

**T**his chapter provides an overview of the unique characteristics of various drugs used in avian species. All suggested drug uses are for companion (non-food) birds only. Complete reviews of all the drugs discussed in this book are available through a variety of desk references and product information forms provided by the manufacturers. The clinician is referred to these references for a review of the general pharmacology and specific contraindications of any drug discussed. The suggestions of the manufacturer should always be followed. A drug should never be used for which the clinician is not fully aware of the indications, contraindications and potential side effects. Some drugs administered concurrently will potentiate toxicity, and the clinician should review any potential drug interactions before placing a bird on more than one drug at a time.

In this chapter, commonly used drugs and their associated doses are provided in table form for easy reference. The information concerning the use of the drugs listed in the table should be reviewed before administering any therapeutic agent. If a drug is not discussed, either insufficient data is available to warrant its use in birds, or it has been used but has little applicability.

The doses and material presented for each drug have been compiled from numerous reference sources, including the various chapters in this book. Some of the recommended doses are based on pharmacokinetic information, and some are based totally on observation. An asterisk in the formulary table indicates that the suggested dose is based on pharmacologic data obtained in some species of birds other than poultry. Notes on any adverse drug reactions should be forwarded to the *Journal of the Association of Avian Veterinarians* to keep colleagues informed of any problems that occur with commonly used therapeutic agents. Representative manufacturers listed in the formulary are for reference purposes only. Other manufacturers may produce similar products of equal efficacy.

CHAPTER

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18

FORMULARY

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**ACETYLCYSTEINE - Mucomyst (Apothecon)**

Neonates treated with nebulized Mucomyst developed dyspnea, lethargy, edema of the eyelids and tachycardia 20 minutes after therapy.

**ACETYLSALICYLIC ACID - Aspirin (Butler; Vedco)**

Available as tablets (5 or 60 grain) for oral administration. Also available as 1.25 grain orange-flavored chewable tablets. May be effective as an analgesic, antipyretic and anti-inflammatory agent in some avian species. May be indicated to prevent clot formation and embolisms secondary to egg-related peritonitis, granulomatous diseases and shock. Uricosuric at low doses and may be effective in some cases of acute and chronic gout. A five grain tablet can be mixed in 30 ml of diluent and administered at a dose of 0.5 ml/kg, TID (or 1 tablet per pint of drinking water).

**(ACTH) ADRENAL CORTICOTROPIC HORMONE - (Vedco; Phoenix; Butler)**

Available as an injectable solution (40 or 80 units/ml) for IM administration. Used to test stimulation of the adrenal glands in suspected cases of adrenal insufficiency. Glucocorticoid administration may falsely elevate endogenous cortisol levels. Prolonged administration induces adrenal gland hyperplasia.

**ACTIVATED CHARCOAL, KAOLIN - Toxiban (Vet-A-Mix)**

Available as a suspension (104 mg/ml activated charcoal and 62.5 mg/ml kaolin) for oral administration. Can be used to absorb some ingested toxins (many insecticides, pesticides, lead, mercury, inorganic arsenic and chemotherapeutic agents) from the gastrointestinal tract. High therapeutic index. Can be mixed with sodium sulfate in cases of heavy metal ingestion to form lead complexes that are not absorbed. Sodium sulfate can cause osmotic diarrhea and should be used with extreme caution in birds that weigh less than one kg. Can be mixed with hemicellulose to function as a bulk laxative and aid in the passage of ingested toxins.

**ACYCLOVIR - Zovirax (Burroughs Wellcome)**

Available as a soluble powder (50 mg/ml when reconstituted) for IV administration and as a capsule (200 mg), tablet (200 mg) or suspension (40 mg/ml) for oral administration. Has been shown to be effective in decreasing mortality associated with flock outbreaks of Pacheco's disease virus. Appears to be most effective if treatment is initiated in an individual bird before clinical signs occur.

Acyclovir is preferentially absorbed by herpesvirus-infected cells and primarily inhibits herpesvirus DNA polymerase. Acyclovir is effective in preventing herpesvirus replication in only those strains of herpesvirus that code for their own DNA polymerase. Acyclovir also has varying effects on different strains of susceptible herpesviruses. Low level of effect on uninfected host cells results in a high therapeutic index. It has been suggested for treatment of poxvirus, but there is no conclusive evidence to support its efficacy.

The injectable product may cause severe muscle necrosis if administered IM and may cause phlebitis (common) and neurologic signs (rare) when administered IV. Oral administration may cause vomiting. Acyclovir has been shown to interfere with spermatogenesis and is mutagenic when administered at high doses in some mammals.

**ALCOHOL**

An excellent solvent for many drugs as well as a popular skin disinfectant. Bactericidal for most common pathogenic bacteria with variable activity for viruses and fungi. Will cause a dramatic decrease in core body temperature when applied to large areas of the skin as a presurgical dressing. Consumption of alcoholic beverages or absorption of ethanol through open wounds can result in lethargy, incoordination and regurgitation in most avian species.

**ALLOPURINOL - Zylprim (Burroughs Wellcome)**

Available as a tablet (100 or 300 mg) for oral administration. Used for the treatment of gout. Well absorbed from the gastrointestinal tract. Functions to inhibit purine catabolism, which prevents the production of uric acid. A 100 mg tablet can be crushed and dissolved in 10 ml of sterile water. Up to 1 ml of the diluted suspension may be added to 30 ml of drinking water. A fresh solution of drinking water should be provided several times per day. A reduction in serum and urinary uric acid levels should be noted within two to three days of administration.

Birds being treated with allopurinol should be thoroughly hydrated at all times. It has been found to cause gout in Red-tailed Hawks, and may cause a skin rash, urticarial lesions or hepatitis. In birds with severe gout, the initial dose should be 25% of the recommended dose, with a gradual increase over several days. Should be used in conjunction with colchicine in severe cases of gout.

**ALOE VERA - George's Aloe Vera (Warren Laboratories)**

Available as a lotion or for topical application on pruritic lesions or as a liquid for oral administration. Solution for treating pruritic skin lesions is made by mixing 0.5 oz of aloe vera oral liquid with 1 tsp of Penetran, 2 drops of Woolite and 1 pint of water.

**AMIKACIN SULFATE - Amiglyde (Aveco); Amikin (Bristol Labs)**

Available as injectable solutions (50 mg/ml and 250 mg/ml) for IM or SC administration. Limited activity against gram-positive organisms. Should be used only in birds when absolutely necessary to treat gram-negative bacteria (*Pseudomonas*, *Klebsiella* spp.) that are resistant to other, less toxic antibiotics. Very effective when used in combination with synthetic penicillins.

Birds should be thoroughly hydrated throughout the treatment period to decrease the possibility of nephrotoxicity. Use in conjunction with furosemide may potentiate renal damage. Toxic effects of aminoglycosides may be potentiated when used in combination with cephalosporins (see Chapter 17).

**AMINOPENTAMIDE HYDROGEN SULFATE - Centrine (Aveco)**

Available as an injectable solution 0.5 mg/ml for SC or IM administration for controlling vomiting.

**AMINOLOID - (Essex; Schering Corporation)**

Has been used to induce molt in raptors. Should induce complete molt within 2 months of administration.

**AMITRIPTYLINE HCL - Elavil (Stuart); Endep (Roche)**

Available as a tablet (10, 25, 50, 75, 100, 150 mg) for oral administration or as an injectable solution (10 mg/ml) for IM administration. Tricyclic antidepressant with a sedative effect that has been suggested for use in some cases of feather picking. Appears to be rarely effective. Should not be used in conjunction with monoamine oxidase inhibitors. May cause depression, arrhythmias, tachycardia, vomiting or muscle rigidity.

**AMMONIUM SOLUTION - Penetran (Trans Dermal Technologies)**

Available as an ointment for topical application. Used as a topical analgesic or antipruritic (see Aloe Vera).

**AMOXICILLIN - Amoxi-drops, Amoxi-Inject (SmithKline)**

Available as a suspension (50 mg/ml, Amoxi-drops) for oral administration or as an injectable solution (250 mg/ml, Amoxi-Inject) for IM administration. Palatable and easy to administer but rarely effective against the bacterial organisms that affect birds. Absorbed from the gut more effectively than ampicillin, resulting in higher blood levels than are achieved with oral ampicillin. Injectable solution stable one year after reconstitution if refrigerated. Oral suspension stable for 14 days if refrigerated (see Chapter 17).

**AMPHOTERICIN B - Fungizone (Squibb)**

Available as an injectable solution (5 mg/ml) for slow (over several hours) IV administration. Functions by binding to sterols in the membrane of fungi, causing alterations in permeability. Rapid administration may cause arrhythmias and death. Can also be given intratracheally. Has been suggested to be effective if administered SC, but efficacy is unknown. Can be nebulized in conjunction with systemic flucytosine or ketoconazole therapy for fungal infections in the upper respiratory tract. Intratracheal or intra-air sac administration does not result in systemic absorption and is effective only against aspergillosis localized to the site of infection. May be effective in treating megabacteria. A lotion or cream (3%) is available that can be used for fungal dermatitis and for oral candidiasis that is resistant to nystatin.

May cause renal damage and bone marrow suppression. May potentiate toxic effects of flucytosine when used in combination. Depression, vomiting and irritation at the injection site are common side effects. Amphotericin B injected into the sinuses of an African Grey Parrot caused a severe granulomatous sinusitis and death. If used in combination with imidazoles may result in fungi that are resistant to amphotericin B. Stable one week after reconstitution if refrigerated. Stable only 24 hours at room temperature. Can be mixed, divided into small aliquots and frozen (see Chapter 17).

**AMPICILLIN - Polyflex (Fort Dodge)**

Available as an injectable suspension (100 mg/ml) for subcutaneous or IM administration. This drug has minimum activity for the common gram-negative bacteria that infect birds. IM administration for treatment of "cat bite" injuries in which pasteurella septicemia is common. Ampicillin administered orally is poorly absorbed and the drug that is absorbed is rapidly excreted by the kidneys. Oral administration is limited to highly sensitive pathogens restricted to the gastrointestinal tract. May be effective in treating salmonella arthritis in gallinaceous birds. May be effective against some L-form bacteria when used in conjunction with erythromycin (see Chapter 17).

**AMPROLIUM - Corid (MSD-Agvet)**

Available as a solution (9.6% - 96 mg/ml) for oral administration. Structurally related to thiamine and competitively inhibits thiamine utilization by some parasites. May be effective against some strains of coccidia. The strains that infect mynahs and toucans appear to be particularly resistant. Resistances may develop following repeated use in an aviary. Not as effective in Galliformes and cranes as monensin. Must be used in conjunction with thorough aviary cleaning to prevent reinfection following treatment.

**ASCORBIC ACID - Vitamin C (Phoenix; Vedco)**

Available as an injectable solution (250 mg/ml) for IM administration. May be beneficial support for avian patients with infectious or debilitating metabolic diseases.

**ATROPINE - (Butler; Vedco; Phoenix)**

Available as an injectable solution (0.5 mg/ml or 15 mg/ml) for IM or SC administration. More concentrated solution used as a treatment for organophosphate poisoning. Used with caution in birds as a preanesthetic. May thicken secretions in the trachea resulting in blockage of the endotracheal tube. Does not cause pupil dilation as occurs in mammals. Inappropriate or excessive use can result in cardiac arrhythmias and gastrointestinal stasis.

**AVIPRO - (Vetark Animal Health)**

Mixture of bacteria, enzymes, electrolytes and vitamins that may be an effective adjunct therapy in debilitated birds.

**AZITHROMYCIN - Zythromax (Pfizer)**

Available as capsules (250 or 500 mg) for oral administration. Used for the treatment of chlamydiosis. Should be administered on an empty stomach. A 250 mg capsule is mixed with 0.25 oz of lactulose and dosed at one drop per gram of body weight BID for 14 days.

**BISMUTH SUBSALICYLATE - Pepto-Bismol (Procter and Gamble)**

Available as a suspension (1.75% subsalicylate) for oral administration. Indicated for gastrointestinal irritation, ulcers or to aid in the removal of some ingested toxins.

**BOTULISM ANTI-TOXIN - (Schering Plough Animal Health; United Vaccine Inc.)**

*Clostridium botulinum* Type C for use in mink. Dose at one-half the mink dose.

**BUTORPHANOL TARTRATE - Stadol (Bristol Labs)**

Available as an injectable solution — Torbutrol (10 mg/ml) IV; or as tablets — Torbugesic (1, 5 or 10 mg) PO. Synthetic opiate that is used for its antitussive effects and to control abdominal pain. May be helpful in suppressing a non-productive cough and for post-surgical pain. May cause vomiting at 10 mg/kg in some species. Should be used with caution in patients with liver disease.

**CALCIUM - (Vedco; Phoenix; Butler)**

Available as a solution (23 mg/ml - Vedco, Phoenix) for oral administration; as an injectable solution (5 mg Ca glycerophosphate and 5 mg Ca lactate/ml - Butler) for IM, SC or IV administration and as a powder for oral administration. Oral administration is recommended for long-term therapy of calcium deficiencies and for supplementation during bone healing, bone development and egg laying. Parenteral administration is recommended for the treatment of hypocalcemia, hypocalcemic tetany, egg binding and soft-shelled eggs. Oral calcium will chelate some tetracycline preparations. Toucans being treated with tetracyclines should receive parenteral calcium supplementation to prevent bone deformities. Supplemental calcium may help prevent hypocalcemia in some African Grey Parrots.

**CALCIUM DISODIUM VERSEDATE - Calcium EDTA (3M Pharm.)**

Available as an injectable solution (200 mg/ml) for IM administration. Used to chelate circulating lead or zinc. Can be used orally to prevent lead or zinc from being absorbed from the gastrointestinal tract. Long-term treatment (over two weeks) can result in unacceptable chelation of normal cations from the blood. May cause renal tubular necrosis and its use should be discontinued if polyuria and polydipsia occur. May cause muscle necrosis when administered IM.

**CAPRILLIC ACID - Kaprycidin A (Ecological Formulas)**

Available as a capsule containing 325 mg of calcium, magnesium and zinc carprylates for oral administration. May be effective as an adjunct therapy with imidazole antifungals for the treatment of aspergillosis.

**CARBARYL - Sevin (Southern Agricultural Insecticides)**

Available as a 5% powder. Used to lightly dust birds for treatment of some ectoparasites. May be added to the nest litter to control mites and ants (one tsp is effective for a small nest box; two tsp may be needed for a larger box). Should be used in conjunction with thoroughly cleaning the box. Should be used only when necessary. May be helpful in reducing ant infestations in the aviary.

**CARNIDAZOLE - Spartrix (Wildlife Laboratories)**

Available as a tablet (10 mg) for oral administration. Single dose treatment for trichomoniasis, hexamitiasis and histomonas in pigeons. High therapeutic index in pigeons. Birds did not develop

any signs of toxicity even when treated with 640 mg/kg (32 times the therapeutic dose).

**CEFOTAXIME - Claforan (Hoescht-Roussel)**

Available as an injectable solution (10 to 300 mg/ml depending on reconstitution) for IM or IV administration. The less concentrated solution should be used for slow IV administration. Broad-spectrum activity for many gram-negative and gram-positive avian pathogens. Penetrates CSF. Reconstituted solution is stable for ten days refrigerated or six months frozen. Cannot be thawed and refrozen (see Chapter 17).

