

**Table 28.1.** Antimicrobial drug selection for selected infections in dogs.<sup>a</sup>

Site	Diagnosis	Common Infecting Organisms	Comments	Suggested drugs
Skin and subcutis	Superficial pyoderma	<i>Staphylococcus</i> spp. (especially <i>S. pseudintermedius</i> ).	Attempt to identify underlying causes (most often allergic dermatitis, but also endocrinopathies). Prolonged treatment may be needed. Culture of pustules is indicated in regions where methicillin-resistant <i>S. pseudintermedius</i> is widespread or if disease is refractory or recurrent.	Consider topical treatment, e.g., with antiseptic shampoos, as an alternative to systemic antimicrobial drugs. Clindamycin or first-generation cephalosporins (e.g., cephalaxin, cefadroxil). Alternatives include amoxicillin-clavulanate, trimethoprim and ormetoprim-potentiated sulphonomides, lincomycin, or erythromycin. Use of other drugs should be based on culture and susceptibility.
	Deep pyoderma	<i>Staphylococcus</i> spp., <i>E. coli</i> , <i>Proteus</i> , <i>Pseudomonas</i> .	Attempt to identify underlying causes. Prolonged treatment may be needed. Culture of skin lesions strongly recommended.	See superficial pyoderma, but drugs that are active against Gram-negative bacteria may be required based on culture and susceptibility.
	Surface pyoderma	<i>Staphylococcus</i> , <i>Streptococcus</i> .	Often secondary to skin folds or self-trauma.	
	<i>Malassezia</i> dermatitis	<i>M. pachydermatis</i> .	Local cleansing and topical antibacterials are sufficient.	
	Dermatophytosis	<i>Microsporium</i> , <i>Trichophyton</i> .	Identify and eliminate underlying causes. Topical treatment with shampoos is recommended.	Itraconazole or fluconazole. Ketoconazole is an alternative but is more likely to cause adverse effects.
	Bite wounds, traumatic and contaminated wounds	<i>Staphylococcus</i> , <i>Streptococcus</i> , <i>Enterococcus</i> , <i>Pasteurella</i> , <i>Escherichia coli</i> , <i>Pseudomonas</i> , anaerobes.	Topical treatment and environmental clean-up required. Localized lesions may not require systemic treatment.	Itraconazole or fluconazole. Alternatives include griseofulvin or terbinafine.
	Anal sac inflammation/abscessation	<i>E. coli</i> , <i>Enterococcus</i> spp., <i>Proteus</i> spp., anaerobes.	Wound irrigation and debridement. Antibiotics of questionable prophylactic benefit for contaminated wounds.	Clavulanic acid–amoxicillin or ampicillin-sulbactam. For serious infections that may involve resistant Gram-positive and Gram-negative bacteria, consider a combination of an aminoglycoside and ampicillin-sulbactam.
Ear	Otitis externa	<i>Staphylococcus</i> spp., and less often streptococci, <i>Pseudomonas</i> , <i>E. coli</i> or <i>Proteus</i> spp.; <i>Malassezia</i> .	Local treatment is usually indicated. Systemic antimicrobials can be used if severe infection is present.	Clavulanic acid–amoxicillin.
	Otitis media and interna	As for otitis externa.	Identify and address underlying causes (allergic dermatitis, foreign bodies, ear mites). Ear cleaning. Consider topical glucocorticoid or analgesic.	Choice should be based on ear cytology and if possible, integrity of the tympanic membrane. Topical enrofloxacin solutions may be considered; or if rods are present, topical preparation that contains aminoglycosides, polymyxin B, or ticarcillin-clavulanate. Ointments that contain clotrimazole, miconazole, or posaconazole may be required if <i>Malassezia</i> is present.
Eye	Superficial ocular infection	<i>Staphylococcus</i> spp., <i>Streptococcus</i> spp., <i>E. coli</i> , <i>Proteus</i> .	Otitis externa also often present. Identify and address underlying causes. Treat as for otitis externa but additional systemic treatment indicated. Avoid ototoxic drugs.	Treatment should be based on ear cytology and culture and susceptibility. If cocci are present, cephalaxin is recommended, but if rods are present, consider a fluoroquinolone. Systemic antifungal drug treatment is indicated if <i>Malassezia</i> is present.
			Identify and correct underlying causes (poor eyelid conformation, dystichiasis, allergies, keratoconjunctivitis sicca).	Topical neomycin-polymyxin-bacitracin.

