

**Table 31.1.** Antimicrobial drug selection for common conditions of sheep and goats.

Condition	Species Affected	Etiological Agent(s)	Recommended Treatment	Comments
<i>Infectious abortion</i> Enzootic abortion of ewes (EAE)	Sheep and goats	<i>Chlamydophila abortus</i>	Tetracycline Oxytetracycline Tylosin	Prophylaxis in high-risk flocks: tetracycline in feed for 6–8 weeks prior to breeding at a dose of 200–400 mg/head/day until lambbed. Outbreak: 400–500 mg/head/day tetracycline in feed until lambing finished. Poor efficacy if placental damage already present. Not recommended for dairy goats because of milk withdrawal. Vaccination or biosecurity should be considered. Outbreak or previous diagnosis: long-acting oxytetracycline at label dosage starting 6–8 weeks before start of lambing every 10–14 days until finished.
Campylobacter abortion (Vibriotic)	Sheep	<i>C. jejuni</i> <i>C. fetus</i> spp. <i>fetus</i>	Penicillin G-streptomycin; tetracycline Oxytetracycline (resistance commonly reported) Tylosin Sulfamethazine Oxytetracycline	Prophylaxis: injections of penicillin-streptomycin for 2–5 days. Antimicrobial susceptibility patterns should be established from any isolates. Vaccination in the face of an outbreak also very successful.
Listeria abortion	Sheep and goats	<i>L. monocytogenes</i>	Monensin Decoquinat	Injectable long-acting tetracycline to all animals at risk in the face of an outbreak.
Toxoplasma abortion	Sheep and goats	<i>T. gondii</i>		Mixed in feed at a dose of 15 mg/head/day from breeding to lambing. Mixed in feed or premix to feed at a dose of 2 mg/kg/day for last 14 weeks of gestation.
Salmonella abortion	Sheep and goats	<i>S. typhimurium</i> , <i>S. abortus ovis</i> , <i>S. montevideo</i> , <i>S. dublin</i>	IM or SC broad-spectrum antimicrobials	Often widespread by the time diagnosis is made. Requires culture and susceptibility testing. Antimicrobials may not eliminate organism; consider culling and environmental management.
Leptospira abortion	Sheep and goats	<i>L. hardjo</i> , <i>L. pomona</i>	Penicillin G-streptomycin; tetracyclines	Treat all pregnant animals at risk with injections.
Coxiellosis (Q fever)	Sheep and goats	<i>C. burnetii</i>	Tetracycline; (fluoroquinolone where permitted)	Abortions are more common in goats than in sheep. Long-acting injectable oxytetracycline (IM or SC) to all pregnant does every 10–14 days until kidded. Watch withdrawal for milk in dairy goats.
<i>Other infectious reproductive disorders</i> Metritis	Sheep and goats	<i>Trueperella pyogenes</i> , <i>E. coli</i> , mixed anaerobes including <i>Clostridium</i> spp.	Penicillin G, ceftiofur; broad-spectrum antimicrobials	Treat for 3–4 days after clinically normal. Uterine evacuation with prostaglandins and tetanus vaccination should also be considered.
Lamb epididymitis	Sheep	<i>H. somni</i> , <i>A. seminis</i> , <i>Corynebacterium pseudotuberculosis</i>	Oxytetracycline	Prophylaxis: low levels in feed in situations where rams intensively managed, or injectable long-acting oxytetracycline (IM or SC). Responds poorly to treatment.
Enzootic posthitis	Sheep and goats	<i>C. renale</i> group	Penicillin G; oxytetracycline	Remove from high-protein diet and treat locally with antibiotic ointments. May treat systemically for severe cases.

