# Canadian Veterinary Medical Association Antimicrobial Prudent Use Guidelines 2008

for beef cattle, dairy cattle, poultry, and swine



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# GLOSSARY

**Antibiotic** — a substance produced by a microorganism and/or by chemical synthesis that possesses the following characteristics:

1. It has the capacity, in dilute solutions, to inhibit the growth of or to kill the microorganisms that harm another organism (e.g., an animal) but has no toxic effect on the latter.
2. It is used with the purpose of selectively eliminating the microorganisms in close contact with the harmed organism (this process is named "antibiosis").

**Antibiotic resistance** — a property of bacteria that confers the capacity to inactivate or exclude antibiotics or a mechanism that blocks the inhibitory or killing effects of antibiotics. Or the ability of bacteria to resist or overcome the deleterious effects of an antibiotic

**Antimicrobial agent** — a substance that kills or suppresses the multiplication of any kind of microscopic organism (i.e., bacteria, virus, fungi, protozoan, mange, etc.). As there is no specification of harmlessness for the host, this term includes all antibiotics, ionophores and arsenicals, disinfectants and antiseptic agents. This term is used preferably with respect to resistance genes, some of which may act on different classes of substances.

Narrow spectrum antimicrobial — an antimicrobial effective against a limited number of bacterial genera; often applied to an antimicrobial active against either gram-positive or gram-negative bacteria.

Broad spectrum antimicrobial — an antimicrobial effective against a large number of bacterial genera; generally describes antibiotics effective against both gram-positive and gram-negative bacteria.

**Antimicrobial resistance** — is the result of microbes changing in ways which diminish or inhibit the effectiveness of drugs or chemicals used to cure or prevent infections.

**Compounding** — the combining or mixing together of two or more ingredients (of which at least one is a drug or pharmacologically active component) to create a final product in an appropriate form for dosing. It can involve the use of raw chemicals or the alteration of the form and strength of commercially available products. It can include reformulation to allow for a novel drug delivery. Compounding does not include mixing, reconstituting, or any other manipulation that is performed in accordance with the directions for use on an approved drug's labeling material.

**Extra-label use** — actual or intended use of a drug in an animal in a manner that is not in accordance with the approved labeling. This includes, but is not limited to, use in species not listed in the labeling, use for indications (disease or other conditions) not listed in the labeling, use at dosage levels, frequencies, or routes of administration other than those stated in the labeling, and deviation from the labeled withdrawal time based on these different uses.

**Immunization** — the process of rendering a subject immune or of becoming immune, either by conventional vaccination or exposure.

**Monitoring** — monitoring includes periodic health surveillance of the population or individual animal examination.

**Swine stage of Production**

Nursery - weaning to 20 – 30 kg (55 – 65 lb)
Growers - 25 – 45 kg (55 – 100 lb)
Finishers - 45 kg (100 lb) to market weight

**Therapeutic** — treatment, control, and prevention of bacterial disease.

**Veterinary–Client–Patient Relationship (VCPR)** — A VCPR exists when all of the following conditions have been met:

1. The veterinarian has assumed the responsibility for making clinical judgments regarding the health of the animal(s) and the need for medical treatment, and the client has agreed to follow the veterinarian's instructions.
2. The veterinarian has sufficient knowledge of the animal(s) to initiate at least a general or preliminary diagnosis of the medical condition of the animal(s). This means that the veterinarian has recently seen and is personally acquainted with the keeping and care of the animal(s) by virtue of an examination of the animal(s) or by medically appropriate and timely visits to the premises where the animal(s) are kept.
3. The veterinarian is readily available for follow-up evaluation, or has arranged for emergency coverage, in the event of adverse reactions or failure of the treatment regimen.

# Preamble

**1** These treatment guidelines are exclusively for the use of veterinarians to be used under an existing and valid "Veterinary – Client – Patient Relationship" (VCPR). **They are in no way meant to provide laypersons with direction on how to administer antimicrobials to animals.**

**2** The Prudent Use Guideline Treatment Tables are meant to provide guidance to veterinarians for antimicrobial selection, but are in no way meant to replace the veterinarian's professional judgment and expertise. **Only the herd veterinarian can and should decide, based on the case history, physical examination, diagnostic test results, and treatment history what is the most prudent antibiotic to select on a case or herd basis.**

**3** These antimicrobial treatment guidelines are intended to be used as a tool by veterinarians in the antimicrobial selection decision-making process. **They are in no way meant to be prescriptive, or to become a "standard of care" enforced by a veterinary regulatory body.** The development of these guidelines has not been undertaken with a view to reviewing any issues relating to the standard of veterinary care applicable in any particular jurisdiction and do not purport to establish any standard whatsoever.

**4** The information in these guidelines is limited to the scientific evidence and the antimicrobial drugs approved at the time of publication (September 2008), new research and antimicrobial drug approvals may become available after publication.

**5** Although it is recognized that antimicrobials can be prescribed by veterinarians for growth promotion and metaphylaxis, the scope of these guidelines is to provide guidance for the prudent antimicrobial treatment of common bacterial diseases.

**6** The antimicrobials listed in the treatment tables are not in a "usage preference order." They are divided into categories based on the Veterinary Drug Directorate's "Categorization of Antimicrobial Drugs Based on Importance in Human Medicine" – See Appendix . Within these groupings, they are listed in alphabetical order.