(continued)

**Table 28.1. Antimicrobial drug selection for selected infections in dogs.<sup>a</sup> (continued)**

Site	Diagnosis	Common Infecting Organisms	Comments	Suggested drugs
Upper respiratory	Bacterial rhinitis	Usually resident bacteria that invade opportunistically. In crowded environments, <i>Bordetella bronchiseptica</i> , <i>Streptococcus equi</i> subspecies <i>zooepidemicus</i> , or <i>Mycoplasma</i> spp. (especially <i>M. cynos</i> ) may be involved. Usually <i>Aspergillus</i> spp.	Treatment with antibiotics alone is rarely curative unless infection is caused by transmissible bacteria (e.g., shelter environments). For other situations, underlying causes (neoplasia, aspergillosis, foreign bodies, nasal mites) must be identified and addressed.	If transmissible bacterial infections are suspected, doxycycline is the treatment of choice because it is active against <i>Bordetella</i> , <i>Streptococcus</i> , and <i>Mycoplasma</i> spp. Amoxicillin-clavulanate is an alternative but is not active against <i>Mycoplasma</i> spp.
	Fungal rhinitis		Rule out nasal neoplasia. Secondary bacterial infection may be present.	Debridement and topical clotrimazole or enilconazole. Systemic itraconazole or voriconazole are alternatives if cribriform plate destruction is present.
	Canine infectious respiratory disease complex	Viruses, <i>Bordetella bronchiseptica</i> , <i>Streptococcus equi</i> subsp. <i>zooepidemicus</i> , <i>Mycoplasma</i> spp. (especially <i>Mycoplasma cynos</i> ).	Most recover untreated in 7–10 days. Treat if mucopurulent discharges are severe or systemic illness is present. Consider the possibility of distemper pneumonia.	Doxycycline. Clavulanic acid–amoxicillin is an alternative but is not active against <i>Mycoplasma</i> spp.; consider nebulized gentamicin if refractory to treatment and infection with <i>B. bronchiseptica</i> has been confirmed with culture.
	Bacterial pneumonia	Single or mixed infections that involve various facultative (especially Gram-negative) bacteria and anaerobes if aspiration pneumonia is present.	Aerobic culture and susceptibility testing on transtracheal wash or bronchoalveolar lavage indicated. Consider anaerobic culture if aspiration suspected.	A combination of clindamycin and enrofloxacin is a suitable initial choice pending the results of culture and susceptibility testing. If anaerobes are suspected, a beta-lactam/ beta-lactamase inhibitor combination may be more appropriate (such as ampicillin-sulbactam and enrofloxacin). Trimethoprim-sulfonamide combinations.
	<i>Pneumocystis jiroveci</i> pneumonia		Secondary to inherited or acquired immunodeficiency.	
	Pyothorax	Various and often mixed, which includes anaerobes, <i>Actinomyces</i> , Gram-negative and Gram-positive bacteria, <i>Nocardia</i> spp.	Culture and susceptibility testing on pleural fluid indicated. Chest tube placement required to drain pus; surgery may be indicated.	Ampicillin-sulbactam and enrofloxacin are suitable initial choices pending the results of culture and susceptibility testing. If <i>Nocardia</i> is suspected based on history or cytology, trimethoprim-sulfamethoxazole should be used. Clindamycin or amoxicillin-clavulanate.
Gastrointestinal and abdominal	Periodontitis, gingivitis	Resident anaerobic and facultative bacteria.	Dental cleaning, scaling, other dental treatment may be needed.	Clindamycin or amoxicillin-clavulanate.
	Malar or carmassial abscess	Resident oral flora.	Dental extractions, alveolar bone curettage, drainage.	
	Gastric helicobacteriosis	<i>Helicobacter</i> spp., gastric helicobacter-like organisms.	Relationship between infection and disease often unclear.	Amoxicillin, clarithromycin and bismuth salicylate or amoxicillin, metronidazole and bismuth salicylate.
	Bacterial enteritis	<i>Salmonella</i> spp.  <i>Campylobacter</i> spp.	Can be found in healthy and sick dogs. When present with diarrhea and systemic illness is not present, treatment is not indicated. Often present in healthy dogs	If systemic infection is present (i.e., with fever, lethargy, changes on the CBC, positive blood cultures), parenteral fluoroquinolones indicated. If diarrhea is present and no other cause of illness can be identified, consider treatment with a macrolide. Metronidazole.
		<i>Clostridium perfringens</i> , <i>C. difficile</i> .	Present in many healthy dogs. Diagnosis of clostridial diarrhea requires demonstration of toxin production by toxin ELISA assays in association with diarrhea. Significance may still be unclear even when toxin is detected.	

