21G	Lateral tail vein, 0.5-1 ml (slowly), <21G
Primate (baboon)	Scruff, 10-30 ml, <20G	Quadriceps/caudal thigh, triceps, 1-3 ml, <20G	50-100 ml, <20G	Cephalic vein, recurrent tarsal vein, jugular vein, 10-20 ml (slowly), <20G

Table A.4. Needle sizes, sites, and recommended volumes for injection (continued)

Species	Injection site			
	SC	IM	IP	IV
Bird	Pectoral, inter-scapular, or inguinal fold, 1-3% BW bid or tid, <21G	Pectoral/per site, 0.2 ml/<100 g BW, 0.2-0.5 ml/100-500 g BW, 0.5-1.0 ml/>500 g BW, <25G	Not applicable	Cutaneous ulnar vein, <25G short bevel
Rabbit	Scruff, flank, 30-50 ml, <20G	Quadriceps/caudal thigh, lumbar muscles, 0.5-1.0 ml, 20G	50-100 ml, <20G	Marginal ear vein, 1-5 ml (slowly), <21G
Rat	Scruff, 5-10 ml, <20G	Quadriceps/caudal thigh, 0.3 ml, <21G	5-10 ml, <21G	Lateral tail vein, 0.5 ml, <23G

Source: From Flecknell, 1987 (reprinted by permission); except "Bird" from Ritchie and Harrison, 1997.

Table A.5. Body surface area conversions including Meeh coefficients (This table should be used for species with K = 10 or 10.1 only. See note below for conversion equation and other values of K.)

kg	M ²	kg	M ²
0.5	0.06	26.0	0.88
1.0	0.10	27.0	0.90
2.0	0.15	28.0	0.92
3.0	0.20	29.0	0.94
4.0	0.25	30.0	0.96
5.0	0.29	31.0	0.99
6.0	0.33	32.0	1.01
7.0	0.36	33.0	1.03
8.0	0.40	34.0	1.05
9.0	0.43	35.0	1.07
10.0	0.46	36.0	1.09
11.0	0.49	37.0	1.11
12.0	0.52	38.0	1.13
13.0	0.55	39.0	1.15
14.0	0.58	40.0	1.17
15.0	0.60	41.0	1.19
16.0	0.63	42.0	1.21
17.0	0.66	43.0	1.23
18.0	0.69	44.0	1.25
19.0	0.71	45.0	1.26
20.0	0.74	46.0	1.28
21.0	0.76	47.0	1.30
22.0	0.78	48.0	1.32
23.0	0.81	49.0	1.34
24.0	0.83	50.0	1.36
25.0	0.85		

Note: $M^2 = \text{weight (g)}^{2/3} \times K \times 10^{-4}$; where M = meters, K = Meeh coefficient (bat = 57.5; bird = 10.0; cat = 10.0; cattle = 9.0; dog >4 kg = 11.2; dog <4 kg = 10.1; fish = 10.0; frog = 10.6; guinea pig = 9.0; monkey = 11.8, mouse = 9.0; rabbit = 9.75; rat = 9.1; sheep = 8.4; snake = 12.5; swine = 9.0). From Schmidt-Nielsen, 1984.

Table A.6. Safe bleeding volume

Species	One bleeding (maximum)	Species	One bleeding (maximum)
	<i>ml/kg</i>		<i>ml/kg</i>
Cat	7.7	Horse	8.8
Cattle	7.7	Monkey (macaque)	6.6
Chicken	9.9	Mouse	7.7
Dog	9.9	Pig	6.6
Goat	6.6	Rabbit	7.7
Guinea pig	7.7	Rat	5.5
Hamster	5.5	Sheep	6.6

Source: Adapted from Mitruka and Rawnsley, 1977.