**CEFOXITIN - Mefoxitin (Merck)**

Available as an injectable solution (10 to 400 mg/ml depending on reconstitution) for IM or IV administration. The less concentrated solution should be used for slow IV administration. Reconstituted solution is stable for ten days refrigerated or six months frozen. Cannot be thawed and refrozen (see Chapter 17).

**CEFTRIAZONE - Rocephin (Roche)**

Available as an injectable solution (10 to 250 mg/ml depending on reconstitution) for IM or IV administration. The less concentrated solution should be used for slow IV administration. Reconstituted solution is stable for ten days refrigerated or six months frozen. Cannot be thawed and refrozen (see Chapter 17).

**CEPHALEXIN - Keflex Pediatric Suspension (Dista)**

Available as an oral suspension (25-100 mg/ml). Varied efficacy for many gram-negative bacteria. Frequent dosing makes treatment in all but hand-feeding neonates impractical. Reconstituted suspension stable for 14 days if refrigerated. May be effective in cases of staphylococcus dermatitis where long-term therapy is necessary (see Chapter 17).

**CEPHALOTHIN - Keflin (Lilly)**

Available as an injectable solution (100 mg/ml) for IV or IM (painful) administration. This drug is not absorbed from the gastrointestinal tract (see Chapter 17).

**CEPHRADINE - Veloself (Squibb)**

Available as a suspension (25 or 50 mg/ml) for oral administration. Similar in activity and spectrum to cephalixin.

**CHLORAMPHENICOL - (Parke-Davis; Fort Dodge)**

Available as injectable solution (100 mg/ml, succinate) for IV administration or as a suspension (30 mg/ml - chloramphenicol palmitate) for oral administration. May cause bone marrow suppression in humans, and clients should be warned to avoid skin contact. A dose of 1000 mg/kg may cause death in most avian species. Should be used with extreme caution in patients with renal or liver disease. Rapidly excreted by pigeons, necessitating a dosing frequency that makes therapy impractical.

Chloramphenicol succinate administered IV is excreted rapidly by the liver. May be useful in suppressing bacterial replication in cases of severe bacterial septicemia.

Chloramphenicol palmitate is erratically absorbed from the gastrointestinal tract. This drug should not be used in critical cases of bacterial septicemia. Usually well accepted by hand-feeding birds. May be useful in some cases of enteritis in young birds. If gastrointestinal stasis has occurred, a parenteral antibiotic should be chosen. Suspension or powder from capsules can be used to lace favorite foods or to mix into a mash for flock treatment of some highly susceptible bacteria. Particularly effective in the flock treatment of salmonella. Has been associated with temporary infertility in male pigeons.

Must be used with caution. Chloramphenicol has been associated with contact dermatitis and pernicious anemia in some people (see Chapter 17).

**CHLORHEXIDINE - Nolvasan (Fort Dodge; Bio-Ceutic)**

Available as a disinfectant solution (2% = 20 mg/ml). Off label use for oral or topical administration. Also available as an ointment or cream for topical administration. Commonly used to clean skin wounds and as a surgical scrub. May be used to prevent further cases of candidiasis in a flock while hygiene problems that caused the outbreak are corrected. Is not absorbed from the gut. May be effective in reducing the spread of some enteric viruses. The scented form added to water may prevent birds from drinking and result in death from dehydration, especially finches. Some preparations contain alcohol that may cause local skin irritation.

As a disinfectant, mix six tablespoons (3 oz or 90 ml)/gallon of water. Not effective for pseudomonas or gram-positive cocci. Extremely toxic to aquatic environments (lakes, ponds, streams). Waste products must be carefully handled. May irritate eyes or mucous membranes.

**CHLORINE - Household bleach**

Available as a 10% solution (100 mg/ml) that can be used to disinfect water (8 drops/gallon). May also be used as a disinfectant when mixed 1:10 with water. The longer the chlorine is in contact with an organism the more efficient it is as a disinfectant. Clorox, like most disinfectants, is not effective if organic debris is present.

Exposure to fumes may cause epiphora, coughing, sneezing, rhinorrhoea and dyspnea in most avian species, particularly neonates. Should not come in contact with some metals. May react with some basic cleaners. Must always be used with adequate ventilation. Difficult to rinse out of porous materials (eg, wooden perches).

**CHLOROQUINE PHOSPHATE - Aralen Phosphate (Sandoz)**

Available as tablet (500 mg) for oral administration. Rapidly and completely absorbed from the intestinal tract. Used to treat the circulating forms of plasmodium (avian malaria). Must be used in conjunction with primaquine phosphate.

Overdose may be fatal. May cause retinal damage, vomiting, diarrhea or CNS problems.

**CHLORTETRACYCLINE (CTC) - Aureomycin (Cyanamid)**

Available as a feed additive (100 g/lb), tablet (25 mg) or powder (200 mg/teaspoon) for oral administration. Also available in pelleted feeds (Zeigler Brothers, Lafeber Co., Bird Life), in impregnated millet (Keet Life - Hartz) and for oral administration. Soybean meal base and CTC soluble powder may be added to cooked mashes containing rice, beans, chick starter ration and ground monkey biscuit for the flock control of chlamydia. Mixture must be made fresh each day. Addition of CTC to water for the flock treatment of chlamydia should not be considered effective. Pelleted foods may be useful in controlling chlamydia outbreaks in flocks of large psittacine birds. Tetracyclines are known to have immunosuppressive effects in other animals and the indiscriminate or periodic use of CTC in a flock of birds is not recommended. CTC chelates divalent and trivalent cations and interferes with normal bone development in mammals. No evidence to support the theory that annual treatment with CTC-impregnated pellets increases productivity as has been reported in the lay literature. Impregnated millet seeds may be helpful in treating chlamydia in flocks of budgerigars and cockatiels. The use of chlortetracycline for the treatment of chlamydia should be considered inferior to the use of doxycycline and enrofloxacin (see Chapter 17 and 34).

**CHLORSULON - Curatrem (MSD Agvet)**

Available as a suspension (8.5%, 85 mg/ml) for oral administration. Has been suggested as a treatment for tapeworms and liver flukes. Leads to death of the parasite by inhibiting glycolytic enzymes and incapacitating the parasite's primary source of energy.

**CIMETIDINE - Tagamet (SmithKline Beecham)**

Available as tablets (200, 300, 400, 800 mg) or liquid (60 mg/ml) for oral administration. Also available as an injectable solution (150 mg/ml) for IM or IV administration. Inhibits gastric acid secretion by inhibiting the effects of histamine at the H<sub>2</sub> receptor of the parietal cells. Indicated in cases of gastric ulceration and to decrease gastric acidity if the cloacal pH is low, a common problem with tenesmus and cloacal papillomas. May cause depression, diarrhea, tachycardia and respiratory failure.

**CIPROFLOXACIN - Cipro (Miles)**

See enrofloxacin. Available as a tablet (250, 500 or 750 mg) for oral administration, as an injectable solution (200 or 400 mg/ml) for slow IV administration or as an ophthalmic solution (3 mg/ml). Well absorbed from the gastrointestinal tract. Tablet can be crushed and added to liquid but must be shaken well before administration. May cause irritability in some birds. May cause CNS problems. Has been associated with crystalluria and joint abnormalities in some mammals (see Chapter 17).

**CLAZURIL - Appertex (Janssen)**

Available as a tablet (2.5 mg) for oral administration. Used for coccidiosis in pigeons. Not as effective in Galliformes and cranes as monensin.

**CLINDAMYCIN - Antirobe (Upjohn)**

Available as a suspension (25 mg/ml) or capsule (25, 75, or 150 mg) for oral administration. Primarily indicated in cases of osteomyelitis where long-term therapy is often required. Renal and hepatic function should be monitored during long-term use. Patients should be monitored for secondary yeast infections.

**CLOMIPRAMINE HCL - Anafranil (Baker Cummins)**

Available as a capsule (25, 50, or 75 mg) for oral administration. Tricyclic antidepressant. Used in humans to control compulsive behavior disorders. May be effective in some cases of feather picking and self-mutilation. Initial dose should be low with a gradual increase over a four- to five-day period. Clinical impressions suggest that this drug is rarely effective in controlling mutilation behavior in birds.

Numerous metabolic side effects. Regurgitation and drowsiness may occur in some birds. One cockatoo developed ataxia following administration.

**COLCHICINE - (Merck; Lilly)**

Available as a tablet (contains 0.5 mg colchicine and 0.5 mg probenecid) for oral administration or as an injectable solution (0.5 mg/ml) for IV administration. Both colchicine and probenecid have anti-gout activity. Inhibits release of histamine-containing granules from mast cells. Injectable solution used as an inhibitor of collagen production and may stimulate collagenase activity. May be indicated in some cases of hepatic fibrosis. Will not reverse fibrosis but may be helpful in preventing further damage.

May potentiate gout formation in some cases. Numerous metabolic side effects. Administration should be discontinued if vomiting or diarrhea occur.

**COPPER SULFATE - Caustic Powder (Phoenix; Butler)**

Available as a powder (51%) for topical application. Used for treating cases of ulcerative dermatitis.

**CYANOCOBALAMIN - Vitamin B<sub>12</sub> (Butler)**

Available as an injectable solution (1 or 3 mg/ml) for IM or SC administration. Birds being treated with B<sub>12</sub> may develop pink droppings.

**DEXAMETHASONE - Azium (Schering)**

Available as an injectable solution (2 or 4 mg/ml) for IM or IV administration. Anti-inflammatory that may be useful in debilitated animals. Dexamethasone is 20 times more active as an anti-inflammatory than prednisolone. Higher dose is used for treatment of shock and to reduce the effects of gram-negative endotoxemia that may occur when patients with bacteremia are treated with antibiotics. Higher dose may be immunosuppressive and a lower dose should be used for repeated therapy. Induces rapid glucocorticoid and anti-inflammatory response. May be useful as an adjunct therapy (with iodine) for treating goiter in budgerigars.

Has been associated with congenital deformities when administered to pregnant mammals. May cause increased levels of liver enzymes, polydipsia, polyuria and diarrhea. AST and ALT activities may increase to three times normal values within 36 hours of IM administration. Doses of three drops/gallon of water were found to be immunosuppressive in pigeons.

**DEXTROSE 5 to 50% - (Fort Dodge; Butler)**

Available as an injectable solution (5% - 50 mg/ml to 50% - 500 mg/ml) for slow IV administration. Used for the treatment of hypoglycemia. Must be given slowly to prevent circulatory collapse. 50% solution is hypertonic and cannot be given IM. Must be diluted to 5% solution for IM administration.

**DIAZEPAM - Valium (Roche)**

Available as an injectable solution (5 mg/ml) for IM or IV administration or as a solution (1 or 5 mg/ml) for oral administration. Can be used to control some seizures and feather picking (0.6 mg/kg IV, IM) in birds. Birds should be carefully supervised. May become so drowsy that they fall from an enclosure or perch.

**DIETHYLSTILBESTROL DIPHOSPHATE - Stilphostrol (Miles)**

Available as a tablet (50 mg) and as an injectable solution (0.25 mg/ml) for IM or IV. Low therapeutic index. Overdosing may cause anemia.

**DIGOXIN - Cardoxin (Evsco); Lanoxin (Coopers)**

Available as a solution for oral administration: Cardoxin = 15 mg/ml; Lanoxin = 0.05 mg/ml. Limited studies in birds. Suggested dosages based on studies in Quaker Conures, sparrows, parakeets and ducks. A dose of 0.01 mg/kg was found to reduce right ventricular enlargement in chickens. A dose of 0.02 mg/kg daily was considered safe and produced satisfactory plasma levels in parakeets.

Low therapeutic index. A dose of 0.1 mg/kg was found to induce arrhythmias in pigeons. Patients receiving digoxin should have regular ECG evaluations. Toxic reactions include depression, ataxia, vomiting, and diarrhea.

**DIHYDROSTREPTOMYCIN - Azimycin (Schering)**

Intramuscular injection has been associated with paralysis and death in some avian species.

**DIMERCAPROL - BAL (Becton Dickinson)**

Available as an injectable solution (100 mg/ml) for IM (painful) administration. Dimercaprol is a chelating agent that binds heavy metals including lead, gold, arsenic or mercury. Binding is reversible and a decreased activity occurs in an acidic environment. Less toxic than calcium EDTA and can be given orally. More rapid reduction in blood lead levels than occurs with calcium EDTA. Considered the drug of choice for removing lead from the CNS;

however, D-penicillamine is also effective and has a higher therapeutic index. Tachycardia is the most common side effect.

#### **DIMETHYLSULFOXIDE - Domoso (Syntex)**

Available as a liquid or gel (90% - 900 mg/ml) for topical application. Has been suggested as a method of reducing swelling and as a vehicle for carrying some antibiotics into difficult-to-reach sites of infection (joints, cellulitis, bumblefoot). May be helpful in reducing the swelling of prolapsed cloacal tissue prior to surgical correction. May cause local skin irritation. Has been associated with birth defects when used in pregnant mammals. Avoid contact with human skin.

#### **DIMETRIDAZOLE - Emtryl (Jensen Salsbury)**

Available as a soluble powder (182 g/6.42 oz) for oral administration. Used to treat giardiasis, trichomoniasis, histomoniasis, and hexamitiasis. Dimetridazole has activity against some anaerobic bacteria and may be useful in some cases of bumblefoot, ulcerative dermatitis, chronic sinusitis and metritis.

Low therapeutic index. Toxic to Pekin Robins and may be toxic in some other Passeriformes. Breeding birds should be treated only by gavage. If dimetridazole is added to the food or drinking water, a toxic level may be consumed or fed to a mate or nestlings. At a dose of one tsp/gal of drinking water, cockatiels, budgerigars and pigeons have been reported to develop incoordination, acute seizures and death. Extended therapy or excessive dosing may result in toxicity. Acute hepatitis has been reported in cockatiel fledglings. Some affected birds may respond to treatment with B vitamins. Is no longer available in the United States.

#### **DINOPROST TROMETHAMINE - Lutalyse (Upjohn)**

Available as a solution (5 mg/ml) for IM administration. Contains naturally occurring prostaglandin F<sub>2</sub> alpha. Prostaglandins may be effective in some cases of egg retention. This agent would be expected to relax the vagina and increase uterine tone, which may facilitate the passage of an egg. Prostaglandins may prove also to have a therapeutic benefit in removing necrotic debris from the uterus in cases of salpingitis.

#### **DIPHENHYDRAMINE HCl - Benadryl (Parke Davis)**

Available as a capsule (25 or 50 mg) for oral administration or injectable solution (10 or 50 mg/ml) for IM or IV administration. May be effective in calming some feather pickers or excessively anxious birds. Has sedative, antihistamine and anti-depressant activity. Dose may need to be altered based on clinical response. Has atropine-like action and toxic side effects.

#### **DOXAPRAM HCl - (Fort Dodge)**

Available as an injectable solution (20 mg/ml) for IV or SC administration. Has been used in birds as a respiratory stimulant. May be helpful in reversing the respiratory depressant effects of ketamine and xylazine.

#### **DOXEPIN HCl - Sinequan (Roerig)**

Available as capsules (10, 25, 50, 75, 100, or 150 mg) or suspension (10 mg/ml) for oral administration. Tricyclic anti-depressant that may be helpful in some cases of feather picking. May cause severe lethargy.