Giardiasis	<i>Giardia</i> spp.	Infection often subclinical. Some assemblages/species may be zoonotic.	Fenbendazole. Alternatives are metronidazole, tinidazole, or ronidazole.
Coccidiosis	<i>Isospora</i> spp.	Clinical illness usually associated with young age or co-infections with other enteric pathogens.	Sulfonamide +/- trimethoprim. Alternatives are ponazuril or toltrazuril (Europe).
Parvoviral enteritis	Secondary facultative and anaerobic bacteria from the gastrointestinal tract.	Parenteral antimicrobial drug treatment is important to counteract opportunistic bacterial invasion.	Ampicillin-sulbactam, ceftazolin (mild disease); ampicillin-sulbactam and a fluoroquinolone (severe disease).
Choleystitis, cholangiohepatitis	<i>Escherichia</i> , <i>Salmonella</i> , <i>Enterococcus</i> anaerobes.	Address underlying causes (e.g., disrupted bile flow). Consider ultrasound-guided collection of bile for aerobic and anaerobic culture and susceptibility.	Beta-lactam and beta-lactamase inhibitor combination with an aminoglycoside or a fluoroquinolone; narrow spectrum based on culture results.
Bacterial peritonitis	Mixed anaerobes and facultative enteric bacteria.	Surgical exploration and lavage may be needed. Culture and susceptibility testing indicated.	As for choleystitis/cholangiohepatitis.
Urinary and urogenital	Lower urinary tract infection/bacterial cystitis	Identify and address underlying cause whenever possible (calculi, tumor, incontinence, hyperadrenocorticism).	Trimethoprim-sulfamethoxazole or amoxicillin. Amoxicillin-clavulanate could be used where the regional prevalence of beta-lactamase production is high.
	Pyelonephritis	Culture and susceptibility recommended. Prolonged treatment required.	Amoxicillin and a fluoroquinolone pending culture results.
	Prostatitis	Culture and susceptibility recommended. Prolonged treatment required. Surgery may be needed for prostatic abscessation or for castration.	Trimethoprim-sulfonamide or a fluoroquinolone. Chloramphenicol is an alternative.
	Orchitis/epididymitis	May be associated with urinary tract infection and prostatitis. Castration may be required.	Trimethoprim-sulfonamide or a fluoroquinolone. Doxycycline and an aminoglycoside (streptomycin or gentamicin) for <i>Brucella</i> ; addition of a fluoroquinolone and rifampin could also be considered for treatment of brucellosis.
	Vaginitis/balanoposthitis	Identify predisposing factors. Local cleaning usually sufficient. Puppy vaginitis resolves with maturity.	
	Metritis, pyometra	Ovariohysterectomy recommended. Culture uterine contents at surgery. Prostaglandin and antibiotic treatment may be successful for open pyometra.	Ampicillin-sulbactam and either a fluoroquinolone or an aminoglycoside.
	Mastitis	Do cytology and culture and susceptibility testing.	If weaning possible, use chloramphenicol (unaffected by milk pH). Otherwise, amoxicillin-clavulanate pending results of culture and susceptibility.
Musculoskeletal	Osteomyelitis, septic arthritis	Culture and susceptibility strongly recommended. Requires debridement and drainage and prolonged treatment with antimicrobial drugs. Local antimicrobial treatment (impregnated beads) may also be useful.	Withhold treatment until results of culture and susceptibility are available. If treatment is considered necessary, clindamycin or clindamycin and an aminoglycoside (if Gram-negative bacteria or methicillin-resistant staphylococci) could be considered. Chloramphenicol is an alternative in regions where the prevalence of methicillin-resistant staphylococci is high, but some may be resistant to chloramphenicol.

(continued)