Table A.7. Toxic doses of antibiotics in rodents

Antibiotic	Mouse	Rat	Guinea pig	Hamster
Penicillin			5000 IU IP: 60% mortality 10,000 IU PO: 20% mortality 100,000 IU IM, two doses in 24 h: 7/8 died	100 mg PO, 600 mg SC: 100% mortality within 5 days
Procaine	0.3 mg/kg: 90% mortality		0.4 mg/kg, 125 mg/kg: 100% with convulsions	
Ampicillin			8 mg/kg SC tid for 5 days: 20% mortality by day 8	5 mg PO tid for 5 days: 90% mortality
Cephalosporins			Cefazolin, 100 mg IM qid for 5 days: 3/12 died	Cephalexin, 5 mg PO tid for 5 days: 90% mortality Cefoxitin, 10 mg IM tid for 5 days: 100% mortality Cephalothin, 20 mg IM tid for 5 days: 80% mortality
Carbenicillin				100 mg/kg PO: 9/10 animals died within 8 days
Ticarcillin				10 mg/kg PO: 10/10 animals died within 8 days

Table A.7. Toxic doses of antibiotics in rodents (*continued*)

Antibiotic	Mouse	Rat	Guinea pig	Hamster
Lincomycin			30 mg/kg SC on alternate days: most animals died 5-14 days after treatment started	>10 mg/kg SC: 20/24 animals died with enteritis
Clindamycin			75 mg/kg IP sid: 100% mortality in 6-8 days	3 mg PO tid for 5 days: 100% mortality
Streptomycin	6 mg/kg IM: acutely 100% mortality		60 mg per animal once PO: 100% mortality in 3-6 days	Acutely lethal at <i>therapeutic</i> dose rates
Gentamicin				1 mg PO tid for 5 days: 20% mortality
Neomycin				285 mg/kg PO: death within 5 days
Chloramphenicol				10 mg PO tid for 5 days: 20% mortality ≥300 mg/kg PO: enteritis
Erythromycin			Oral ≥33 mg/kg for 3 days: 40% mortality 33 mg/kg IP: 100% mortality	5 mg PO tid for 5 days: 100% mortality 30-200 mg/kg IP: 100% mortality

Table A.7. Toxic doses of antibiotics in rodents (*continued*)

Antibiotic	Mouse	Rat	Guinea pig	Hamster
Aureomycin			5 mg/kg PO: 100% mortality; 100 mg/kg diet: 8/9 died	
Tetracycline	150 mg/kg		50 mg/kg in diet	100 mg/kg PO: majority of animals died within 3-4 days
Chlortetracycline			20 mg/animal PO: mortality % not given	
Vancomycin				5 mg PO tid for 5 days: 90% mortality
Bacitracin			2000 IU/animal: 80% mortality	
Spiramycin	3.13 g/kg: acute oral LD ₅₀	4.85 g/kg: acute oral LD ₅₀	3.5 g/kg: acute oral LD ₅₀ 0.25 g/kg: chronic oral LD ₅₀ with enteritis	
Trimethoprim-sulfamethoxazole			75 mg/kg IP sid: 100% mortality in 6-8 days	33 mg trimethoprim, 167 mg sulfamethoxazole/kg PO: 6/20 animals died

Source : Morris, 1995 (reprinted by permission). See Morris, 1995, for references.