**7** As stated in each species' "Guidelines on the Prudent Use of Antimicrobial Drugs," the labeled antimicrobial should be selected first unless there is evidence to support efficacy, dosage regimen, indication and withdrawal times for extra-label drug use. **If an antimicrobial is selected that is an extra-label use, the veterinarian must provide, in writing, the appropriate information on dose, route, frequency, duration and withdrawal time to avoid a risk to food safety. The Canadian Global Food Animal Residue Avoidance Database (www.cgfarad.usask.ca) should be consulted for residue avoidance information when antimicrobials are used in an extra-label manner.** It is recommended that veterinary practitioners document the extra-label use of antimicrobials and that they obtain the "informed consent" of the owner after any risks have been explained.

**8** For some species, different management and handling systems exist that influence the antimicrobial that has been recommended. For example, similar diseases affect both beef and dairy cattle, but management differences preclude them from being treated using the same antimicrobial treatment regimens.

**9** The bacterial diseases selected for the given species are not meant to be an exhaustive list of all bacterial diseases a species may encounter. It is a list of the most common bacterial diseases faced by veterinary practitioners in Canada.

**10** It is recognized that a full portfolio of pharmacologic data and high-quality clinical trials in peer-reviewed publications to support evidence-based medicine is frequently lacking in veterinary medicine.

**11** The Canadian Global Food Animal Residue Avoidance Database CgFARAD (www.cgfarad.usask.ca ) is an integral part of these Prudent Use Guidelines. The CVMA, along with other veterinary, animal health industry, and livestock commodity groups should help seek and/or contribute to adequate and permanent sustainable funding of CgFARAD.

# CVMA Antimicrobial Prudent Use Guidelines 2008

## Beef Cattle

# CVMA Guidelines on the Prudent Use of Antimicrobial Drugs in Beef Cattle

**1** Veterinarians should assist their clients in the design and implementation of management, health, and housing programs that will reduce the incidence of infectious disease, and decrease the need for the use of antimicrobial drugs. Specifically, veterinarians should discuss with their clients:

- **a.** Management, including animal husbandry practices, animal housing, and hygiene in order to reduce exposure to infectious disease agents.
- **b.** The health status of individual animals and the herd, including the role of general and specific immunity in preventing infectious diseases, the sources and modes of transmission of common infectious organisms, the importance of concurrent infections and other factors that contribute to the development of infectious disease, and the impact of disease on growth and productivity.
- **c.** Housing, including, space required for cattle as they grow, bedding, ventilation, and exposure to weather and other environmental factors that could contribute to reduced health and the development of infectious diseases.
- **d.** Nutrition, including the importance of water, protein, energy, and micronutrient intake to overall health and productivity.

**2** Where appropriate, and where scientifically and medically valid, veterinarians should consider alternative therapeutic options prior to initiating antimicrobial therapy, or as an adjunct to antimicrobial therapy to reduce duration of treatment with antimicrobials. Examples include:

- **a.** Supportive care (electrolyte therapy).
- **b.** Symptomatic care (anti-inflammatory therapy).

**3** Veterinarians should dispense and prescribe antimicrobials only within the confines of a valid veterinary–client–patient relationship (VCPR). See the glossary (pg. 2) for definition of VCPR as it appears in the CVMA Guidelines on the Prudent Use of Antimicrobial Drugs.

**4** Veterinarians should select and use antimicrobial drugs properly.

- **a.** Veterinarians should optimize therapeutic antimicrobial use by using current pharmacological information and principles, including:
  - i. consulting package inserts for information,
  - ii. participating in continuing education programs that deal with antimicrobial use and antimicrobial resistance issues, and
  - iii. not compounding antimicrobial drugs or not using combination therapies of antimicrobials that are not approved. Cost should not be considered as justification for using compounded antimicrobial drugs.
- **b.** Veterinarians should confine therapeutic antimicrobial use to appropriate clinical indications.
  - i. veterinarians should strive to distinguish diseases caused by bacteria from diseases caused by parasitism, mycotoxicoses, nutritional imbalances, and viral infections, with the recognition that secondary bacterial infections frequently associated with these conditions may require antimicrobial therapy.
- **c.** Veterinarians should use history, clinical signs, and previous on-farm experience, together with culture and sensitivity results where indicated, to aid in the selection of antimicrobials.
  - i. veterinarians should utilize appropriate reference materials for proper procedures and accurate interpretation of susceptibility results, such as the NCCL S publication M3 I–A2, Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated from Animals; Approved Standard.
- **d.** Veterinarians should use antimicrobials that are considered important in treating refractory infections in humans or animals only after careful review and justification.
- **e.** Veterinarians should minimize the use of therapeutic antimicrobials by treating only for as long as needed and at the dose required to achieve the desired clinical response. The use of antimicrobials in chronic, nonresponsive clinical cases should be discouraged.

**f.** Veterinarians should limit therapeutic antimicrobial administration to ill animals or those at risk, and treat the fewest animals indicated. When deciding whether or not to initiate treatment at the group level veterinarians should consider the following factors:

i. the infectious organisms suspected to be associated with the disease,
ii. group morbidity and mortality rates, and
iii. history of therapeutic antimicrobial use in the farm.

**g.** Veterinarians should minimize the risk of environmental contamination with antimicrobials by:

i. ensuring that water medicators and feeders are properly adjusted to deliver the desired dose and to avoid spillage and waste,
ii. recommending that proper and adequate flushing methods are used at the feed mill after the preparation of a medicated feed batch, and
iii. ensuring that feed handling practices are implemented to minimize the risk of cross-contamination between medicated and non-medicated feeds during storage and delivery, and to minimize the risk that a medicated feed be fed to unintended animals.