#### **DOXYCYCLINE - (Pfizer; Henry Schein; Roerig)**

Available as a suspension (5 mg/ml, Vibramycin monohydrate), syrup (10 mg/ml, Vibramycin calcium syrup) or capsules (100 mg, Henry Schein) for oral administration. Also available in the US as an injectable solution (10 mg/ml, Vibramycin hyclate) for IV administration. In Europe and Canada, an injectable solution (20 mg/ml, Vibravenös) is available that can be administered IM. A doxycycline for IM administration produced by a compounding pharmacist has been suggested for use in individual birds.

Doxycycline is the therapeutic agent of choice for the treatment of chlamydiosis. This agent has greater activity, less immunosuppression and fewer side effects with fungal overgrowth than other tetracycline preparations. Calcium and zinc have little effect on the absorption of doxycycline. Iron decreases absorption substantially. Calcium and zinc may reduce the half-life of doxycycline by binding excreted doxycycline and thereby preventing enterohepatic circulation. A bird's feces may turn red when being treated with oral doxycycline.

Vibramycin hyclate IV is the therapeutic agent of choice for treating acute and severe cases of chlamydiosis in the United States. Once a patient is stabilized with IV administration, it can be switched to an oral suspension (monohydrate or syrup). Vibravenös, available in Europe and Canada, administered IM, is the preparation of choice for treating chlamydiosis where available. Vibramycin monohydrate designed for IV administration may cause severe muscle necrosis when administered IM.

Injectable doxycycline should be used within six hours of being reconstituted. The drug may remain stable if refrigerated for 72 hours. Reconstituted IV injectable (hyclate only) solution can be maintained in the freezer. In general, the time-related degeneration of tetracyclines results in the formation of toxic by-products. If vomiting occurs with the higher recommended dose of oral doxycycline, the dose should be split and administered BID. If vomiting continues, the dose should be reduced in 5 mg/kg intervals until vomiting stops. Macaws appear to be particularly sensitive to doxycycline and are the most frequent species to regurgitate following oral administration. Consumption of doxycycline-medicated food caused an increase in AST and LDH activities in Goffin's Cockatoos. Gram's stains of the feces should be monitored for proliferation of candida when any tetracycline is being administered. Doxycycline does persist and may stop oviposition in egg-laying hens. Toucans, particularly young birds, are sensitive to tetracyclines and may develop bone deformities following its use (see Chapter 17).

#### **D-PENICILLAMINE - Cuprimine (Merck); Depen (Wallace)**

Available as capsules (Cuprimine, 125 or 250 mg); or tablets (Depen, 250 mg) for oral administration. Used as a chelating agent. Particularly effective for copper. May also reduce blood and tissue concentrations of lead, zinc and other heavy metals. Low therapeutic index. May cause aplastic anemia, agranulocytosis, vomiting and diarrhea.

#### **D-TUBOCURARINE**

Mydriatic (3 mg/ml strength) (see Chapter 26).

#### **ECHINACEA - (BioBotanica Inc.)**

Available as a solution (a derivative of *Angustifolia purpurea*) for oral administration. Used as an immunostimulant. May speed recovery in some cases of poxvirus and in debilitated birds.

#### **EDTA - TRIS Lysozyme Solution**

Must be prepared from a chemical base. Best obtained from a compounding pharmacist. Materials to prepare the solution are available from Sigma Chemical Co. The solution is made by mixing 3.07 g Trizma HCL, 3.71 g Trizma base, 1.12 g disodium EDTA and 0.045 g lysozyme in 1000 ml of water. Solution can be used intratracheally, intranasally or to lavage wounds. Toxic if administered orally or parenterally. Particularly effective in treating pseudomonas dermatitis and sinusitis. EDTA - TRIS solution can be mixed and frozen. The lysozyme component should be added just before use.

The impermeability of the cell wall of gram-negative bacteria results in some of the antibiotic resistance seen with this group of bacteria. EDTA binds bivalent cations, which are required for

formation of the lipopolysaccharide layer of the cell wall. Lysozyme catalyzes the hydrolysis of peptidoglycans found in the bacterial cell wall. The damaged cell wall is more permeable to antibiotics.

**ENILCONAZOLE - Clinafarm (Sterwin)**

Available as a solution (13.8% - 138 mg/ml) for topical use on hatchery and farm equipment for the control of aspergillosis. Corrosive and may cause irreversible damage to the eyes.

**ENROFLOXACIN - Baytril (Haver/Diamond)**

Available as a tablet (5.7, 22.7 or 68 mg) for oral administration or as an injectable solution (22.7 mg/ml) for IM administration. Baytril is the veterinary-labelled form of a fluoroquinolone class of antibiotics (human product = ciprofloxacin). The injectable solution can be administered orally. IM injection may result in severe muscle necrosis in some species. There is no advantage to using ciprofloxacin in place of enrofloxacin. Inability of bacteria to develop resistance is over-rated. Many gram-negative bacteria, particularly pseudomonas, are resistant to enrofloxacin and ciprofloxacin. Early studies show encouraging results in chlamydia therapy (see Chapter 34). Birds should be monitored for the development of secondary yeast infections.

Enrofloxacin may cause irritability in some birds. Long-term enrofloxacin treatment in pigeons was well tolerated; however, a dose-dependent increase in embryonic mortality was associated with drug administration to breeding pigeons. Hens receiving 800 ppm of enrofloxacin passed the drug in their crop milk, causing decreased weight gains and occasional joint abnormalities in squabs. A Senegal Parrot treated with enrofloxacin and ketoconazole for ten days was found to have renal damage. This drug should be used with caution in young birds. Quinolones have been suggested as a cause of joint problems in young psittacines and pigeons in Europe (see Chapter 17).

**EPINEPHRINE (1:1000) - (Webster; Vedco; Butler; Phoenix)**

Available as an injectable solution. Dilute with 10 parts LRS. This drug should be used with caution in birds. The therapeutic index for this drug is low. Clinical indications are confined to desperate attempts at restoring cardiac function in cases of peracute death from anesthesia.

**ERGONOVINE MALEATE - Ergotrate maleate (Lilly)**

Available as an injectable solution (0.2 mg/ml) for IM administration. Causes firm contractions of the uterus. Used in conjunction with calcium gluconate to induce the passage of an egg from the oviduct. Contraindicated if the egg is adhered to the wall of the oviduct or if a mechanical blockage is preventing egg passage.

**ERYTHROMYCIN - (Sanofi; Lextron)**

Available as an injectable solution (100 or 200 mg/ml) for IM or IV administration or as tablets (250 or 500 mg) or solutions for oral administration. Most gram-negative bacteria that affect psittacines are resistant to this drug. May be effective in cases of sinusitis and air sacculitis caused by mycoplasma. Injectable solution can be used in a nebulizer to treat upper respiratory infections caused by mycoplasma. Injectable solution administered IM can cause severe muscle necrosis (see Chapter 17).

**ETHAMBUTOL HYDROCHLORIDE - Myambutol (Lederle)**

Available as tablets (100 or 400 mg) for oral administration. Used for the treatment of *Mycobacterium* spp. infections, particularly strains that are resistant to isoniazid.

**FENBENDAZOLE - Panacur (Hoechst-Roussel)**

Available as a suspension (10% - 100mg/ml) for oral administration. Can be used for ascarids, some microfilaria, flukes and capillaria. Fenbendazole should not be used while active feather development is occurring (may damage developing feathers). Has not been

found to be effective against the gizzard worm that infects finches. May not always be effective against capillaria. May be effective against *Syngamus* spp. The drug has a low therapeutic index in some species of finches. A dose of 10 ml/liter of water has been associated with death three to five days following administration. This dose may cause ataxia, depression and mydriasis in canaries.

**FERRIC SULFATE - Monsel's Solution**

Available as a liquid or powder for topical application. Used for chemical cauterization of minor bleeding caused by damage to beak or nails. Should not be used to stop bleeding associated with soft tissue or damaged pin feathers. Placing a foreign compound into a feather follicle can cause the formation of feather cysts.

**FLUCONAZOLE - Diflucan (Roerig)**

Available as tablets (50, 100 or 200 mg) for oral administration or as an injectable solution (2 mg/ml) for IV administration. *In vitro* activity for aspergillosis, candida and cryptococcus. Passes blood-brain barrier.

May not be compatible with other antifungals. Transient regurgitation may occur in some species, particularly cockatoos and cockatiels. Elevated AST and LDH levels have been reported in some species being treated with fluconazole (see Chapter 17).

**FLUCYTOSINE - 5-fluorocytosine, Ancobon (Roche)**

Available as a capsule (250 and 500 mg) for oral administration. May be indicated for the long-term treatment of aspergillosis infections or for severe candidiasis infections that are resistant to nystatin. Because nystatin is not absorbed from the gut, flucytosine may be used to treat candida infections in other organ systems (particularly respiratory infections).

Flucytosine is toxic to the bone marrow and frequent CBCs should be used to monitor for evidence of bone marrow damage.

**FLUNIXIN-MEGLUMINE - Banamine (Schering)**

Available as an injectable solution (50 mg/ml) for IV or IM administration. Derived from nicotinic acid. Potent cyclo-oxygenase inhibitor that functions as a non-steroidal analgesic, anti-inflammatory and antipyretic agent. May be helpful in some cases of shock and trauma. May also be useful as an antipyretic in cases of hyperthermia. May cause vomiting and diarrhea in some birds.

**FURAZOLIDONE**

Has been associated with congestive heart failure and death in chicks, ducklings and turkey poults.

**FUROSEMIDE - Lasix (Hoescht-Roussel)**

Available as an injectable solution (5% - 50 mg/ml) for IM or IV administration or as a syrup (1% - 10 mg/ml) for oral administration. Used as a diuretic. Furosemide should be considered to have a low therapeutic index in birds. Some avian species (particularly lorries) are extremely sensitive. Overdose may cause severe dehydration and electrolyte abnormalities. Toxic reactions are characterized by neurologic signs and death.

**GENTAMICIN SULFATE - (Butler; Schering)**

Available as an injectable solution (50 mg/ml) that may be used orally, intranasally, topically or for nebulization. Also available as ophthalmic ointment or as otic solution (3 mg/ml) that can be used intranasally or topically. For nebulization, 1 ml of injectable solution is mixed with 10 ml of saline and nebulized for 15 minutes TID.

Experimental data indicate that the doses needed to maintain therapeutic blood levels and the doses that cause nephrotoxicity and ototoxicity vary widely among avian species. A transient polyuria indicative of renal damage is common. The dose that is considered nephrotoxic has not been determined for all birds.

Prolonged use in any bird can cause permanent renal damage. Owls appear to be particularly sensitive to the toxic effects of gentamicin, as are some cockatoo species. A dose of 20 mg/kg IM, subcutaneously or IV can cause collapse, respiratory arrest and death in some avian species, particularly lories. Parenteral administration of amikacin is safer in birds. Gentamicin ophthalmic solution must be used with caution in small birds to prevent overdosing and nephrotoxicity. Gentamicin should be used only in life-threatening infections that have been shown to be resistant to less toxic antibiotics or amikacin.

Gentamicin is not absorbed from the gut and can be given orally to sterilize the gut or to treat severe cases of enteritis in which an infection is localized to the gastrointestinal tract. Oral administration is generally needed only for two to three days. This drug can be nebulized for the treatment of upper respiratory infections (sinuses, trachea, lungs). Topical preparations may impair wound contraction and retard healing. The toxic effects of aminoglycosides may be potentiated when used in combination with cephalosporins or furosemide (see Chapter 17).

#### **GENTIAN VIOLET - GV-11 (Noremco)**

Available as a powder or solution (1.6% - 16 mg/ml) for oral administration. Can be used to treat gastrointestinal candidiasis that is resistant to nystatin. Acts as a drying agent, which may be helpful in treating moist dermatitis. Will stain clothing, feathers and hands.

#### **HALOPERIDOL - Haldol (Henry Schein)**

Available as a solution (2 mg/ml) for oral administration or as an injectable solution (50 or 100 mg/ml) for IM administration. Used in humans to treat compulsive, obsessive behavior. Has a tranquilizing effect in humans with mental confusion. May be effective in some cases of feather picking and self-mutilation in birds. Appears to work best in cockatoos. African Grey Parrots and Quaker Parakeets may be disoriented or neurotic following administration. The IM product may provide two to three weeks of activity. Should be used in conjunction with behavioral modification to correct the inciting cause of the destructive behavior. The dose should be adjusted by increasing or decreasing 0.01 ml every two days. Administration should be discontinued if anorexia, ataxia or vomiting occur. Quaker Parakeets and Umbrella and Moluccan Cockatoos appear to be particularly sensitive to this drug and may respond to much lower doses (0.08 mg/kg, SID).

#### **HALOXON**

Often combined with piperazine for the treatment of capillaria in pigeons. Low therapeutic index in Psittaciformes, Anseriformes and raptors. Antidote for toxicity is atropine.

#### **HEMICELLULOSE - Psyllium; Metamucil (Searle)**

Found as a fiber source in some formulated diets. May be effective in controlling glucosuria, hypocalcemia and hypercholesterolemia. Can be administered as a bulk laxative to aid in the passage of foreign bodies. Large doses may precipitate out in the crop or upper intestinal tract causing an impaction.

#### **HYDROCHLORIC ACID**

A one M/l solution is mixed at a rate of 30 ml/pint of drinking water. May be effective in some cases of enteritis that are not responsive to traditional therapy. Preliminary findings suggest that this treatment may help in some cases of megabacteriosis.

#### **IMMUNOREGULIN - (Immunovet)**

Available as a solution for IV administration. Has been suggested as an immunostimulant in birds, but there is no scientific documentation that it is effective. Anaphylactic reactions and death have been reported in some birds.

#### **IODINE - Lugol's Solution (Butler); Renografin-76 (Solvay)**

Available as a solution (50 mg/ml free iodine and 100 mg/ml potassium iodine). Used in water to prevent goiter in iodine-deficient areas. Will oxidize if exposed to light and must be stored in dark-colored bottle. Concentrated solution is made by mixing two ml of Lugol's solution in 30 ml of water. Working solution is mixed fresh daily by mixing one drop of concentrated solution in 250 ml of drinking water. Organic iodines (diatrizoate sodium, 37% iodine) can be administered IM (122 mg/kg) in budgerigars with goiter.

#### **IPRONIDAZOLE - Ipropan (Roche)**

Available as a soluble powder (61 g/2.65 oz) for oral administration. Used to treat trichomoniasis, histomoniasis and giardiasis.

#### **IRON DEXTRAN - (Butler; Lextron; Vedco)**

Available as a solution (100 mg/ml) for IM injection. Indicated in some cases of anemia and hemorrhage. Must be used with caution in toucans and mynah birds that are prone to hemochromatosis.

#### **ISONIAZID - INH (CIBA Pharmaceuticals)**

Available as a tablet (300 mg) Also available as a capsule in combination with rifampin (Rifamate - 300 mg isoniazid and 300 mg rifampin). Destroys actively growing tubercle bacilli. May cause a fatal hepatitis, vomiting, depression and ataxia.

#### **ITRACONAZOLE - Sporanox (Janssen)**

Available as capsules (100 mg) for oral administration. *In vitro* activity for aspergillosis, candida and cryptococcus. Used successfully in Europe for aspergillosis in waterfowl and penguins. This drug is considered to be more effective against aspergillosis and less toxic than other anti-fungals.