Table A.8. Adverse effects of antibiotic treatment in rabbits

Antibiotic	Toxic dose	Toxic effects
Ampicillin	25 mg/kg IM for 2 days 5 mg/kg IM for 2 days 40 mg/kg SC for 4 days 10 mg/kg PO for 6 days 8 mg/kg bid SC >5 mg/kg PO antibiotic-treated water for 3 days	Fatal enteritis Weight loss 40% fatal enteritis over next 2 weeks 50% fatal enteritis over next month Enteritis, previously also had penicillin Fatal enteritis in 7/11 rabbits
Penicillin	LD ₅₀ 5.25 g/kg PO	Both acute and chronic toxicity (enteritis)
Cephalexin	200 mg/rabbit for 7 days	Diarrhea
Lincomycin	100 mg PO single dose in 1.5- to 2.0-kg rabbits 24 mg/kg PO antibiotic-treated water 30 mg/day PO in 2.0- to 2.5-kg rabbits 1.3 mg/adult rabbit in feed for 3 days 0.2 mg/kg IM for 2 days	66% mortality with enteritis 90% mortality with enteritis 100% mortality with enteritis by 3 days 20/130 rabbits died with enteritis 33% mortality in 2 days
Clindamycin	15 mg/kg PO for 3 days 5 mg/kg PO for 2 days Single IV dose of 30 mg/kg	100% mortality with enteritis 50% mortality with enteritis within 72 h 4/6 rabbits had fatal enteritis 12-14 days after treatment
Tylosin	100 mg/rabbit for 7 days	Diarrhea
Erythromycin	3 g/l in drinking water for 7 days	Diarrhea
Spectinomycin	1 g/l in drinking water for 7 days	Diarrhea
Vancomycin	75 mg/kg IV	Acute toxicity with 100% mortality
Minocycline	30 mg/kg IM for 3 days	Reduction in growth rate
Spiramycin	Acute oral LD ₅₀ 4.85 g/kg	Nervous signs

Source: Morris, 1995 (reprinted by permission). See Morris, 1995, for references.

Table A.9. Heat dissipation levels for various species

Species	Activity level	Body weight (kg)	Heat dissipated (kcal/day)
Chicken	Caged	1.8	210
Dog	Basal	25	874
Dog	Basal	14	533
Rabbit	Basal	2.5	120
Rabbit	Caged	2.6	381
Rat	Basal	0.28	28
Rat	Caged	0.26	50
Swine	Grouped	68	4008

Source: Adapted from Besch and Woods, 1977.

Table A.10. Long-term anesthesia protocols

Saffan (alfadolone/alfaxalone)

C	9-12 mg/kg BW IV, then 0.2-0.3 mg/(kg·min) IV
M	15-20 mg/kg BW IV, then 0.25-0.75 mg/(kg·min) IV
N	10-12 mg/kg BW IV, then 0.3-0.6 mg/(kg·min) IV
R	10-12 mg/kg BW IV, then 0.2-0.7 mg/(kg·min) IV
Sh	2-3 mg/kg BW IV, then 0.1-0.2 mg/(kg·min) IV
Sw	2 mg/kg BW IV, then 0.1-0.2 mg/(kg·min) IV

Propofol

C	7.5 mg/kg BW IV, then 0.2-0.5 mg/(kg·min) IV
D	5-7.5 mg/kg BW IV, then 0.2-0.4 mg/(kg·min) IV
M	26 mg/kg BW IV, then 2-2.5 mg/(kg·min) IV
N	7-8 mg/kg BW IV, then 0.2-0.5 mg/(kg·min) IV
R	10 mg/kg BW IV, then 0.5-1 mg/(kg·min) IV
Sw	2-2.5 mg/kg BW IV, then 0.1-0.2 mg/(kg·min) IV; after ketamine premedication (10 mg/kg IM), add alfentanil 20-30 µg/kg IV, then 2-5 µg/(kg·min) IV

Midazolam combinations

D	Midazolam at 50-100 µg/kg BW IV plus alfentanil at 10-20 µg/kg IV, then midazolam at 5 µg/(kg·min) IV with alfentanil at 4-5 µg/(kg·min) IV
Rb	Midazolam at 1-2 mg/kg IV plus fentanyl/fluanisone at 0.3 ml/kg IM, then fentanyl at 2-5 µg/(kg·min) IV

Source: Adapted from Flecknell, 1996.

Table A.11. IP or SC fluid replacement recommendations

Species	SC (ml/kg)	IP (ml/kg)
Cat	17	5.6–11.2
Gerbil	17–33	50
Guinea pig	10–20	20
Hamster	30	30
Mouse	17–33	33
Rabbit	10–17	17
Rat	25	25

Source: Adapted from Flecknell, 1996.

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