About the Series

• Subject experts cover all important diseases and conditions in a given species

• Each topic covers subject basics, diagnosis, treatment, medications, and follow-up care

• Fast referencing with consistent, alphabetical format from book to book

• Alphabetical and subject-specific table of contents for quick search

• Customizable client handouts available for quick download on companion website (select titles)

• Authoritative coverage of:
  ◦ Cats and dogs
  ◦ Small mammals
  ◦ Birds
  ◦ Horses
  ◦ Cattle, sheep, and goats (ruminant)
  ◦ Lab tests and diagnostic procedures (cats and dogs)
  ◦ Veterinary practice management (clinical and textbook)
Lymphoma—Cats

**Basics**

**OVERVIEW**

- Lymphocytes are a type of white blood cell that are formed in lymphatic tissues throughout the body; lymphocytes normally are involved in the immune process.

- Lymphoma is cancer (malignancy) of lymphocytes that usually involves lymph nodes or other lymphatic tissue of the body, but may involve other organs of the body (such as the liver or kidneys).

- Lymphoma in cats is found in various anatomic locations in the body, including the mediastinum (known as the “mediastinal form of lymphoma”)—the mediastinum is the center portion of the chest that contains the heart and other organs (except for the lungs); the gastrointestinal tract (known as the “alimentary form of lymphoma”); the kidneys (known as the “kidney or renal form of lymphoma”); multiple organs/tissues throughout the body (known as the “multi-centric form of lymphoma”); and the spinal cord (known as the “spinal form of lymphoma”).

**SIGNALMENT/DESCRIPTION OF PET**

**Species**

- Cats

**Breed Predilections**

- Siamese and other Oriental breeds may be more likely to have lymphoma than other cat breeds

**Mean Age and Range**

- Mean age of feline leukemia virus (FeLV)-positive cats with lymphoma—3 years
- Mean age of FeLV-negative cats with lymphoma—7 years
- Median age of cats with localized lymphoma, outside of the lymph nodes—13 years
- Most cats with Hodgkin’s-like lymphoma are older than 6 years of age

**SIGNS/OBSERVED CHANGES IN THE PET**

- Depend on anatomic form

- Mediastinal form (located in the center of the chest)—open-mouthed breathing; coughing; regurgitation; lack of appetite (known as “anorexia”); weight loss; the front part of the chest is very firm and resistant to gentle compression during physical examination; fast breathing rate (known as “tachypnea”)

- Alimentary form (located in the gastrointestinal tract)—lack of appetite (anorexia); weight loss; sluggishness (lethargy); vomiting; constipation; diarrhea; black, tarry stools, due to the presence of digested blood (known as “melena”); frank blood in the stool; thickened intestines or abdominal masses

- Kidney or renal form—consistent with kidney failure (such as vomiting; lack of appetite [anorexia]; increased thirst [known as “polydipsia”]; increased urination [known as “polyuria”]; and sluggishness [lethargy]); large, irregular kidneys
• Nasal form (located in the nose or nasal passages)—discharge from the nose (known as “nasal discharge”) or bleeding in the nose and nasal passages (known as “epistaxis” or a “nosebleed”); facial deformity; abnormalities of the eyes; excessive tearing (known as “epiphora”); abnormal breathing sounds; sneezing; lack of appetite (anorexia)

• Multi-centric form (located in multiple organs/tissues throughout the body)—possibly none in early stages; lack of appetite (anorexia), weight loss, and depression with progression of disease; enlargement of lymph nodes throughout the body; possible spleen and liver enlargement

• Spinal form—quickly progressing weakness to partial paralysis in rear legs (known as “posterior paresis”)

• Cutaneous (skin) lymphoma—itchiness (known as “pruritus”); bleeding (hemorrhage); or masses on the skin accompanied by hair loss (hair loss known as “alopecia”)

• All forms—fever; dehydration; depression; extreme weight loss with muscle wasting (known as “cachexia”) in some pets

CAUSES
• Feline leukemia virus infection—pets inconsistently test positive during illness (for example, 85% are positive with the mediastinal form, 45% with the kidney form, 20% with the multi-centric form, and 15% with the alimentary (intestinal) forms of lymphoma test positive on FeLV test); older cats with lymphoma are usually FeLV negative, while younger cats are usually FeLV positive

RISK FACTORS
• Feline leukemia virus exposure
• Exposure to environmental tobacco smoke
• Feline immunodeficiency virus infection

Treatment

HEALTH CARE
• Outpatient, whenever possible
• Supportive medical care, if needed depending on clinical signs
• Fluid therapy, appetite stimulants, and other treatments based on clinical signs
• Radiation therapy—may be used for localized lymphoma such as in the nose; relapses outside the radiation field are not uncommon
• Consult a veterinary oncologist for chemotherapy doses, schedules, and to help assess best option(s) for treatment

ACTIVITY
• Normal

DIET
• No change in most cases; may require dietary change if cat has kidney failure
• Can add omega-3 (n-3) fatty acids (fish oil origin) to the diet

SURGERY
• To relieve intestinal blockages or obstructions, repair “holes” in the intestinal tract (known as “perforations”) that develop secondarily to the presence of the tumor and to surgically remove individual tumors
• To obtain biopsy specimens for microscopic examination

Medications

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive

• Chemotherapy—used in a combination or sequential protocol; some protocols have induction and maintenance periods
• Many variations of similar combination chemotherapy exist; they all have similar effectiveness
• Low-grade intestinal lymphoma can respond to oral chlorambucil and prednisolone
Follow-Up Care

PATIENT MONITORING
- Physical examination, complete blood count (CBC), and platelet count—before each weekly chemotherapy treatment and one week after each time a new drug is administered, or if concerned about low blood cell counts
- X-rays (radiographs) or advanced imaging—as necessary, depending on location of primary tumor

PREVENTIONS AND AVOIDANCE
- Avoid exposure to or breeding feline leukemia virus—positive cats

POSSIBLE COMPLICATIONS
- Low white blood cell counts (known as “leukopenia”)
- Generalized bacterial infection (sepsis)
- Lack of appetite (anorexia), vomiting, weight loss from side effects of chemotherapy or advancing lymphoma

EXPECTED COURSE AND PROGNOSIS
- Depends on initial response to chemotherapy, anatomic type, feline leukemia virus status, and tumor burden; overall response rate is 50–70% to treatment
- Median survival with prednisone/prednisolone alone—1.5–2 months
- Median survival with combination chemotherapy (COP or CHOP)—6–9 months
- Mediastinal form (located in the center of the chest)—about 10% of affected pets with live more than 2 years
- Median survival with alimentary form (located in the gastrointestinal tract)—8 months
- Median survival with peripheral multi-centric form (located in multiple organs/tissues: “peripheral” refers to tissues away from the center of the body)—23.5 months
- Median survival with kidney form—if FeLV-negative, 11.5 months; if FeLV-positive, 6.5 months
- Median survival with nasal form—1.5–2.5 years with radiation and chemotherapy; chemotherapy may not improve survival over radiation alone
- Cats with Hodgkin's-like lymphoma can do well for extended periods of time (months to years), even without treatment

Key Points
- A treatment protocol should be established that fits the pet and the owner's lifestyle
- Side effects of chemotherapy are treatable and should be addressed promptly
- Goal is to induce remission and achieve a good quality of life for pets for as long as possible
- More than 80% of pet owners are pleased with their cat’s quality of life during chemotherapy
- Young cats with lymphoma are generally FeLV positive; overall survival for positive cats is 3.5-4 months, for negative cats 7-17.5 months
Add patient-specific information or instructions to any client handout.

Enter notes here
CONTENTS

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abortion, Spontaneous (Early Pregnancy Loss)—Cats</td>
<td>2</td>
</tr>
<tr>
<td>Abortion, Spontaneous (Early Pregnancy Loss)—Dogs</td>
<td>4</td>
</tr>
<tr>
<td>Abortion, Termination of Pregnancy</td>
<td>6</td>
</tr>
<tr>
<td>Abscessation</td>
<td>8</td>
</tr>
<tr>
<td>Acetaminophen (APAP) Toxicosis</td>
<td>10</td>
</tr>
<tr>
<td>Acidosis, Metabolic (Traditional Approach)</td>
<td>12</td>
</tr>
<tr>
<td>Acne—Cats</td>
<td>14</td>
</tr>
<tr>
<td>Acne—Dogs</td>
<td>15</td>
</tr>
<tr>
<td>Acral Lick Dermatitis</td>
<td>16</td>
</tr>
<tr>
<td>Acromegaly—Cats</td>
<td>17</td>
</tr>
<tr>
<td>Actinomycosis</td>
<td>19</td>
</tr>
<tr>
<td>Acute Abdomen</td>
<td>20</td>
</tr>
<tr>
<td>Acute Respiratory Distress Syndrome</td>
<td>23</td>
</tr>
<tr>
<td>Adenocarcinoma, Anal Sac</td>
<td>25</td>
</tr>
<tr>
<td>Adenocarcinoma, Lung</td>
<td>26</td>
</tr>
<tr>
<td>Adenocarcinoma, Nasal</td>
<td>27</td>
</tr>
<tr>
<td>Adenocarcinoma, Pancreas</td>
<td>29</td>
</tr>
<tr>
<td>Adenocarcinoma, Prostate</td>
<td>30</td>
</tr>
<tr>
<td>Adenocarcinoma, Renal</td>
<td>31</td>
</tr>
<tr>
<td>Adenocarcinoma, Salivary Gland</td>
<td>32</td>
</tr>
<tr>
<td>Adenocarcinoma, Skin (Sweat Gland, Sebaceous)</td>
<td>33</td>
</tr>
<tr>
<td>Adenocarcinoma, Stomach, Small and Large Intestine, Rectal</td>
<td>34</td>
</tr>
<tr>
<td>Adenocarcinoma, Thyroid—Dogs</td>
<td>35</td>
</tr>
<tr>
<td>Aggression to Unfamiliar People and Unfamiliar Dogs</td>
<td>37</td>
</tr>
<tr>
<td>Aggression Toward Children—Dogs</td>
<td>39</td>
</tr>
<tr>
<td>Aggression Toward Familiar People—Dogs</td>
<td>40</td>
</tr>
<tr>
<td>Aggression Toward Humans—Cats</td>
<td>42</td>
</tr>
<tr>
<td>Aggression, Food and Resource Guarding—Dogs</td>
<td>44</td>
</tr>
<tr>
<td>Aggression, Intercat Aggression</td>
<td>46</td>
</tr>
<tr>
<td>Aggression, Overview—Cats</td>
<td>49</td>
</tr>
<tr>
<td>Aggression, Overview—Dogs</td>
<td>51</td>
</tr>
<tr>
<td>Aggression—Between Dogs in the Household</td>
<td>55</td>
</tr>
<tr>
<td>Alkalosis, Metabolic (Traditional Approach)</td>
<td>57</td>
</tr>
<tr>
<td>Alopecia—Cats</td>
<td>59</td>
</tr>
<tr>
<td>Alopecia—Dogs</td>
<td>61</td>
</tr>
<tr>
<td>Alopecia, Non-Inflammatory—Dogs</td>
<td>63</td>
</tr>
<tr>
<td>Amebiasis</td>
<td>65</td>
</tr>
</tbody>
</table>

354 client education handouts are available at www.fiveminutevet.com/canineandfeline for you to download and use in practice
Ameloblastoma 66
Amitraz Toxicosis 67
Amphetamines and ADD/ADHD Medication Toxicosis 69
Amyloidosis 71
Anaerobic Infections 73
Anal Sac Disorders 74
Anaphylaxis 75
Anemia of Chronic Kidney Disease 77
Anemia, Aplastic 79
Anemia, Heinz Body 80
Anemia, Immune-Mediated 81
Anemia, Iron-Deficiency 83
Anemia, Metabolic (Anemias with Spiculated Red Cells) 84
Anemia, Nonregenerative 85
Anemia, Nuclear Maturation Defects (Anemia, Megaloblastic) 87
Anemia, Regenerative 88
Anisocoria 90
Anorexia 92
Antebrachial Growth Deformities 94
Anterior Uveitis—Cats 96
Anterior Uveitis—Dogs 98
Antidepressant Toxicosis—SSRIs and SNRIs 100
Antidepressant Toxicosis—Tricyclic 102
Aortic Stenosis 104
Aortic Thromboembolism 106
Apudoma 109
Arteriovenous Fistula and Arteriovenous Malformation 110
Arteriovenous Malformation of the Liver 111
Arthritis (Osteoarthritis) 113
Arthritis, Septic 115
Ascites 117
Aspergillosis, Nasal 119
Aspergillosis, Systemic 121
Aspirin Toxicosis 123
Asthma, Bronchitis—Cats 124
Astrocytoma 126
Astrovirus Infection 127
Ataxia 128
Atherosclerosis 130
Atlantoaxial Instability 131
Atopic Dermatitis 133
Atrial Fibrillation and Atrial Flutter 135
Atrial Premature Complexes 138
Atrial Septal Defect 140
Atrial Standstill 141
Atrial Wall Tear 143
Atrioventricular Block, Complete (Third Degree) 145
Atrioventricular Block, First Degree 147
Atrioventricular Block, Second Degree—Mobitz I 149
Atrioventricular Block, Second Degree—Mobitz II 151
Atrioventricular Valve Dysplasia 153
Atrioventricular Valve (Myxomatous) Disease 155
Atrioventricular Valvular Stenosis 158
Azotemia and Uremia 161
Babesiosis 164
Baclofen Toxicosis 166
Bartonellosis 167
Basal Cell Tumor 168
Battery Toxicosis 169
Baylisascariasis 170
Benign Prostatic Hyperplasia (BPH) 171
Benzodiazepine and Other Sleep Aids Toxicosis 172
Beta Blocker Toxicosis 174
Beta-2 Agonist Inhaler Toxicosis 175
Bile Duct Carcinoma 176
Bile Duct Obstruction (Extrahepatic) 177
Bile Peritonitis 180
Bilious Vomiting Syndrome 182
Blastomycosis 183
Blepharitis 185
Blind Quiet Eye 187
Blood Transfusion Reactions 189
Blue-Green Algae Toxicosis 190
Botulism 191
Brachial Plexus Avulsion 192
Brachycephalic Airway Syndrome 193
Brain Injury 195
Brain Tumors 197
Breeding, Timing 199
Bronchiectasis 201
Bronchitis, Chronic 202
Brucellosis 204
Calcium Channel Blocker Toxicosis 206
Campylobacteriosis 207
Candidiasis 208
Canine Coronavirus Infections 209
Canine Distemper 210
Canine Infectious Respiratory Disease 212
Canine Influenza 214
Canine Parvovirus Infection 216
Canine Schistosomiasis (Heterobilharziasis) 218
Capillariasis (Pearsonema) 219
Car Ride Anxiety—Dogs and Cats 220
Carbon Monoxide Toxicosis 223