Has been associated with anorexia and depression in African Grey Parrots given 8-10 mg/kg BID. Other reports indicate that it is effective against aspergillosis in Psittaciformes with few side effects at a dose of 10 mg/kg BID for months. Has been associated with hepatitis in mammals (see Chapter 17).

#### **IVERMECTIN - Ivomec, Eqvalen (Merck Agvet)**

Supplied as an injectable solution (10 mg/ml) for IM, topical or oral administration. Effective for some nematodes, mites and lice. Most effective therapy for *Knemidokoptes*. Calculated dose can be used topically on affected areas or can be given orally.

May also be effective for *Oxyspirura*, some coccidia, some nematodes, gapeworms and sternostomatosis. May not be effective against all coccidia. Toxic in bullfinches and goldfinches when used topically at 0.4 mg/kg. Propylene glycol is used as a carrier in the solution designed for cattle and pig use. This product will precipitate out if diluted with sterile water. The propylene glycol-based product may cause toxic reactions when administered IM, particularly in small birds. Ivermectin diluted in propylene glycol will settle out and the diluted product should be thoroughly mixed before administration. The water-soluble preparation designed for use in horses is easier to work with and appears to be safer. However, deaths in finches and budgerigars have been reported when Eqvalan (the water based formula) was administered IM at the recommended dose.

Ivermectin is environmentally stable and is highly toxic to fish and crustaceans. The drug or its metabolites should not be allowed to contaminate lakes, streams or rivers.

#### **KETOCONAZOLE - Nizoral (Janssen)**

Available as a tablet (200 mg) for oral administration. Used for the treatment of severe candidiasis in which other therapies have been ineffective. This drug is water-soluble and is easiest to dissolve in acid. Tablets can be dissolved in 0.8 ml one M hydrochloric acid and 3.2 ml of water for administration by gavage. The mixture normally turns light pink.



Crushed tablets can also be added to mashes or mixed in orange juice, aloe vera, lactulose or pineapple juice if accepted by the patient. Crushed tablets can be mixed with methyl-cellulose by a compounding pharmacist to produce a stable product that is easy to administer. This drug impairs synthesis of ergosterol, which is a critical component of the fungal cell membrane. May cause hepatocellular necrosis (see Chapter 17).

#### LACTATED RINGER'S SOLUTION (LRS)

Available as an isotonic solution for IV administration. Can also be administered orally if gastrointestinal stasis or vomiting are absent. In cases of mild dehydration (5%), oral administration may be effective. Absorption may be enhanced by mixing with psyllium and sugar. In more severe cases, parenteral administration of fluids is required. Fluid replacement is calculated by: body wt in g X % dehydration = quantity of fluid in ml. The maintenance fluid requirement for birds is considered to be 50 ml/kg/day.

#### LACTOBACILLUS - Probiocin (Pioneer)

Contains *Lactobacillus planatarum*, *Streptococcus faecium*, *L. casei* and *L. acidophilus*. Multi-dose application may be effective in establishing flora that can act to prevent pathogenic gram-negative bacteria from colonizing the gastrointestinal tract. Should be considered as adjunct therapy in any bird that has received antibiotics, has bacterial enteritis or has a reduced population of intestinal microbes as determined by Gram's staining.

#### LACTULOSE - Cephalac (Marion Merrell Dow)

Available as a suspension (667 mg/ml) for oral administration. Acts as an osmotic retardant to the absorption of potential toxins from the gastrointestinal tract. Palatable and usually well tolerated by patients. Can be used as a carrier for many less palatable drugs. Indicated in cases of liver disease to decrease the load of metabolites that must be processed by the liver. May be effective as an appetite stimulant in some birds. May also be effective in establishing a gastrointestinal environment that favors the growth of autochthonous flora. Can be used daily for weeks if needed. The dosage should be reduced if diarrhea occurs.

#### LEVAMISOLE - Levasole (Pitman Moore);

#### Tramisol (American Cyanamid); L-Spartakon (Janssen)

Available as an injectable solution (13.65% - 136.5 mg/ml) for IM, SC, or PO or as tablets (20 mg) in Europe for PO in pigeons. May be effective for intestinal nematodes. Experimental studies in chickens suggest that a dose of 1.25-2.5 mg/kg administered PO or SC increases immune response in immunosuppressed birds. However, there is no work to confirm a positive immunostimulatory effect in other birds. Suggested dosing when used as an immunostimulant is 2 mg/kg IM or SC every 14 days for three doses. May cause swelling at the injection site.

Low therapeutic index. This drug is not recommended for use in debilitated patients. Parenteral administration of 2 to 4 times therapeutic dose may cause vomiting, neurologic problems and death. A dose of 40 mg/kg SC or IM has been associated with ataxia, depression, regurgitation and mydriasis in some cockatoos, budgerigars and mynah birds. Clinical signs are most severe when administered IM. A dose of 25 mg/kg IM has been associated with hepatotoxicity in budgerigars. Death has been reported in pigeons administered 35 mg/kg IM, Peach-faced Lovebirds administered 66 mg/kg IM and White Ibis administered 22 mg/kg IM.

#### LEVOTHYROXINE SODIUM - Thyroxine I (Butler)

Available in tablet form (0.1, 0.2, 0.3, 0.5, or 0.8 mg) or suspension (0.4 mg/ml) for oral administration. Can be mixed with drinking water (mixed fresh daily) to treat goiter and hypothyroidism. A tablet (0.1 mg) is crushed and mixed with 4-12 oz of drinking water. Response to therapy is widely variable. May induce molt. T<sub>4</sub>

levels should be monitored with long-term therapy to maintain proper blood levels and prevent overdose. Should be used with extreme caution except in cases of documented hypothyroidism. Overdose causes an iatrogenic hyperthyroidism (tachycardia, polydipsia, polyuria, vomiting, weight loss, convulsion and death) (see Chapter 23).

#### LINCOMYCIN HCL - Lincocin (Upjohn)

Available as a solution (50 mg/ml) for oral administration or as an injectable solution (100 mg/ml) for IM or IV administration. This drug has poor activity against most gram-negative bacteria but does have good activity for many gram-positive organisms. May be effective in treating chronic respiratory infections caused by mycoplasma. May be useful in cases of chronic dermatitis caused by gram-positive organisms. Has been associated with death in some birds when administered IV. Patients should be monitored for secondary yeast infections.

#### LEUPROLIDE - Lupron (TAP Pharmaceuticals)

Available as lyophilized microspheres (7.5 mg/vial) for IM injection. Has been shown to cause cessation of ovarian activity for up to 14 days in cockatiels. May be used in cases of egg-related peritonitis to stop ovarian function. Reduces levels of testosterone to castration levels. Has been used to stop aggressive male behavior.

#### LORELCO - Probacoll (Merrell Dow)

Available as tablets (250 or 500 mg) for oral administration. Used in mammals to lower blood cholesterol levels. Has been used in birds to control lipemia and suppress the growth of lipomas. In humans, drug administration is discontinued if a patient has a prolonged QT interval.

#### MANNITOL - (Webster; Vedco)

Available as an injectable solution (20 mg/ml or 180 mg/ml) for slow IV administration. Functions as an osmotic diuretic and may be effective in reducing intraocular and intracranial pressure. Used primarily to reduce brain swelling following head trauma.

#### MEBENDAZOLE - Telmintic, Telmin (Pitman Moore)

Available as a soluble powder (Telmintic, 40 mg/g) or suspension (Telmin, 33.3 mg/ml) for oral administration by gavage or by lacing food. Primarily used for capillaria. Has been associated with hepatitis in some mammals and raptors. Death and intestinal obstruction caused by dead nematodes have been reported at all doses in some finches and some psittacine birds. Reported to be toxic in pigeons, cormorants, pelicans and raptors. Commonly mixed in the food of geese and pheasants. A dose of 12 mg/kg may cause death in Columbiformes.

#### MEDROXYPROGESTERONE ACETATE - (Upjohn)

Available as tablets (2.5, 5, or 10 mg, Provera promone) for oral administration or as an injectable suspension (100 mg/ml, Depo-provera) for IM or SC administration. Intramuscular injection may cause muscle necrosis. Can be used to inhibit ovulation and as an antipyretic. Inhibits secretion of pituitary gonadotropin and prevents follicular development and ovulation. In some birds, one dose may be effective in suppressing ovulation for six months. The dose of medroxyprogesterone varies with the size of the bird (150 g [0.05 mg/g]; 150-300 g [0.04 mg/g]; 300-700 g [0.03 mg/g]; 700 g [0.025 mg/g]; Umbrella Cockatoo [0.018 mg/g]).

There are numerous metabolic side effects. A single dose may cause lethargy, obesity, polydipsia, polyuria and fatty liver syndrome in some species. Cockatoos and Quaker Parakeets appear to be very sensitive and require a reduced dose (see Chapter 29).

**METHRIDINE -**

Used to treat capillaria in raptors only. Commonly causes vomiting which helps expel parasites in the pharynx and esophagus. Should not be stored in plastic.

**METHYLPREDNISOLONE ACETATE - Depo-Medrol (Upjohn)**

Available as an injectable solution (20 or 40 mg/ml) for IM administration. Has been associated with birth defects when administered to pregnant mammals.

**METOCLOPRAMIDE HCl - Reglan (Robins)**

Available as tablets (10 mg) or syrup (1 mg/ml) for oral administration. Also available as an injectable solution (5 mg/ml) for IV or IM administration. Thought to sensitize tissues to acetylcholine. In mammals, stimulates gastrointestinal motility without increasing gastric, biliary or pancreatic secretions. Indicated in birds with gastrointestinal motility problems, slow crop-emptying, regurgitation and vomiting that is not associated with blockage of the gastrointestinal tract.

Has been associated with hyperactivity in some birds. Should not be used when gastrointestinal stasis is caused by intraluminal or extraluminal masses that are preventing the movement of ingesta. Also contraindicated in cases of gastrointestinal bleeding or perforation.

**METRONIDAZOLE - Flagyl (Searle)**

Available as tablets (250 or 500 mg) for oral administration or as an injectable solution (5 mg/ml) for slow IV administration. Used for treatment of giardia, hexamita and for anaerobic bacterial infections. Resistant organisms may require two daily injections followed by two more doses in 14 days.

Contraindicated in finches. Injectable solution can be administered IM but may cause necrosis at the site of injection. Needles and IV sets containing aluminum should not be used with some preparations.

**MIBOLERONE - Cheque (Upjohn)**

Available as a solution (100 µg/ml) for oral administration. May be effective in stopping oviposition. The experimental dose is 10 µg/kg.

**MICONAZOLE - Monistat (Janssen)**

Available as an injectable solution (10 mg/ml) for slow IV administration or as an ointment or cream (1 or 2%) for topical administration. Used for the treatment of systemic mycosis, particularly candida and cryptococcus. Must be given slowly to prevent tachycardia, cardiac arrhythmia or death. Ointment can be used for nasal or dermal fungal infections. High therapeutic index in mammals.

**MINERAL OIL**

Administered by gavage as a laxative and to aid in the removal of intraluminal foreign bodies (eg, lead, zinc, plastics). Aspiration pneumonia is common if administered orally.

**MONENSIN SODIUM - Coban (Elanco)**

Available as a feed additive (45 or 60 g/lb) for oral administration. Used to prevent coccidiosis in Galliformes, quail, cranes and pigeons. Has been shown to be safe in cranes at five times the therapeutic dose. Monensin was more effective than clazuril or amprolium for treating coccidiosis in Galliformes and cranes. May be lethal if consumed by mature turkey or guinea fowl.

**MORPHINE**

Sensitivity and response varies with species. In Galliformes, 2.5 - 30 mg/kg produces analgesia.

**NALOXONE - (Pitman; Moore)**

Available as an injectable solution for slow IV administration as a narcotic and tranquilizer antagonist.

**NATAMYCIN - Natacyn (Alcon)**

Available as a 5% solution for ophthalmic use. Used for ocular and periocular fungal infections. Patients receiving this medication should be slowly weaned off the drug by a gradual reduction in dosing.

**NEOMYCIN - Biosol (Upjohn)**

Available as a solution (50 mg/ml) for oral administration. The drug preparation that contains methscopolamine bromide (BiosolIM) can be toxic. Not absorbed from the gastrointestinal tract. Drug preparation used mainly for sterilizing the gut in infections localized to the gastrointestinal tract.

**NEOMYCIN TOPICAL - (Schering)**

Available as an ointment or cream for topical administration. Some preparations may also contain other antibiotics, steroids, trypsin, and chymotrypsin. The preparations containing trypsin and chymotrypsin are particularly useful for debriding and providing antimicrobial activity to necrotic areas of skin.

**NICLOSAMIDE - Nicloside (Miles)**

Available as a tablet (500 mg) for gavage or by lacing food. Primarily used for tapeworms. Causes the expulsion of the parasite, which can be a diagnostic aid in difficult-to-detect infections. The ground tablets are not soluble in water and must be added to a gruel. Has been used in a baked bread type of food for administration to finches in Australia. Tablets can be administered directly to some larger species. All doses have been associated with death in pigeons, geese and some other Anseriformes.

**NITROFURAZONE - Furacin (SmithKline Beecham)**

Available as a soluble powder (9.2% - 92 mg/ml) for oral administration or as a solution or ointment (0.2% - 2 mg/ml) for topical application. May be effective in preventing the spread of *E. coli* and salmonella-induced enteritis on a flock basis. Has been used to treat some strains of coccidia in psittacine birds. The coccidia that infect toucans and mynahs appear to be less susceptible. Topical preparations slow epithelialization and retard wound healing.

Nitrofurazone has a low therapeutic index and should not be mixed in nectar. Overdose may cause neurologic signs or death. If neurologic signs occur, treatment should stop immediately. A dose of 1 tsp/gallon of drinking water may cause screaming, incoordination, vomiting, and death in mynahs, lorikeets and lorries. Topical preparations slow epithelialization of damaged tissues. Furacin powder should not be used on wounds that could be open to the pneumatic bones or to the abdomen or thorax. May cause severe granulation formation if it enters the air sacs.

**NITROTHIAZOLE - Enhapfin (American Cyanamid)**

All doses administered orally have been associated with death in finches.

**NORTRIPTYLINE HCl - Aventyl HCl (Lilly)**

Available as a tablet (25 mg/ml) or syrup (2 mg/ml) for oral administration. A tricyclic anti-depressant that is used in humans as a mood elevator to treat depression. May be effective in treating some cases of feather picking. If a bird becomes hyperactive, the drug dose should be reduced and if it remains hyperactive, treatment should be stopped. Clinical experience suggests that this drug is rarely effective in cases of feather picking.

**NYSTATIN - Mycostatin (Apothecon); Myco 20 (Squibb)**

Available as a suspension (100,000 units/ml) or as a feed premix (Myco 20) for oral administration. Used for the treatment of sus-

ceptible strains of candida localized to the gastrointestinal tract. Nystatin must come in contact with candida to be effective and is not absorbed from the gastrointestinal tract. Oral lesions must be treated topically and will not resolve if nystatin is administered by gavage. Neonates that are receiving antibiotics should be monitored by Gram's stains for the early detection of candida overgrowth. If candida is found to be proliferating, nystatin therapy should be initiated. Some strains of candida are resistant to nystatin and Gram's stains should be used to monitor therapeutic results.