**Table 28.1. Antimicrobial drug selection for selected infections in dogs.<sup>a</sup> (continued)**

Site	Diagnosis	Common Infecting Organisms	Comments	Suggested drugs
Nervous system	Disko-spondylitis	<i>Staphylococcus</i> , <i>Streptococcus</i> , <i>Brucella</i> , <i>E. coli</i> , <i>Aspergillus</i> .	Blood culture and susceptibility recommended, also <i>Aspergillus</i> antigen and <i>Brucella</i> antibody serology. Disk aspiration or urine culture may also yield a causative organism.	Clavulanic acid–amoxicillin or cephalixin; consider addition of a fluoroquinolone if there is no response after a week, and diagnostic test results are negative.
	Bacterial meningitis	<i>Staphylococcus</i> , <i>Pasteurella</i> , <i>Actinomyces</i> , <i>Nocardia</i> , sometimes anaerobes.	CSF culture and susceptibility recommended.	Consider a combination of ampicillin and metronidazole (which has improved penetration). Alternatives are trimethoprim-sulfamethoxazole or chloramphenicol.
	Tetanus	<i>Clostridium tetani</i> .	Nursing case, antitoxin, wound debridement.	Metronidazole or penicillin.
	Botulism	<i>Clostridium botulinum</i> .	Nursing care.	Not indicated.
Other bacterial	Hepatic encephalopathy	Normal intestinal flora.	Oral antimicrobial drugs to suppress ammonia production by gastrointestinal bacteria; add lactulose and restricted protein diet.	Ampicillin or neomycin.
	Actinomycosis	<i>Actinomyces</i> spp.	Mostly with other bacteria in infections of the subcutaneous tissues, thorax, abdomen, retroperitoneum. Drainage, debridement, prolonged treatment needed. Identify and remove any plant foreign bodies.	Penicillin G or ampicillin.
	Bacteremia, bacterial endocarditis	Various Gram-positive and Gram-negative facultative bacteria, <i>Bartonella</i> , rarely anaerobes.	Blood culture and susceptibility testing indicated. Treat parenterally for 7–10 days (or as long as possible) then switch to oral treatment for 4–6 weeks.	Penicillin and an aminoglycoside pending the results of culture and susceptibility.
	Bartonellosis	<i>Bartonella vinsonii</i> subsp. <i>berkhoffii</i> , <i>Bartonella henselae</i> .	<i>Bartonella</i> serology and culture (low sensitivity) indicated. Significance as a cause of disease may be unclear unless endocarditis is present.	Penicillin and an aminoglycoside for endocarditis. Prognosis guarded to poor as valve replacement often required.
	Brucellosis	<i>Brucella canis</i> .	Potential zoonosis.	Doxycycline plus dihydrostreptomycin or gentamicin; consider addition of rifampin.
	Leptospirosis	Various serovars of <i>Leptospira interrogans</i> .	Potential zoonosis. Fluid therapy essential, dialysis may be required.	Penicillin, ampicillin, or doxycycline; oral doxycycline recommended once vomiting ceases for elimination of the carrier state.
	Lyme borreliosis	<i>Borrelia burgdorferi</i>	Consider non-steroidal anti-inflammatory drugs for analgesia.	Doxycycline. Amoxicillin is a possible alternative.
	Nocardiosis	<i>Nocardia</i> spp.	Pulmonary, systemic, or cutaneous lesions.	Trimethoprim-sulfonamide.
	Neonatal septicemia	<i>Streptococcus</i> spp., <i>E. coli</i> , <i>Staphylococcus</i> spp.		Ampicillin-sulbactam, first-generation cephalosporin. Consider cautious use of an aminoglycoside if Gram-negative bacteria are suspected.
	Rapidly growing mycobacteria	<i>Mycobacterium fortuitum</i> , <i>Mycobacterium smegmatis</i> .	Cutaneous-subcutaneous and less often systemic infections.	High-dose doxycycline or a fluoroquinolone; aminoglycosides could also be considered.
	Slow-growing opportunistic mycobacteria	<i>Mycobacterium avium</i> .	Usually systemic infections in immunocompromised dogs.	Three-drug combination of a macrolide (such as clarithromycin) with rifampin, ethambutol, doxycycline, and/or a fluoroquinolone suggested.
	Tuberculous mycobacteria	<i>Mycobacterium tuberculosis</i> , <i>Mycobacterium bovis</i> .	Prolonged combination drug treatment; potential zoonosis.	Combination of isoniazid, rifampin, and clarithromycin, with or without ethambutol. Isoniazid may cause seizures.