Brucella ovis ram epididymitis	Sheep	<i>Brucella ovis</i>	Oxytetracycline with dihydrostrepto-mycin	20 mg/kg oxytetracycline at 3-day intervals for 5 treatments and 12.5 mg/kg streptomycin 2 x/day for 7 days decreases shedding of bacteria and improves semen quality but may not cure. Should consider culling.
<i>Infectious diseases of lambs and kids, systemic</i>				
Enterotoxaemia/pulpy kidney	Sheep and goats	<i>C. perfringens</i> type C and D	Oral virginiamycin, penicillin G or bacitracin	Vaccinate all animals at risk. Withdraw carbohydrate source in diet, give C&D antitoxin and a balanced electrolyte solution (BES) parenterally.
Omphalophlebitis	Sheep and goats	<i>T. pyogenes</i> , <i>E. coli</i> , mixed anaerobes	Penicillin G; broad-spectrum antimicrobials	Antibiotic therapy alone not often effective. Local drainage and treatment and possibly surgical removal should be considered.
Watery mouth (lambs)	Sheep	Probable <i>E. coli</i> endotoxin	Oral amoxicillin; apramycin	Prevention by ensuring clean environment and good colostrum ingestion. Early prophylactic treatment with oral antibiotics.
Metabolic acidosis without dehydration (kids)	Goats	Unknown	Broad-spectrum antimicrobials	Isotonic bicarbonate solutions to correct acid-base deficit followed by balanced electrolyte solution (BES).
Tickborne fever (tick pyemia)	Sheep	<i>Anaplasma phagocytophilum</i> and/or <i>S. aureus</i>	Long-acting oxytetracycline	At 1–3 weeks of age and repeated at 5–7 weeks, in addition to dipping with an acaricide at those times.
Erysipelothrix polyarthrits	Sheep	<i>E. rhusiopathiae</i>	Penicillin G	Treat minimum of 3 days.
<i>Infectious diseases of lambs and kids, digestive</i>				
Colibacillosis	Sheep and goats	Enterotoxigenic <i>E. coli</i>	Broad-spectrum anti microbials parenterally	Appropriate diagnosis is necessary (culture and susceptibility testing), also treat with BES. Clean environment and adequate colostrum is important. Consider vaccination. Resistance to antimicrobials is common.
Salmonella dysentery	Sheep and goats	<i>S. typhimurium</i> and others	Broad-spectrum antimicrobials	Often poor efficacy due to unpredictable susceptibility patterns. May not eliminate carriers if host-adapted species.
Abomasitis/abomasal hemorrhage	Sheep and goats	<i>Clostridium</i> spp.	Oral penicillins	Rarely effective. Should treat symptomatically with antitoxins, non-steroidal anti-inflammatory drugs, and BES. Use polyvalent clostridial vaccine.
Coccidiosis	Sheep and goats	<i>Eimeria</i> spp.	Monensin; lasalocid; decoquimate; salinomycin; amprolium; or sulfonamides	Mixing should be done at a feed mill and all feeds pelleted. Some products can be mixed with salt. Dose varies with feed management. Artificially raised lambs/kids can be medicated via milk replacer. Feed from 2 weeks of age until market age. Ionophores toxic to horses and dogs.
<i>Infectious conditions of lambs and kids, respiratory</i>				
Pneumonic pasteurellosis	Sheep and goats	<i>M. haemolytica</i> , <i>P. multocida</i>	Tilmicosin; oxytetracycline; ceftiofur; florfenicol	Long-acting oxytetracycline, tilmicosin, or florfenicol can be used as a prophylaxis and during an outbreak therapeutically. Tilmicosin should not be used in goats (therapeutic dose very close to toxic dose). Ceftiofur for daily treatment of affected animals when meat or milk withdrawal is an issue (e.g., market lambs close to slaughter, lactating dairy sheep).
Pasteurella septicaemia	Sheep	<i>Bibersteinia trehalosi</i>	As with <i>M. haemolytica</i>	B. trehalosi shows more resistance and because the disease is peracute, vaccination is recommended for susceptible animals. (continued)