Nystatin feed premixes contain high levels of calcium and should not be used in conjunction with tetracycline therapy (see Chapter 17).

**OXFENBENDAZOLE - Synanthic (Syntex)**

Available as a suspension (90.6 or 225 mg/ml) for oral administration. May be effective for some nematode infections.

**OXYTETRACYCLINE - Liguamycin - LA200 (Pfizer)**

Long-acting tetracycline available as an injectable solution (200 mg/ml) for IM or IV administration. It may be effective in treating chlamydiosis, but severe muscle necrosis may occur in some species following IM administration. Secondary yeast infections may be a problem (see Chapter 17).

**OXYTOCIN - (Butler; Lextron; Vedco)**

Available as an injectable solution (20 units/ml) for IM, IV or SC administration. Used in conjunction with calcium gluconate for the treatment of uncomplicated uterine stasis. Should not be used if an egg is adhered to the oviduct, if the uterus is ruptured or if passage of an egg is mechanically inhibited.

**2-PAM**

Available as an injectable solution for IM injection as an antidote to cholinesterase inhibitor toxicosis as seen in many insecticide toxicities.

**PANCREATIC ENZYMES - Viokase V (Fort Dodge); Hi-Vegi-Lip (Freeda Vit, Inc.)**

Available as a powder for oral administration. Contains lipase, protease and amylase. Can be mixed with food or administered by gavage. Primarily indicated in cases of pancreatic insufficiency but may also help in the digestion of food in some cases of weight loss, enteritis or slowed crop-emptying. Viokase has been developed for use in mammals. Hi-Vegi-Lip may be more effective for assisting in the digestion of high-cellulose diets consumed by grain-eating birds. This product is available in 2400 g tablets. One-fourth of a tablet may be mixed with water or hand feeding formula and gavaged in a 250-500 g bird with each meal.

**PANCURONIUM BROMIDE - (Astra)**

Synthetic, non-depolarizing, neuro-muscular blocking agent used to dilate the pupil. Dose of 0.06 mg/kg injected into the anterior chamber of the eye of an eagle resulted in tachycardia, dyspnea and depression within 20 minutes.

**PARCONAZOLE**

Used as a food additive in Europe to control candida.

**PHENOBARBITAL - Donnatal (Robins)**

Available as a tablet (16.2 mg), elixir (3 mg/ml), or solution (4 mg/ml) for oral administration. Has a peripheral anticholinergic, antispasmodic and mild sedative effect. Should not be used in patients with gastrointestinal blockage. May cause depression, vomiting and ataxia.

**PHENYLBUTAZONE - Butazoludin (Coopers)**

Available as an injectable solution (200 mg/ml) for IV administration or as a tablet (100 or 400 mg) for oral administration. Non-

steroidal anti-inflammatory anti-pyretic agent. Not for SC or IM administration.

**PIPERACILLIN - Pipracil (Lederle)**

Available as an injectable solution (200 mg/ml) for IM or IV administration. Lower end of dose range used when combined with aminoglycoside administration.

Piperacillin is unstable (48 hours when refrigerated) once it is reconstituted. It can be reconstituted, transferred into sterile vials and frozen for one month (see Chapter 17).

**PIPERAZINE - (Agrilabs)**

Available as a suspension (17% - 170 mg/ml or 34% - 340 mg/ml) for oral administration. Has been used for ascarids in gallinaceous birds. Has not been shown to be effective in psittacine birds and finches.

**POLYMYXIN B**

A dose of 5-10 mg/kg has been associated with weakness, incoordination, vomiting and death in Amazon parrots.

**POTASSIUM CHLORIDE**

Available as an injectable solution for slow IV administration in concert with electrolyte analysis and electrocardiography. Can cause arrhythmias.

**PRAZIQUNTEL - Droncit (Haver/Diamond)**

Available as tablets (23 or 34 mg) for oral administration or as an injectable solution (56.8 mg/ml) for IM, SC or PO. Used for treating tapeworm infections. Can be administered by gavage or by lacing food. May stop the shedding of tapeworm eggs but not eliminate the adults. Discussed as treatment for liver flukes but may not be effective (see chlorsulon).

Injectable form may be toxic in some species, particularly finches. A dose of 100 to 250 mg/kg IM has been associated with depression and death in some species.

**PREDNISOLONE SODIUM SUCCINATE - Cort Sol (Butler); Solu-Delta-Cortef (Upjohn)**

Available as a tablet (5 mg) for oral administration or as an injectable solution (10 or 50 mg/ml) for IM or IV administration. For oral administration, mix one (5 mg) tablet in 2.5 ml of water (makes a solution of 2 mg/ml). Dose is 6 mg/kg BID. Can be mixed with lactulose for oral administration. Used as an anti-inflammatory in cases of shock and trauma. Long-term therapy should be avoided. Also effective in reducing the effects of endotoxins released from the destruction of gram-negative bacteria.

**PRIMAQUINE PHOSPHATE**

See chloroquine phosphate. Used in combination with chloroquine for the treatment of avian malaria (*Plasmodium* sp.).

**PROCAINE PENICILLIN G AND PENICILLIN BENZATHINE - Ambi-pen (Butler); Benza-pen (SmithKline Beecham)**

Available as an injectable solution (150,000 units penicillin G procaine and 150,000 units penicillin benzathine) for IM or SC administration. Maintains therapeutic blood levels up to 48 hours in some species. Most effective in gallinaceous species and Anseriformes that are difficult to catch for more frequent drug administration. Should not be used in small birds because of a high incidence of procaine overdose and death in these species. A dose of 1 mg/kg has been associated with paralysis and death in some species.

**PROPRANOLOL - Inderol (Wyeth-Ayerst)**

Available as a tablet (10, 20, 40, 60, 80 mg) for oral administration or as an injectable (1 mg/ml) for slow IV administration. Beta adrenergic receptor blocker that has antihypertensive and antiar-

rhythmic effects. Used in cases of tachycardia. May cause depression, vomiting, heart failure or bradycardia, and patients should be carefully monitored during administration.

**PYRANTEL PAMOATE - Strongid T (Pfizer)**

Available as an oral suspension (4.5 mg/ml). High therapeutic index. Effective for many intestinal nematodes.

**PYRETHRINS**

Used topically for the treatment of external parasites that are resistant to carbaryl. Therapy for lice is the primary indication for use. Lice frequently inhabit the axillary regions, and the wings should be extended during treatment to ensure that pyrethrin is properly applied to the axillary regions.

**PYRIMETHAMINE - Daraprim (Burroughs Wellcome)**

Available as a tablet (25 mg) for oral administration. To facilitate administration, tablets can be mixed in 21 ml of water and 4 ml of KY jelly, creating a suspension containing 1 mg/ml. Used to treat plasmodium, toxoplasma and sarcocystis. The drug is a folic acid antagonist and its effects are potentiated by the administration of sulfonamides.

**QUINACRINE HCL - Atabrine (Sanofi; Winthrop)**

Available in a tablet (100 mg) that can be crushed and administered by gavage. Effective for the treatment of *Haemoproteus*; however, this parasite is not currently considered to be pathogenic, and treatment is not recommended. Low therapeutic index. Dose of 50-150 mg/kg (five times the recommended dose) causes hepatotoxicity in cockatoos.

**RAFOXANIDE**

For treatment of cestodes in Falconiformes. May be effective against some trematodes. Dose is 40 mg/kg orally.

**RIFAMPIN - Rifadin (Marion Merrell Dow)**

Available as a capsule (150 or 300 mg) for oral administration. Also available in combination with isoniazid (Rifamate). Inhibits DNA-dependent RNA polymerase activity. Interferes with bacterial but not mammalian RNA polymerase. Destroys growing tubercle bacilli. May cause a fatal hepatitis, CNS signs, depression or vomiting.

**SODIUM SULFATE - GoLYTELY (Braintree Laboratories)**

Osmotic cathartic that can be used to evacuate the gastrointestinal tract. Used in heavy metal poisoning to prevent absorption from the gastrointestinal tract by forming insoluble complexes. Should not be used in cases with impaired gastrointestinal function. Contraindicated with dehydration.

**SPECTINOMYCIN - Spectam (Sanofi; Syntex)**

Available as an injectable solution (50 or 100 mg/ml - Spectam) for IM administration or as a water-soluble solution (50 mg/ml) for oral administration. Used with some success for the flock (Galliformes) treatment of enteritis caused by gram-negative bacteria.

**STA SOLUTION**

Salicylic acid (3 g), tannic acid (3 g) qs in ethyl alcohol to 100 ml. Used as a topical treatment for moist and fungal dermatitis.

**STANOZOLOL - Winstrol V (Upjohn)**

Available as a tablet (2 mg) for oral administration or an injectable solution (50 mg/ml) for IM administration. For oral administration, a 2 mg tablet is crushed in 4 oz of water. Anabolic steroid used to increase weight gain and improve recovery from debilitating disease. Should be used with caution in birds with hepatic or renal disease. The effects of administration to gravid hens is unknown. A controlled substance in some states.

**STREPTOMYCIN SULFATE**

Used frequently in Columbiformes and Galliformes. Low therapeutic index. Appears to be highly toxic in most species of companion birds.

**SUCRALFATE - Carafate (Marion Merrell Dow)**

Available as a tablet (1 g) for oral administration. Can be mixed in 10 ml of water for administration. Disaccharide that reacts with stomach acids to form a complex that binds to the proteins associated with an ulcer, producing a protective layer that protects the ulcerated mucosa from gastric acids and microbial pathogens. Indicated in cases of gastrointestinal bleeding.

**SULFACHLORPYRIDAZINE - Vetisulid (Solvay)**

Available as an oral suspension (5% - 50 mg/ml) for oral administration or as an injectable solution (215 mg/ml) for IV administration. Used for treatment of *E. coli*-induced enteritis in Galliformes. Can cause hypersensitivity reaction resulting in a hemorrhagic syndrome. Repeated use of sulfonamides can induce hypersensitization and toxicity (hemorrhagic crisis).

**TESTOSTERONE CYPIONATE - (Henry Schein; Upjohn)**

Available as a tablet (10 mg or 25 mg, Methyltestosterone) for oral administration or as an injectable solution (200 mg/ml, Depo-testosterone) for IM administration. Incorrectly used to increase male reproductive activity and for some cases of feather loss. May be useful in some cases of reproductive-associated feather picking and chronic egg-laying. Prolonged use is not advised. Contraindicated in cases of renal or liver disease. For water administration, 100 mg is added to one oz. of water. Five drops of the stock solution is added to one oz of drinking water and is mixed fresh daily.

**TETRACYCLINE**

Available as a soluble powder, capsules (250 mg), suspension or solution (100 mg/ml) for oral administration. Also available as an eye ointment that is particularly effective in many cases of idiopathic conjunctivitis in cockatiels. Ineffective for many of the avian pathogens frequently found in pet birds. Immunosuppressive in many animal species. Potentiates secondary fungal infections. Few therapeutic uses in birds. Toucans, particularly young birds, are sensitive to tetracyclines and may develop bone deformities following its use. See Chapter 34 for chlamydia indications.

**THIABENDAZOLE - Equizole (MSD AgVet)**

Available as a suspension (4 mg/30 ml) for oral administration. Used for the treatment of ascarids and *Syngamus trachea*. May be toxic in ostriches, diving ducks and cranes.

**THIAMINE - Vitamin B<sub>1</sub> (Butler; Phoenix; Vedco)**

Available as an injectable solution (200 or 500 mg/ml) for IM administration. Also available as a powder to be added to the feed of birds consuming fish that contain thiaminase.

**TICARCILLIN - Ticar (SmithKline Beecham)**

Available as an injectable solution (30 to 400 mg/ml depending on reconstitution) for IM or IV administration. Lower concentration is used for IV injection. Good activity against many *Pseudomonas* spp. Wide therapeutic index. Good synergistic effect with aminoglycosides for use in difficult-to-treat gram-negative bacteria. Can be reconstituted and held in refrigerator for 72 hours or mixed into individual doses and frozen. IM infection in conjunction with tobramycin was associated with hepatotoxicity in a Rose-breasted Cockatoo (see Chapter 17).

**TOBRAMYCIN - Nebcin (Lilly)**

Available as an injectable solution (40 mg/ml) for IM administration. Low therapeutic index. Reserved for use in life-threatening infections caused by pseudomonas that are resistant to combina-

tion therapy with other aminoglycosides and synthetic penicillins (see Chapter 17).

**TRIMETHOPRIM/SULFADIAZINE - Bactrim (Roche);**

**Tribrisen (Coopers)**

Available as a suspension (8 mg trimethoprim and 40 mg sulfamethoxazole/ml, Bactrim) for oral administration or as an injectable solution (Tribrisen 48%; 80 mg trimethoprim and 400 mg sulfadiazine/ml) for IV administration or (Tribrisen 24%; 40 mg trimethoprim and 200 mg sulfadiazine/ml) for IM or SC administration.

Oral suspension is one of the drugs of choice for treating gastrointestinal and respiratory infections in hand-feeding babies that do not have gastrointestinal stasis. May be effective in treating some cases of coccidiosis, particularly in toucans and mynahs.

Regurgitation, facial flushing and GI stasis have been noted in some birds (particularly macaws). Should not be used in patients with liver disease or bone marrow suppression (see Chapter 17).

**TSH - Dermathycin (Jen-Sal Laboratories)**

Used for thyroid stimulation testing.

**TYLOSIN - (Butler; Elanco)**

Available as an injectable solution (50 mg/ml or 200 mg/ml Tylan 200) for IM injection. Also available as a soluble powder (Elanco) for oral administration. Soluble powder can be mixed with sterile water (mixed 1:10) and used as an eye spray. Tylosin 200 mg/ml injectable solution can be mixed with DMSO (1 ml tylosin/50 ml DMSO) and used for nebulization. May be effective in the initial therapy of upper respiratory infections, particularly when nebulized. May be useful as an eye spray for the frequent treatment of conjunctivitis (particularly if mycoplasma is suspected). Tissue concentrations of tylosin may last for three hours following an hour of nebulization in quail and pigeons. High therapeutic index (see Chapter 17).

**VERCURONIUM BROMIDE**

Available as an injectable solution. Used topically to induce mydriasis. Suggested dose in raptors is 4 mg/ml every 5 min x 3 (see Chapter 26).

**VITAMINS, MULTIPLE - Injacom (Hoffman LaRoche)**

A mixture of vitamins A, D, and E, in an aqueous emulsion for IM or SC injection. Indicated in the treatment of Vitamin A and D<sub>3</sub> deficiencies, bone healing, egg binding and other reproductive or debilitating diseases. Should be used with caution in species that appear to have problems with Vitamin D<sub>3</sub> and calcium metabolism including macaws and African Grey Parrots. Must be used with caution in birds on formulated (heavily fortified) diets.

**VITAMINS, MULTIPLE - Injacom + B (Hoffman LaRoche)**

A mixture of vitamins A, D<sub>3</sub>, E, and B available in an aqueous emulsion for IM or SC injection. Indicated in the treatment of Vitamin A and D<sub>3</sub> deficiencies, bone healing, egg binding and other reproductive or debilitating diseases. Should be used with caution in species that appear to have problems with Vitamin D<sub>3</sub> and calcium metabolism including macaws and African Grey Parrots. Must be used with caution in birds on formulated (heavily fortified) diets.