354 client education handouts are available at www.fiveminutevet.com/canineandfeline for you to download and use in practice
Carcinoid and Carcinoid Syndrome 224
Cardiac Glycoside Plant Toxicosis 225
Cardiomyopathy—Boxer (Arrhythmogenic Right Ventricular) 226
Cardiomyopathy, Dilated—Cats 227
Cardiomyopathy, Dilated—Dogs 230
Cardiomyopathy, Hypertrophic—Cats 233
Cardiomyopathy, Hypertrophic—Dogs 235
Cardiomyopathy, Restrictive—Cats 236
Cardiopulmonary Arrest 238
Carnitine Deficiency 240
Cataracts 241
Cerebellar Degeneration 243
Cerebellar Hypoplasia 244
Cerebrovascular Accidents 245
Ceruminous Gland Adenocarcinoma, Ear 247
Cervical Spondylomyelopathy (Wobbler Syndrome) 248
Chagas Disease (American Trypanosomiasis) 250
Chediak-Higashi Syndrome 251
Chemodectoma 252
Cheyletiellosis 253
Chlamydiosis—Cats 254
Chocolate (Methylxanthine) Toxicosis 256
Cholangitis/Cholangiohepatitis Syndrome 259
Cholecystitis and Choleodochitis 262
Cholelithiasis 264
Chondrosarcoma, Bone 266
Chondrosarcoma, Larynx and Trachea 267
Chondrosarcoma, Nasal and Paranasal Sinus 268
Chondrosarcoma, Oral 269
Chorioretinitis 270
Chylothorax 272
Cirrhosis and Fibrosis of the Liver 274
Clostridial Enterotoxosis 277
Coagulation Factor Deficiency 279
Coagulopathy of Liver Disease 281
 Cobalamin Deficiency 283
Coccidioidomycosis 285
Coccidiosis 287
Cognitive Dysfunction Syndrome 288
Cold Agglutinin Disease 290
Colibacillosis 291
Colitis and Proctitis 293
Colitis, Histiocytic Ulcerative 296
Compulsive Disorders—Cats 297
Compulsive Disorders—Dogs 299
Congenital and Developmental Renal Diseases 301
Congenital Ocular Anomalies 303
<table>
<thead>
<tr>
<th>Condition</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congenital Spinal and Vertebral Malformations</td>
<td>305</td>
</tr>
<tr>
<td>Congestive Heart Failure, Left-Sided</td>
<td>307</td>
</tr>
<tr>
<td>Congestive Heart Failure, Right-Sided</td>
<td>309</td>
</tr>
<tr>
<td>Conjunctivitis—Cats</td>
<td>311</td>
</tr>
<tr>
<td>Conjunctivitis—Dogs</td>
<td>313</td>
</tr>
<tr>
<td>Constipation and Obstipation</td>
<td>315</td>
</tr>
<tr>
<td>Contact Dermatitis</td>
<td>317</td>
</tr>
<tr>
<td>Coonhound Paralysis (Acute Polyradiculoneuritis)</td>
<td>318</td>
</tr>
<tr>
<td>Copper Associated Hepatopathy</td>
<td>320</td>
</tr>
<tr>
<td>Coprophagia and Pica</td>
<td>324</td>
</tr>
<tr>
<td>Corneal and Scleral Lacerations</td>
<td>326</td>
</tr>
<tr>
<td>Corneal Opacities—Degenerations and Infiltrates</td>
<td>328</td>
</tr>
<tr>
<td>Corneal Opacities—Dystrophies</td>
<td>329</td>
</tr>
<tr>
<td>Corneal Sequestrum—Cats</td>
<td>330</td>
</tr>
<tr>
<td>Cough</td>
<td>331</td>
</tr>
<tr>
<td>Craniomandibular Osteopathy</td>
<td>333</td>
</tr>
<tr>
<td>Cruciate Ligament Disease, Cranial</td>
<td>334</td>
</tr>
<tr>
<td>Cryptococcosis</td>
<td>336</td>
</tr>
<tr>
<td>Cryptorchidism</td>
<td>338</td>
</tr>
<tr>
<td>Cryptosporidiosis</td>
<td>339</td>
</tr>
<tr>
<td>Crystalluria</td>
<td>340</td>
</tr>
<tr>
<td>Cutaneous Drug Eruptions</td>
<td>342</td>
</tr>
<tr>
<td>Cuterebriasis</td>
<td>343</td>
</tr>
<tr>
<td>Cyanosis</td>
<td>344</td>
</tr>
<tr>
<td>Cyclic Hematopoiesis</td>
<td>346</td>
</tr>
<tr>
<td>Cylindruria</td>
<td>347</td>
</tr>
<tr>
<td>Cysticercosis</td>
<td>348</td>
</tr>
<tr>
<td>Cytosauzoonasis</td>
<td>349</td>
</tr>
<tr>
<td>Deafness</td>
<td>350</td>
</tr>
<tr>
<td>Deciduous Teeth, Persistent</td>
<td>352</td>
</tr>
<tr>
<td>Degenerative Myelopathy</td>
<td>353</td>
</tr>
<tr>
<td>Demodicosis</td>
<td>355</td>
</tr>
<tr>
<td>Dental Caries</td>
<td>357</td>
</tr>
<tr>
<td>Dentigerous Cyst</td>
<td>359</td>
</tr>
<tr>
<td>Dermatomyositis</td>
<td>360</td>
</tr>
<tr>
<td>Dermatophiosis</td>
<td>362</td>
</tr>
<tr>
<td>Dermatophytosis</td>
<td>363</td>
</tr>
<tr>
<td>Dermatomes, Depigmenting Disorders</td>
<td>365</td>
</tr>
<tr>
<td>Dermatomes, Erosive or Ulcerative</td>
<td>367</td>
</tr>
<tr>
<td>Dermatomes, Exfoliative</td>
<td>369</td>
</tr>
<tr>
<td>Dermatomes, Neoplastic</td>
<td>371</td>
</tr>
<tr>
<td>Dermatomes, Papulonodular</td>
<td>373</td>
</tr>
<tr>
<td>Dermatomes, Sterile Nodular/Granulomatous</td>
<td>375</td>
</tr>
<tr>
<td>Dermatomes, Sun-Induced</td>
<td>377</td>
</tr>
<tr>
<td>Dermatomes, Vesiculopustular</td>
<td>378</td>
</tr>
<tr>
<td>Dermatomes, Viral (Non-Papillomatosis)</td>
<td>380</td>
</tr>
<tr>
<td>Destructive and Scratching Behavior—Cats</td>
<td>381</td>
</tr>
</tbody>
</table>

354 client education handouts are available at www.fiveminutevet.com/canineandfeline for you to download and use in practice

xxxiv
CONTENTS by Subject

APPENDICES

Appendix I Normal Reference Ranges for Laboratory Tests 1416
  Table I-A Normal hematologic values 1416
  Table I-B Normal biochemical values 1416
  Table I-C Conversion table for hematologic units 1417
  Table I-D Conversion table for clinical biochemical units 1418
Appendix II Endocrine Testing 1419
  Table II-A Endocrine function testing protocols 1419
  Table II-B Tests of the endocrine system 1420
  Table II-C Conversion table for hormone assay units 1421
Appendix III Approximate Normal Ranges for Common Measurements in Dogs and Cats 1422
Appendix IV Normal Values for the Canine and Feline Electrocardiogram 1423
Appendix V Antidotes and Useful Drugs: Method of Treatment 1424
Appendix VI Toxic Home and Garden Hazards for Pets 1427
  Table VI-A Toxic plants and their clinical signs—antidotes and treatment 1427
  Table VI-B Herbal toxicities 1433
  Table VI-C Household cleaners, disinfectants and solvents – products, clinical signs and treatment 1435
Appendix VII Pain Management 1440
  Table VII-A Recommended parenteral opioid dosages and indications 1440
  Table VII-B Recommended dispensable opioid dosages and indications 1440
  Table VII-C Recommended parenteral NSAID dosage and indications 1441
  Table VII-D Recommended dispensable NSAID dosage and indications 1441
  Table VII-E Dosages and indications for selected drugs used to treat neuropathic pain 1442
Appendix VIII Glossary of Terminology for Seizures and Epileptic Disorders 1443
Appendix IX—Blackwell’s Five-Minute Consult Drug Formulary 1445
Appendix X—Conversion Tables 1549
  Table X-A Conversion table of weight to body surface area (in square meters) for dogs 1549
  Table X-B Approximate equivalents for degrees, Farenheit and Celsius 1549
  Table X-C Weight-unit conversion factors 1550
Appendix XI Important Resources for Veterinarians 1551

354 client education handouts are available at www.fiveminutevet.com/canineandfeline for you to download and use in practice
Behavior

Aggression to Unfamiliar People and Unfamiliar Dogs 37
Aggression Toward Children—Dogs 39
Aggression Toward Familiar People—Dogs 40
Aggression Toward Humans—Cats 42
Aggression, Food and Resource Guarding—Dogs 44
Aggression, Intercat Aggression 46
Aggression, Overview—Cats 49
Aggression, Overview—Dogs 51
Aggression—Between Dogs in the Household 55
Car Ride Anxiety—Dogs and Cats 220
Cognitive Dysfunction Syndrome 288
Compulsive Disorders—Cats 297
Compulsive Disorders—Dogs 299
Coprophagia and Pica 324
Destructive and Scratching Behavior—Cats 381
Destructive Behavior—Dogs 382
Excessive Vocalization and Waking at Nights 470
Fear and Aggression in Veterinary Visits 484
Fears, Phobias, and Anxieties—Cats 488
Fears, Phobias, and Anxieties—Dogs 490
Housesoiling—Cats 639
Housesoiling—Dogs 643
Marking, Roaming, and Mounting Behavior—Cats 845
Marking, Roaming, and Mounting Behavior—Dogs 847
Maternal Behavior Problems 852
Pediatric Behavior Problems and Training—Dogs 1025
Pediatric Behavior Problems—Cats 1027
Polyphagia 1090
Separation Distress Syndrome 1208
Submitive and Excitement Urination—Dogs 1282
Thunderstorm and Noise Phobias 1306
Unruly Behaviors: Jumping, Pulling, Chasing, Stealing—Dogs 1339

Cardiology

Aortic Stenosis 104
Aortic Thromboembolism 106
Arteriovenous Fistula and Arteriovenous Malformation 110
Ascites 117
Atherosclerosis 130
Atrial Fibrillation and Atrial Flutter 135
Atrial Premature Complexes 138
Atrial Septal Defect 140
Atrial Standstill 141

354 client education handouts are available at www.fiveminutevet.com/canineandfelinelibrary for you to download and use in practice.
Atrial Wall Tear 143
Atrioventricular Block Complete (Third Degree) 145
Atrioventricular Block, First Degree 147
Atrioventricular Block, Second Degree—Mobitz I 149
Atrioventricular Block, Second Degree—Mobitz II 151
Atrioventricular Valve Dysplasia 153
Atrioventricular Valve (Myxomatous) Disease 155
Atrioventricular Valvular Stenosis 158
Cardiomyopathy—Boxer (Arrhythmogenic Right Ventricular) 226
Cardiomyopathy, Dilated—Cats 227
Cardiomyopathy, Dilated—Dogs 230
Cardiomyopathy, Hypertrophic—Cats 233
Cardiomyopathy, Hypertrophic—Dogs 235
Cardiomyopathy, Restrictive—Cats 236
Cardiopulmonary Arrest 238
Carotid Deficiency 240
Congestive Heart Failure, Left-Sided 307
Congestive Heart Failure, Right-Sided 309
Digoxin Toxicity 402
Ebstein’s Anomaly 429
Electric Cord Injury 437
Endocarditis, Infective 442
Endomyocardial Diseases—Cats 444
Fever 512
Heartworm Disease—Cats 573
Heartworm Disease—Dogs 574
Heat Stroke and Hyperthermia 576
Hypertension, Pulmonary 687
Hypertension, Systemic 689
Hypothermia 727
Idioventricular Rhythm 737
Left Anterior Fascicular Block 788
Left Bundle Branch Block 790
Lymphedema 827
Murmurs, Heart 887
Myocardial Infarction 909
Myocarditis 911
Patent Ductus Arteriosus 1021
Pericardial Effusion 1035
Pericarditis 1038
Peripheral Edema 1044
Peritoneopericardial Diaphragmatic Hernia 1047
Phlebitis 1057
Pleural Effusion 1063
Pulmonary Thromboembolism 1129
Pulmonic Stenosis 1131
Right Bundle Branch Block 1183

354 client education handouts are available at www.fiveminutevet.com/canineandfeline for you to download and use in practice
Dentistry

Deciduous Teeth, Persistent 352
Dental Caries 357
Dentigerous Cyst 359
Discolored Tooth/Teeth 406
Enamel Hypoplasia/Hypocalcification 438
Epulis 457
Gingival Hyperplasia/Enlargement 550
Halitosis 566
Malocclusions—Skeletal and Dental 837
Maxillary and Mandibular Fractures 854
Odontoma 961
Oral Masses 969
Oral Ulceration 973
Oronasal Fistula 979
Periodontal Diseases 1042
Stomatitis 1272
Stomatitis, Caudal—Cats 1274
Temporomandibular Joint Disorders 1293
Tooth Formation/Structure, Abnormal 1314
Tooth Fracture 1315
Tooth Luxation or Avulsion 1317

354 client education handouts are available at www.fiveminutevet.com/canineandfeline for you to download and use in practice.
Tooth—Missing 1318
Tooth Resorption—Cat 1319
Tooth Root Abscess (Apical Abscess) 1320

Dermatology

Acne—Cats 14
Acne—Dogs 15
Acral Lick Dermatitis 16
Alopecia—Cats 59
Alopecia—Dogs 61
Alopecia, Non-Inflammatory—Dogs 63
Anal Sac Disorders 74
Atopic Dermatitis 133
Cheyletiellosis 253
Contact Dermatitis 317
Cutaneous Drug Eruptions 342
Demodicosis 355
Dermatomyositis 360
Dermatophytosis 362
Dermatophytosis 363
Dermatoses, Depigmenting Disorders 365
Dermatoses, Erosive or Ulcerative 367
Dermatoses, Exfoliative 369
Dermatoses, Neoplastic 371
Dermatoses, Papulonodular 373
Dermatoses, Sterile Nodular/Granulomatous 375
Dermatoses, Sun Induced 377
Dermatoses, Vesiculopustular 378
Dermatoses, Viral (Non-Papillomatosis) 380
Ear Mites 428
Eosinophilic Granuloma Complex 447
Feline Paraneoplastic Alopecia 510
Feline Symmetrical Alopecia 511
Flea Bite Hypersensitivity and Flea Control 523
Food Reactions, Dermatologic 526
Lupus Erythematosus, Cutaneous (Discoid) 816
Lymphoma, Cutaneous Epitheliotic 832
Malassezia Dermatitis 835
Mycobacterial Infections 897
Nail (Claw) and Nailbed (Clawfold) Disorders 927
Nasal Dermatoses—Canine 930
Notoedric Mange 956
Otitis Externa and Media 987
Panniculitis/Steatitis 1006
Papillomatosis 1011
Pemphigus 1032

354 client education handouts are available at www.fiveminutevet.com/canineandfeline for you to download and use in practice
Abortion, Spontaneous (Early Pregnancy Loss)—Cats

**BASICS**

**DEFINITION**
- Spontaneous abortion—natural expulsion of fetus(es) prior to the point at which they can sustain life outside the uterus. • Early pregnancy loss—generalized term for any loss of conceptus including early embryonic death and resorption.

**PATHOPHYSIOLOGY**
- Infectious causes result in pregnancy loss directly by affecting the embryo, fetus, or fetal membranes, or indirectly by creating debilitating systemic disease in the queen. • Non-infectious causes of pregnancy loss result from any factor other than infection that leads to the death or premature expulsion of the conceptus (e.g., uterine disease, inadequate maternal nutrition, endocrine dysfunction, toxicity, genetic defects).

**SYSTEMS AFFECTED**
- Endocrine • Reproductive • Other systems—any debilitating illness can result in pregnancy loss.

**GENETICS**
- Genetic defects are more prevalent in highly inbred individuals; heritability of susceptibility to FIP thought to be very high.

**INCIDENCE/PREVALENCE**
- Unknown—pregnancy frequently not confirmed, owners may not recognize late pregnancy loss if the queen is fastidious; early embryonic death is difficult to document.

**SIGNMENT**
- **Species** Cat
- **Breed Predilections** Purebred cats—higher incidence of non-infectious abortion; inbreeding increases risk of genetic disease. Predisposition to developing FIP increased in some breeds including Bengal, Birmers, and Himalayan.
- **Mean Age and Range** In young and aged queens.
- **Infectious abortion seen in all ages; non-infectious abortion seen more commonly in young and aged queens.

**SIGNS**
- **General Comments** Early embryonic death and resorption frequently have no clinical symptoms; any combination of historical and physical examination findings may occur, with some queens displaying no symptoms.

**HISTORICAL FINDINGS**
- Failure to deliver litter at expected time, return to estrus sooner than expected, decrease in abdominal diameter and weight loss; discovery of fetal material, behavior change, anorexia, vomiting, diarrhea.

**PHYSICAL EXAMINATION FINDINGS**
- Purulent, mucoid, watery, or serous vaginal discharge; dehydration, fever, abdominal straining, abdominal discomfort.