**h.** Veterinarians should encourage producers to maintain accurate written or computerized records of treatments employed and treatment outcomes in order to evaluate the efficacy of selected therapeutic regimens by:

i. ensuring accurate animal or group identification within a production system for effective residue avoidance,
ii. monitoring compliance with recommended treatment regimens by reviewing pertinent records,
iii. consulting appropriate sources or databases reporting antimicrobial susceptibility and resistance trends.

**i.** Veterinarians should prescribe extra-label antimicrobial therapy only in accordance with Health Canada's Food and Drug Regulations.

i. Veterinarians should be aware that certain drugs are expressly prohibited for extra-label use in food animals or animals that are intended for human consumption.

**NOTE: For more information on extra-label drug use, refer to Health Canada's Food and Drug Regulations, Section C.08.012 (Sale of Medicated Feeds) and Section C.01.610.1 (Prohibited Drugs). For information on the use of hormonal growth promotants in veal calves refer to Canadian Food Inspection Agency Meat Hygiene Directive MHD 2004-41.**

ii. When prescribing extra-label use of drugs, veterinarians shall supply the producer with a written prescription that includes the withdrawal time. Veterinarians should determine an appropriate withdrawal time by considering the pharmacodynamics and pharmacokinetics of the drug. Veterinarians prescribing extra-label use of drugs may obtain a recommendation for a withdrawal time based on available information contained in the CgFARAD database by calling the global Food Animal Residue Avoidance Database (CgFARAD) at 1-866- CGFARAD, by e-mailing cgfarad@umontreal.ca, or through the Web site at cgfarad@usask.ca. A written record of any such consultation should be maintained.

**NOTE: For more information refer to the Canadian Food Inspection Agency Regulations: Examination, inspection, humane treatment and slaughter, packaging and labeling.**

**[SOR/94-683, s.4; SOR/2001-167, s.10]**

**Antemortem examination, antemortem inspection and humane treatment and slaughter of food animals [SOR/2001-167, s.10], Sections 66(1), 66(2)(C) and the Canadian Food Inspection Agency, Meat Hygiene Manual of Procedures, Chapter 4. – Inspection Procedures, Dispositions, and Monitoring and Controls.**

**j.** Veterinarians should work with those responsible for the care of animals so that antimicrobials are used judiciously regardless of the distribution system through which the antimicrobial was obtained.

i. Proper farm use requires the oversight of a veterinarian in the decision-making process.

ii. Veterinarians should prescribe or dispense drug quantities appropriate to the production-unit size and expected need so that stockpiling of antimicrobials on the farm is avoided.

iii. Veterinarians are the primary source of information on the use of antimicrobials.

iv. Veterinarians should ensure that labels of antimicrobial drugs left on farms are accurate and complete.

v. Veterinarians should instruct farm personnel on the correct use of antimicrobials, the accurate diagnosis of common diseases, indications for antimicrobial use, dosage and dosage calculation, route of administration, withdrawal time, precautions, storage, handling and record-keeping.

vi. Veterinarians should provide accurate written guidelines for animal health practices to clients whenever possible to describe conditions and instructions for antimicrobial use on-farm.

## Beef Cattle Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Acute bovine interdigital necrobacillosis** ("pasture footrot") | *Fusobacterium necrophorum*; *Bacteroides* spp. ; *Porphyromonas* spp. | **Florfenicol:** 40 mg/kg SC as a single injection or 20 mg/kg IM repeated in 48 h. Meat withdrawal of 36 d following IM treatment and 55 d following SC treatment. | III | |
| | | **Oxytetracycline dihydrate:** 20 mg/kg by injection (route dependent on formulation of individual product used). Meat withdrawal of 21 to 48 d (dependent on product used and route of administration). | III | |
| | | **Procaine penicillin G** — Long-acting stable suspension: 20 mg/kg SC or IM as a single dose. If necessary the dose may be repeated in 72 h. Meat withdrawal of 14 d if administered SC. Meat withdrawal of 21 d if administered IM. | II | |
| | | **Tulathromycin:** 2.5 mg/kg, SC as a single dose. Meat withdrawal of 44 d | II | |
| | | **Ceftiofur hydrochloride:** 1.0 mg/kg IM or SC daily for 3-5 d; Meat withdrawal of 3 d. | I | |
| | | **Ceftiofur sodium:** 1.0 mg/kg, IM daily for 3 d; No meat withdrawal time. | I | |
| **Bacterial pneumonia undifferentiated respiratory disease** | *Mannheimia haemolytica* *Pasteurella multocida* *Histophilus somni* *Mycoplasma bovis* *Mycoplasma* spp. | **Florfenicol:** 40 mg/kg SQ or 20 mg/kg IM repeated in 48 h. Meat withdrawal of 36 d following im treatment, and 55 d following SQ treatment. | III | |
| | | **Oxytetracycline dihydrate:** 20 mg/kg by injection (route dependent on formulation of individual product used); Meat withdrawal of 21 to 48 days (dependent on product used and route of administration) | III | |