**VITAMIN B COMPLEX - (Butler; Lextron; Vedco)**

Available in injectable solution for IM administration. Indicated for cases of neuromuscular disease, debilitating illness of the liver, kidney and gastrointestinal tract, and anemia. Overdosing may cause an anaphylactic reaction.

**VITAMIN E AND SELENIUM - Seletoc (Schering)**

Available as an injectable solution (1 mg Se and 50 mg vit E/ml) for IM or SC administration. Used in cases of neuromuscular disease. May be helpful in some cockatiels with jaw, eyelid and tongue paralysis. Can be given before or shortly after stressful event (capture) to reduce the chances of capture myopathy in long-legged birds. Selenium can cause toxicity if administered in high doses.

**VITAMIN K<sub>1</sub> - (Butler; Phoenix; Vet-A-Mix; Vedco)**

Available as injectable solution (10 mg/ml) for IM or SC administration or as tablets (25 mg) for oral administration. May be effective in cases of severe and pathologic hemorrhage. Can also be used to offset the effects of drugs that cause hemorrhage (eg, sulfas, amprolium).

**YEAST CELL DERIVATIVES - Preparation H (Whitehall Laboratories)**

Stimulate epithelialization. Used to treat wounds that are not healing. Can be used in the eye.

**TABLE 18.1 Conversions and Formulas for Drug Dose Calculations**

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$\text{mg/g} \times \text{wt divided by mg/ml} = \text{dose in ml}$
$(\text{wt in g}/1000) \times (\text{mg/kg}) \text{ divided by mg/ml} = \text{dose in ml}$
1 ppm (dry weight) = 1 mg/kg
1 ppm (liquid) = 100 µg/dl
1 oz (dry) = 28.35 g
1 oz (liquid) = 29.5 ml
1 lb = 454 g
1% = 10 mg/ml
16 oz = 480 ml = 1 pint
1 cup = 8 oz = 237 ml
1 TBS = 15 ml
1 tsp = 5 cc
1 oz = 30 ml
1 ml = 1 cc

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TABLE 18.2 Therapeutic Agents

DRUG	SPECIES	ROUTE	DOSAGE
Acetylsalicylic acid	Most	Oral	1 tablet in 250 mls of water; see formulary
ACTH	Pigeon	IM	50-125 µg
Activated charcoal	Most	Oral	2-8 g/kg as needed
Acyclovir	Most	Oral	80 mg/kg TID, up to 240 mg/kg of food
Allopurinol	Budgerigar	Oral (water)	See formulary
Aloe vera	Most	Topical	0.5 ounce/pint of water, use as spray
Amikacin*	Most	IV, IM, SC	10-15 mg/kg BID or TID
Aminopentamide Hydrogen Sulfate	Most	IM, SC	0.05 mg/kg q 12 hrs - 5 doses maximum
Aminolid	Raptors	IM	0.25-0.75 mg/kg, repeat 10-14 days
Amitypyline HCl	Psittaciformes	Oral	1-2 mg/kg SID to BID
Ammonium solution	Most	Topical	See formulary
Amoxicillin	Most Pigeons Pigeons	Oral IM Oral	150-175 mg/kg SID or BID 150 mg/kg every 4 hrs 150 mg/kg QID
Amphotericin B	Raptors, Psittaciformes Raptors, Psittaciformes Raptors, Psittaciformes Most	IV Intratracheal Nebulize Topical	1.5 mg/kg BID to TID 1 mg/kg BID to TID 1 mg/ml saline (15 min BID) BID
Ampicillin*	Pigeons Pigeons Psittaciformes Psittaciformes Galliformes	IM Oral Oral IM Oral (drinking water)	150 mg/kg every 2 hrs 150 mg/kg QID 100-200 mg/kg TID to QID 100 mg/kg every 4 hrs 250 mg/8 ounces of water
Amprolium	Most	Water	2-4 ml/gallon for 5 days
Ascorbic acid (vitamin C)	Most	IM	20-40 mg/kg, daily to weekly
Atropine	Most	IM, SC	0.01-0.02 mg/kg as needed; see formulary
Avipro	Psittaciformes	Oral	4 g/200 mls of water
Azithromycin	Most	Oral	See formulary
Butorphanol tartrate	Psittaciformes	IV, oral	See formulary; 3-4 mg/kg
Calcium gluconate	Most Most Most Most	Water IM, SC IV Feed	1 ml/30 mls of water to effect 5-10 mg/kg, BID as needed 50-100 mg/kg, slowly to effect 1/8 tsp/kg feed, as needed
Calcium disodium versenate (CaEDTA)	Most	IM	20-40 mg/kg BID-TID
Caprillic acid	Most	Oral	1/4 capsule/300 g
Carbaryl	Most	Topical	See formulary
Camidazole	Pigeons	Oral	Adults 200 mg/kg once Newly weaned 100 mg/kg once
Cefotaxime*	Most	IM, IV	75-100 mg/kg TID, QID; see text
Cefoxitin*	Most	IM, IV	See formulary
Ceftriaxone	Most	IM, IV	75-100 mg/kg TID, QID or every 4 hrs; see formulary
Cephalexin*	Most Pigeons, Cranes, Emus	Oral Oral	35-50 mg/kg QID to every 4 hrs 100 mg/kg QID to every 4 hrs
Cephalothin*	Most	IM, IV	100 mg/kg QID
Cephradine	Most	Oral	See cephalixin
Chloramphenicol*	Pigeons Most Psittaciformes Galliformes	Oral (with grit) Oral (without grit) IM IV, IM Oral	95 mg/kg QID 30 mg/kg QID 80 mg/kg BID or TID 50 mg/kg TID or QID 50 mg/kg TID or QID
Chlorhexidine	Most Most Finches	Oral Topical Oral	10-30 ml/gallon 0.5% as wound lavage Very sensitive, toxic, may not drink
Chlorine	Most	Oral, topical	See formulary

## CHAPTER 18 FORMULARY

DRUG	SPECIES	ROUTE	DOSAGE
Chloroquine phosphate	Penguin	Oral	10 mg/kg once, then 5 mg/kg at 6, 18, 24 hrs
Chlortetracycline	Psittaciformes	Oral	See formulary and Chapter 34
Chlorsulon	Psittaciformes	Oral	20 mg/kg, 3 times, two weeks apart
Cimetidine	Psittaciformes	Oral	300 mg/5cc
Ciprofloxacin	Most (see enrofloxacin)	Oral	20-40 mg/kg BID
Clazuril	Pigeons	Oral	1 tablet/pigeon
Clindamycin*	Pigeons	Oral	100 mg/kg SID
Clomipramine HCl	Psittaciformes	Oral	0.5-1 mg/kg SID or BID
Colchicine	Psittaciformes	Oral	0.04 mg/kg/day, BID
Copper Sulfate	Most	Topical	As needed
Cyanocobalamin (vitamin B <sub>12</sub> )	Most	IM	250-500 µg/kg once/week
Dexamethasone	Most Raptors	IM, IV IM, IV	2 mg/kg SID or BID 1 mg/kg
Dextrose - 50%	Most	IV	50-100 mg/kg, slowly
Diazepam	Most Psittaciformes	IM, IV Oral	0.5-1 mg/kg BID, TID 2.5-4 mg/kg as needed
Diethylstilbestrol	Most	IM Oral	0.1-0.3 ml/kg 1 drop/30 mls of water
Digoxin	Conures, parakeets	Oral	0.02-0.05 mg/kg SID
Dimercaprol (BAL)	Most	Oral	25-35 mg/kg BID 5 days per week for 3-5 weeks
Dimethylsulfoxide	Most	Topical	1 ml/kg, BID as needed for swelling
Dimetridazole	Budgerigars  Most Lories, mynahs	Oral (gavage)  Oral (drinking water) Oral (drinking water)	Stock solution: 1 tsp/pint of water Dose: 0.5 ml/30 g repeat at 12 and 24 hrs 1 tsp/gallon 0.5 tsp/gallon
Dinoprost tromethamine	Most	Intraoacal, IM	0.02-0.1 mg/kg once
Diphenhydramine HCl	Psittaciformes	Oral	0.5 tsp/8 ozs water or 2-4 mg/kg BID
Doxapram	Most	IM, IV	5-10 mg/kg once
Doxepin HCl	Psittaciformes	Oral	0.5-1 mg/kg BID
Doxycycline*	Pigeons Pigeons  Pigeons  Cockatiels, Amazons, African Greys, cockatoos Macaws Other Psittaciformes	IM Oral (with grit)  Oral (without grit)  Oral Oral IM (Vibravenös) IV	10 mg/kg QID 7.5 mg/kg QID 25 mg/kg BID 150 mg/kg SID 3 mg/kg QID 7.5 mg/kg BID 25 mg/kg SID 40-50 mg/kg SID or BID 25 mg/kg SID or BID 75-100 mg/kg every 5-7 days 25-50 mg/kg; see formulary
D-penicillamine	Most	Oral	52 mg/kg BID
D-tubocurarine	Raptors	Ophthalmic	Every 5 min x 3
Echinacea	Psittaciformes	Oral Water	2.5 drops/kg 5 drops/cup of drinking water
EDTA-TRIS	Most	See formulary	See formulary
Enilconazole	See formulary		
Enrofloxacin*	Greys, Amazons Cockatoos Pigeons Psittaciformes	IM, Oral IM, Oral, SC Oral Oral (food)	7.5-15 mg/kg SID to BID 5 mg/kg BID 15 mg/kg BID 250-1000 ppm; see Chapter 34
Epinephrine	Most	IV, IO, IT, IC	0.1 mg/kg
Ergonovine maleate	Most	IM	0.06 mg/kg, once
Erythromycin	Most Most Psittaciformes	Oral (Powder) Nebulize injectable Oral (Suspension)	500 mg/gallon of drinking water 1 ml/10 ml saline 15 min TID 10-20 mg/kg BID
Ethambutol	Most	Oral	15 mg/kg BID

table continued on next page

DRUG	SPECIES	ROUTE	DOSAGE
Fenbendazole	Anseriformes Most	Oral Oral	5-15 mg/kg daily for 5 days For ascarids 20-50 mg/kg - repeat 10 days For flukes 20-50 mg/kg SID for 3 days For capillaria 20-50 mg/kg SID for 5 days
Ferric subsulfate	Most	Topical	As needed for hemorrhage
Fluconazole	Most	Oral	2-5 mg/kg SID, 7 days
Flucytosine	Most Raptors Psittaciformes, mynahs	Oral (gavage) Oral (gavage) Oral (feed)	20-50 mg/kg BID for 21 days 20-30 mg/kg QID 250-550 mg/kg of feed
Flunixin-meglumine	Most	IM	1-10 mg/kg
Furosemide	Most (see text)	IM, SC	0.15-2 mg/kg, SID-BID
Gentamicin*	Most	Ophthalmic solution intra-nasally	Several drops/nostril TID
Gentian Violet	Psittaciformes	Oral (feed), topical	0.5-1.0 g/kg of feed
Haloperidol	Psittaciformes	IM Oral	1-2 mg/kg every 2-3 weeks 0.2 mg/kg BID for birds < 1 kg 0.15 mg/kg SID-BID for birds > 1 kg; see formulary
Haloxon	Pigeons	See formulary	See formulary
Immunoregulin	Most	See formulary	See formulary
Iodine	Budgerigars	Water, IM	See formulary
Ipronidazole	Most Psittaciformes	Water Oral	500 mg/gallon for 7-21 days 0.25 tsp/gallon
Iron dextran	Most	IM	10 mg/kg, repeat in 7-10 days if needed
Isoniazid	Most	Oral	15 mg/kg BID
Itraconazole	Penguins, waterfowl Psittaciformes	Oral	5-10 mg/kg BID
Ivermectin	Most	IM, oral, topical	200 µg/kg, repeat 10-14 days
Ketoconazole*	Most Most Most	Oral (gavage) Oral (water) Oral (feed)	20-30 mg/kg BID for 21 days 200 mg/l 10-20 mg/kg
Lactated Ringer's solution	All	IV	See formulary
Lactobacillus	Psittaciformes	Oral	1 pinch/day/bird 1 tsp/ quart of hand-feeding formula
Lactulose	Most	Oral	0.3 ml/kg
Levamisole	Anseriformes Australian parakeets Most Most	Oral (gavage) Oral (gavage) Oral (drinking water) IM, SC	20-50 mg/kg 15 mg/kg, repeat 10 days 5-15 ml/gallon, 1 to 3 days 5 mg/kg, repeat 10-14 days
Levothyroxine	Most	Oral	20 µg/kg SID to BID; see formulary
Lincomycin	Budgerigar Amazon parrots Raptors Most	Oral Oral Oral Water	1 drop BID 75 mg/kg BID 100 mg/kg SID 1/8 - 1/4 tsp/pint of water
Leuprolide	Psittaciformes	IM	See formulary
Lorelco	Psittaciformes	Oral	0.25 tsp/day for 2-4 months
Mannitol	Most	IV	0.5 mg/kg slowly SID
Mebendazole	Anseriformes Raptors, Psittaciformes	Oral Oral	5-15 mg/kg daily for 2 days 25 mg/kg BID for 5 days
Medroxyprogesterone acetate	Pigeons Most	Oral (feed) IM, SC	0.1% of ration, continuous 5-25 mg/kg, every 4 to 6 weeks; see formulary
Methylprednisolone acetate	Most	IM	0.5-1 mg/kg
Metoclopramide	Most	IM, IV, oral	0.5 mg/kg
Metronidazole	Psittaciformes	Oral IM	10-30 mg/kg, BID for 10 days 10 mg/kg SID for 2 days
Miconazole	Psittaciformes	IV, topical	20 mg/kg TID
Mineral oil	Most	Oral	6-10 ml/kg, repeated as needed