**Table 31.1. Antimicrobial drug selection for common conditions of sheep and goats. (continued)**

Condition	Species Affected	Etiological Agent(s)	Recommended Treatment	Comments
Necrotic laryngitis	Sheep and goats	<i>Fusobacterium necrophorum</i>	Penicillin G; oxytetracycline	
Mycoplasma pneumonia	Sheep and goats	<i>M. ovipneumoniae</i> , <i>M. arginini</i>	Oxytetracycline; tylosin	Often seen in conjunction with pasteurellosis (atypical pneumonia) or alone.
Mycoplasma mycoides	Goats	<i>M. mycoides</i> ss. <i>mycoides</i> large colony type	Oxytetracycline; lincomycin; or tylosin	Treatment of peracute septicaemia often ineffective. If goat survives, it will probably be a carrier.
<i>Infectious conditions of the integument</i>				
Pinkeye (infectious keratoconjunctivitis)	Sheep and goats	<i>C. psittaci</i> , <i>M. conjunctivae</i> , <i>R. conjunctivae</i> , <i>Neisseria</i>	Spiramycin; oxytetracycline; tiamulin IM	Spiramycin or oxytetracycline repeated days 1, 5, and 10; tiamulin repeated days 1, 3, 6, and 9. Oxytetracycline eye ointment. Conjunctival injection of penicillin (least effective).
Secondary infection of contagious ecthyma (Orf)	Sheep and goats	<i>S. aureus</i>	Tilmicosin; oxytetracycline; ampicillin	May also try local antimicrobials but wear gloves, as is a zoonosis.
Dermatomycosis (lumpy wool)	Sheep	<i>Dermatophilus congolensis</i>	Long-acting oxytetracycline	Decrease humidity (ventilation) if possible, and protect from rain. Powder sheep with powdered alum to help prevent reinfection.
Caseous lymphadenitis	Sheep and goats	<i>Corynebacterium pseudotuberculosis</i>	No effective treatment	Although susceptible to penicillin, not effective because of the thick abscess wall. Recommend cull infected animals and avoid opening abscesses as it spreads the pathogen.
<i>Infectious conditions of the foot and musculoskeletal system</i>				
Contagious foot rot	Sheep and goats	<i>D. nodosus</i> F. <i>necrophorum</i>	Long-acting oxytetracycline	10–20% zinc sulphate with 2% w/v sodium lauryl sulphate, as a foot bath with or without foot trimming. Must remain in bath 20 minutes. Repeat in 5–7 days. Can use in conjunction with systemic antimicrobials and/or vaccination. Cull chronic non-responders.
Foot scald	Sheep and goats	<i>F. necrophorum</i>		Zinc sulfate foot bath as above.
Strawberry foot rot	Sheep and goats	<i>D. congolensis</i>	As with lumpy wool	Verify that condition is not chorioretinitis.
Polyarthritis	Sheep and goats	<i>Chlamydophila pecorum</i>	Oxytetracycline	Poor response, may relapse.
Polyarthritis	Goats	<i>Mycoplasma mycoides</i> subsp. <i>mycoides</i> , LC other <i>Mycoplasma</i> spp.	Oxytetracycline; tylosin	Poor response, may relapse.
<i>Infectious conditions of the mammary gland</i>				
Gangrenous mastitis	Sheep and goats	<i>S. aureus</i> , <i>M. haemolytica</i>	Tilmicosin; broad-spectrum antimicrobials	Gland will be lost if animal survives, so should probably be culled.
Contagious agalactia	Sheep and goats	<i>M. agalactiae</i> , <i>M. mycoides</i> ss <i>mycoides</i> (goats)	Tetracyclines; tylosin	Probably ineffective; so animal should be culled. Carrier state likely.

Subclinical and clinical mastitis	Sheep and goats	<i>S. aureus</i> , <i>M. haemolytica</i> , environmental streptococci, coagulase-negative <i>Staphylococcus</i> spp.	Tilmicosin; cloxacillin; cephalirin benzathine; oxytetracycline	Dry treatment to be used at the end of lactation in dairy goats or at weaning for prevention of new infections in high-risk sheep flocks. Do not split tubes. Tilmicosin should not be used in goats (therapeutic dose very close to toxic dose).
<i>Infectious conditions of the oral cavity</i>				
Periodontal disease	Sheep	Many species	No effective treatment	
Tooth root abscess	Sheep and goats	Many species	Oxytetracycline; florfenicol; broad-spectrum antimicrobials fail.	4–6 weeks of therapy. Consider surgical intervention if antimicrobials fail.
Actinobacillosis	Sheep	<i>Actinobacillus lignieresii</i>	Sodium iodide	70 mg/kg as 10–20% solution every 2 weeks for 2–3 doses.
Actinomycosis	Sheep	<i>Actinomyces bovis</i>	Sodium iodide; sulfadimethoxine; isoniazid	As for actinobacillus. Treat for weeks to months. Prognosis poor.
<i>Infectious conditions of the urinary tract</i>				
Leptospirosis	Sheep and goats	<i>Leptospira interrogans</i>	Dihydrostreptomycin; oxytetracycline	Drugs are potentially nephrotoxic, questionable efficacy.
Cystitis	Sheep and goats	<i>Corynebacterium renale</i> , other species	Broad-spectrum antimicrobials	Therapy should be based on culture and sensitivity and should be given for 10–14 days.
<i>Infectious conditions of the nervous system</i>				
Bacterial meningitis	Sheep and goats	Many species	Broad-spectrum antimicrobials	Anti-inflammatory drugs important.
Listeriosis	Sheep and goats	<i>L. monocytogenes</i>	Oxytetracycline; penicillin G	Injectable long-acting formulation: 22,000–44,000 IU/kg IM twice per day. Broad-spectrum antimicrobials include: ampicillin-sulbactam, ceftiofur, fluoroquinolones, trimethoprim-sulfamethazine, or other potentiated sulfonamide combinations.