**CAUSES**

**Infectious**
- Bacterial—organisms implicated in causing abortion via ascending infection include Escherichia coli, Staphylococcus spp., Streptococcus spp., Chlamydia spp., Pasteurella spp., Klebsiella spp., Pseudomonas spp., Salmonella spp., Mycoplasma spp., and Staphylococcus spp. • Feline—Toxoplasma gondii • Viral—FHV-1, FIV, FeLV, FPLV

**Non-infectious**
- Uterine—cystic endometrial hyperplasia, pyometra, chronic endometritis, anatomical abnormalities of the uterus, mechanical trauma to uterus or fetus. • Ovarian—early termination of corpora lutea function causes a decline in serum progesterone concentrations resulting in early parturition/abortion. Primary hypothyroidism is rare but secondary hypothyroidism may result from certain drugs, prolonged stress and uterine inflammation. • Fetal—chromosomal abnormalities resulting in abnormal or arrested development and embryonic or fetal death. • Systemic—malnutrition or nutritional disorders such as taurine deficiency; vitamin A deficiency or toxicity; severe non-reproductive illness; exogenous drug administration: estrogen, glucocorticoids, PGF, and dopamine agonists (cabelplage, bromocriptine) will disrupt normal corpora lutea function; fetotoxic or teratogenic drugs; chemotherapeutic agents, antimicrobial agents, some antibiotics (trimethoprim-sulfonamides, tetracyclines, gentamicin); modified live vaccines.

**RISK FACTORS**
- Prior history of pregnancy loss • Concurrent systemic disease • Recent trauma • Purebred cat with high degree of inbreeding • Very young or old queen • Persistent use of progesterone to suppress estrus • Malnourishment • Homemade and raw diets • Overcrowded or unsanitary environment

**DIAGNOSTIC PROCEDURES**

**DIFFERENTIAL DIAGNOSIS**
- Early pregnancy loss—failure to conceive, disorder of sexual development, anovulatory cycle. • Vulvar discharge—pyometra, mucocervical, uterine stump pyometra; vaginitis, metritis, cystitis; impeding parturition or dystocia; neoplasia or trauma of urinary bladder, urethra, vagina, or uterus; estrus—very little discharge typically seen • Abdominal straining or discomfort: urethral obstruction; internal foreign body.
Infectious diseases—verify client is follow-
Surgical management: OHE for queens
Hypoluteoidism: progesterone in
enzyme-linked immunosorbent
www.whelpwise.com
indirect
ELISA
Diabetes, CEH, masculinization of female
Serial ultrasound evaluation q 5–7 days to
Institute infectious disease prevention,
Sexual Development
PGF
FIV
Abortion, Spontaneous (Early Pregnancy Loss)—Cats
r
= Progesterone in oil—diabetes, pyometra,
Terbutaline—cardiac or respiratory disease,
OHE
Breeding, Timing
FHV-1
r
= No activity restrictions for most non-
r
=r
Fair
=r
Queens
=r
=cystic endometrial hyperplasia
Replace
Milan Hess
Restrict activity
www.theriojournal.com
FIPV
Genetic disease—increase in inbred
FPLV
Tocolytic therapy to prevent uterine
Discuss risk of zoonotic disease
ovario-
Feline
Nutrition—discuss routine diet
Amoxicillin-clavulanic acid 13.75 mg/kg
r
IFA
Outpatient management: typically no
r
×
JWST589-A12-01 JWST589-Tilley  Printer: Yet to Come August 1, 2015 10:10 279mm
bacteria and
reduce risk for ingestion of pathogenic
inappropriate taurine or vitamin A
use in pregnancy. Correct diets with
Feed commercially available diet labeled for
as indicated for pregnancy loss due to trauma.
CLIENT EDUCATION
• Infectious diseases—verify client is follow-
good vaccination protocols and disease
surveillance measures and is utilizing
quarantine facilities for pregnant queens and
new arrivals. • Breeding management—
discuss normal reproductive behavior and
good breeding management; advise clients to
keep detailed records related to reproductive
performance, pedigree analysis, and social
behavior of queens within the cattery.
• Nutrition—discuss routine diet
recommendations for breeding queens; advise
homemade diets undergo nutritional analysis.
• Genetic disease—increase in inbred
individuals; many reproductive traits are
heritable. • Discuss risk of neonatal disease
from Toxoplasma gondii.
MEDICATIONS
DRUG(S) OF CHOICE
• Will depend on etiology
• Amoxicillin-clavulanic acid 13.75 mg/kg
PO q12hs or enrofloxacin 5 mg/kg/day PO
based on bacterial culture results.
• Tocolytic therapy to prevent uterine
contractions and help maintain pregnancy—
Terbutaline 0.03–1.0 mg PO as needed based on
tocolyndynamics; 0.05 mg/kg PO q6hs if
tocolyndynamics not available.
• Hypoluteoidism: progesterone in
oil—2.0–3.0 mg/kg IM as needed based on
serum progesterone concentration and
tocolyndynamics.
CONTRAINdications
• Terbutaline—cardiac or respiratory disease,
prometra, infectious disease, hypertension.
• Progesterone in oil—diabetes, prometra,
infectious disease, CEH.
PRECAUTIONs
• Use of tocolytics to maintain pregnancy requires
accurate documentation of breeding
dates to know when treatment should be
discontinued; tocolytics used most
successfully in combination with
tocolyndynamics to establish desired dosing
interval based on increasing preterm uterine
activity. • Terbutaline can cause hypertension
leading to increased hemorrhage from the
placental sites during parturition or at the
time of c-section.
POSSIBLE INTERACTIONS
• Progesterone administration during
pregnancy is associated with masculinization
of female fetuses; do not administer in the
first half of pregnancy and use with informed
consent thereafter. • Use of tocolytics to
maintain pregnancy is associated with
increased risk of dystocia, failure of normal
placental separation at parturition, lack of
mammary gland development and milk
production, and poor maternal behavior for the
first few days postpartum.
FOLLOW-UP
PATIENT MONITORING
• Serial ultrasound evaluation q 5–7 days to
evaluate fetal viability for queens receiving
tocolytics.
PREVENTION/AvoidANCE
• Institute infectious disease prevention,
control, and surveillance plan. • Replace
infertile queens with more reproducitively fit
individuals. • Avoid exposure to abortifacient,
teratogenic, or fetoxic drugs.
POSSIBLE COMPLICATIONS
• Depends on etiology. • Metritis,
endometritis, uterine rupture, sepsis, shock.
• Diabetes, CEH, masculization of female
fetuses with progesterone treatment.
EXPECTED COURSE AND PROGNOSIS
• Infectious disease—normal pregnancy,
repeated abortion, or infertility possible with
viral disease. • Poor prognosis for normal
pregnancy in queens with severe CEH. • Fair
prognosis for successful pregnancy with
treatment for primary hypoluteoidism;
significant monitoring required for good
outcome. • Pregnancy loss due to genetic
abnormalities likely to recur if queen is bred
to same with similar pedigree.
ABORTION, SPONTANEOUS (EARLY PREGNANCY LOSS)—DOGS

BASICS

DEFINITION
Loss of a fetus because of resorption in early stages or expulsion in later stages of pregnancy.

PATHOPHYSIOLOGY
- Direct causes—congenital abnormality, infectious disease, trauma. • Indirect causes—infectious placentitis, abnormal ovarian function, abnormal uterine environment.

SYSTEMS AFFECTED
- Reproductive. • Any dysfunction of a major body system can adversely affect pregnancy.

GENETICS
- No genetic basis for most causes of abortion.
- Lymphocytic hypothyroidism—single-gene recessive trait in borzois.

INCIDENCE/PREVALENCE
- True incidence unknown.
- Resorption estimated between 11–13%, some estimates up to 30% of all one resorption.
- Incidence of stillbirth reported as 2.2–4.4% increases with dystocia up to 22.3%.

SIGNalement
Species
Dog

Breed Predictions
- Familial lymphocytic hypothyroidism reported in borzois—prolonged interestrus interval, poor conception rates, abortion, midgetstasis, stillbirths. • Many breeds considered at risk for familial hypothyroidism (see Hypothyroidism).

Mean Age and Range
- Usually >6 years old.

Predominant Sex
Intact bitches

SIGNS
Historical Findings
- Failure to weep on time. • Expulsion of recognizable fœtuses or placental tissues.
- Decrease in abdominal size; weight loss.
- Anorexia. • Vomiting, diarrhea.
- Behavioral changes.

Physical Examination Findings
- Sanguineous or purulent vulvar discharge.
- Disappearance of vesicle or fœtuses previously documented by palpation, ultrasonography, or radiography.
- Abdominal straining, discomfort.
- Depression. • Dehydration. • Fever in some patients.

CAUSES
Infectious
- Brucella canis. • Canine herpesvirus.
- Toxoplasma gondii, Neospora caninum.

Miscellaneous bacteria—E. coli, Streptococcus, Campylobacter, Salmonella.
- Miscellaneous viruses—distemper virus, parvovirus, adenovirus.
- Uterine
- Cystic endometrial hyperplasia and pyometra. • Trauma—acute and chronic.
- Neoplasia. • Embryotoxic drugs.
- Chemotherapeutic agents. • Estrogens.
- Glucocorticoids—high doses.
- Ovarian
- Prostaglandins—lysis of corpora lutea.
- Dopamine agonists—lysis of corpora lutea via suppression of prolactin; bromocriptine, cabergoline.
- Hypothyroidism—abnormal luteal function in the absence of fetal, uterine, or placental disease; progesterone concentrations <1–2 ng/mL, most often seen at 40–45 days gestation.

Hormonal Dysfunction
- Hypothyroidism; new data shows this is less common than previously thought.
- Hypoadrenocorticism. • Environmental factors—endocrine disrupting contaminants have been documented in human and wildlife populations of fetal loss.

Fetal Defects
- Lethal chromosomal abnormality. • Lethal organ defects.

RISK FACTORS
- Exposure of the broad bitch to carrier animals • Old age • Hereditary factors

DIAGNOSIS

DIFFERENTIAL DIAGNOSIS
- Differentiate infectious from non-infectious causes. • B. canis of immediate and nonostatic concern. • Differentiate resorption from infertility—helped by early diagnosis of pregnancy. • History of drug use during pregnancy—particularly during the first trimester, or use of drugs (e.g., dexamethasone, progestinoids, ketocansolone, griseofulvin, doxycycline, tetracycline, dantrolene, among others) known to cause fetal death.
- Vulvar discharges during diestrus—may mimic abortion; evaluate discharge and origin to differentiate uterine from distal reproductive tract disease.
- Necropy of aborted fœtas, stillborn puppies, and placenta(s)—enhances chances of a definitive diagnosis, refrigerate but do not freeze prior to submission. • History of systemic or endocrine disease—may indicate problems with the maternal environment.

CIBC/BIOCHEMISTRY/RNALYSIS
- Usually normal. • Systemic disease, uterine infection, viral infection, or endocrine abnormalities—may produce changes in CIBC, biochemistry, or urinalysis.

OTHER LABORATORY TESTS
- Serologic testing—B. canis, canine herpesvirus, and Toxoplasma, Neospora; collect serum as soon as possible after abortion; repeat testing for raising titer for canine herpesvirus, Toxoplasma, Neospora. • Slide test for B. canis—very sensitive; negative results reliable; prevalence of false positives as high as 60% (D’Tec CIB, Synbiotics Corp., (800)773-5500). • PCR for B. canis now available. • Definitive diagnosis made via culture. • Tube agglutination test for B. canis—gives titers; titers >1:200 considered positive; titers from 1:50–1:200 considered suspicious. • Agar gel immunodiffusion test for B. canis—effectively differentiates between false positives and true positives in agglutination test; detects cytolytic and cell surface antigens (Cornell University Animal Health Diagnostic Laboratory, (607)253-3900). • Baseline T4 serum concentration (when no infectious agents are identified)—hypothyroidism is a common endocrine disease and has been suggested as a cause for fetal wastage; role in pregnancy loss unclear; subnormal T4 concentrations indicate need for further testing (see Hypothyroidism). • Serum progesterone concentration (when no infectious agents are identified)—hypothyroidism may cause fetal wastage; dogs depend on ovarian progesterone production throughout gestation (minimum of 2 ng/mL required to maintain pregnancy); collect sample and determine as soon as possible after abortion; in subsequent pregnancies, start weekly monitoring at week 3, which may be before pregnancy can be documented with ultrasound; start bivestral sampling around the gestational age of previous loss. Pregnancy loss typically occurs during the seventh week of gestation (see Premature Labor).

Vaginal culture—B. canis with positive serologic test. • Mycoplasma, Ureaplasma, other bacterial agents; all except B. canis can be normal flora, therefore diagnosis difficult from vaginal cultures alone; Salmonella associated with systemic illness in the bitch.

IMAGING
- Radiography—identifies fetal structures after 45 days of gestation; earlier, can determine uterine enlargement but cannot assess uterine contents.
- Ultrasonography—identifies uterine size and contents, assesses fluid and its consistency; assesses fetal remains or fetal viability by noting heartbeats (normal, >200 bpm, stress, <150 or >280 bpm).

DIAGNOSTIC PROCEDURES
- Vaginoscopy—identify source of vulvar discharges and vaginal lesions; use a scope of sufficient length (16–20 cm) to examine the entire length of the vagina. • Cytologic examination and bacterial culture—may reveal an inflammatory process (e.g., uterine infection); technique for culture: see a
guarded ovah culture instrument to ensure an anterior sample (ideal reproductive tract is normally heavily contaminated with bacteria), or collection of secretions via transcervical catheterization.

PATHOLOGIC FINDINGS
Histopathologic examination of culture of fetal and placental tissues—may reveal infectious organisms; tissue culture, particularly of stomach contents, to identify infectious bacterial organisms.

TREATMENT

APPROPRIATE HEALTH CARE
• Most bitches should be confined and isolated pending diagnosis. • Hospitalization of infectious patients preferred. • B. canis—highly infective to dogs; shed in high numbers during abortion; suspected cases should be isolated. • Outpatient medical management—medically stable patients with non-infectious causes of pregnancy loss, endocrinopathies, or endometrial disease.
• Partial abortion—may attempt to salvage the live fetuses; administer antibiotics if a bacterial component is identified.

NURSING CARE
Dehydration—use replacement fluids, supplementation with electrolytes if imbalances are identified by serum biochemistries.

ACTIVITY
Partial abortion—surgery generally recommended, although the positive effect on reducing further abortion is unknown.

DIET
No special dietary considerations for uncomplicated cases.

CLIENT EDUCATION
• Critical for B. canis—if confirmed, euthanasia recommended due to lack of successful treatment and to prevent spread of infection; may try OHE and long-term antibiotic; discuss surveillance program for subsequent estrous cycles, monthly serumology for all individuals, culling any positive animals, until three consecutive negative tests are obtained; discuss asymptomatic potential. • Primary uterine disease—OHE is indicated in patients with no breeding value; cystic endometrial hyperplasia is an irreversible change. • Infertility or pregnancy loss—may recur in subsequent estrous cycles despite successful immediate treatment. • Prostaglandin treatments—discuss side effects (see Abortion, Termination of Pregnancy). • Infectious diseases—establish surveillance and control measures.

SURGICAL CONSIDERATIONS
OHE—preferred for stable patients with no breeding value.

CANINE AND FELINE, SIXTH EDITION
5

MEDICATIONS

DRUG(S) OF CHOICE
• PGF₂α (Lutalyse, dinoprost tromethamine)—uterine evacuation after abortion; 0.05-0.1 mg/kg SC q24–48h; cloprostenol (Estrumate, cloprostenol)—1–3 μg/kg SC q24h; not approved for use in dogs, but adequate documentation legitimizes its use; use only if all living fetuses have been expelled.
• Antibiotics—for bacterial disease; initially initiate broad-spectrum agent; specific agent depends on culture and sensitivity testing of vaginal tissue or neoplasy of fetus.
• Progestrone (Regu-Mate) at 0.088 mg/kg (1 mL/25 kg PO q48h); progesterone in oil at 2 mg/kg IM q48–72h; progesterone (Prometrium), 10 mg/kg PO q24h, adjust daily dosage based on serum progesterone—pour to maintain pregnancy, must have accurate date to know when to discontinue therapy—unpredictably prolonging gestation will result in fetal death.

CONTRAINDICATIONS
Progestrone supplementation—contraindicated in dogs with endometrial or mammary gland disease.

PRECAUTIONS
PGF₂α—metabolized in the lung, side effects are related to smooth muscle contraction, are dose-related, and diminish with each injection; panting, salivation, vomiting, and dehiscence common; dosing critical (LE50 for abortion—5 mg/kg).

ALTERNATIVE DRUG(S)
Oxytocin—1 U/5 kg SC q6–24h for uterine evacuation; should only be considered in cases where uterine evacuation is desired solely through uterine contraction.