Other protozoal	Babesiosis	<i>Babesia canis</i>	Imidocarb dipropionate or a combination of atovaquone and azithromycin.
	Cryptosporidiosis	<i>Babesia gibsoni</i> <i>Babesia conradae</i> <i>Cryptosporidium</i> spp.	Atovaquone and azithromycin. Atovaquone and azithromycin. No uniformly successful treatment; some improvement may be seen with paramomycin or azithromycin.
	Hepatozoonosis	<i>Hepatozoon americanum</i> <i>Hepatozoon canis</i>	<i>H. americanum</i> : acute—clindamycin, sulfonamide, trimethoprim, pyrimethamine; chronic—decoquinone
	Leishmaniasis	<i>Leishmania</i> spp.	<i>H. canis</i> : imidocarb dipropionate. Meglumine antimonate and allopurinol. Alternatives are amphotericin B or miltefosine.
	Neosporosis	<i>Neospora caninum</i>	Clindamycin. Alternative is sulfonamide plus pyrimethamine.
	Toxoplasmosis	<i>Toxoplasma gondii</i>	Clindamycin. Alternative is sulfonamide plus pyrimethamine or azithromycin.
	Trypanosomiasis, American	<i>Trypanosoma cruzi</i>	Nifurtimox or benznidazole.
Rickettsial, ehrlichial, and hemotropic mycoplasma infections	Rocky Mountain Spotted Fever	<i>Rickettsia rickettsia</i>	Doxycycline.
	Ehrlichiosis, anaplasmosis	<i>Ehrlichia canis</i> , <i>Ehrlichia ewingii</i> , <i>Anaplasma phagocytophilum</i> , <i>Anaplasma platys</i>	Doxycycline.
	Hemoplasmosis	<i>Mycoplasma haemocanis</i> , <i>Mycoplasma haematoparvum</i>	Doxycycline or a fluoroquinolone.
Systemic mycoses	Aspergillosis, disseminated	<i>Aspergillus terreus</i> , <i>A. deflexus</i>	Itraconazole or voriconazole are alternatives but may be expensive. Consider addition of terbinafine for refractory cases. Do not use fluconazole.
	Blastomycosis	<i>Blastomyces dermatitidis</i>	Itraconazole or fluconazole, with or without amphotericin B.
	Coccidioidomycosis	<i>Coccidioides</i> spp.	Itraconazole or fluconazole, with or without amphotericin B. Voriconazole may also be effective and has CNS penetration but is expensive.
	Cryptococcosis	<i>Cryptococcus neoformans</i> or <i>Cryptococcus gattii</i>	Fluconazole with or without amphotericin B; itraconazole may be effective when fluconazole fails.
	Histoplasmosis	<i>Histoplasma capsulatum</i>	Itraconazole with or without amphotericin B.
	Sporotrichosis	<i>Sporothrix schenckii</i>	Itraconazole with or without amphotericin B; supersaturated potassium iodide is an alternative.

<sup>a</sup>These selections reflect personal opinion based on review of the literature, discussion with colleagues, and clinical experience. They are intended to guide drug selection when laboratory data are lacking. Laboratory data (Gram stain of exudate or aspirate, or culture and susceptibility test) should be used to guide drug selection if available. Selection may change once culture and drug susceptibility test results are known. See Greene, 2012, for additional information. (Greene C. Infectious Diseases of the Dog and Cat, 4th ed. St. Louis: Elsevier Saunders.)