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Bacterial pneumonia undifferentiated respiratory disease** *(continued)* | *Mannheimia haemolytica*<br>*Pasteurella multocida*<br>*Histophilus somni*<br>*Mycoplasma bovis*<br>*Mycoplasma* spp.<br>*(continued)* | **Oxytetracycline hydrochloride:** 6.7 mg/kg by injection, once daily for 2-3 d (route dependent on formulation of individual product used); Meat withdrawal of 18 d. | II | The bacteriostatic action of oxytetracycline HCl may require ELDU in the form of increased duration of treatment (1). Consult CgFARAD for residue avoidance information. |
| | | **Tilmicosin:** 10 mg/kg, SC as a single dose. Meat withdrawal of 28 d. | II | |
| | | **Trimethoprim-sulphadoxine:** 16 mg/kg IM or IV daily for up to 5 d: Milk withdrawal of 96 h. Meat withdrawal of 10 d. | II | Based on pharmacokinetic and efficacy studies, a dose of 16 mg/kg BID or greater may be necessary to treat infections in cattle that are less than very sensitive to trimethoprim-sulpha (2–6). |
| | | **Tulathromycin:** 2.5 mg/kg, SC as a single dose. Meat withdrawal of 44 d. | II | |
| | | **Ceftiofur hydrochloride:** 1.0 mg/kg IM or SC daily for 3-5 d; Meat withdrawal of 3 d. | I | Ceftiofur has limited antimicrobial activity against *Mycoplasma* spp. |
| | | **Ceftiofur sodium:** 1.0 mg/kg, IM daily for 3 d; No meat withdrawal time. | I | Ceftiofur has limited antimicrobial activity against *Mycoplasma* spp. |
| | | **Ceftiofur crystalline free acid:** 6.6 mg/kg as a single subcutaneous injection in the middle third of the posterior aspect of the ear. Meat withdrawal of 3 d. | I | Ceftiofur has limited antimicrobial activity against *Mycoplasma* spp. |
| | | **Danofloxacin:** 6 mg/kg, SC. Meat withdrawal of 7 d. | I | |
| | | **Enrofloxacin:** 7.5–12.5 mg/kg SC, administered once or 2.5-5.0 mg/kg, SC repeated daily for 3 d. Meat withdrawal of 36 d. | I | |

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Diptheria/laryngitis** | *Histophilus somni*<br>*Fusobacterium necropherum* | **Florfenicol:** 40 mg/kg SC as a single injection or 20 mg/kg IM repeated in 48 h (4).<br>*Note: Extralabel drug use (indication) - consult CgFARAD for residue avoidance information.* | **III** | |
| | | **Oxytetracycline dihydrate:** 20 mg/kg by injection (route dependent on formulation of individual product used.<br>*Note: Extralabel drug use (indication) - consult CgFARAD for residue avoidance information.* | **III** | |
| | | **Oxytetracycline hydrochloride:** 6.7 mg/kg by injection, once daily for 2-3 d. (route dependent on formulation of individual product used). Meat withdrawal 18 d. | **III** | The bacteriostatic action of oxytetracycline HCl may require ELDU in the form of increased duration of treatment (1). Consult CgFARAD for residue avoidance information. |
| | | **Tulathromycin:** 2.5 mg/kg, SC as a single dose (7).<br>*Note: Extralabel drug use (indication) - consult CgFARAD for residue avoidance information.* | **II** | |
| | | **Procaine penicillin G:** 15 000-21 000 IU/kg IM, daily for up to 5 days. Meat withdrawal of 10 d. | **II** | |
| | | **Procaine penicillin G** — Long-acting stable suspension: 20 mg/kg SC or IM as a single dose. If necessary, the dose may be repeated in 72 hours. Meat withdrawal of 14 d if administered SC. Meat withdrawal of 21 d if administered IM. | **II** | |

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Enteritis - neonatal** (if signs of systemic illness are present) | *Escherichia coli; Salmonella* spp. | **Trimethoprim-sulphadoxine:** 16-30 mg/kg IM or IV twice daily for up to 5 d. *Note: Extralabel drug use (dose) - consult CgFARAD for residue avoidance information.* | II | The bacteriostatic action of oxytetracycline HCl may require ELDU in the form of increased duration of treatment (1). Consult CgFARAD for residue avoidance information |
| | | **Ceftiofur hydrochloride or sodium:** 2.2 mg/kg IM twice daily for 5 d, or 5 mg/kg IM once daily for 5 d. *Note: Extra-label drug use (indication, dose) — consult CgFARAD for residue avoidance information.* | I | Dosage recommendations for ceftiofur are based on published pharmacokinetic, pharmacodynamic and bacterial MIC studies. Ceftiofur has been used experimentally at the extra-label dose of 5 mg/kg daily in the treatment of Salmonella infection of calves (8–12). |
| **Infectious bovine keratoconjunctivitis (IBK)** (mild clinical signs, no corneal vascularization) | *Moraxella bovis* | **General Note:** *Topical applications of intrammamary antimicrobial preparations have been used to treat IBK, but there are no supportive studies in the literature using intramammary products available in Canada.* *Clinical cases that progress to moderate or severe (corneal vascularization, ulceration) may require more aggressive veterinary intervention (14).* | | |
| | | **Florfenicol:** 40 mg/kg SC as a single injection or 20 mg/kg IM repeated in 48 h. Meat withdrawal of 36 d following IM treatment and 55 d following SC treatment. | III | |
| | | **Oxytetracycline dihydrate:** 20 mg/kg by injection (route dependent on formulation of individual product used), withdrawal 21 to 48 d (dependent on product used and route of administration). | III | |
| | | **Tulathromycin:** 2.5 mg/kg SC as a single dose (13). Meat withdrawal of 44 d. | II | |