FOLLOW-UP

PATIENT MONITORING
• Partial abortion—monitor viability of remaining fetuses with ultrasonography; monitor systemic health of the dam for signs of subsequent pregnancy. • Vulva discharges—daily; for decreasing amount, odor, and inflammatory component; for consistency (increasing mucoid content is prognostically good). • PGF₂α—continued for 5 days or until most of the discharge ceases (range 3–15 days). • B. canis—monitor after neutering and antibiotic therapy; yearly serologic testing to identify recrudescence. • Hypothyroidism—treat appropriately; neutering recommended (hereditary nature); see Hypothyroidism.

PREVENTION/AVOIDANCE
• Brucellosis and other infectious agents—surveillance programs to prevent introduction to kennel. • OHE—for bitches with no breeding value. • Use of modified-live vaccines (e.g., some distemper, parvovirus, etc., vaccines).

POSSIBLE COMPLICATIONS
• Uncontrolled pyometra—septicemia, toxaemia, death. • Brucellosis—disseminated, endophalmitis, recurrent urethritis.

EXPECTED COURSE AND PROGNOSIS
• Pyometra—recurrence rate during subsequent estrus is high (up to 70%) unless pregnancy is established. • CEH—recovery of fertility unlikely, pyometra common complication. • Hormonal dysfunction—often manageable, familial aspects should be considered. • Brucellosis—guarded, extremely difficult to successfully eliminate infection even if combined with neutering.

MISCELLANEOUS

AGE-RELATED FACTORS
Older bitches more likely to have CEH.

ZOONOTIC POTENTIAL
B. canis—can be transmitted to humans, especially when handling the aborting bitch and expelled tissues; massive numbers of organisms expelled during abortion.

Pathologists should be warned when B. canis is suspected, people that are immunocompromised are at greatest risk for infection.

SEE ALSO
• Brucellosis • Hypothyroidism • Infertility. • Female—Dogs • Premature Labor • Pyometra

ABBREVIATIONS
• CEH—cystic endometrial hyperplasia • OHE—ovari hysterectomy • PGF₂α—prostaglandin F₂α

Suggested Reading

Author Julie T. Cecere
Consulting Editor Sara K. Lyle
Acknowledgement The author and editors acknowledge the prior contribution of Beverly J. Purswell.
Abortion, Termination of Pregnancy

**BASICS**

**DEFINITION**
Termination of an unwanted pregnancy. May be accomplished by drugs that alter embryo transport in the oviduct impeding establishment of a pregnancy, and/or cause luteal regression, terminating an established pregnancy. Due to their possible side effects (CEH, aplastic anemia and bone marrow suppression), drugs that impair embryonic transit through the oviduct (estrogens) are not commonly used or recommended.

**PATHOPHYSIOLOGY**
After fertilization the embryo travels the oviduct in a timely manner before entering the uterus. Impaired embryo transport through the oviduct leads to embryonic degeneration and implantation abnormalities. In the dog and cat, pregnancy maintenance is dependent on progesterone production from the corpora lutea. In dogs and cats, maintenance of the corpora lutea during the second half of gestation is also supported by prolactin. Drugs that cause luteal regression, terminating an established pregnancy, and/or cause luteal regression during treatment will terminate pregnancy.

**SYSTEMS AFFECTED**
- Cardiopulmonary
- Digestive
- Neurologic (caused by drugs used for treatment)
- Reproductive
- Respiratory

**GENETICS**
N/A

**INCIDENCE/PREVALENCE**
N/A

**GEOGRAPHIC DISTRIBUTION**
N/A

**SIGNALMENT**
Species
Dog and cat

**Breed Predictions**
N/A

**Mean Age and Range**
Postpuberal bitch and queen

**Predominant Sex**
Pregnant bitch or queen

**SIGNS**
- Depends on stage of gestation: 
  - None
  - Vaginal discharge
  - Fetal expulsion

**CAUSES**
- Impaired oviductal transport
- Luteal regression
- Progesterone receptor antagonism

**RISK FACTORS**
N/A

**DIAGNOSIS**
- Confirm pregnancy first, less than 40% of mismated bitches become pregnant:
  - Abdominal palpation (bitch: 31–33 days after LH surge; queen: 21–23 days after breeding): ∼25–35 days after LH surge; queen: ≥16 days after breeding).
  - Abdominal radiographs (bitch: ≥45 days after LH surge; queen: ≥38 days after breeding): ∼28 days after LH surge/ (Waters® Relain, Synbiotics/ Zoetis Corp., http://synbiotics.com/index.html; (800)733-5500). Acetaim that a breeding took place; a tie in the bitch and cortisol “after-reaction” in the queen.

**DIFFERENTIAL DIAGNOSIS**
- Hydrometra
- Mucometra
- Hematometra
- Pyometra
- Pseudopregnancy

**CBC/BIOCHEMISTRY/URINALYSIS**
- Within normal limits during first half of pregnancy in healthy patients. Decrease in PCV during second half of pregnancy in bitches and queens is normal.
- Recommended as screening test prior to treatment in patients with suspected underlying disease.

**OTHER LABORATORY TESTS**
- Vaginal cytology—determines stage of estrous cycle and presence of sperm. Absence does not rule out a previous breeding.
- Methods to increase detection of sperm: infuse and recover 5–10 mL of saline from anterior vagina using standard AI pipette, cervicovaginal, examine pellet; collect sterile routine cytology and allow swab to sit in 1–2 mL of saline, express fluid, centrifuge, examine pellet. Serum progesterone concentration determines if the female is in diestrus and monitors luteal regression during treatment.

**IMAGING**
- Abdominal radiographs.

**PATHOLOGIC FINDINGS**
N/A

**TREATMENT**

**APPROPRIATE HEALTH CARE**
- Physical examination before initiation of treatment.
- Monitor 50–60 minutes after treatments for side effects (vomiting, defecation, hylaemia, hyperpyrexia, micturition, tachycardia).
- Pregnancy status in early diestrus is unknown; ultrasound confirmation of pregnancy is possible until ∼4 weeks after breeding. Treatment on day 6–7 of diestrus—may have reduced efficacy compared to midgestation but can be less distasteful to client (less discharge and recognizable fetuses are not passed).
- PGF₂α and bromocriptine given in combination—improved efficacy of either drug given alone.

**NURSING CARE**
N/A

**ACTIVITY**
Normal

**DIET**
Avoid feeding prior to each treatment and for 1–2 hours after treatments (reduces nausea and vomiting).

**CLIENT EDUCATION**
- Discuss patient’s reproductive future with owner. If no litters are desired, then OHE is the best option.
- Discuss with the client the potential side effects of the treatment options; reach a mutual agreement on the treatment plan.

**SURGICAL CONSIDERATIONS**
OHE is recommended for patients with no reproductive value or when owners do not desire future litters.

**DRUG(S) OF CHOICE**
- Confirmation of pregnancy before initiating any of the treatment protocols suggested below is recommended. Lengths of treatment suggested may vary: treatments should be continued until abortion is complete.
- Prostaglandin (PGF₂α): causes luteal regression with subsequent decline in progesterone concentration, cervical relaxation, and uterine contractions; bitches and cats low dose protocol: 10 μg/kg SC, q6–8h for 7–10 days or until pregnancy terminated (in the bitch), then 25 μg/kg q6h for 1–2 days; then 50 μg/kg q6h for 3–4 days (the queen is more resistant to the luteolytic effects of PGF₂α than bitches—often higher doses for longer periods are required); bitch standard dose protocol: 150 μg/kg SC, q24h for 2 days, then 200 μg/kg SC, q24h until pregnancy terminated; queen: 0.5–1 mg/kg SC q12h every other day > day 40, or 2 mg/cat IM q24h for 5 days > day 53.
- Cloprostenol (prostaglandin analogue): bitches: 2.5 μg/kg SC q6–8h or q12h every 48 hours until pregnancy terminated (>6 days after start of treatment).
- Dienethisterone: mode of action is unknown; bitches: 0.2 mg/kg PO q8–12h for 5 days, then decreasing from 0.16 to 0.02 mg/kg over the last five days; treatment failures not uncommon.
- Cabergoline (PRL antagonist): causes luteal regression; bitches: 1.05 μg/kg SC q24h for 5 days or 0.5 μg/kg PO q24h for 5 days > day 40; queens: 1.65 μg/kg SC for
Abortion, Termination of Pregnancy

Canine and Feline, Sixth Edition

ALTERNATIVE DRUG(S)

- The following drugs are recommended for use in bitches but not available in the United States: Melprofen (RU486), progestin and glucocorticoid receptor antagonist: 2.5 mg/kg PO q24h for 4–5 days > day 2.5 of treatment until abortion complete (≤ 7 days).
- Bromocriptine (PRL antagonist): causes post-LH surge within 7 days. Vomiting, diarrhea, polydipsia, and polyphagia may be observed. Agluprine and cloprostenol combination: agluprine (10 mg/kg SC) combined with cloprostenol (10 mg/kg SC) q24h for 2 days > 25 days post-LH surge (dog); pregnancy is terminated within 6–10 days after treatment; preparament-like behavior has been observed; abortion may be followed by serumogestin vaginal discharge for 2–3 days; not yet available in the US (currently in Phase I clinical trials for prostate cancer in men).

EXPECTED COURSE AND PROGNOSIS

- The interval between administration of prostaglandins and PRL inhibitors may be shortened (<1 month). Queens may resume estrous behavior 2–3 days after pregnancy termination. Subsequent estrus fertility is not affected.

MISCELLANEOUS

ASSOCIATED CONDITIONS

N/A

AGE-RELATED FACTORS

N/A

ZOO NOTIC POTENTIAL

N/A

PREGNANCY/FERTILITY/BREEDING

SYNONYMS

Induced abortion

SEE ALSO

Breeding, Timimg

ABBREVIATIONS

- CEH = cystic endometrial hyperplasia
- GnRH = gonadotropin-releasing hormone
- LH = luteinizing hormone
- OHE = ovariosurgery
- PCV = packed cell volume
- PG = prostaglandin F2α
- PRL = prolactin

Suggested Reading


FOLLOW-UP

PATIENT MONITORING

In animals treated with luteolytic drugs (prostaglandins and PRL antagonists), progesterone assays and transabdominal ultrasound examinations should be performed to monitor decrease of serum progesterone concentrations and complete evacuation of uterine contents. In patients treated with progesterone receptor antagonist drugs, transabdominal ultrasound examinations are recommended to monitor complete evacuation of the uterus.

PREVENTION/AVOIDANCE

- OHE for bitches and queens not intended for breeding. Eustrus suppression or confinement of bitches and queens intended for breeding during a later cycle to avoid misnaming.

POSSIBLE COMPLICATIONS

Pregnancy termination may not be achieved after one treatment protocol and continuation or change in treatment protocol may be necessary.

Client Education Handout

available online
**IMMUNOSUPPRESSION—FELV/FIV INFECTION**

- **Neoplasia**—variable growth, consistent.
- **Inflammation and discharge from a fistulous**
- **Hepatobiliary**—liver parenchyma
- **Fibrous scar tissue**—firm; non-painful.
- **Diabetes mellitus**—persistent.
- **Pyogenic bacteria**—classic signs of inflammation (heat, pain, swelling, and loss of function) are associated with specific anatomic location of the abscess. Inflammation and discharge from a fistulous tract may be visible if the abscess is superficial and has ruptured to an external surface.
- **Necrosis**—variable sized, painful mass of fibrin to firm consistency attached to surrounding tissues may be palpable.
- **Sepsis** occasionally, especially if abscess ruptures internally.

**CAUSES**

- **Foreign objects.**
- **Prostatic bacteria**—Staphylococcus spp.; Escherichia coli; β-hemolytic Streptococcus spp.; Peptostreptococcus; Mycoplasma and Mycoplasmata-like organisms (l-forms); Pasteurella multocida; Corynebacterium; Actinomyces spp.; Nocardia; Bartonella.
- **Obligate anaerobes**—Bacteroides spp.; Clostridium spp.; Peptostreptococcus; Fusobacterium.

**RISK FACTORS**

- **Anal sac**—impaction; anal sacitis.
- **Brain—otitis interna sinusitis oral infection.**
- **Liver—ophtalmophlebitis sepsis.**
- **Lung—foreign object aspiration bacterial pneumonia.**
- **Mammary gland—mastitis.**
- **Peritesticular—dental disease, chewing of wood or other plant material.**
- **Perineum—fighting, trauma, or surgery.**
- **Prostate gland—bacterial prostatitis.**
- **Immunosuppression**—FelV/FIV infection, immunosuppressive chemotherapy, acquired or inherited immune system dysfunctions, underlying predisposing disease (e.g., diabetes mellitus, chronic renal failure, hyperadrenocorticism).

**DIAGNOSIS**

- **DIFFERENTIAL DIAGNOSIS**
- **Mass Lesions**
  - **Cyst**—less or only transiently painful; slower growing.
  - **Rhabdomyosarcoma**—firm; non-painful.
  - **Granuloma—less painful; slower growing; generally firmer without fluctuant center.**
  - **Hematoma/serosa—variable pain (depends on cause); non-encapsulated; rapid initial growth but slow increase once full size is attained; unattached to surrounding tissues; fluctuant and fluid filled initially but more firm with organization.

- **Neoplasia**—variable growth, consistent; painful.

**Draining Tracts**

- **Mycobacterial disease.**
- **Actinomycosis**—blastoconidia, Actinomyces israeli, Nocardia asteroides, Staphylococcus aureus, Escherichia coli, Peptostreptococcus, Clostridium.
- **Neoplasia**—variable growth, consistent.
- **Phaeohyphomycosis**—Sporotrichosis
- **Systemic fungal infection**—Blastomyces, Cryptococcus, Histoplasma, Coccidioides.

**CBC/BC/URINALYSIS**

- **CBC**—normal or neutrophilia with or without regenerative left shift. Neutrophilia and degenerative left shift if sepsis present.
- **Urinalysis**—findings consistent with inflammatory response of focal infection.
- **Serum chemistry profile**—depends on system affected.
- **Prostatic**—pyuria.
- **Liver and/or pancreatic—high liver enzymes and/or total bilirubin.
- **Pancreatic—high amylase/lipase.**

**OTHER LABORATORY TESTS**

- **FeLV and FIV**—for cats with recurrent or slow-healing abscesses.
- **CSF evaluation**—increase in cellularity and protein expected with brain abscess. 
- **Adrenal function**—evaluate for hyperadrenocorticism.

**IMAGING**

- **Radiography**—soft tissue density mass in affected area; may reveal foreign body.
- **Ultrasoundography**—determine if mass is fluid filled or solid; determine organ system affected; reveal fluid or appearing fluid characteristic of pus; may reveal foreign object.
- **Echocardiography**—helpful for diagnosis of pericardial abscess.
- **CT or MRI**—helpful for diagnosis of brain abscess.

**DIAGNOSTIC PROCEDURES**

- **Aspiration**—reveals a red, white, yellow, or green liquid.
- **Nucleated cell count—3,000–10,000 per cu mm.**
- **Impression smears—stained and examined.**
- **Tissue—submit for histopathologic examination and culture.**
Depends on location of abscess.

Discuss need for adequate drainage and therapy required.

Nocardiosis

Inpatient—sepsis; extensive surgical drainage; may requireoldemetric removal of nidus of infection or tissue destruction.

MRI

Surrounding tissue—congested; fibrin; large number of neutrophils; variable number of lymphocytes; plasma cells; macrophages.

Causative agent variably detectable.

Treatment

Appropriate health care

• Depends on location of abscess and treatment required.
• Outpatient—bite-induced abscesses.
• Inpatient—septic, extensive surgical procedures, treatment requiring extended hospitalization.
• Establish and maintain adequate drainage.
• Surgical removal of nidus of infection or foreign object(s) if necessary.
• Institution of appropriate antimicrobial therapy.

Nursing care

• Depends on location of abscess.
• Apply hot packs to inflamed area as needed.
• Use protective bandaging and/or Elizabethan collar as needed.
• Accumulated exudate—drain abscess; maintain drainage by medical and/or surgical means.
• Sepsis or peritonitis—aggressive fluid therapy and support.

Activity

Restrict until the abscess has resolved and adequate healing of tissues has taken place.

Diets

• Sufficient nutritional intake to promote a positive nitrogen balance.
• Depends on location of abscess and treatment required.

Client education

• Discuss need to correct or prevent risk factors.
• Discuss need for adequate drainage and continuation of antimicrobial therapy for an adequate period of time.

Surgical considerations

• Appropriate debridement and drainage—may need to leave the wound open to an external surface; may need to place surgical drains.
• Early drainage—to prevent further tissue damage and formation of abscess wall.
• Remove any foreign object(s), necrotic tissue, or nidus of infection.