**Table 28.2.** Antimicrobial drug selection for selected infections in cats.<sup>a</sup>

Site	Diagnosis	Common Infecting Organisms	Comments	Suggested Drugs
Skin and subcutis	Bacterial pyoderma	<i>Staphylococcus</i> spp., <i>Streptococcus</i> spp.	Attempt to identify underlying causes (most often allergic dermatitis, but also endocrinopathies). Prolonged treatment may be needed. Culture of skin lesions is indicated in regions where methicillin-resistant <i>S. aureus</i> is widespread or if disease is refractory or recurrent.	Clindamycin or first-generation cephalosporins (e.g., cephalexin, cefadroxil). Alternatives include amoxicillin-clavulanate. Use of other drugs should be based on culture and susceptibility.
	Cat fight abscesses Surface pyoderma	<i>Pasteurella</i> , anaerobes. <i>Staphylococcus</i> , <i>Streptococcus</i> .	Drainage is most important. Often secondary to skin folds or self-trauma. Local cleansing and topical antibacterials are sufficient.	Clavulanic acid–amoxicillin.
Ear	<i>Malassezia</i> dermatitis	<i>M. pachydermatis</i> .	Identify and eliminate underlying causes. Topical treatment with shampoos is recommended.	Itraconazole or fluconazole. Ketoconazole is an alternative but is more likely to cause adverse effects.
	Dermatophytosis	<i>Microsporium</i> , <i>Trichophyton</i> .	Topical treatment and environmental clean-up required. Localized lesions may not require systemic treatment.	Itraconazole or fluconazole. Alternatives include griseofulvin or terbinafine.
	Feline leprosy	<i>Mycobacterium lepraemurium</i> , others.	Surgical removal preferred if possible.	Clofazamine and clarithromycin.
	Rapidly growing opportunistic mycobacterial infections Tuberculosis mycobacteriosis Otitis externa	<i>Mycobacterium fortuitum</i> , <i>M. smegmatis</i> , <i>M. chelonae</i> , <i>M. abscessus</i> . <i>Mycobacterium microti</i> , <i>Mycobacterium bovis</i> . <i>Staphylococcus</i> spp., and less often streptococci; <i>Malassezia</i> .	Culture and susceptibility testing recommended if possible. Early surgical resection may lead to dehiscence. Primarily occurs in the UK. Identify and address underlying causes (allergic dermatitis, foreign bodies, polyps, retrovirus infections, ear mites). Ear cleaning.	High-dose doxycycline or a fluoroquinolone; consider aminoglycosides. Clarithromycin with rifampin and a fluoroquinolone. Choice should be based on ear cytology and, if possible, integrity of the tympanic membrane. Topical enrofloxacin solutions may be considered; or if rods are present, topical preparation that contains aminoglycosides, polymixin B, or ticarcillin-clavulanate. Ointments that contain clotrimazole, miconazole, or posaconazole may be required if <i>Malassezia</i> is present.
Eye	Otitis media and interna	As for otitis externa.	Otitis externa also often present. Identify and address underlying causes. Treat as for otitis externa but additional systemic treatment indicated. Avoid ototoxic drugs.	Treatment should be based on ear cytology and culture and susceptibility. If cocci are present, cephalexin is recommended, but if rods are present, consider a fluoroquinolone. Systemic antifungal drug treatment is indicated if <i>Malassezia</i> is present.
	Conjunctivitis	Feline herpesvirus-1 or calicivirus, <i>Chlamydophila felis</i> , <i>Mycoplasma</i> spp., <i>Bordetella bronchiseptica</i> (kittens).	The presence of feline herpesvirus-1 is likely if keratitis is also present.	Doxycycline. Famciclovir or topical idoxofvir may be indicated for severe herpesviral infections.

Upper respiratory	Feline upper respiratory tract disease/rhinitis	Usually resident bacteria ( <i>Staphylococcus</i> , <i>Pasteurella</i> , <i>Mycoplasma</i> that invade opportunistically). Resistant <i>Pseudomonas aeruginosa</i> rhinitis may occasionally be involved. In crowded environments and young animals, <i>Bordetella bronchiseptica</i> , <i>Streptococcus canis</i> or <i>Streptococcus equi</i> subsp. <i>zooepidemicus</i> , or <i>Mycoplasma</i> spp. (especially <i>M. felis</i> ) may be primary pathogens.	Consider underlying causes (viral infections, nasal neoplasia, foreign bodies, oronasal fistulas).	If transmissible bacterial infections are suspected, doxycycline is the treatment of choice because it is active against <i>Bordetella</i> , <i>Streptococcus</i> , and <i>Mycoplasma</i> spp. Amoxicillin-clavulanate is an alternative but is not active against <i>Mycoplasma</i> spp. Cats with chronic idiopathic rhinosinusitis may require repeated treatment with antimicrobial drugs; culture and susceptibility should be performed wherever possible.
	Fungal rhinitis	Usually <i>Cryptococcus</i> spp. but occasionally <i>Aspergillus</i> spp.	Rule out nasal neoplasia. Secondary bacterial infection may be present.	Fluconazole, itraconazole, or ketoconazole for cryptococcosis; for refractory disease, addition of flucytosine or amphotericin B should be considered. Aspergillosis may be treated with itraconazole or posaconazole but complete resolution of infection may not be achievable.
	Bacterial pneumonia	Single or mixed infections that involve various facultative (especially Gram-negative) bacteria and anaerobes if aspiration pneumonia is present; <i>Bordetella bronchiseptica</i> may be involved in young kittens.	Aerobic culture and susceptibility testing on endotracheal wash indicated. Consider underlying causes such as feline inflammatory airway disease.	A combination of clindamycin and a fluoroquinolone is a suitable initial choice pending the results of culture and susceptibility testing. If anaerobes are suspected, a beta-lactam/beta-lactamase inhibitor combination may be more appropriate (such as ampicillin-sulbactam and a fluoroquinolone). Doxycycline is the treatment of choice if <i>Bordetella pneumoniae</i> is suspected.
	Pyothorax	Various and often mixed, which includes anaerobes, <i>Actinomyces</i> , <i>Pasteurella</i> , and sometimes <i>Mycoplasma</i> .	Culture and susceptibility testing on pleural fluid indicated. Chest tube placement required to drain pus; surgery may be indicated.	Ampicillin-sulbactam or penicillin G and metronidazole (some anaerobes may produce beta-lactamase enzymes).
Gastrointestinal and abdominal	Periodontitis, gingivitis	Resident anaerobic and facultative bacteria.	Dental cleaning, scaling, other dental treatment may be needed.	Clindamycin or amoxicillin-clavulanate.
	Lymphoplasmacytic (caudal) gingivostomatitis	Resident oral flora	Complete dental extraction may be required for refractory cases; immunomodulators such as prednisolone or recombinant feline interferon omega could also be considered; chlorhexidine oral rinses.	Clindamycin.
	Gastric helicobacteriosis	<i>Helicobacter</i> spp., gastric helicobacter-like organisms.	Relationship between infection and disease often unclear.	Amoxicillin, clarithromycin and bismuth salicylate or amoxicillin, metronidazole and bismuth salicylate.
	Bacterial enteritis	<i>Salmonella</i> spp.	Primarily causes disease in immunocompromised cats or kittens. Treat only if systemic illness is present.	If systemic infection is present (i.e., with fever, lethargy, changes on the CBC, positive blood cultures), parenteral fluoroquinolones indicated.