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Listeriosis** | *Listeria monocytogenes* | **General Note:** *For clinical listeriosis cases exhibiting nerological signs, ELDU IV oxytetracycline or crystalline penicillin may be the preferred route when treatment is commenced (1).*<br>*Extended duration of therapy (1-2 wk) may be required to reduce the incidence of recurrence (1).* | | |
| | | **Oxytetracycline dihydrate:** 20 mg/kg injectable (route dependent on formulation of individual product used)<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | III | The bacteriostatic action of oxytetracycline HCl may require ELDU in the form of increased duration of treatment (1). Consult CgFARAD for residue avoidance information |
| | | **Oxytetracycline hydrochloride:** 6.7 mg/kg by injection once daily for 2-3 d (route dependent on formulation of individual product used.<br>*Note: Extra-label drug use (indication) – Consult CgFARAD for residue avoidance information.* | III | |
| | | **Procaine penicillin G:** 21 000 IU/kg IM daily for up to 5 d.<br>*Note: Extra-label drug use (indication) – Consult CgFARAD for residue avoidance information.* | II | |
| **Neonatal septicemia**<br>(Often a complication of FPT, enteritis, navel ill, etc.) | *Escherichia coli; Salmonella* spp. *multiple species* | **Trimethoprim-sulphadoxine:** 16-30 mg/kg IM or IV twice daily for up to 5 d.<br>*Note: Extra-label drug use (dose) - consult CgFARAD for residue avoidance information.* | II | Based on pharmacokinetic and efficacy studies, a dose of 16 mg/kg BID or greater may be necessary to treat infections in cattle that are less than very sensitive to trimethoprim-sulpha (1–6). |
| | | **Ceftiofur hydrochloride or sodium:** 2.2 mg/kg IM twice daily for 5 d, or 5 mg/kg IM once daily for 5 d.<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information.* | II | Dosage recommendations for ceftiofur are based on published pharmacokinetic, pharmacodynamic and bacterial MIC studies. Ceftiofur has been used experimentally at the extra-label dose of 5 mg/kg daily in the treatment of *Salmonella* infection of calves (8–12). |

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Neonatal septicemia** (often a complication of FPT, enteritis, navel ill, etc.) *(continued)* | *Escherichia coli; Salmonella* spp. *multiple species* ***(continued)*** | **Danofloxacin:** 6 mg/kg subcutaneously. Treatment should be repeated once approximately 48 h following the first injection. *Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | I | The fluorquinolone label advises that this class of antimicrobials should not be used in veal calves or dairy cattle. |
| | | **Enrofloxacin:** 7.5–12.5 mg/kg as a single subcutaneous dose, or 2.5–5.0 mg/kg subcutaneously every 24 h for 3 d. For animals that are clinically improved but still exhibit some signs of disease, additional treatments may be given on days 4 and 5. *Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | I | |
| **Otitis media** | *Pasteurella multocida; Histophilus somni; Mannheimia hemolytica; Mycoplasma* spp. | **Florfenicol:** 40 mg/kg SC as a single injection or 20 mg/kg IM repeated in 48 h (16). Meat withdrawal of 36 d following IM treatment and 55 d following SC treatment. *Note: Extra-label drug use (indication) - consult CgFARAD for residue avoidance information.* | III | |
| | | **Oxytetracycline dihydrate:** 20 mg/kg by injection (route dependent on formulation of individual product used). Meat withdrawal of 21 to 48 d (dependent on product used and route of administration). *Note: Extra-label drug use (indication) - consult CgFARAD for residue avoidance information.* | III | |

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Otitis media** *(continued)* | *Pasteurella multocida; Histophilus somni; Mannheimia hemolytica; Mycoplasma* spp. ***(continued)*** | **Oxytetracycline hydrochloride:** 6.7 mg/kg by injection once daily for 2–3 d (route dependent on formulation of individual product used). *Note: Extra-label drug use (indication) - consult CgFARAD for residue avoidance information.* | **III** | The bacteriostatic action of oxytetracycline HCl may require ELDU in the form of increased duration of treatment (1). Consult CgFARAD for residue avoidance information |
| | | **Tilmicosin:** 10 mg/kg, SC as a single dose (1). *Note: Extra-label drug use (indication) - consult CgFARAD for residue avoidance information.* | **II** | |
| | | **Tulathromycin:** 2.5 mg/kg SC as a single dose (1). *Note: Extra-label drug use (indication) - consult CgFARAD for residue avoidance information.* | **II** | |
| | | **Enrofloxacin:** 7.5-12.5 mg/kg SC, administered once or 2.5–5.0 mg/kg, SC repeated daily for 3 days (1,10,15). *Note: Extra-label drug use (indication) - consult CgFARAD for residue avoidance information.* | **I** | |
| **Thromboembolic meningoencephalitis** ("TEME") | *Histophilus somni* | **General Note:** *Extended duration of therapy (1–2 wk) may be required to reduce the incidence of disease recurrence (1).* | | |
| | | **Oxytetracycline dihydrate:** 20 mg/kg by injection (1) (route dependent on formulation of individual product used). *Note: Extra-label drug use (indication) - consult CgFARAD for residue avoidance information.* | **III** | |
| | | **Florfenicol:** 40 mg/kg SC as a single injection or 20 mg/kg IM repeated in 48 h (1,16). *Note: Extra-label drug use (indication) - consult CgFARAD for residue avoidance information.* | **III** | Pharacokinetic studies indicate florfenicol should be given IV and at more frequent dosing intervals to achieve MICs in CSF for H. somni in calves (16). |