Medications

Drug(s) of choice

• Antimicrobial drugs—effective against the causative agent(s) and with both aerobic and anaerobic activity; until results of culture and sensitivity are known.
• Broad-spectrum agent—bactericidal and active against the causative organism.
• Clindamycin (5 mg/kg PO q12h) and trimethoprim/sulfadiazine (15 mg/kg PO IM q12h), Cuts with Mycoplasma and l-forms doxycycline (5 mg/kg PO q12h).
• Aggressive antimicrobial therapy—sepsis or peritonitis.

Contraindications

N/A

Precautions

N/A

Possible interactions

N/A

Alternative drug(s)

N/A

Follow-up

Patient monitoring

Monitor for progressive decrease in drainage, resolution of inflammation, and improvement of clinical signs.

Prevention/avoidance

• Pericutaneous abscesses—prevent fighting.
• Anal sac abscesses—prevent impaction; consider anal saculectomy for recurrent cases.
• Prostatic abscesses—castration possibly helpful.
• Mastitis—prevent lactation (spaying).
• Periorbital abscesses—do not allow chewing on foreign object(s).

Possible complications

• Sepsis.
• Peritonitis/pleuritis if intra-abdominal or infraorificial abscess ruptures.
• Compromise of organ function.
• Delayed evacuation may lead to chronically draining fistulous tracts.

Expected course and prognosis

Early drainage and intervention involved and amount of tissue destruction.

Miscellaneous

Associated conditions

• FeLV or FIV infection.
• Immunosuppression.

Age-related factors

N/A

Zoonotic potential

• Minimal for pyogenic bacteria.
• Mycobacteria and systemic fungal infections carry some potential.

Pregnancy/fertility/breeding

Teratogenic agents—avoid use in pregnant animals.

See also

• Actinomyces.
• Anaerobic infections.
• Colibacillosis.
• Mycoplasmosis.
• Nocardiosis.
• Sepsis and Bacteremia.

Abbreviations

• CSF = cerebrospinal fluid.
• CT = computed tomography.
• FeLV = feline leukemia virus.
• FIV = feline immunodeficiency virus.
• MRI = magnetic resonance imaging.
• PAS = periodic acid–Schiff.

Suggested reading


Author: Adam J. Borkhorst, Consulting Editor: Stephen C. Barr. Acknowledgment: The author and editors acknowledge the prior contributions of Johnny D. Hoskins.
**Acetaminophen (apap) Toxicosis**

**Basics**

**Definition**
Results from accidental animal ingestion or owner administration of over-the-counter acetaminophen-containing analgesic and antipyretic medications.

**Pathophysiology**
When the normal biotransformation mechanisms for detoxification (glucuronidation and sulfation) are saturated, cytochrome P450-mediated oxidation produces a toxic metabolite (N-acetyl-p-benzoquinone imine) that is electrophilic, conjugates with glutathione, and binds to sulfhydrol groups leading to hepatic necrosis.

**Dogs**
- Liver is most susceptible to toxicity.
- Signs commonly observed at exposures with dark or bloody colored urine or drinking water—available at all times.
- Edema—face, paws, and possibly forelimbs; hepatotoxic mushrooms
- Signs may develop 1–4 hours after dosing
- Gentle handling—imperative for clinically depressed patients
- Anemia, hematuria, or hemoglobinuria—onions/garlic
- Methemoglobinemia and progressively darkened mucous membranes
- Shock
- Simultaneous administration of other antipyretic medications
- Results from accidental animal ingestion or owner administration of over-the-counter acetaminophen-containing analgesic and antipyretic medications.
- Other causes of methemoglobinemia
- Oxygen therapy may be needed.
- Darkened mucous membranes—reflect methemoglobinemia

**Incidence/Prevalence**
Common drug toxicity in cats; less frequent in dogs.

**Geographic Distribution**
N/A

**Signalment**
Species
- Cats more often than dogs

**General Comments**
Relatively common—owing to widespread human use.

**Historical Findings**
- Depression
- Hyperventilation
- Darkened mucous membranes
- Signs may develop 1–4 hours after dosing

**Physical Examination Findings**
- Progressive depression
- Salivation
- Vomiting
- Abdominal pain
- Tachypnea and cyanosis or muddied mucous membranes—reflect methemoglobinemia
- Edema—face, paws, and possibly forelimbs; after several hours
- Chocolate-colored urine—hematuria and hemoglobinuria or hematuria.

**Causes**
Acetaminophen toxicosis

**Risk Factors**
- Nutritional deficiencies of glucose and/or sulfate
- Simultaneous administration of other glutathione-depressing drugs

**Diagnosis**

**Differential Diagnosis**

**Other causes of liver injury**
- Hepatotoxic mushrooms
- Blue-green algae
- Alkaloids
- Iron, copper, zinc
- Xylitol
- Cyan palms
- NSAIDs

**Other causes of methemoglobinemia**
- Onion/garlic
- Naphthalene
- Chlorates
- Nitrites
- Sulfafoxine
- Phenol
- Benzosine
- Propylene glycol (cats)

**CBC/Biochemistry/UrinealYSIS**
- Methemoglobinemia and progressively rising serum concentrations of liver enzymes (ALT, AST)—characteristic.
- As hepatic function becomes impaired—decreased BUN, cholesterol, and albumin, and increased serum bilirubin.
- Heinz bodies (cats)—prominent in RBCs

**Other Laboratory Tests**
Acetaminophen plasma, serum, or urine concentrations

**Imaging**
N/A

**Diagnostic Procedures**
N/A

**Pathologic Findings**
- Methemoglobinemia
- Pulmonary edema.
- Centrilobular necrosis and congestion of the liver.
- Renal tubular edema and degeneration with proteinaceous tubular casts.

**Treatment**

**Appropriate Health Care**
- With methemoglobinemia—must evaluate promptly.
- With dark or bloody colored urine or signs—impatient.

**Nursing Care**
- Gentle handling—imperative for clinically affected patients.
- Induced emesis and gastric lavage—useful within 4–6 hours of ingestion.
- Anemia, hematuria, or hemoglobinuria—may require whole blood transfusion.
- Fluid therapy—maintain hydration and electrolyte balance.
- Oxygen therapy may be needed.
- Drinking water—available at all times.
- Food—offered 24 hours after initiation of treatment.
Acetaminophen (apap) Toxicosis

**ACTIVITY**
- Restricted

**DIET**
- N/A

**CLIENT EDUCATION**
- Warn client that treatment in clinically affected patients may be prolonged and expensive.
- Inform client that patients with liver injury may require prolonged and costly management.

**SURGICAL CONSIDERATIONS**
- N/A

**MEDICATIONS**

**DRUG(S) OF CHOICE**
- Activated charcoal 2 g/kg PO; immediately after completion of emesis or gastric lavage.
- N-acetylcysteine (Mucomyst) 140 mg/kg diluted in D5W at loading dose PO, IV; then 70 mg/kg diluted in D5W PO, IV, q6h for 5–7 additional treatments.
- S-adenosylmethionine (SAMe) as a glutathione donor; 40 mg/kg PO × 1 dose, then 20 mg/kg q24h PO × 7 days.
- Added benefit of using methylene blue, cimetidine, and/or ascorbic acid is controversial.

**CONTRAINDICATIONS**
- Drugs that contribute to methemoglobinemia or hepatotoxicity.

**PRECAUTIONS**
- Drugs requiring extensive liver metabolism or biotransformation—use with caution; expect their half-lives to be extended.

**POSSIBLE INTERACTIONS**
- Drugs requiring activation or metabolism by the liver have reduced effectiveness.

**FOLLOW-UP**

**PATIENT MONITORING**
- Ongoing clinical monitoring of methemoglobinemia—vital for effective management; laboratory determination of methemoglobin percentage every 2–3 hours.
- Serum liver enzyme activities (ALT, ALP) every 12 hours; monitor liver damage.

**PREVENTION/AVOIDANCE**
- Never give acetaminophen to cats.
- Give careful attention to the acetaminophen dose in dogs.

**POSSIBLE COMPLICATIONS**
- Liver necrosis and resulting fibrosis—may compromise long-term liver function in recovered patients.

**EXPECTED COURSE AND PROGNOSIS**
- Rapidly progressive methemoglobinemia—serious sign.
- Methemoglobin concentrations ≥ 50%—grave prognosis.
- Progressively raising serum liver enzymes 12–24 hours after ingestion—serious concern.
- Expect clinical signs to persist 12–48 hours; death owing to methemoglobinemia possible at any time.
- Dogs and cats receiving prompt treatment that reverses methemoglobinemia and prevents excessive liver necrosis—may recover fully.

**CONTRAINDICATIONS**
- Drugs that contribute to methemoglobinemia or hepatotoxicity.

**PRECAUTIONS**
- Drugs requiring extensive liver metabolism or biotransformation—use with caution; expect their half-lives to be extended.

**POSSIBLE INTERACTIONS**
- Drugs requiring activation or metabolism by the liver have reduced effectiveness.

**FOLLOW-UP**

**PATIENT MONITORING**
- Ongoing clinical monitoring of methemoglobinemia—vital for effective management; laboratory determination of methemoglobin percentage every 2–3 hours.
- Serum liver enzyme activities (ALT, ALP) every 12 hours; monitor liver damage.

**MISCELLANEOUS**

**ASSOCIATED CONDITIONS**
Keratoconjunctivitis sicca (KCS) may develop in small-breed dogs as a sequela.

**AGE-RELATED FACTORS**
Young and small dogs and cats—greater risk from owner-given single-dose acetaminophen medications.

**ZOONOTIC POTENTIAL**
- None

**PREGNANCY/FERTILITY/BREEDING**
- Imposes additional stress and higher risk on exposed animals.

**SYNONYMS**
- Paracetamol
- Tylenol

**SEE ALSO**
- Poisoning (Intoxication) Therapy

**ABBREVIATIONS**
- PAP = p-aminophenol
- ALT = alanine aminotransferase
- AST = aspartate transaminase
- RBC = red blood cell
- D5W = 5% dextrose injection