(continued)

**Table 28.2. Antimicrobial drug selection for selected infections in cats.<sup>a</sup> (continued)**

Site	Diagnosis	Common Infecting Organisms	Comments	Suggested Drugs
		<i>Campylobacter</i> spp.	No clear association with diarrhea.	If diarrhea is present and no other cause of illness can be identified, consider treatment with a macrolide. Metronidazole.
		<i>Clostridium perfringens</i> , <i>C. difficile</i> .	No clear association with diarrhea. Diagnosis of clostridial diarrhea requires demonstration of toxin production by toxin ELISA assays in association with diarrhea. Significance may still be unclear even when toxin is detected.	
	Giardiasis	<i>Giardia</i> spp.	Infection often subclinical. Some assemblages/species may be zoonotic.	Fenbendazole. Alternatives are metronidazole, tinidazole, or ronidazole.
	Coccidiosis	<i>Isospora</i> spp.	Clinical illness usually associated with young age or co-infections with other enteric pathogens.	Sulfonamide +/- trimethoprim. Alternatives are ponazuril or toltrazuril (Europe).
	Parvoviral enteritis	Secondary facultative and anaerobic bacteria from the gastrointestinal tract	Parenteral antimicrobial drug treatment is important to counteract opportunistic bacterial invasion.	Ampicillin-sulbactam, ceftazolin (mild disease); ampicillin-sulbactam and a fluoroquinolone (severe disease).
	Cholecystitis, cholangiohepatitis	<i>Escherichia</i> , <i>Salmonella</i> , <i>Enterococcus</i> , anaerobes.	Address underlying causes (e.g., disrupted bile flow). Consider ultrasound-guided collection of bile for aerobic and anaerobic culture and susceptibility.	Beta-lactam and beta-lactamase inhibitor combination with an aminoglycoside or a fluoroquinolone; narrow spectrum based on culture results.
	Bacterial peritonitis	Mixed anaerobes and facultative enteric bacteria.	Surgical exploration and lavage may be needed. Culture and susceptibility testing indicated.	As for cholecystitis/cholangiohepatitis.
Urinary and urogenital	Lower urinary tract infection/bacterial cystitis	<i>E. coli</i> , <i>Staphylococcus</i> spp., <i>Proteus</i> , <i>Streptococcus</i> , <i>Enterococcus</i> , <i>Enterobacter</i> , <i>Klebsiella</i> , <i>Pseudomonas</i> .	Rare in cats unless underlying disease such as renal failure, hyperthyroidism, or diabetes mellitus is present.	Trimethoprim-sulfamethoxazole or amoxicillin. Amoxicillin-clavulanate could be used where the regional prevalence of beta-lactamase production is high.
	Pyelonephritis	See lower urinary tract infection.	Culture and susceptibility recommended. Prolonged treatment required.	Amoxicillin and a fluoroquinolone pending culture results.
	Metritis, pyometra	<i>E. coli</i> , <i>Streptococcus</i> , <i>Staphylococcus</i> ; other Gram-negative bacteria, sometimes anaerobes.	Ovari hysterectomy recommended. Culture uterine contents at surgery.	Ampicillin-sulbactam and either a fluoroquinolone or an aminoglycoside.
Musculoskeletal	Osteomyelitis, septic arthritis	<i>Staphylococcus</i> and to a lesser extent <i>Streptococcus</i> , <i>Enterococcus</i> , anaerobes; <i>Mycoplasma</i> may cause arthritis.	Culture and susceptibility strongly recommended. Requires debridement and drainage and prolonged treatment with antimicrobial drugs.	Withhold treatment until results of aerobic, anaerobic, and mycoplasma culture and susceptibility are available. If treatment is considered necessary, clindamycin or clindamycin and a fluoroquinolone (if Gram-negative bacteria or mycoplasmas suspected) could be considered.
Nervous system	Bacterial meningitis	<i>Staphylococcus</i> , <i>Streptococcus</i> , <i>Pasteurella</i> , rarely <i>Mycoplasma</i> .	CSF culture and susceptibility recommended.	Ampicillin or penicillin G; an alternative is trimethoprim-sulfamethoxazole. Doxycycline or a fluoroquinolone are indicated if mycoplasmas are suspected.