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DRUG	SPECIES	ROUTE	DOSAGE
Monensin	Galliformes, cranes	Oral (feed)	90 g/ton of feed
Morphine	Galliformes	IM, SC	2.5-3 mg/kg
Naloxone	Most	IV	2 mg 14-21 hours
Natamycin	Most	Ophthalmic	1 drop QID; after 14-21 days, taper off
Neomycin	Most	Water	1-8 drops/oz water; 5 g/gallon
Neomycin ointment	All	Topical	BID to QID as needed
Nicosamide	Most Finches, see text	Gavage Gavage	50 mg/kg, repeat 10-14 days 500 mg/kg, weekly for 4 weeks
Nitrofurazone	Most Psittaciformes Lories, Lorikeets, Passeriformes	Water Water	1 tsp/gallon of water 0.5 tsp/gallon water
Nortriptyline HCl	Psittaciformes	Oral	1 ml/4 oz drinking water
Nystatin	Most Most	Oral (gavage) Oral (feed)	1 ml/300 g BID to TID, 7 days
Oxytetracycline*	Pheasants Owls Psittaciformes Cockatoos	IM IM IM IM, SC	43 mg/kg, every 24 hrs 16 mg/kg, every 24 hrs 58 mg/kg, every 24 hrs 50-100 mg/kg, every 2-3 days
Oxytocin	Most	IM	0.01-0.1 ml, once
2-PAM	Most	IM	10-30 mg/kg SID
Pancreatic enzymes	Most	Oral (feed)	1/8 tsp/kg; see formulary
Phenobarbital	Most	Oral	1-5 mg/kg BID
Phenylbutazone	Psittaciformes Raptors	Oral	3.5-7 mg/kg BID to TID 20 mg/kg TID
Piperacillin*	Most Amazon parrots	IM, IV IM	100-200 mg/kg TID to QID 75-100 mg/kg QID to every 4 hrs
Piperazine	Galliformes Anseriformes	Oral	100-500 mg/kg; repeat 10-14 days 45-200 mg/kg
Potassium chloride	Most	IV	0.1-0.3 mg/kg
Praziquantel	Most	Oral IM	10-20 mg/kg; repeat 10-14 days 9 mg/kg (flukes: SID for 3 days then oral for 11 days; tapeworms: once, then repeat in 10 days)
Prednisolone	Most	IM or IV	0.5-1 mg/kg once (anti-inflammatory) 2-4 mg/kg (immunosuppressive)
Primaquine	Penguins	Oral	0.03 mg/kg, SID for 3 days
Procaine penicillin G	Galliformes	IM	100 mg/kg SID every 2 days
Propranolol	Most	IM IV	0.2 mg/kg 0.04 mg/kg slowly
Pyrantel pamoate	Most	Oral	4.5 mg/kg, repeat 10-14 days
Pyrethrins	Most	Topical	See formulary
Pyrimethamine	Most	Oral	0.5 mg/kg BID
Quinacrine	Psittaciformes	Oral	5-10 mg/kg, SID for 7 days
Rifampin	Most	Oral	10-20 mg/kg BID
Sodium bicarbonate	Most	IV	1-4 mEq/kg slowly over 15-30 minutes - do not exceed 4 mEq/kg
Sodium sulfate	Large birds	Oral	2 g/kg, slurry for 2 days; see Chapter 37
STA solution	Most	Topical	As needed
Stanozolol	Most	IM	25 to 50 mg/kg, 1 to 2 times weekly
Streptomycin	Most larger birds	IM	10-30 mg/kg BID or TID
Sucralfate	Psittaciformes	Oral	25 mg/kg TID
Sulfachlorpyridazine	Most	Water	0.25 - 1 tsp/gallon
Testosterone	Most	IM	8 mg/kg, weekly as needed
Tetracycline	Most	Water Oral	0.25 - 1 tsp/gallon 200-250 mg/kg BID

table continued on next page

DRUG	SPECIES	ROUTE	DOSAGE
Thiabendazole	Most	Oral	For ascarids; 250-500 mg/kg, repeat 10-14 days For <i>Syngamus</i> ; 100 mg/kg, SID for 7 to 10 days
Thiamine	Raptors, penguins, cranes	Oral	1-2 mg/kg, daily
Ticarcillin	Most	IM, IV	150-200 mg/kg TID or QID
Tobramycin	Pheasants, cranes, Psittaciformes	IM	2.5-5 mg/kg BID
Trimethoprim and Sulfamethoxazole*	Psittaciformes Toucans, mynahs Psittaciformes	Oral Oral (for coccidia) IM	16-24 mg/kg BID or TID 25 mg/kg SID 8 mg/kg BID
TSH	Psittaciformes	IM	1-2 IU/kg; see Chapter 23
Tylosin*	Most Quail, pigeons, emus Cranes Most Cockatiels, Psittaciformes Most	IM IM IM Water Eye spray Nebulization	10-40 mg/kg TID or QID 15-25 mg/kg TID or QID 15 mg/kg TID or QID 2 tsp/gallon BID or TID (see formulary) One hour BID (see formulary)
Vitamin A, D <sub>3</sub> , E (Injacom 100)	Most	IM	0.1-0.2 ml/300 g, weekly as needed
Vitamin B complex	Most	IM	1-3 mg thiamine/kg, weekly
Vitamin B complex (Methiscol)	Most	Oral	1-2 g/kg food, daily
Vitamin E/Selenium (Seletoc)	Most	IM	0.05 to 0.1 mg/kg, every 14 days
Vitamin K <sub>1</sub>	Most	IM	0.2-2.5 mg/kg, as needed
Yeast cell derivatives	Most	Topical	See formulary

\* Pharmacological data are available to support doses in avian species other than poultry.

### Brand Names and Nonproprietary Names (brand names in italics)

<b>Acetylcysteine</b> - <i>Mucomyst</i>	<i>Bactrim</i> - Trimethoprim/Sulfadiazine	<b>Chlortetracycline</b> - <i>CTC</i>
<b>Acetylsalicylic acid</b> - <i>Aspirin</i>	<i>BAL</i> - Dimercaprol	<b>Cimetidine</b> - <i>Tagamet</i>
<b>ACTH</b> - Adrenal Corticotrophic Hormone	<i>Banamine</i> - Flunixin Meglumine	<b>Clindamycin</b> - <i>Antirobe</i>
<b>Activated charcoal/kaolin</b> - <i>Toxiban</i>	<i>Baytril</i> - Enrofloxacin	<i>Cipro</i> - <b>Ciprofloxacin</b>
<b>Acyclovir</b> - <i>Zovirax</i>	<i>Benadryl</i> - Diphenhydramine HCl	<b>Ciprofloxacin</b> - <i>Cipro</i>
Adrenal Corticotrophic Hormone - <b>ACTH</b>	<b>Bismuth subsulicylate</b> - <i>Pepto-Bismol</i>	<i>Claforan</i> - <b>Cefotaxime</b>
<b>Allopurinol</b> - <i>Zyloprim</i>	<i>Biosol</i> - Neomycin	<b>Clazuril</b> - <i>Appertex</i>
<i>Ambi pen</i> - Procaine Pen. G and Pen. Benzathine	<i>Butazolodin</i> - Phenylbutazone	<i>Clinafarm</i> - Enilconazole
<i>Amiglyde</i> - Amikacin Sulfate	<b>Butorphanol Tartrate</b> - <i>Torbutrol, Torbugesic</i>	<b>Clomipramine HCl</b> - <i>Anafranil</i>
<b>Amikacin Sulfate</b> - <i>Amiglyde</i>	<b>Calcium EDTA</b> - Calcium Disodium Versenate	<i>Coban</i> - Monensin Sodium
<b>Amitriptyline HCl</b> - <i>Elavil</i>	<b>Calcium Disodium Versenate</b> - Calcium EDTA	<b>Copper Sulfate</b> - <i>Caustic Powder</i>
<b>Ammonium Solution</b> - <i>Penetran</i>	<b>Caprillic Acid</b> - <i>Kaprycidin A</i>	<i>Corid</i> - <b>Amprolium</b>
<i>Amoxi-drops</i> - Amoxicillin	<i>Carafate</i> - Sucralfate	<i>CTC</i> - Chlortetracycline
<i>Amoxi-Inject</i> - Amoxicillin	<b>Carbaryl</b> - <i>Sevin</i>	<i>Cuprimine</i> - D-Penicillamine
<b>Amoxicillin</b> - <i>Amoxi-drops, Amoxi-Inject</i>	<b>Cardindazole</b> - <i>Spartix</i>	<i>Curatrem</i> - Chlorsulon
<b>Amphotericin B</b> - <i>Fungizone</i>	<i>Cardoxin</i> - Digoxin	<b>Cyanocobalamin</b> - Vitamin B <sub>12</sub>
<b>Ampicillin</b> - <i>Polyflex</i>	<i>Cart Sol</i> - Prednisolone Sodium Succinate	<b>D-Penicillamine</b> - <i>Cuprimine</i>
<b>Amprolium</b> - <i>Corid</i>	<i>Caustic Powder</i> - Copper Sulfate	<i>Daraprim</i> - Pyrimethamine
<i>Anafranil</i> - Clomipramine HCl	<b>Cefotaxime</b> - <i>Claforan</i>	<i>Depo-Medrol</i> - Methylprednisolone Acetate
<b>Ancobon</b> - Flucytosine	<b>Cefoxitin</b> - <i>Mefoxitin</i>	<i>Dermathycin</i> - TSH
<i>Antirobe</i> - Clindamycin	<b>Ceftriaxone</b> - <i>Rocephin</i>	<b>Dexamethasone</b> - <i>Azium</i>
<i>Appertex</i> - Clazuril	<b>Cephalexin</b> - <i>Keflex Pediatric Suspension</i>	<b>Diazepam</b> - <i>Valium</i>
<i>Aralen Phosphate</i> - Chloroquine Phosphate	<b>Cephalothin</b> - <i>Keflin</i>	<b>Diethylstilbestrol Diphosphate</b> - <i>Stilphostrol</i>
<b>Ascorbic Acid</b> - Vitamin C	<b>Cephtrandine</b> - <i>Veloself</i>	<i>Diffucan</i> - Fluconazole
<i>Aspirin</i> - Acetylsalicylic acid	<i>Cephulac</i> - Lactulose	<b>Digoxin</b> - <i>Cardoxin, Lanoxin</i>
<i>Atabrine</i> - Quinacrine HCl	<i>Cheque</i> - Mibolerone	<b>Dihydrostreptomycin</b> - <i>Azimycin</i>
<i>Aventyl HCl</i> - Nortriptyline HCl	<b>Chlorhexidine</b> - <i>Nolvasan</i>	<b>Dimercaprol</b> - <i>BAL</i>
<i>Azimycin</i> - Dihydrostreptomycin	<b>Chlorine</b> - <i>Household Bleach</i>	<b>Dimethylsulfoxide</b> - <i>Domoso</i>
<b>Azithromycin</b> - <i>Zythromax</i>	<b>Chloroquine Phosphate</b> - <i>Aralen Phosphate</i>	<b>Dimetridazole</b> - <i>Emtryl</i>
<i>Azium</i> - Dexamethasone	<b>Chlorsulon</b> - <i>Curatrem</i>	<b>Dinoprost Tromethamine</b> - <i>Lutalyse</i>

## CHAPTER 18 FORMULARY

- Diphenhydramine HCl** - *Benadryl*  
*Domoso* - **Dimethylsulfoxide**  
*Donnatal* - **Phenobarbital**  
*Dopram* - **Doxapram HCl**  
**Doxapram HCl** - *Dopram*  
**Doxepin HCl** - *Sinequan*  
*Droncit* - **Praziquantel**  
**Echinacea** - *Echinacea angustifolia*  
*Echinacea angustifolia* - **Echinacea**  
**EDTA** - *TRIS*  
*Elavil* - **Amitriptyline HCl**  
*Emtryl* - **Dimetridazole**  
*Enhaptin* - **Nitrothiazole**  
**Enilconazole** - *Clinafarm*  
**Enrofloxacin** - *Baytril*  
**Enzymes** - see **pancreatic enzymes**  
*Eqizole* - **Thiabendazole**  
*Eqvalen* - **Ivermectin**  
**Ergonovine Maleate** - *Ergotrate maleate*  
*Ergotrate maleate* - **Ergonovine Maleate**  
**Ethambutol** - *Myambutol*  
**Fenbendazole** - *Panacur*  
**Ferric Sulfate** - *Monsel's Solution*  
*Flagyl* - **Metronidazole**  
**Fluconazole** - *Diffucan*  
**Flucytosine** - *Ancobon*  
**Flunixin** - *Banamine*  
*Fungizone* - **Amphotericin B**  
*Furacin* - **Nitrofurazone**  
**Furosemide** - *Lasix*  
**Gentian Violet** - *GV-11*  
*GoLYTELY* - **Sodium Sulfate**  
*GV-11* - **Gentian Violet**  
*Halodol* - **Haloperidol**  
**Haloperidol** - *Halodol*  
**Hemicellulose** - *Psyllium*  
*Hi-Vegi-Lip* - **Pancreatic Enzymes**  
*Inderol* - **Propranolol**  
*Injacom + B* - **Vitamins, Multiple**  
**Iodine** - *Lugol's Solution, Renografin 76*  
**Iprnidazole** - *Ipropan*  
*Ipropan* - **Iprnidazole**  
**Itraconazole** - *Sporanox*  
**Ivermectin** - *Eqvalen*  
*Kaprycidin A* - **Caprillic Acid**  
*Keflex Pediatric Suspension* - **Cephalexin**  
*Keflin* - **Cephalothin**  
**Ketoconazole** - *Nizoral*  
*L-Spartakon* - **Levamisole**  
**Lactobacillus** - *Probiocin*  
**Lactulose** - *Cephulac*  
*Lanoxin* - **Digoxin**  
*Lasix* - **Furosemide**  
*Luprolide* - **Lupron**
- Levamisole** - *Levasole, Tramisol, L-Spartakon*  
*Levasole* - **Levamisole**  
**Levothyroxine Sodium** - *Thyroxine L*  
*Lincocin* - **Lincomycin HCl**  
**Lincomycin HCl** - *Lincocin*  
*Liquamycin LA200* - **Oxytetracycline**  
**Lorelco** - *Probacoll*  
*Lugol's Solution* - **Iodine**  
*Lupron* - **Leuprolide**  
*Lutalyse* - **Dinoprost Tromethamine**  
**Mebendazole** - *Telmintic, Telmin*  
*Mefoxitin* - **Cefoxitin**  
**Meglumine** - *Banamine*  
**Methylprednisolone Acetate** - *Depo-Medrol*  
**Metoclopramide HCl** - *Reglan*  
**Metronidazole** - *Flagyl*  
**Mibolerone** - *Cheque*  
**Miconazole** - *Monistat*  
**Monensin Sodium** - *Coban*  
*Monistat* - **Miconazole**  
*Monsel's Solution* - **Ferric Sulfate**  
*Mucomyst* - **Acetylcysteine**  
*Myambutol* - **Ethambutol**  
*Mycostatin* - **Nystatin**  
*Natacyn* - **Natamycin**  
**Natamycin** - *Natacyn*  
*Nebicin* - **Tobramycin**  
**Neomycin** - *Biosol*  
**Niclosamide** - *Nicloside*  
*Nicloside* - **Niclosamide**  
**Nitrofurazone** - *Furacin*  
**Nitrothiazole** - *Enhaptin*  
*Nizoral* - **Ketoconazole**  
*Nolvasan* - **Chlorhexidine**  
**Nortriptyline HCl** - *Aventyl HCl*  
*Nystatin* - **Mycostatin**  
**Oxfenbendazole** - *Synanthic*  
**Oxytetracycline** - *Liquamycin LA200*  
*Panacur* - **Fenbendazole**  
**Pancreatic Enzymes** - *Hi-Vegi-Lip, Viokase V*  
*Penetran* - **Ammonium Solution**  
*Pepto-Bismol* - **Bismuth subsalicylate**  
**Phenobarbital** - *Donnatal*  
**Phenylbutazone** - *Butazolidin*  
**Pipercillin** - *Pipracil*  
*Pipracil* - **Pipercillin**  
*Polyflex* - **Ampicillin**  
**Praziquantel** - *Droncit*  
**Prednisolone Sodium Succinate** - *Cart Sol*  
*Preparation H* - **Yeast Cell Derivatives**  
*Probacoll* - **Lorelco**  
*Probiocin* - **Lactobacillus**  
**Procaine Penicillin G and Penicillin Benzathine** - *Ambi pen*
- Propranolol** - *Inderol*  
*Psyllium* - **Hemicellulose**  
**Pyrantel Pamoate** - *Strongid T*  
**Pyrimethamine** - *Daraprim*  
**Quinacrine HCl** - *Atabrine*  
*Reglan* - **Metoclopramide HCl**  
*Renografin 76* - **Iodine**  
*Rifadin* - **Rifampin**  
**Rifampin** - *Rifadin*  
*Rocephin* - **Ceftriaxone**  
*Seletoc* - **Vitamin E and Selenium**  
*Sevin* - **Carbaryl**  
*Sinequan* - **Doxepin HCl**  
**Sodium Sulfate** - *GoLYTELY*  
*Spartix* - **Cardindazole**  
*Spectam* - **Spectinomycin**  
**Spectinomycin** - *Spectam*  
*Sporanox* - **Itraconazole**  
**Stanozolol** - *Winstrol V*  
*Stilphostrol* - **Diethylstilbestrol Diphosphate**  
*Strongid T* - **Pyrantel Pamoate**  
*Sucrafate* - *Carafate*  
**Sulfachlorpyridazine** - *Vestisulid*  
*Synanthic* - **Oxfenbendazole**  
*Tagamet* - **Cimetidine**  
*Telmin* - **Mebendazole**  
*Telmintic* - **Mebendazole**  
**Thiabendazole** - *Eqizole*  
**Thiamine** - *Vitamin B<sub>1</sub>*  
*Thyroxine L* - **Levothyroxine Sodium**  
*Ticar* - **Ticarcillin**  
**Ticarcillin** - *Ticar*  
**Tobramycin** - *Nebicin*  
*Torbutrol* - **Butorphanol tartrate**  
*Torbugesic* - **Butorphanol tartrate**  
*Toxiban* - **Activated charcoal/kaolin**  
*Tramisol* - **Levamisole**  
**Trimethoprim/Sulfadiazine** - *Bactrim*  
**TRIS** - *EDTA*  
**TSH** - *Dermathycin*  
*Valium* - **Diazepam**  
*Veloself* - **Cephtrandine**  
*Vestisulid* - **Sulfachlorpyridazine**  
*Viokase V* - **Pancreatic Enzymes**  
**Vitamin B<sub>12</sub>** - **Cyanocobalamin**  
**Vitamin E and Selenium** - *Seletoc*  
**Vitamin C** - **Ascorbic Acid**  
**Vitamin B<sub>1</sub>** - **Thiamine**  
**Vitamins, Multiple** - *Injacom + B*  
*Winstrol V* - **Stanozolol**  
**Yeast Cell Derivatives** - *Preparation H*  
*Zovirax* - **Acyclovir**  
*Zyloprim* - **Allopurinol**  
**Zythromax** - **Azithromycin**