**INTERNET RESOURCES**
- http://www.aspca.org/pet-care/poison-control/

**Suggested Reading**

**Author**
- Lisa A. Murphy

**Consulting Editor**
- Lynn R. Hovda

**Client Education Handout available online**
## Appendix IX

### Blackwell’s Five-Minute Consult Drug Formulary

<table>
<thead>
<tr>
<th>Drug Name (Trade or Other Names)</th>
<th>Pharmacology and Indications</th>
<th>Adverse Effects and Precautions</th>
<th>Dosing Information and Comments</th>
<th>Formulations</th>
<th>Usage (Unless Otherwise Indicated, Dose is the Same for Dogs and Cats)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acepromazine</strong> (PromAce and many generic brands)</td>
<td>Phenothiazine tranquilizer: Inhibits action of dopamine as neurotransmitter. Used for sedation and preanesthetic purposes.</td>
<td>Phenothiazines can cause sedation as a common side effect. May cause α-adrenergic blockade. Produces extrapyramidal side effects in some individuals.</td>
<td>Usually used as preanesthetic in combination with other drugs. When used as preanesthetic, dose is ordinarily 0.02–0.2 mg/kg IM, SC, IV.</td>
<td>5, 10, 25 mg tablet and 10 mg/mL injection</td>
<td>Dog: Sedation 0.5–2.2 mg/kg PO q6–8h, or 0.02–0.1 mg/kg IV, IM, SC in a single dose. Do not exceed 3 mg total dose in dogs Cat: Sedation 1.13–2.25 mg/kg PO q6–8h, or 0.02–0.1 mg/kg IM, SC, IV in a single dose</td>
</tr>
<tr>
<td><strong>Acetaminophen</strong> (Tylenol and many generic brands)</td>
<td>Analgesic agent. Exact mechanism of action is not known. Not a prostaglandin synthesis inhibitor.</td>
<td>Well tolerated in dogs at doses listed. High doses have caused liver toxicity. Do not administer to cats.</td>
<td>Many OTC formulations available. Acetaminophen with codeine may have synergistic analgesic efficacy in some animals.</td>
<td>120, 160, 325, 500 mg tablets</td>
<td>Dog: 15 mg/kg PO q8h Cat: not recommended</td>
</tr>
<tr>
<td><strong>Acetaminophen with codeine</strong> (Tylenol with codeine and many generic brands)</td>
<td>Same as above, except the opiate codeine is added to enhance analgesia</td>
<td>See Codeine and Acetaminophen.</td>
<td>Oral solution and tablets. Many forms, for example: 300 mg acetaminophen plus either 15, 30, or 60 mg codeine</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acetazolamide</strong> (Diamox)</td>
<td>Glaucoma, Ca inhibitor</td>
<td>Can potentially produce hypokalemia in some patients. Significant bicarbonate loss can occur with repeated administration. In dogs, possible respiratory acidosis.</td>
<td>In combination with other agents, is usually used to decrease intraocular pressure in treatment of glaucoma. Has been used to produce alkaline urine to prevent formation of some urinary calculi.</td>
<td>125, 250 mg tablets 5–10 mg/kg PO q8–12h (glaucoma); 4–8 mg/kg PO q8–12h (other diuretic uses)</td>
<td></td>
</tr>
<tr>
<td><strong>Acetylcysteine</strong> (Mucomyst)</td>
<td>Decreases viscosity of secretions. Used as mucolytic agent in eyes and in bronchial nebulizing solutions. However, as a donor of sulfhydryl group, used as antidote for intoxications (e.g., acetaminophen toxicosis in cats).</td>
<td>May cause sensitization with prolonged topical administration. May react with certain materials in nebulizing equipment.</td>
<td>Available as agent for decreasing viscosity of respiratory secretions, but most common use is as a treatment for intoxications</td>
<td>20% solution</td>
<td>Antidote: 140 mg/kg (loading dose), then 70 mg/kg q6h IV or PO for 5 doses Eye: 2% solution topically q2h</td>
</tr>
<tr>
<td><strong>Acetylsalicylic acid</strong></td>
<td>See Aspirin.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drug Name (Trade or Other Names)</td>
<td>Pharmacology and Indications</td>
<td>Adverse Effects and Precautions</td>
<td>Dosing Information and Comments</td>
<td>Formulations</td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------</td>
<td>--------------------------------</td>
<td>---------------------------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td>ACTH</td>
<td>See Corticotropin.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activated charcoal</td>
<td>See Charcoal, activated.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequan</td>
<td>See Polysulfated glycaminoglycan (PSGAG).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albendazole (Valbazen)</td>
<td>Benzimidazole antiparasitic drug. Inhibits glucose uptake in parasites.</td>
<td>At approved doses, there is a wide margin of safety. Adverse effects can include anorexia, lethargy, and bone marrow toxicity. At high doses, it has been associated with bone marrow toxicity. Adverse effects are possible when administered for longer than 5 days.</td>
<td>Used primarily as anthelminthic, but also has demonstrated efficacy for giardiasis. 113.6 mg/mL suspension and 300 mg/mL paste. For giardiasis, 25–50 mg/kg q12h PO × 3 days. For respiratory parasites, use 50 mg/kg q24h PO × 10–14 days.</td>
<td>25–50 mg/kg q12h; PO × 3 days for Giardia, use 25 mg/kg q12h × 2 days for respiratory parasites, use 50 mg/kg q24h PO × 10–14 days.</td>
<td></td>
</tr>
<tr>
<td>Albuterol (Proventil, Ventolin)</td>
<td>β₂-adrenergic agonist. Bronchodilator. Stimulates β₂ receptors to relax bronchial smooth muscle. May also inhibit release of inflammatory mediators, especially from mast cells. Causes excessive β₂-adrenergic stimulation at high doses (tachycardia, tremors). Arrhythmias occur at toxic doses. Avoid use in pregnant animals.</td>
<td>Causes excessive β₂-adrenergic stimulation at high doses (tachycardia, tremors).</td>
<td>Doses are primarily derived from extrapolation of human dose. Well-controlled efficacy studies in veterinary medicine are not available. Onset of action is 15–30 min; duration of action may be as long as 8 h.</td>
<td>2, 4, 5 mg tablets; 2 mg/5 mL syrup.</td>
<td></td>
</tr>
<tr>
<td>Allopurinol (Lopurin, Zyloprim)</td>
<td>Decreases production of uric acid by inhibiting enzymes responsible for uric acid synthesis. Also used for leishmaniasis.</td>
<td>Increases skin reactions (hypersensitivity).</td>
<td>Used in people primarily for treating gout. In animals, used to decrease formation of uric acid uroliths.</td>
<td>100, 300 mg tablets.</td>
<td></td>
</tr>
<tr>
<td>Alprazolam (Xanax)</td>
<td>Tranquilizer. Benzodiazepine. Excess sedation; paradoxical excitement. Often combined with other sedatives and anesthetics.</td>
<td>Dogs: 0.025–0.1 mg/kg q12h, PO. Cats: 0.125 mg per cat, PO q12h. For urate urolith, 10 mg/kg q12h, then reduce to 10 mg/kg q24h, PO for leishmaniasis, use 10 mg/kg q24h PO for at least 4 months.</td>
<td>10–30 mg/kg PO q12h (with meals).</td>
<td>10–30 mg/kg PO q12h (with meals).</td>
<td></td>
</tr>
<tr>
<td>Aluminium carbonate gel (Basalgel)</td>
<td>Antacid (neutralizes stomach acid), and phosphate binder in intestine.</td>
<td>Generally safe. May interact with other drugs administered orally.</td>
<td>Antacid doses are designed to neutralize stomach acid, but duration of acid suppression is short. Capsules (equivalent to 500 mg aluminum hydroxide)</td>
<td>64 mg/mL oral suspension; 600 mg tablet.</td>
<td></td>
</tr>
<tr>
<td>Aluminium hydroxide gel (Amphojel)</td>
<td>Antacid (neutralizes stomach acid), and phosphate binder in intestine.</td>
<td>Generally safe. May interact with other drugs administered orally.</td>
<td>Antacid doses are designed to neutralize stomach acid, but duration of acid suppression is short. 64 mg/mL oral suspension; 600 mg tablet.</td>
<td>10–30 mg/kg PO q12h (with meals).</td>
<td></td>
</tr>
<tr>
<td>Drug Name (Trade or Other Names)</td>
<td>Pharmacology and Indications</td>
<td>Adverse Effects and Precautions</td>
<td>Dosing Information and Comments</td>
<td>Dosage (Unless Otherwise Indicated, Dose is the Same for Dogs and Cats)</td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------</td>
<td>-------------------------------</td>
<td>--------------------------------</td>
<td>--------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Amikacin (Amiglyde-V veterinary) and Amikin human</td>
<td>Aminoglycoside antibacterial drug (inhibits protein synthesis). Mechanism is similar to other aminoglycosides (see Gentamicin sulfate), but may be more active than gentamicin.</td>
<td>May cause nephrotoxicosis with high doses or prolonged therapy. May also cause ototoxicity and vestibulotoxicity.</td>
<td>Once-daily doses are designed to maximize peak minimum inhibitory concentration (MIC) ratio.</td>
<td>Dog: 50, 250 mg/mL injection Cat: 15–30 mg/kg q24h IV, IM, SC; 10–14 mg/kg q24h IV, IM, SC</td>
<td></td>
</tr>
<tr>
<td>Aminopentamide (Centrine)</td>
<td>Antidiarrheal drug. Anticholinergic (blocks acetylcholine at parasympathetic synapse).</td>
<td>Use cautiously in animals with Gl stasis or when anticholinergic drugs are contraindicated (e.g., glaucoma).</td>
<td>Dosing guidelines based on manufacturer’s recommendation</td>
<td>Dog: 0.01–0.03 mg/kg q8–12h IM, SC, PO Cat: 0.1 mg/cat q8–12h IM, SC, PO</td>
<td></td>
</tr>
<tr>
<td>6-Aminosalicylic acid See Mesalamine, Olsalazine.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amiodarone (Cordarone)</td>
<td>Class III antiarrhythmic agent with potassium-channel blocking properties; indicated for severe refractory atrial and ventricular arrhythmias</td>
<td>Most common effect in dogs is decreased appetite. Prolonged QT interval is a concern. Other adverse effects include: bradycardia, chronic heart failure (CHF), hypotension, atrioventricular (AV) block, thyroid dysfunction, pulmonary fibrosis, and hepatotoxicity. Acute cardiac toxicity has been observed in dogs.</td>
<td>Use for recurrent hemodynamically unstable ventricular tachycardia; takes weeks to achieve therapeutic levels. Typically, loading doses are administered, followed by maintenance dose. Safe doses for injection have not been established.</td>
<td>Dog: start with 10–15 mg/kg q12h PO for 1 week, then 5–7 mg/kg q12h for 2 weeks Maintenance doses are 7.5 mg/kg q24h, PO Cat: no safe dose established</td>
<td></td>
</tr>
<tr>
<td>Amitraz (Mitaban)</td>
<td>Antiparasitic drug for ectoparasites. Used for treatment of mites, including Demodex. Inhibits monoamine oxidase in mites.</td>
<td>Causes sedation in dogs (α2-agonist), which may be reversed by yohimbine or atipamezole. When high doses are used, other side effects reported include prostration, polyuria and polydipsia (PUPD), bradycardia, hypothermia, hyperglycemia, and (rarely) seizures.</td>
<td>Manufacturer’s dose should be used initially. But, for refractory cases, this dose has been escalated to produce increased efficacy.</td>
<td>10.6 ml concentrated dip (19.9%) 10.6 ml per 7.5 l water (0.025% solution). Apply 3–6 topical treatments q1–q4d. For refractory cases, this dose has been exceeded to produce increased efficacy. Doses that have been used include: 0.025, 0.05, and 0.1% concentration applied 1–2× per week In extreme cases 0.125% solution applied to one-half of the body alternating side the next day, every day for 4 weeks to 5 months</td>
<td></td>
</tr>
<tr>
<td>Drug Name (Trade or Other Names)</td>
<td>Pharmacology and Indications</td>
<td>Adverse Effects and Precautions</td>
<td>Dosing Information and Comments</td>
<td>Formulations</td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------</td>
<td>--------------------------------</td>
<td>--------------------------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td>Amitriptyline hydrochloride (Elavil)</td>
<td>Tricyclic antidepressant drug. Action is via inhibition of uptake of serotonin and other transmitters at presynaptic nerve terminals. Used in animals to treat variety of behavioral disorders, such as anxiety. Used in cats for chronic idiopathic cystitis.</td>
<td>Multiple side effects are associated with tricyclic antidepressants, such as antimuscarinic effects (dry mouth, rapid heart rate) and antihistamine effects (sedation). High doses can produce life-threatening cardiotoxicity. In cats, reduced grooming, weight gain, and sedation are possible.</td>
<td>Doses are primarily based on empiricism. There are no controlled efficacy trials available for animals. There is evidence for success treating idiopathic cystitis in cats. Clomipramine is preferred for behavior problems.</td>
<td>10, 25, 50, 75, 100, 150 mg tablets</td>
<td></td>
</tr>
<tr>
<td>Amlodipine besylate (Norvasc)</td>
<td>Calcium channel-blocking drug of the dihydropyridine class. Decreases calcium influx in cardiac and vascular smooth muscle. Its greatest effect is as a vasodilator. In cats and dogs, it is used to treat hypertension.</td>
<td>Can cause hypotension and bradycardia. Use cautiously with other vasodilators.</td>
<td>In cats, efficacy has been established at 0.625 mg/cat once daily. If cats are large size (&gt; 4.5 kg) or refractory, increase to higher dose (J Vet Int Med 12:157–162, 1998).</td>
<td>2.5, 5, and 10 mg tablets</td>
<td></td>
</tr>
<tr>
<td>Ammonium chloride (generic)</td>
<td>Urine acidifier</td>
<td>Do not use in patients with systemic acidemia. May be unpalatable when added to some animals’ food.</td>
<td>Doses are designed to maximize urine acidifying effect.</td>
<td>Available as crystals</td>
<td></td>
</tr>
<tr>
<td>Amoxicillin (Amoxi-Tabs, Biomox, and other brands. [Omnipen, Principen, Totacillin are human forms])</td>
<td>β-lactam antibiotic. Inhibits bacterial cell wall synthesis. Generally broad-spectrum activity. Used for a variety of infections in all species.</td>
<td>Usually well tolerated. Allergic reactions are possible. Diarrhea is possible with oral doses.</td>
<td>Dose recommendations vary depending on the susceptibility of bacteria and location of infection. 50, 100, 150, 200, 400 mg tablets; 250 and 500 mg capsules; 50 mg/mL oral suspension (human forms)</td>
<td>6.6–20 mg/kg q8–12h PO</td>
<td></td>
</tr>
<tr>
<td>Amoxicillin + clavulanate potassium (Clavamox)</td>
<td>β-lactam antibiotic + β-lactamase inhibitor (clavulanate/clavulanic acid)</td>
<td>Same as for amoxicillin</td>
<td>Same as for amoxicillin</td>
<td>62.5, 125, 250, 375 mg tablets and 62.5 mg/mL suspension</td>
<td></td>
</tr>
<tr>
<td>Drug Name (Trade or Other Names)</td>
<td>Pharmacology and Indications</td>
<td>Adverse Effects and Precautions</td>
<td>Dosing Information and Comments</td>
<td>Formulations</td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------------------------------</td>
<td>---------------------------------</td>
<td>-------------------------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td><strong>Amphotericin B (Fungizone)</strong></td>
<td>Antifungal drug. Fungicidal for systemic fungi, by damaging fungal membranes.</td>
<td>Produces a dose-related nephrotoxicosis. Also produces fever, phlebitis, and tremors.</td>
<td>Administer IV via slow infusion diluted in fluids, and monitor renal function closely. When preparing IV solution, do not mix with electrolyte solutions (use D-5-W, for example); administer NaCl fluid loading before therapy.</td>
<td>50 mg injectable vial</td>
<td></td>
</tr>
<tr>
<td><strong>Amphotericin B, liposomal formulation (ABLC, Abelcet)</strong></td>
<td>Same indications as for conventional amphotericin B. Liposomal formulations may be used at higher doses, and safety margin is increased. Expense is much higher than for conventional formulations.</td>
<td>Renal toxicity is the most dose-limiting effect. Higher doses can be used compared to conventional formulation of amphotericin B. Dilute in 5% dextrose in water to 1 mg/mL, and administer IV over 1–2 hours.</td>
<td>Higher doses can be used compared to conventional formulation of amphotericin B. Dilute in 5% dextrose in water to 1 mg/mL, and administer IV over 1–2 hours.</td>
<td>100 mg/20 mL in lipid formulation</td>
<td></td>
</tr>
<tr>
<td><strong>Ampicillin (Omnipen, Principen, others [human forms])</strong></td>
<td>β-lactam antibiotic. Inhibits bacterial cell wall synthesis. Use cautiously in animals allergic to penicillin-like drugs.</td>
<td>Dose requirements vary depending on susceptibility of bacteria. Absorbed approximately 50% less, compared with amoxicillin, when administered orally.</td>
<td>Absorption is slow and may not be sufficient for acute serious infection. Absorption is slow and may not be sufficient for acute serious infection.</td>
<td>250, 500 mg capsules; 125, 250, 500 mg vials of ampicillin sodium. Ampicillin trihydrate: 10 and 25 g vials for injection</td>
<td></td>
</tr>
<tr>
<td><strong>Ampicillin + sulbactam (Unasyn)</strong></td>
<td>Ampicillin plus a β-lactamase inhibitor (sulbactam). Sulbactam has similar activity as clavulanate.</td>
<td>Same as for ampicillin</td>
<td>2:1 combination for injection. 1.5 and 3 g vials</td>
<td>10–20 mg/kg IV, IM q8h</td>
<td></td>
</tr>
<tr>
<td><strong>Ampicillin trihydrate (Polyflex)</strong></td>
<td>β-lactam antibiotic. Inhibits bacterial cell wall synthesis. Use cautiously in animals allergic to penicillin-like drugs.</td>
<td>Absorption is slow and may not be sufficient for acute serious infection.</td>
<td>10, 25 mg vials for injection</td>
<td>10–20 mg/kg IV, IM q8h</td>
<td></td>
</tr>
<tr>
<td><strong>Amprolium (Corid)</strong></td>
<td>Enteric coccidiostat Toxicity observed only at high doses. CNS signs are caused by thiamin deficiency, which may be reversed by adding thiamin to the diet.</td>
<td>Used to control and treat coccidiosis in puppies. It is administered orally, often mixed with food.</td>
<td>9.6% (9.6 g/dL) oral solution, soluble powder</td>
<td>1.25 g of 20% amprolium powder to daily feed, or 30 mL of 9.6% amprolium solution to 3.8 L of drinking water for 7 days</td>
<td></td>
</tr>
<tr>
<td>Drug Name (Trade or Other Names)</td>
<td>Pharmacology and Indications</td>
<td>Adverse Effects and Precautions</td>
<td>Dosing Information and Comments</td>
<td>Formulations</td>
<td>Dose (Unless Otherwise Indicated, Dose is the Same for Dogs and Cats)</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
<td>--------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Antacid drugs</td>
<td>See Aluminum hydroxide, Magnesium hydroxide, Calcium carbonate.</td>
<td>Produces emesis before serious adverse effects occur. Use cautiously in cats that may be sensitive to opiates.</td>
<td>Consult local poison center or pharmacist for availability. Not as effective in cats as dogs.</td>
<td>6 mg tablets, 10 mg/mL ampule or 3 mL preloaded syringes</td>
<td>0.03–0.05 mg/kg IV, IM, 0.1 mg/kg SC, or instill 0.25 mg in conjunctiva of eye. (dissolve 6 mg tablet in 1–2 mL of saline)</td>
</tr>
<tr>
<td>Apomorphine hydrochloride (generic)</td>
<td>Emetic drug. Causes emesis via dopamine release or direct effects on chemoreceptor trigger zone</td>
<td></td>
<td></td>
<td>Various forms, including 250 mg/mL sodium ascorbate</td>
<td>600–1000 mg/animal/day (diet supplement), or 100 mg/animal q8h (urine acidification)</td>
</tr>
<tr>
<td>Ascorbic acid (Vitamin C)</td>
<td>Vitamin. Used as acidifier.</td>
<td>Toxicity only at very high doses</td>
<td>Primarily used as nutritional supplement, but high doses have been used for treatment of certain diseases.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-Asparaginase (Elspar)</td>
<td>Anticancer agent. Purified enzyme from E. coli. Used in lymphoma protocols. Depletes cancer cells of asparagine and interferes with protein synthesis.</td>
<td>Hypersensitivity, allergic reactions</td>
<td>Usually used in combination with other drugs in cancer chemotherapy protocols</td>
<td>10,000 U per vial for injection</td>
<td>Dog: 400 U/kg IM weekly or 10,000 U/m^2 weekly × 3 weeks Cat: 400 U/kg SC weekly</td>
</tr>
<tr>
<td>Aspirin (many generic and brand names [Bufferin, Ascriptin])</td>
<td>Nonsteroidal anti-inflammatory drug (NSAID). Anti-inflammatory action is generally considered to be caused by inhibition of prostaglandins. Used as analgesic, anti-inflammatory, and antiplatelet drug.</td>
<td>Narrow therapeutic index. High doses frequently cause vomiting. Other GI effects can include ulceration and bleeding. Cats susceptible to salicylate intoxication because of slow clearance. Use cautiously in patients with coagulopathies because of platelet inhibition.</td>
<td>Analgesic and anti-inflammatory doses have primarily been derived from empiricism. Antiplatelet doses are lower because of prolonged effect of aspirin on platelets.</td>
<td>81, 325 mg tablets</td>
<td>Mild analgesia: (dog) 10 mg/kg q12h PO Anti-inflammatory: Dog: 20–25 mg/kg q12h PO Cat: 10–20 mg/kg q48h PO Antiplatelet: Dog: 5–10 mg/kg q24–48h PO Cat: 81 mg/cat q48–72h PO</td>
</tr>
<tr>
<td>Atenolol (Tenormin)</td>
<td>β-adrenergic blocker. Relatively selective for β1-receptor. Used primarily as an antiarrhythmic or for other cardiovascular conditions to slow sinus rate.</td>
<td>Bradycardia and heart block are possible. May produce bronchospasm in sensitive patients.</td>
<td>Dosing precautions are similar to other β-blocking drugs. Atenolol is reported to be less affected by changes in hepatic metabolism than other β-blockers.</td>
<td>25, 50, 100 mg tablets</td>
<td>Dog: 6.25–12.5 mg/dog q12–24h or 0.25–1.0 mg/kg q12–24h, PO Cat: 6.25–12.5 mg per cat q12h PO</td>
</tr>
<tr>
<td>Drug Name (Trade or Other Names)</td>
<td>Pharmacology and Indications</td>
<td>Adverse Effects and Precautions</td>
<td>Dosing Information and Comments</td>
<td>Formulations</td>
<td>Dosage (Unless Otherwise Indicated, Dose is the Same for Dogs and Cats)</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------</td>
<td>----------------------------------</td>
<td>-------------------------------</td>
<td>--------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td><strong>Atipamezole (Antisedan)</strong></td>
<td>$\alpha_2$-antagonist. Used to reverse $\alpha_2$-agonists, such as dexmedetomidine and xylazine.</td>
<td>Can cause some initial excitement in some animals shortly after reversal.</td>
<td>When used to reverse dexmedetomidine, inject same volume as used for dexmedetomidine.</td>
<td>5 mg/mL injection</td>
<td>Inject same volume as used for dexmedetomidine. Range of doses = 0.32 mg/kg for small animals to 0.14 mg/kg for large dogs</td>
</tr>
<tr>
<td><strong>Atovaquone (Mepron)</strong></td>
<td>In animals, it has been used, often in combination with azithromycin, to treat refractory protozoan diseases and bloodborne pathogens. In dogs, it has been used to treat Babesia gibsoni.</td>
<td>Adverse effects have not been reported in animals. In people, adverse reactions consist of skin rash, cough, and diarrhea.</td>
<td>There has been only limited experience for treatment of infections in animals. A few clinical trials have shown efficacy when combined with azithromycin for treatment of protozoa infections.</td>
<td>750 mg/5 mL liquid oral suspension (150 mg/mL)</td>
<td>Dog: 13.3 mg/kg q8h, PO for 10 days, usually in combination with azithromycin (10 mg/kg q24h, PO) Cat: 15 mg/kg q8h, PO, in combination with azithromycin (10 mg/kg q24h)</td>
</tr>
<tr>
<td><strong>Atracurium (Tracrium)</strong></td>
<td>Neuromuscular blocking agent (nondepolarizing). Competes with acetylcholine at neuromuscular end plate. Used primarily during anesthesia or other conditions in which it is necessary to inhibit muscle contractions.</td>
<td>Produces respiratory depression and paralysis. Neuromuscular blocking drugs have no effect on analgesia.</td>
<td>Administer only in situations in which careful control of respiration is possible. Doses may need to be individualized for optimum effect. Do not mix with alkalizing solutions or lactated Ringer's solution.</td>
<td>10 mg/mL injection</td>
<td>0.2 mg/kg IV initially, then 0.15 mg/kg every 30 min (or IV infusion at 4–9 $\mu$g/kg/min)</td>
</tr>
<tr>
<td><strong>Atropine (many generic brands)</strong></td>
<td>Anticholinergic agent (blocks acetylcholine effect at muscarinic receptors), parasympatholytic. Used primarily as adjunct to anesthesia or other procedures to increase heart rate and decrease respiratory and gastrointestinal secretion. Also used as antidote for organophosphate intoxication.</td>
<td>Potent anticholinergic agent. Do not use in patients with glaucoma, intestinal ileus, gastroparesis, or tachycardia. Side effects of therapy include xerostomia, ileus, constipation, tachycardia, urine retention.</td>
<td>Used ordinarily as adjunct with anesthesia or other procedures. Do not mix with alkaline solutions.</td>
<td>400, 500, 540 $\mu$g/mL injection; 15 mg/mL injection</td>
<td>0.02–0.04 mg/kg q6–8h IV, IM, SC 0.2–0.5 mg/kg IV, IM (as needed) for organophosphate and carbamate intoxicosis</td>
</tr>
</tbody>
</table>
### Azathioprine (Imuran)