	Tetanus	<i>Clostridium tetani</i> .	Nursing case, antitoxin, wound debridement. Rare in cats.	Metronidazole or penicillin.
	Hepatic encephalopathy	Normal intestinal flora.	Oral antimicrobial drugs to suppress ammonia production by gastrointestinal bacteria; add lactulose and restricted protein diet.	Ampicillin or neomycin.
Other bacterial	Bartonellosis	<i>Bartonella henselae</i> , <i>Bartonella clarridgeiae</i> .	<i>Bartonella</i> serology and culture indicated. Significance as a cause of disease may be unclear because subclinical bacteremia is widespread.	Doxycycline or azithromycin.
	Plague	<i>Yersinia pestis</i> .	Human health risk. Treat fleas and lance buboes.	Aminoglycoside; doxycycline or fluoroquinolones are less optimal alternatives. Aminoglycoside.
	Tularemia	<i>Francisella tularensis</i> .	Potential zoonosis through biting.	Trimethoprim-sulfonamide.
	Nocardiosis	<i>Nocardia</i> spp.	Pulmonary, systemic, or cutaneous lesions.	Combination of atovaquone and azithromycin.
Other protozoal	Cytauxzoonosis	<i>Cytauxzoon felis</i> .	High mortality but treatment may be effective.	Clindamycin. Alternative is sulfonamide plus pyrimethamine or azithromycin.
	Toxoplasmosis	<i>Toxoplasma gondii</i> .		No uniformly successful treatment; some improvement may be seen with paramomycin, nitazoxanide, or azithromycin.
	Cryptosporidiosis	<i>Cryptosporidium</i> spp.	Infection often subclinical and self-limiting. Potential zoonosis.	Meglumine antimonate and allopurinol. Alternatives are amphotericin B or miltefosine.
	Leishmaniasis	<i>Leishmania</i> spp.	Complete resolution of infection may not occur.	Doxycycline.
Rickettsial, ehrlichial and hemotropic mycoplasma infections	Ehrlichiosis, anaplasmosis	<i>Ehrlichia</i> spp., <i>Anaplasma phagocytophilum</i> .	Uncommonly reported in cats.	
	Hemoplasmosis	<i>Mycoplasma haemofelis</i> , " <i>Candidatus</i> Mycoplasma haemominutum", " <i>Candidatus</i> Mycoplasma turicensis."	<i>M. haemofelis</i> is most likely to be associated with anemia.	Doxycycline or a fluoroquinolone. " <i>Candidatus</i> <i>M. haemominutum</i> " may be refractory to antimicrobial treatment; fluoroquinolones may be more active against this species.
Systemic mycoses	Aspergillosis, sinonasal or sinoorbital	<i>Aspergillus</i> spp. (especially <i>Aspergillus fumigatus</i> ) <i>Neosartorya</i> spp.	Prognosis better for sinonasal disease	Itraconazole or itraconazole with amphotericin B; posaconazole. Do not use voriconazole to treat cats.
	Histoplasmosis	<i>Histoplasma capsulatum</i> .		Itraconazole with or without amphotericin B.
	Sporotrichosis	<i>Sporothrix schenckii</i> .		Itraconazole with or without amphotericin B; supersaturated potassium iodide is an alternative.

<sup>a</sup>These selections reflect personal opinion based on review of the literature, discussion with colleagues, and clinical experience. They are intended to guide drug selection when laboratory data are lacking. Laboratory data (Gram stain of exudate or aspirate, or culture and susceptibility test) should be used to guide drug selection if available. Selection may change once culture and drug susceptibility test results are known. See Greene, 2012, for additional information. (Greene C. Infectious Diseases of the Dog and Cat, 4th ed. St. Louis: Elsevier-Saunders.)