DRUG DOSING CHART

		Drug Concentration mg/ml or mg/unit													
		0.1	0.4	0.5	0.8	1.0	2.0	4.0	5.0	10.0	15.0	20.0	23.0	25.0	
Drug Dose (mg/kg)	0.1			0.0002											
	0.2			0.0004		0.0002				0.00002					
	0.25					0.00025									
	0.5					0.0005			0.0001	0.00005				0.0002	
	1.0						0.0005	0.00025	0.0002	0.0001	0.000066	0.00005		0.0004	
	1.5								0.0003	0.00015					
	2.0					0.002	0.001	0.0005	0.0004	0.0002	0.00013	0.0001			
	3.0								0.00075	0.0006	0.0003				
	4.0	0.04	0.01	0.008	0.005	0.004	0.002	0.001	0.0008	0.0004	0.00027	0.00015			
	5.0								0.001			0.00025	0.00022	0.0002	
	6.0								0.0012						
	8.0	0.08	0.02	0.016	0.01		0.004	0.002	0.0016	0.0008	0.00053			0.00035	
	10.0								0.002	0.001		0.0005	0.0004		
	15.0									0.0015	0.001			<b>0.00065</b>	0.0006
	20.0	0.2	0.05	0.04	0.025		0.01	0.005	0.004	0.002	0.00133	0.001			
	25.0								0.005	0.0025					0.001
	30.0									0.006	0.003		0.0015		
	35.0										0.0035				
	40.0									0.008	0.004		0.002		
	50.0									0.01	0.005		0.0025	0.0022	0.002
60.0															
75.0									0.015	0.0075		0.00375		0.003	
80.0															
100.0									0.02	0.01		0.005	0.0044	0.004	
150.0									0.03	0.015		0.0075		0.006	
175.0															
200.0										0.02		0.01		0.008	

The quantity of drug to administer for agents listed in Table 18.1 can be quickly and easily calculated by knowing the bird's weight in grams, the drug concentration and the drug dose. A bird's weight in grams is multiplied by the factor that corresponds to a drug's concentration and its respective dose. For example, the dose for enrofloxacin administered orally is 15 mg/kg. This drug is available in an injectable solution (23 mg/ml) that can be administered orally. The factor that corresponds to 23 mg/ml and 15 mg/kg is 0.00065. The drug dose for a 100 gram bird would be 0.00065 X 100 = 0.065 mls. The drug dose for a 600 gram bird would be 0.00065 X 600 = 0.39 mls.

## CHAPTER 18 FORMULARY

## DRUG DOSING CHART

		Drug Concentration (mg/ml or mg/unit)										
		30.0	40.0	50.0	75.0	85.0	100.0	104.0	150.0	200.0	250.0	400.0
Drug Dose (mg/kg)	0.1											
	0.2											
	0.25											
	0.5			0.00001								
	1.0		0.000025	0.00002	0.000013		0.00001		0.000007	0.000005		
	1.5											
	2.0		0.00005	0.00004			0.00002	0.000019		0.00001		
	3.0											
	4.0							0.000038	0.000026			
	5.0	0.00017	0.00012	0.0001			0.00005			0.000025		
	6.0							0.000058				
	8.0			0.00016				0.000077	0.000053	0.00004		
	10.0		0.00025	0.0002	0.00013		0.0001			0.00005	0.00004	
	15.0	0.0005	0.00037	0.0003			0.00015		0.0001	0.000075	0.00006	
	20.0					0.00023		0.0002		0.0001	0.00008	0.00005
	25.0	0.00083	0.00063	0.0005	0.00033		0.00025		0.00017	0.00013	0.0001	0.00006
	30.0	0.001					0.0003			0.00015	0.00012	
	35.0					0.00035						
	40.0			0.0008			0.0004			0.0002	0.00016	0.0001
	50.0	0.0016	0.0013	0.001	0.00067		0.0005		0.00033	0.00025	0.0002	0.00013
60.0									0.0003			
75.0			0.0015	0.001		0.00075		0.0005	0.00038	0.0003		
80.0	0.0026	0.002	0.0016			0.0008						
100.0		0.0025	0.002	0.00133		0.001		0.00067	0.0005	0.0004	0.00025	
150.0	0.005	0.0375	0.003	0.002		0.0015		0.001	0.00075	0.0006	0.00037	
175.0			0.0035							0.0007	0.00044	
200.0	0.0067	0.005	0.004	0.0027		0.002		0.0013	0.001	0.0008	0.0005	

**TABLE 18.3 Distributors of Drugs Discussed in the Formulary**

<b>Agri Laboratories Inc.</b> 6221 North K Highway P.O. Box 3101 St. Joseph, MO 64505 Phone 816-233-9533 Order 800-542-8916	<b>Elanco Products Co.</b> Lilly Corporate Center Indianapolis, IN 46285 317-276-3000	<b>Merck Sharp &amp; Dohme</b> Division of Merck & Co., Inc. West Point, PA 19486 215-661-5000	<b>Sterwin Laboratories</b> P.O. Box 537 Millsboro, DE 19966-0537 Phone 302-934-0537 Order 800-633-0462
<b>A. H. Robins Co.</b> P.O. Box 26609 Richmond, VA 23261-6609 Phone 804-257-2000 Emergency 215-688-4400	<b>Eli Lilly</b> (see Dista)	<b>Miles Inc. Pharmaceutical Division</b> 400 Morgan Lane West Haven, CT 06516 Phone 800-468-0894 203-937-2000	<b>Stuart Pharmaceuticals</b> Wilmington, DE 19897 302-886-2231
<b>American Cyanamid Co.</b> One Cyanamid Plaza Wayne, NJ 07470 609-799-0400	<b>Elkin-Sinn Inc.</b> 2 Esterbrook Lane Cherry Hill, NJ 08003-4099 215-688-4400	<b>MSD-Agvet</b> P.O. Box 2000, WBF475 Rahway, NJ 07065-0912 201-855-3800	<b>Syntex Animal Health</b> 4800 Westown Parkway Building 3, Suite 200 West Des Moines, IA 50265 Phone 515-224-2400 Order 800-247-2210
<b>Apothecon</b> (see E. R. Squibb and Sons Inc.)	<b>E. R. Squibb and Sons Inc.</b> P.O. Box 4000 Princeton, NY 08543-4000 Phone 609-921-4000 Service 800-321-1335	<b>Parke Davis</b> 201 Tabor Road Morris Plain, NJ 07950 Phone 201-540-2000 Info 800-223-0432	<b>Tap Pharmaceuticals</b> 2355 Waukegan Road Deerfield, IL 60015 708-317-5700
<b>Astra Pharmaceutical Products</b> 50 Otis Street Westboro, MA 01581-4428 508-366-1100	<b>EVSCO Pharmaceuticals</b> P.O. Box 209 Buena, NJ 08310 609-691-2577	<b>Pfizer Labs Division</b> (see Roerig)	<b>3M Pharmaceuticals</b> 225-15-07 3M Center St. Paul, MN 55144 Service 800-423-5197
<b>Baker Cummins Pharmaceuticals</b> 8800 NW 36th Street Miami, FL 33178-2404 800-347-4474	<b>Fort Dodge Laboratories</b> P.O. Box 518 Fort Dodge, IA 50501 515-955-4600	<b>Phoenix Pharmaceuticals Inc.</b> 3336 Pear Street P.O. Box 7, Fairleigh Station St. Joseph, MO 64506-0007 816-364-5777	<b>Trans Dermal Technologies</b> 1368 North Killian Drive Lake Park, FL 33403 Phone 407-624-0222 Order 800-676-7354
<b>Becton Dickinson Microbiology Systems</b> P.O. Box 243 Cockeysville, MD 21030 800-638-8663	<b>Freeda Vitamins, Inc.</b> 36 East 41 Street New York, NY, 10017 800-777-3737	<b>Pioneer</b> 4601 Westown Parkway, STE 120 West Des Moines, IA 50265 800-247-5782	<b>United Vaccine, Inc.</b> 7819 Airport Road Middleton, WI 53562 608-836-8788
<b>Bio-Botanica, Inc.</b> 75 Commerce Drive Hanppauge, NY 11788 516-231-5522	<b>G. D. Searle Co.</b> Box 5110 Chicago, IL 60680 800-323-1603	<b>Pitman-Moore Inc.</b> 421 East Hawley Street Mundelein, IL 60060 Phone 708-949-3300 Order 800-525-9480	<b>Upjohn Company</b> 7000 Portage Road Kalamazoo, MI 49001 Phone 616-329-8244 616-385-6736
<b>Bio-Ceutic</b> 2621 North Belt Highway St. Joseph, MO 64506 Phone 816-233-2804 Order 800-325-9167	<b>Haver/Diamond Scientific</b> 12707 West 63rd Street P.O. Box 390 Shawnee, KS 66201	<b>Roerig Division</b> Pfizer Incorporated 235 East 42nd Street New York, NY 10017 Phone 212-573-2187 Service 800-533-4535	<b>Vedco Inc</b> Route 6, Box 35A St. Joseph, MO 64504 816-238-8840
<b>Burroughs Wellcome Co.</b> 3030 Cornwallis Road Research Triangle Park, NC 27709 Phone 800-722-9292 Emergency 800-443-6763	<b>Hoechst-Roussel Pharmaceuticals</b> Route 202-206 P.O. Box 2500 Somerville, NJ 00876-1258 Phone 800-445-4474 Service 800-451-4455	<b>Sandoz Pharmaceuticals Co.</b> Route 10 East Hanover, NJ 07936 201-503-7500	<b>Vet-A-Mix Animal Health</b> 604 West Thomas Avenue Shenandoah, IA 51601 Phone 712-246-4000 Order 800-831-0004
<b>Butler Company</b> 5000 Bradenton Avenue Publin, OH 43017-0753 614-761-9095	<b>Immunovet Inc.</b> 5910-G Breckenridge Pkwy. Tampa, FL 33610 813-621-9447	<b>Sanofi Animal Health</b> 7101 College Blvd Overland Park, KS 66210 Phone 913-451-3434 Order 800-255-6144	<b>Wallace Laboratories</b> Post Office Box 1001 Cranbury, NJ 08512 609-655-6000
<b>CIBA Pharmaceuticals</b> Div. of CIBA-GEIGY 581 Main Street Woodbridge, NJ 07095	<b>Janssen Pharmaceutical Inc.</b> 40 Klingsbridge Road Piscataway, NJ 08855-3998 Phone 201-524-9591 800-253-3682	<b>Schering-Plough Animal Health</b> P.O. Box 529 Kenilworth, NJ 07033 Phone 201-298-4000 Order 800-648-2118	<b>Warren Laboratories, Inc.</b> 12603 Executive Drive Stafford, TX 77477 713-240-2563
<b>Coopers Animal Health</b> 421 East Hawley Street Mundelein, IL 60060 Phone 708-949-3300 Order 800-525-9480	<b>Lannett Co.</b> 9000 State Road Philadelphia, PA 19136 215-333-9000	<b>SmithKline Beecham Animal Health</b> Whiteland Business Park 812 Springdale Drive Exton, PA 19341 215-363-3100	<b>Westwood-Squibb Pharmaceuticals</b> 100 Forest Avenue Buffalo, NY 14213 716-887-3400
<b>Dista</b> Division of Eli Lilly Lilly Research Laboratories Lilly Corporate Center Indianapolis, IN 46285 317-276-3714	<b>Lederle Laboratories</b> Pearl River, NY 10965 914-735-2815	<b>SmithKline Beecham Pharmaceuticals</b> One Franklin Plaza P.O. Box 7929 Philadelphia, PA 19101 215-751-4000	<b>Wildlife Laboratories</b> 1401 Duff Dr., Suite 600 Ft. Collins, CO 80524 303-484-6267
<b>Ecological Formulations</b> 106113 Shary Circle Concord, CA 94518 510-827-2636	<b>Lextron Inc</b> 630 "O" Street P.O. Box BB Greeley, CO 80632 303-353-2600	<b>Solvay Animal Health</b> 1201 Northland Drive Mendota Heights, MN 55120-1139 800-247-1830	<b>Wyeth-Ayerst Laboratories</b> Post Office Box 8299 Philadelphia, PA 19101 215-688-4400



## ■ C H A P T E R S

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**20 HEPATOLOGY**

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**21 NEPHROLOGY**

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**22 PNEUMONOLOGY**

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**23 ENDOCRINOLOGY**

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**24 DERMATOLOGY**

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**25 ONCOLOGY**

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**26 OPHTHALMOLOGY**

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**28 NEUROLOGY**

R. Avery Bennett

**29 THERIOGENOLOGY**

Kim L. Joyner

**30 NEONATOLOGY**

Keven Flammer  
Susan L. Clubb

**IV**

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**SECTION FOUR**

**INTERNAL  
MEDICINE**

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**IV**