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Thromboembolic meningoencephalitis** ("TEME") *(continued)* | *Histophilus somni (continued)* | **Tilmicosin:** 10 mg/kg SC as a single dose. *Note: Extra-label drug use (indication) - consult CgFARAD for residue avoidance information.* | II | |
| | | **Trimethoprim-sulphadoxine:** 16–30 mg/kg IM or IV twice daily for up to 5 days. *Note: Extra-label drug use (dose) - consult CgFARAD for residue avoidance information.* | II | |
| | | **Tulathromycin:** 2.5 mg/kg SC as a single dose. *Note: Extra-label drug use (indication) - consult CgFARAD for residue avoidance information.* | II | Based on pharmacokinetic and efficacy studies, a dose of 16 mg/kg BID or greater may be necessary to treat infections in cattle that are less than very sensitive to trimethoprim-sulpha (1–6). |

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# CVMA Antimicrobial Prudent Use Guidelines 2008

## Dairy Cattle

# CVMA Guidelines on the Prudent Use of Antimicrobial Drugs in Dairy Cattle

The following are general guidelines for the prudent therapeutic use of antimicrobials in dairy cattle:

**1** Veterinarians should advise their clients on the design and implementation of immunization, housing, and nutritional programs that will reduce disease occurrence and spread, and thereby decrease the requirement for antimicrobial use.

**2** Veterinarians can dispense and prescribe antimicrobials only within the confines of a valid veterinarian-client-patient relationship (VCPR). A VCPR is valid only if the veterinarian has been on the farm within the last 12 months. A producer may have a VCPR with more than one veterinarian or veterinary practice. Veterinarians would limit prescribing and dispensing activities to cover only the type of service they were currently providing to a particular operation. The prescribing veterinarian would undertake full responsibility for the animals for which the prescription or treatment recommendation was made.

For example, a veterinarian doing only reproductive work in a herd, would not prescribe and dispense antimicrobials for treatment of sick calves unless he/she has specifically examined these animals and is undertaking full responsibility for their ongoing care and is available as needed for effective follow-up.

**3** Veterinarians should select and use antimicrobial drugs properly.

3.1 Veterinarians are responsible for remaining current on information concerning antimicrobials, their usage and the risks attached to their usage in food animal treatment, either through continuing education programs or evaluation of the scientific literature.

The frequency and nature of participation in continuing education should be recommended by licensing organizations or made mandatory.

3.2 Veterinarians should advise against the use of antimicrobial drugs for the treatment of hopeless cases.

Diseases in dairy cattle which are unlikely to respond to antimicrobial therapy include chronic mastitis caused by *Staphylococcus. aureus, Nocardia, Mycoplasma, Enterobacter, Klebsiella* sp. and yeast. Chronic cases should be managed to reduce suffering, the risk of spread of infection to other animals, and to the risk of the sale of meat or milk of unacceptable quality.

3.3 Veterinarians should have strong evidence (based upon clinical signs, history, necropsy examination, laboratory data, and past experience) that a disease is caused by a bacterial pathogen, and knowledge of the likely identity of the target organism often associated with the condition on a particular operation.

3.4 Veterinarians should only use antimicrobial drugs for which there is an established meat and milk withdrawal period that is applicable to the way the products are to be used.

3.5 Veterinarians should use antimicrobial drugs labeled for the condition diagnosed whenever possible. The label dose and the route, frequency of administration, and the duration of treatment should be followed.

3.6 When a labeled product is not available for use, veterinarians should select an antimicrobial treatment that is appropriate for the target bacterium and the condition to be treated, and administer that treatment at a dosage and by a route that is most likely to achieve a cure.

3.7 Veterinarians should not use compounded antimicrobial formulations. Only under exceptional circumstances, when there are no labeled products available, and using only products with a drug identification number (DIN), should an antimicrobial be applied in a form different from its labeled recommendation.

3.8 Veterinarians should base antimicrobial drug selection and treatment regimens on scientific, peer-reviewed, and published data which should provide evidence for a clinical regimen that uses an antimicrobial in a manner different than that described on the label.

3.9 Where animal suffering is not a concern, antimicrobial therapy should be evaluated for the likelihood of a cure in comparison with the cost of the therapy. For example, subclinical mastitis reduces milk production but causes little animal suffering. Repeated antimicrobial treatments during lactation are often unsuccessful and result in costly milk discard, excessive antibiotic use, and greatly increase the risk of milk contamination with low levels of antimicrobials. Frequently subclinical mastitis is most effectively treated by use of a single intramammary antimicrobial treatment at the end of lactation.

3.10 Veterinarians should strive to use antimicrobial drugs of lesser importance in human medicine provided that this can be achieved while still protecting the health and safety of animals under their care and the milk or meat they produce. Veterinarians should strive to use antimicrobial drugs of lesser importance in human medicine provided that this can be achieved while still protecting the health and safety of animals under their care and the milk or meat they produce. See Appendix – Veterinary Drug Directorate's (VDD) Categorization of Antimicrobial Drugs Based on their importance in Human Medicine (Table 23 – Version November 30, 2006).