**Thiopurine immunosuppressive drug.** Acts to inhibit T cell lymphocyte function. This drug is metabolized to 6-mercaptopurine, which may account for immunosuppressive effects. Used to treat various immune-mediated disease.

- **Bone marrow suppression** is most serious concern. Cats particularly are susceptible. There has been some association with development of pancreatitis when administered with corticosteroids.

**Dosing Information**

- **Usual use** in combination with other immunosuppressive drugs (such as corticosteroids) to treat immune-mediated disease. Doses of 2.2 mg/kg in cats have produced toxicity.

- **25, 50, 75, and 100 mg tablets; 10 mg/mL for injection**

**Dosage (Unless Otherwise Indicated, Dose is the Same for Dogs and Cats)**

- **Dog:** 2 mg/kg q24h PO initially then 0.5–1 mg/kg q48h
- **Cat (use cautiously):** 0.3 mg/kg q24h PO initially, then q48h, with careful monitoring (will require compounding)

### Azithromycin (Zithromax)

**Azalide antibiotic.** Similar mechanism of action as macrolides (erythromycin), which is to inhibit bacteria protein synthesis via inhibition of ribosome. Spectrum is primarily gram-positive.

- **Vomiting is likely with high doses. Diarrhea may occur in some patients.**

**Adverse Effects and Precautions**

- **Azithromycin may be better tolerated than erythromycin. Primary difference from other antibiotics is the high intracellular concentrations achieved.**

**Dosing Information**

- **250 mg capsules, 250 and 600 mg tablets, 100 or 200 mg/5 ml oral suspension, and 500 mg vials for injection**

**Dosage (Unless Otherwise Indicated, Dose is the Same for Dogs and Cats)**

- **Dog:** 5–10 mg/kg PO once daily for 5–7 days, then tapering to q48h
- **Cat:** 5–10 mg/kg PO once daily for 7 days, then tapering to q48h; upper respiratory infection: 15 mg/kg q24h PO

### AZT (Azidothymidine)

See Zidovudine.

### BAZ (British antilewisite)

See Dimercaprol.

### Benazepril (Lotensin)

**Angiotensin-converting enzyme (ACE) inhibitor.** Used for hypertension and heart failure. Action is similar to enalapril and captopril.

- **Similar to those for captopril and enalapril**

**Dosing Information**

- **Dose is based on approved use in dogs in Europe and Canada. Monitor renal function and electrolytes 3–7 days after initiating therapy and periodically thereafter.**

- **5, 10, 20, 40 mg tablets**

**Dosage (Unless Otherwise Indicated, Dose is the Same for Dogs and Cats)**

- **Dog:** 0.25–0.5 mg/kg q24h PO, may be increased to 1 mg/kg in dogs that are not responsive. Cat (systemic hypertension and renal disease): 0.5–1 mg/kg q24h PO, or 2.5 mg/cat per day up to maximum of 5 mg/cat per day PO

### Bethanechol chloride (Urecholine)

**Muscarinic, cholinergic agonist.** Parasympathomimetic. Stimulates gastric and intestinal motility, but primarily used to increase contraction of urinary bladder.

- **High doses of cholinergic agonists will increase motility of GI tract and cause abdominal discomfort and diarrhea. Can cause circulatory depression in sensitive animals.**

**Dosing Information**

- **Administer injection SC only, not IV. Doses are derived from extrapolation of human doses or via empiricism. There are no well-controlled efficacy studies available for veterinary species.**

**Dosage (Unless Otherwise Indicated, Dose is the Same for Dogs and Cats)**

- **Dog:** 5–15 mg/dog q8h PO
- **Cat:** 1.25–5 mg/cat q8h PO
<table>
<thead>
<tr>
<th>Drug Name (Trade or Other Names)</th>
<th>Pharmacology and Indications</th>
<th>Adverse Effects and Precautions</th>
<th>Dosing Information and Comments</th>
<th>Formulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bisacodyl (Dulcolax)</td>
<td>Laxative/cathartic. Acts via local stimulation of GI motility, most likely by irritation of bowel. Used primarily as laxative or for procedures in which bowel evacuation is necessary.</td>
<td>Avoid use in patients with renal disease. Avoid overdose.</td>
<td>Available as OTC tablet. Doses are derived from extrapolation of human doses or via empiricism. There are no well-controlled efficacy studies available for veterinary species.</td>
<td>5 mg tablets</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bismuth subsalicylate (Pepto-Bismol)</td>
<td>Antidiarrhea agent and GI protectant. Anti-prostaglandin action of salicylate component may be beneficial for enteritis. Bismuth component is efficacious or treating infections caused by spirochete bacteria (Helicobacter gastritis).</td>
<td>Adverse effects are uncommon; however salicylate component is absorbed systemically, and overdose should be avoided in animals that cannot tolerate salicylates (such as cats and animals allergic to aspirin). Owners should be warned that bismuth will discolor stools.</td>
<td>Available as OTC product. Doses are derived from extrapolation of human doses or via empiricism. There are no well-controlled efficacy studies available for veterinary species. Oral suspension: 262 mg/15 mL, or 525 mg/mL in extra strength formulation; 262 mg tablets</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bleomycin (Blenoxane)</td>
<td>Anticancer, antibiotic agent. Used for treatment of various sarcomas and carcinomas. Exact mechanism of action is unknown, but may bind to DNA and prevent synthesis.</td>
<td>Causes local reaction at site of injection. Causes pulmonary toxicity in people as well as fever and chills, but side effects are not well documented in veterinary species.</td>
<td>Injectable solution usually used in combination with other anticancer agents. Consult anticancer protocols for details regarding use. 15 U vials for injection</td>
<td>10 U/m² IV or SC q24h for 3 days, then 10 U/m² weekly (maximum cumulative dose 200 U/m²)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Budesonide (Entocort)</td>
<td>Corticosteroid. Budesonide is a locally-acting corticosteroid. It is designed to release locally – in the intestine – after oral administration. Only a small fraction is absorbed systemically. Budesonide is used to treat inflammatory bowel disease.</td>
<td>No serious adverse effects are reported. However, some systemic absorption may cause glucocorticoid effects in animals (such as adrenal suppression).</td>
<td>The capsules are designed for human use. When administering to animals, do not disrupt the coating on the drug or the intestinal release may be compromised.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.3 mg capsule</td>
</tr>
<tr>
<td>Drug Name (Trade or Other Names)</td>
<td>Pharmacology and Indications</td>
<td>Adverse Effects and Precautions</td>
<td>Dosage Information and Comments</td>
<td>Formulations</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------</td>
<td>--------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td><strong>Bunamidine hydrochloride</strong> <em>(Scolaban)</em></td>
<td>Used as an anthelminthic agent. Primarily to treat tapeworm infections in dogs and cats. Mechanism of action is to damage integrity of protective integument on parasite.</td>
<td>Vomiting and diarrhea have occurred after use. Avoid use in young animals. Do not break tablets. Administer tablets on empty stomach. Do not feed for 3 h after administration.</td>
<td>100, 200, 400 mg tablets</td>
<td>20-50 mg/kg once PO</td>
</tr>
<tr>
<td><strong>Bupivacaine hydrochloride</strong> <em>(Marcaine, and generics)</em></td>
<td>Local anesthetic. Inhibits nerve conduction via sodium channel blockade. Longer-acting and more potent than lidocaine or other local anesthetics.</td>
<td>Adverse effects rare with local infiltration. High doses absorbed systemically can cause nervous system signs (tremors and convulsions). After epidural administration, respiratory paralysis is possible with high doses.</td>
<td>Used for local infiltration or infusion into epidural space. One may admix 0.1 mEq sodium bicarbonate per 10 mL solution to increase pH, decrease pain from injection, and increase onset. Use immediately after mixing with bicarbonate.</td>
<td>2.5 and 5 mg/mL solution injection</td>
</tr>
<tr>
<td><strong>Buprenorphine hydrochloride</strong> <em>(Buprenex [Vetergesic in the UK]; Simbadol)</em></td>
<td>Opioid analgesic. Partial ( \mu ) receptor agonist, ( \kappa ) receptor antagonist. 25–50× more potent than morphine. Buprenorphine may cause less respiratory depression than other opiates.</td>
<td>Adverse effects are similar to other opiate agonists, except there may be less respiratory depression. Dependency from chronic use may be less than with pure agonists.</td>
<td>Used for analgesia, often in combination with other analgesics or in conjunction with general anesthesia. Longer acting than morphine. Only partially reversed by naloxone.</td>
<td>0.324 mg/mL solution, 1.8 mg/mL solution for SC administration in cats. For people, transdermal patches and buccal tablets also are available.</td>
</tr>
<tr>
<td><strong>Buspirone (BuSpar)</strong></td>
<td>Antianxiety agent. Acts by binding to serotonin receptors. In veterinary medicine, has been primarily used for treatment of urine spraying in cats.</td>
<td>Some cats show increased aggression; some cats show increased affecton to owners. Some efficacy trials suggest effectiveness for treating urine spraying in cats. There may be a lower relapse rate compared to other drugs.</td>
<td>Usualy used in combination with other analgesics. Consult specific protocol for details.</td>
<td>5, 10, 15, and 30 mg tablets</td>
</tr>
<tr>
<td><strong>Busulfan (Myleran)</strong></td>
<td>Anticancer agent. Bifunctional alkylating agent and acts to disrupt DNA of tumor cells. Used primarily for lymphoreticular neoplasia.</td>
<td>Leukopenia is most severe side effect.</td>
<td>Usually used in combination with other anticancer agents. Consult specific protocol for details.</td>
<td>2 mg tablets</td>
</tr>
</tbody>
</table>
INDEX

Text in boldface denotes chapter discussions. Prefixes are normally ignored in the alphabetical sequence; thus S-adenosylmethionine is listed after adenosine.

A
ABCB1 gene deletion, 225, 771
Abdomen, acute, 20–22
Abdominocentesis (paracentesis)
for acute abdomen, 21
for ascites, 118, 276, 609, 611, 686
for bile peritonitis, 180
for nephrotic syndrome, 946
for peritonitis, 1048–1049
Aberdeen terrier, dystocia, 424
Abortion,
partial, in dogs, 5
spontaneous
in cats, 2–3
in dogs, 4–5
termination of pregnancy, 6–7
Abrus precatorius, 1431
Abscessation,
anal sac, 9, 74
hepatic, 616–617
orbital, 975–976
prostatic, 1110–1111
tooth root, 1320–1321
Abyssinian cat
aggression, 49
amyloidosis, 71, 72, 595
anemia, 81, 88
aortic thromboembolism, 106
chronic renal failure, 1164
hyperesthesia syndrome, 497
hypothyroidism, 729
myasthenia gravis, 895
neonatal isoerythrolysis, 590
paresis/paralysis, 906
pyruvate kinase deficiency, 1145
renal amyloidosis, 72, 301
retinal dysplasia, 103, 1174
stomatitis, 973, 1274
tooth resorption, 1319
Acanthamoeba infections, 65
Acanthocytic anemia, 84
Acanthomatous ameloblastoma, canine (CAA), 457, 458, 969, 970
Acanthomatous epulis (AE), 457, 458, 969
Acaebose, 389, 665
Acetic acids, for tick control, 1311
Accreditation, 1553
Accutane. See Isotretinoin
ACE inhibitors. See Angiotensin-converting enzyme inhibitors
Acenanthanella infections, 65
Acanthocyte anemia, 84
Acanthomatosus anemolabiatoma, canine (CAA), 457, 458, 969, 970
Acanthomatosus epulis (AE), 457, 458, 969
Aciclovir, for feline herpesvirus infection, 496
Aciclovir toxicosis, 10–11, 80
Acenanthanella infections, 65
Acetaminophen, 1442
formulary information, 1445
for acetaminophen toxicosis, 11, 80, 879
for acute hepatic failure, 601
for blue-green algae toxicosis, 190
formulary information, 1445
for hepatic encephalopathy, 598–599
for hepatic lipidosis, 604
for hepatotoxicity, 627
for infectious canine hepatitis, 614
for keratoconjunctivitis sicca, 779
for methemoglobinemia, 345, 879
for mycotoxicosis, 901
for sago palm toxicosis, 1193
for ulcerative keratitis, 778
Acetylsalicylic acid. See Aspirin
Acne,
14–15
in cats, 14
in dogs, 15
papules and/or nodules, 373–374
Acinetum spp., 1430
Acquired portosystemic shunting. See Portosystemic shunting, acquired
Acrail lick dermatitis, 16
Acromegaly, 17–18
Acta spp., 1427
ACTH (corticotropin)
ecopic secretion, 650
formulary information, 1465–1466
plasma reference ranges, 1420
stimulation test, 1419
Actigall. See Ursodeoxycholic acid
Actinic keratosis, 377
Actinomycesis, 19
Activated charcoal. See Charcoal, activated
Acupuncture, for spondylolysis deformans, 1255
Acute abdomen, 20–22