**Table 31.2** Common antimicrobial dosage regimens for sheep and goats. Many of the drugs listed are not approved for use in sheep and goats in the United States and elsewhere, so that their use constitutes extra-label drug use (ELDU). ELDU of feed additives is prohibited in the United States and fluoroquinolones are banned from ELDU in food-producing animals in the United States.

Drug	Route	Species	Dose Rate	Units	Frequency (h)
Amoxicillin-clavulanic acid	IV, IM	Sheep and goats	20	mg/kg	8
Amoxicillin trihydrate	IM	Sheep and goats	10	mg/kg	8
Ampicillin sodium	IV, IM	Sheep and goats	10–20	mg/kg	12
Amprolium	PO in feed or water	Sheep and goats	10–60	ppm	24, for 5–21 days for control; high dose 5 days for treatment
			10	mg/kg	
Ceftiofur sodium	IM	Sheep*	1.1–2.2	mg/kg	24, for 3 days
		Goats*	1.1–2.2	mg/kg	24, for 3 days
Chlortetracycline	PO	Sheep*	22	ppm	Daily during late gestation to prevent infectious abortion
		Goats	22	ppm	Daily during late gestation to prevent infectious abortion
Decoquinat	PO in feed	Sheep and goats	25–100	ppm	Daily in feed for period of coccidiosis risk
			0.5	mg/kg	Daily during gestation to prevent T. gondii abortion
Danofloxacin	IM, SC	Sheep and goats	1.25	mg/kg	24 3–5 days
Enrofloxacin	IV, IM	Sheep and goats	5	mg/kg	24
Erythromycin	IM	Sheep and goats	3–5	mg/kg	8–12 up to 5 days
Florfenicol	IM, SC	Sheep and goats	20 (IM), 40 (SC)	mg/kg	48(IM) 96(SQ)
Gamithromycin	SQ	Sheep and goats	6	mg/kg	
Lasalocid	PO in feed	Sheep and goats	30	ppm	Daily in feed for period at risk
			1	mg/kg	
Lincomycin hydrochloride	IM	Sheep and goats	10–20	mg/kg	12–24
Marbofloxacin	SC, IM	Sheep and goats	2	mg/kg	24
Monensin	PO in feed	Sheep and goats	11–22	ppm	Daily in feed for period of coccidiosis risk
			1	mg/kg	Daily during gestation for prevention of T.gondii
Neomycin sulfate	PO in feed or water	Sheep and goats	22	mg/kg	24 for up to 14 days

Oxytetracycline	PO in feed	Sheep* and goats	22	ppm	
Oxtetracycline hydrochloride	IV, IM	Sheep* and goats	10	mg/kg	12-24
Oxytetracycline long-acting	IM	Sheep and goats	20	mg/kg	48-72
Penicillin G potassium or sodium	IV	Sheep and goats	20,000-40,000	IU/kg	6
Penicillin G procaine	IM	Sheep* and goats	20,000-40,000	IU/kg	12
Salinomycin	PO in feed	Sheep and goats	11-16	ppm	In feed for period of risk
Sulfonamides	PO in water	Sheep* and goats	50 (loading 100)	mg/kg	24
Tilmicosin	SC	Sheep* Goats	10	mg/kg	Single treatment Do not use due to toxicity
Trimethoprim-sulfonamide	IM	Sheep and goats	24-30	mg/kg	24
Tulathromycin	SC	Sheep and goats	2.5	mg/kg	Single treatment
Tylosin	IM	Sheep and goats	20	mg/kg	12

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