3.11 Veterinarians should use antimicrobial drugs to achieve specific clinical outcome(s), such as fever reduction, return of mastitic milk to normal, to reduce bacterial shedding, contagion, or recurrence of disease.

3.12 Veterinarians should periodically monitor herd pathogen susceptibility and therapeutic response, especially for routinely employed treatments (e.g., dry cow intramammary antibiotics), to detect changes in microbial susceptibility patterns and to reevaluate antimicrobial selections. Valid susceptibility testing methodology using a susceptibility determination based on a clinically validated breakpoint for cattle must be used. For example, Kirby-Bauer disc susceptibility testing is not a valid method for evaluating the likelihood of therapeutic success of most antimicrobials for bovine mastitis pathogens.

3.13 When they are likely to be most effective, veterinarians should employ prophylactic or metaphylactic use of antimicrobial drugs at a therapeutic dosage as standard practice. For example, "blanket" dry cow treatment (treatment of all cows at the end of lactation) will be an effective mastitis preventative provided the pathogens that commonly infect a particular herd are susceptible to the antibiotics labeled for dry cow treatment.

3.14 Veterinarians should protect drug integrity through proper handling, storage, and observation of the expiration date.

3.15 Veterinarians should dispose of antimicrobial drugs in a proper manner to reduce their exposure to the environment.

## 4 Veterinarians should ensure proper on-farm drug use.

4.1 Veterinarians should prescribe or dispense drug quantities appropriate to the production-unit size and expected need, so that stockpiling of antimicrobial drugs on the farm is avoided.

4.2 Veterinarians should provide written guidelines and train farm personnel who use antimicrobials on indications, dosages, withdrawal times, route of administration, injection site precautions, storage and handling. The veterinarian should ensure that product labels are accurate and complete.

4.3 The veterinarian should assist a producer to develop and maintain a treatment record system that identifies treated animals during the course of treatment and captures a permanent record of the dates, animal identification, treatment type, and treatment duration.

4.4 Where antimicrobials are to be administered by feed, veterinarians must provide a written prescription giving details about dosage, group signalment, mixing instructions and duration of use. Feed prescriptions should be reviewed at an appropriate interval depending on the indications, but no less frequently than once per year.

## Dairy Cattle Antimicrobial Treatment Guidelines for Select Bacterial Diseases

(Lactating dairy cattle and replacement heifers only – these treatment guidelines are not meant for veal calves)

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Acute bovine interdigital necrobacillosis** ("Pasture Footrot") | *Fusobacterium necrophorum; Bacteroides* spp.; *Porphyromonas* spp. | **Florfenicol:** 40 mg/kg SC as a single injection or 20 mg/kg IM repeated in 48 h. Meat withdrawal of 55 d after SQ treatment, 36 d after IM treatment. | III | This product must not be used in lactating dairy cattle. Use only in dairy cattle < 20 months of age. |
| | | **Oxytetracycline dihydrate:** 20 mg/kg injectable (route dependent on formulation of individual product used); Meat withdrawal of 21 to 48 d (dependent on product used and route of administration) | III | This product must not be used in lactating dairy cattle. Use only in dairy cattle < 20 months of age. |
| | | **Oxytetracycline hydrochloride:** 6.7 mg/kg by injection once daily for 2–3 d (route dependent on formulation of individual product used): Milk withdrawal 72 h. Meat withdrawal 18 d. | III | The bacteriostatic action of oxytetracycline HCl may require ELDU the form of increased duration of treatment (1). Consult CgFARAD for residue avoidance information. |
| | | **Procaine penicillin G:** 21 000 IU/kg IM daily for up to 5 d. Milk withdrawal of 96 h. Meat withdrawal of 10 d. | II | |
| | | **Procaine penicillin G — Long-acting stable suspension:** 20 mg/kg SC or IM as a single dose. If necessary the dose may be repeated in 72 h. Meat withdrawal of 14 d if administered SC. Meat withdrawal of 21 d if administered IM. | II | |
| | | **Trimethoprim-sulphadoxine:** 16 mg/kg IM or IV daily for up to 5 d: Milk withdrawal of 96 h. Meat withdrawal of 10 d. | II | Based on pharmacokinetic studies, a dose of 16–30 mg/kg BID or greater may be necessary to treat infections in cattle that are less than very sensitive to trimethoprim-sulpha (1–5). |
| | | **Tulathromycin:** 2.5 mg/kg, SC as a single dose. Meat withdrawal of 44 d. Not to be used in veal calves.. | II | This product must not be used in lactating dairy cattle. Use only in dairy cattle < 20 months of age. |
| | | **Ceftiofur hydrochloride:** 1.0 mg/kg IM or SC daily for 3–5 d; Milk withdrawal of 0 d. Meat withdrawal of 3 d. | I | |
| | | **Ceftiofur sodium:** 1.0 mg/kg IM daily for 3–5 d; Milk withdrawal of 0 d. Meat withdrawal of 0 d. | I | |

**Dairy Antimicrobial Treatment Guidelines for Select Bacterial Diseases**
(Lactating dairy cattle and replacement heifers only – these treatment guidelines are not meant for veal calves)