1553
Acute kidney injury (AKI), 1161–1163
drugs inducing, 947, 948
in ethylene glycol toxicosis, 469
in grape, raisin and currant toxicosis, 564
in heat stroke/hyperthermia, 577
Acute lymphoblastic leukemia, 808
Acute pain, 996–999
Acute polyradiculoneuritis
Acute respiratory distress syndrome (ARDS), 23–24
ADAMTS17
Adenosine, for supraventricular tachycardia, 1285
Adenomyosis, epididymal, 1247
Adenocarcinoma, 24–36
analogic, 25
ceruminous gland, ear, 247
large intestine, 34
lung, 26
nasal, 27–28
pancreas, 29
prostate, 30
rectal, 34
renal, 31
salivary gland, 32
skin (sweat gland, sebaceous), 33
small intestine, 34
stomach, 34
thyroid, 35–36
Adenomyosis, epididymal, 1247
Adenosine, for supraventricular tachycardia, 1285
S-Adenosylmethionine (SAMe)
for acetaminophen toxicosis, 11
for acute hepatic failure, 601
for aggression in cats, 50
for bile duct obstruction, 178
for bile peritonitis, 181
for blue-green algae toxicosis, 190
for cholangitis/cholangiohepatitis syndrome, 261
for cholecystitis and choleodochitis, 263
for cholelithiasis, 264
for chronic hepatitis, 610
for cirrhosis and fibrosis of liver, 276
for cognitive dysfunction syndrome, 289
for copper-associated hepatoathy, 322
for diabetic hepatitis, 392–393
for fears, phobias and anxieties, 491
for gallbladder mucocele, 530
for hepatic encephalopathy, 598
for hepatic lipidosis, 604
for hepatotoxicity, 627
for infectious canine hepatitis, 614
for liver fluke infections, 808
for mycotoxicosis, 901
for phospholipid rodenticide toxicosis, 1190
for sago palm toxicosis, 1193
Adenos., 1428
Adrenocorticotropic hormone.
Adrenalin.
Adenalin. See Epinephrine
Alpha-2-Adrenergic agonists.
Agkistrodon spp. envenomation,
Air plant, 1427
Airway obstruction. See also
Beachyheadache airway syndrome
cardiovascular airway arrest, 238
dyspnea and respiratory distress, 422
hypercapnia, 656
pulmonary edema, 1127, 1128
sterior and stratud, 1270–1271
Akita
acral lick dermatitis, 16
alopecia, 61, 63
epulis, 457
glaucoma, 551
human-directed
in cats, 42–43, 49
in dogs, 37–41, 51
impulse control, in cats, 49
intercat, 46–48, 49
intermale, in cats, 46
maternal, 852, 853
in cats, 42, 46, 49
in dogs, 51
play-related
in cats, 42, 46, 49
in dogs, 51
predatory
in cats, 46, 49
in dogs, 51
recognition failure-related, in cats, 46
redirected, in cats, 42, 46, 49
sexual, in cats, 46
status-related, in cats, 46
territorial
in cats, 46, 49
in dogs, 37, 51
to unfamiliar people/dogs (in dogs), 37–38
in veterinary visits, 484–487
Aglisizodon spp. envenomation,
1241–1242
Agilepstone
for mammary gland hyperplasia, 839
for pyometra, 1140, 1368
for termination of pregnancy, 7
Air plant, 1427
Airedale terrier
atrioventricular block, 151
cerebellar hypoplasia, 128, 244, 672
corneal dystrophy, 329
flank alopecia, 61, 63
lymphoma, 830
melanocytic tumors, 863
pancreatic carcinoma, 29, 1401
plasmacytoma, 1062
spinal cord deformities, 1255
vaginal hyperplasia and prolapse, 1369, 1370
von Willebrand disease, 455, 1404
Airway collapse, 1324–1325
Airway obstruction. See also
Beachyheadache airway syndrome
cardiovascular airway arrest, 238
dyspnea and respiratory distress, 422
hypercapnia, 656
pulmonary edema, 1127, 1128
sterior and stratud, 1270–1271
Akita
acral lick dermatitis, 16
alopecia, 61, 63
epulis, 457
glaucoma, 551
INDEX
Amikacin
for canine infectious respiratory disease, 213
for colibacillosis, 292
formulary information, 1447
for gastrointestinal obstruction, 548
for nocardiosis, 953
for otitis externa and media, 988
for pyogranulomatous abscessation, 169
for urinary tract infections, 811
Amino acid supplements, 392, 556, 1283
Aminoglycosides. See also specific agents
for canine infectious respiratory disease, 213
for corneal and scleral lacerations, 327
for endocarditis, 443
for nephrotoxicity, 947, 948
for nocardiosis, 953
for sepsis and bacteremia, 1212
Aminopenamide, 770, 1447
Aminophylline, 76, 1447
Aminophylline, 76, 203
Amsodarone
for dilated cardiomyopathy, 232
formulary information, 1447
for ventricular arrhythmias, 1380, 1382, 1388
Amirtraz
for chyloretroto, 253
for canine infectious respiratory disease, 213
formulary information, 1447
for notoedric mange, 956
for sarcotic mange, 1199
Amnitrax toxicosis, 67–68
Amniphyline
for acral lick dermatitis, 16
for agression, 43, 48, 50
for alopecia, 60, 511
for atopic dermatitis, 134
for compulsive disorders, 298, 300
for fears, phobias and anxieties, 489
for feline idiopathic lower urinary tract disease, 899
formulary information, 1448
for marking, roaming and mounting behavior, 848
for neuropathic pain, 1442
for polyphagia, 1091
for pruritus, 1121
for separation distress syndrome, 1210
for syringomyelia and Chiari-like malformation, 1290
for urin marking in cats, 641
Amlodipine
for atrial wall tear, 144
for cerebrovascular accident, 246
for chronic kidney disease, 1165
for congestive heart failure, 308
formulary information, 1448
for hypertension, 456, 690, 1177
Ammonium chloride
formulary information, 1448
tolerance test, 1167
for urinary acidification, 1080
Ammonium urate crystalluria, 340, 341
Amorphous urate crystalluria, 340, 341
Amoxicillin
for abscessation, 9
for actinomycosis, 19
for aspiration pneumonia, 1375
for clostridial enterotoxicosis, 278, 294
for dermatophilosis, 362
for feline calicivirus infection, 492
for feline herpesvirus infection, 496
formulary information, 1448
for Helicobacter eradication, 535, 537, 579, 1402
for hepatic encephalopathy, 414, 598
for leptospirosis, 799
for Lyme borreliosis, 820
for mastitis, 851
for tulariaemia, 1336
for urinary tract infections, 811
Amoxicillin-clavulanic acid
for abscessation, 9
for anaerobic infections, 73
for anal sac disorders, 74
for bacterial folliculitis, 379
for blepharitis, 186
for bronchiectasis, 201
for canine infectious respiratory disease, 213
for dyschezia and hematochezia, 417
for encephalitis, 440
for eosinophilic granuloma complex, 448
formulary information, 1448
for mastitis, 851
for metritis, 880
for oral ulceration, 974
for otitis, 571, 988, 990
for pneumonia, 1068
for prostatitis/prostatic abscess, 1111
for pyoderma, 1137
for pyometra, 1110
for pyothorax, 1143
for spontaneous abortion, 3
for staphylococcal infections, 1267
for stomatitis, 1272
for suppurative hepatitis/hepatic abscess, 617
for urinary tract infections, 811
for vestibular disease, 1394, 1395
Amoxicillin-sulbactam, for hemorrhagic gastroenteritis, 543
Amfamonte toxicosis, 69–70
Amphetamine
for anorexia, 93
for battery toxicity, 169
Amfamonte toxicosis, 69–70
Amphetamine toxicosis, 69–70
for behavioral disorders, 298
for compulsive disorders, 298
for encephalitis, 440
for dyschezia and hematochezia, 417
for encephalitis, 440
for eosinophilic granuloma complex, 448
formulary information, 1448
for mastitis, 851
for metritis, 880
for oral ulceration, 974
for otitis, 571, 988, 990
for pneumonia, 1068
for prostatitis/prostatic abscess, 1111
for pyoderma, 1137
for pyometra, 1110
for pyothorax, 1143
for spontaneous abortion, 3
for staphylococcal infections, 1267
for stomatitis, 1272
for suppurative hepatitis/hepatic abscess, 617
for urinary tract infections, 811
for vestibular disease, 1394, 1395
Amoxicillin-sulbactam, for hemorrhagic gastroenteritis, 543
Amfamonte toxicosis, 69–70
Amphetamine toxicosis, 69–70
for behavioral disorders, 298
for compulsive disorders, 298
for encephalitis, 440
for dyschezia and hematochezia, 417
for encephalitis, 440
for eosinophilic granuloma complex, 448
formulary information, 1448
for mastitis, 851
for metritis, 880
for oral ulceration, 974
for otitis, 571, 988, 990
for pneumonia, 1068
for prostatitis/prostatic abscess, 1111
for pyoderma, 1137
for pyometra, 1110
for pyothorax, 1143
for spontaneous abortion, 3
for staphylococcal infections, 1267
for stomatitis, 1272
for suppurative hepatitis/hepatic abscess, 617
for urinary tract infections, 811
for vestibular disease, 1394, 1395
Amoxicillin-sulbactam, for hemorrhagic gastroenteritis, 543
for corneal and scleral lacerations, 327
for discospondylitis, 409
for esophageal pain, 465
for hip dysplasia, 632
for hypertrophic osteodystrophy, 695
for lameness, 783
for pancreatitis, 1001, 1003
for shoulder problems, 1224
for spondylosis deformans, 1255
for syringomyelia and Chiari-like
malformation, 1290
**Anaphylaxis**, 75–76
blood transfusion reactions, 189
peripheral edema, 1045
**Anaplasma**, 433–434
*Anaplasma phagocytophilum*, 706
for proteinuria, 1117
Animal drugs, 1553
*Anisocoria*, 90–91
inhibitors
777
**Anterior uveitis**, 96–99
anisocoria, 90
in cats, 96–97
in dogs, 98–99
Heinz body, 80
of chronic kidney disease, 77–78, 85
iron-deficiency, 83, 85
metabolic (with spiculated red cells), 84
nonregenerative, 85–86
nuclear maturation defects
(megaloblastic), 87
regenerative, 88–89
**Angiostrongylus vasorum**, 342
**Angiostatin**, 1276
**Angiotensin-converting enzyme (ACE)**
inhibitors
for atrial wall tear, 144
for atrioventricular valve disease, 154,
156, 159
for cardiomyopathy, 231, 234, 237
for cerebrovascular accident, 246
for congestive heart failure, 308, 310
for familial shar-pei fever, 482
for hypertension, 456, 690
for kidney disease, 554, 1117, 1165
for nephrotic syndrome, 946
nephrotoxicity, 947
Angiotensin receptor blockers (ARBs)
for ascertes, 685–686
for cirrhosis and Fibrosis of liver, 275–276
for hypertension, 690
for hypothyroidism, 706
for proteinuria, 1117
Animal drugs, 1553
Antiglomerular basement membrane
(asthma and bronchitis in cats, 125
for bartonellosis, 167
for battery toxi cosis, 169
for bile duct obstruction, 178
for bile peritonitis, 180
for blepharitis, 186
for bronchiectasis, 201
for brucellosis, 205
for campylobacteriosis, 207
for canine distemper, 211
for canine infectious respiratory
disease, 213
for canine influenza, 214
for cathereter-related infections, 1058
for central nervous system infections,
871
for cholangitis/cholangiohepatitis
syndrome, 260
for cholecytitis and choledochitis,
262–263
for cholelithiasis, 264
for chronic bronchitis, 203
for clostridial enterotoxicosis, 278
for colitis, 294, 296
for colibacillosis, 292
for colitis and proctitis, 294, 296
for conjunctivitis, 312, 314
for corneal and scleral lacerations, 327
for corneal opacities, 328
for cough, 332
for cough, 396, 397
for dental abscess, 409
for dyschecia and hemachecia, 417
for enterococcus, 440
for eosinophilic granuloma complex,
448
for epiphrenic and reflux, 449
for epistaxis, 453
for esophageal disorders, 465
for exocrine pancreatic insufficiency,
475
for feline calicivirus infection, 492
for feline herpervirus infection, 496
for feline peritonitis, 513
for gallbladder mucocele, 530
for gastritis and duodenitis, 541
for gastrointestinal tract
inflammation, 548
for gastrointestinal ulceration, 579
for hemorrhagic gastroenteritis, 583
for hepatic encephalopathy, 441
for immunoproliferative enteropathy
of Basenjis, 744
for liver disease, 77–78, 85
for liver failure, 85
for long bone fractures, 92–93
for bacterial peritonitis, 109
for necrotizing enteritis, 169
for pancreatitis, 238
for proteinuria, 294
for renal failure, 296
for renal insufficiency, 417
for renal transplant failure, 417
for septic shock, 417
for spontaneous bacterial peritonitis,
417
for systemic inflammatory response
syndrome, 417
for typhoid fever, 417
for upper respiratory tract infections,
417
for urolithiasis, 417
for urinary tract infection, 417
for urinary tract obstruction, 417
for urinary tract stone, 417
for urinary tract vesicoureteral
reflux, 417
for vertigo, 453
for vertigo, 465
for vomiting, 465
for Wilson's disease, 465
for xanthomata, 465
for xeroderma, 465
for xeroderma pigmentosum, 465
for Yogurt, 465
for hepatic encephalopathy, 441
for immunoproliferative enteropathy
of Basenjis, 744
for liver disease, 77–78, 85
for liver failure, 85
for long bone fractures, 92–93
for bacterial peritonitis, 109
for necrotizing enteritis, 169
for pancreatitis, 238
for proteinuria, 294
for renal failure, 296
for renal insufficiency, 417
for renal transplant failure, 417
for septic shock, 417
for spontaneous bacterial peritonitis,
417
for systemic inflammatory response
syndrome, 417
for typhoid fever, 417
for upper respiratory tract infections,
417
for urinary tract infection, 417
for urinary tract obstruction, 417
for urinary tract stone, 417
for urinary tract vesicoureteral
reflux, 417
for vertigo, 453
for vertigo, 465
for vomiting, 465
for Wilson's disease, 465
for xanthomata, 465
for xeroderma, 465
for xeroderma pigmentosum, 465
for Yogurt, 465
for hepatic encephalopathy, 441
for immunoproliferative enteropathy
of Basenjis, 744
for liver disease, 77–78, 85
for liver failure, 85
for long bone fractures, 92–93
for bacterial peritonitis, 109
for necrotizing enteritis, 169
for pancreatitis, 238
for proteinuria, 294
for renal failure, 296
for renal insufficiency, 417
for renal transplant failure, 417
for septic shock, 417
for spontaneous bacterial peritonitis,
417
for systemic inflammatory response
syndrome, 417
for typhoid fever, 417
for upper respiratory tract infections,
417
for urinary tract infection, 417
for urinary tract obstruction, 417
for urinary tract stone, 417
for urinary tract vesicoureteral
reflux, 417
for vertigo, 453
for vertigo, 465
for vomiting, 465
for Wilson's disease, 465
for xanthomata, 465
for xeroderma, 465
for xeroderma pigmentosum, 465
for Yogurt, 465
for hepatic encephalopathy, 441
for immunoproliferative enteropathy
of Basenjis, 744
for liver disease, 77–78, 85
for liver failure, 85
for long bone fractures, 92–93
for bacterial peritonitis, 109
for necrotizing enteritis, 169
for pancreatitis, 238
for proteinuria, 294
for renal failure, 296
for renal insufficiency, 417
for renal transplant failure, 417
for septic shock, 417
for spontaneous bacterial peritonitis,
417
for systemic inflammatory response
syndrome, 417
for typhoid fever, 417
for upper respiratory tract infections,
417
for urinary tract infection, 417
for urinary tract obstruction, 417
for urinary tract stone, 417
for urinary tract vesicoureteral
reflux, 417
for vertigo, 453
for vertigo, 465
for vomiting, 465
for Wilson's disease, 465
for xanthomata, 465
for xeroderma, 465
for xeroderma pigmentosum, 465
for Yogurt, 465
for hepatic encephalopathy, 441
for immunoproliferative enteropathy
of Basenjis, 744