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Bacterial pneumonia undifferentiated respiratory disease** | *Mannheimia haemolytica*<br>*Pasteurella multocida*<br>*Histophilus somni*<br>*Mycoplasma bovis*<br>*Mycoplasma* spp. | **Florfenicol:** 40 mg/kg SC as a single injection or 20 mg/kg IM repeated in 48 h. Meat withdrawal of 55 d after SC treatment, 36 d after IM treatment. | III | This product must not be used in lactating dairy cattle. Use only in dairy cattle < 20 months of age. |
| | | **Oxytetracycline dihydrate:** 20 mg/kg injectable (route dependent on formulation of individual product used); Meat withdrawal of 21 to 48 d (dependent on product used and route of administration) | III | This product must not be used in lactating dairy cattle. Use only in dairy cattle < 20 months of age. |
| | | **Oxytetracycline hydrochloride:** 6.7 mg/kg by injection, once daily for 2–3 d (route dependent on formulation of individual product used); Milk withdrawal of 72 h. Meat withdrawal of 18 d. | III | The bacteriostatic action of oxytetracycline HCl may require ELDU in the form of increased duration of treatment (1). Consult CgFARAD for residue avoidance information. |
| | | **Tilmicosin:** 10 mg/kg SC as a single dose. Meat withdrawal of 28 d. | II | This product must not be used in lactating dairy cattle. Use only in dairy cattle < 20 months of age. |
| | | **Trimethoprim-sulphadoxine:** 16 mg/kg IM or IV daily for up to 5 d: Milk withdrawal of 96 h. Meat withdrawal of 10 d. | II | Based on pharmacokinetic and efficacy studies, a dose of 16 mg/kg BID or greater may be necessary to treat infections in cattle that are less than very sensitive to trimethoprim-sulpha (1–5). |
| | | **Tulathromycin:** 2.5 mg/kg SC as a single dose. Meat withdrawal of 44 d. Not to be used in veal calves. | II | This product must not be used in lactating dairy cattle. Use only in dairy cattle < 20 months of age. |
| | | **Ceftiofur crystalline free acid:** 6.6 mg/kg as a single subcutaneous injection in the middle third of the posterior aspect of the ear. Meat withdrawal of 3 d. | I | This product must not be used in lactating dairy cattle. Use only in dairy cattle < 20 months of age. |

**Dairy Cattle Antimicrobial Treatment Guidelines for Select Bacterial Diseases**
(Lactating dairy cattle and replacement heifers only – these treatment guidelines are not meant for veal calves)

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Bacterial pneumonia undifferentiated respiratory disease** *(continued)* | *Mannheimia haemolytica*<br>*Pasteurella multocida*<br>*Histophilus somni*<br>*Mycoplasma bovis*<br>*Mycoplasma* spp.<br>***(continued)*** | **Ceftiofur hydrochloride:** 1.0 mg/kg IM or SC daily for 3–5 d; Milk withdrawal of 0 d. Meat withdrawal of 3 d. | I | |
| | | **Ceftiofur sodium:** 1.0 mg/kg IM daily for 3–5 d; Milk withdrawal of 0 d. Meat withdrawal of 0 d. | I | |
| **Digital dermatitis** ("Hairy Heelwart" "Strawberry Footrot") | Unidentified. | **Tetracycline hydrochloride:** 2 g placed on bandage material and applied directly to affected area (6-7). *Note: Extra-label drug use (indication, route) – consult CgFARAD for residue avoidance information.* | III | |
| | | **Tetracycline hydrochloride:** 0.1 – 0.4% concentration in a topical footbath application (0.1% conc. = 6.3 X 100 g packages of tetracycline HCl – 25 g active ingredient per 100 g package – into 156 L of water. 0.4% conc. = 25.2 X 100 g packages of tetracycline HCl – 25g active ingredient per 100g package – into 156 L of water) (6-7). *Note: Extra-label drug use (indication, route, dose) — consult CgFARAD for residue avoidance information.* | III | |
| | | **Lincomycin hydrochloride:** 0.01% concentration in a topical footbath application (1 X 80 g package of soluble powder – 32 g active ingredient per 80 g package - into 280 L of water) (6-7). *Note: Extra-label drug use (indication, route, and dose) - consult CgFARAD for residue avoidance information.* | II | |

**Dairy Cattle Antimicrobial Treatment Guidelines for Select Bacterial Diseases**
(Lactating dairy cattle and replacement heifers only – these treatment guidelines are not meant for veal calves)

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Digital dermatitis** ("Hairy Heelwart" "Strawberry Footrot" *(continued)* | Unidentified. *(continued)* | **Lincomycin hydrochloride/Spectinomycin sulfate:** 0.05% concentration in a topical footbath (1 X 150 g package of soluble powder – 100 g active ingredient per 150 g package into 200 L of water) (6-7). *Note: Extra-label drug use (indication, route, dose) — consult CgFARAD for residue avoidance information.* | II | |
| **Enteritis - acute adult** | Invasive *Salmonella* sp. | **Trimethoprim-sulphadoxine:** 16–30 mg/kg IM or IV twice daily for up to 5 d (1). *Note: Extra-label drug use (dose) - consult CgFARAD for residue avoidance information.* | II | Based on pharmacokinetic MIC studies, a dose of 16–30 mg/kg BID or greater may be necessary to treat infections such as Salmonella in cattle that are less than very sensitive to trimethoprim-sulpha (1–5). |
| | | **Ceftiofur hydrochloride or sodium:** 2.2 mg/kg IM twice daily for 5 d (1,8). *Note: Extra-label drug use (indication, dose) — consult CgFARAD for residue avoidance information.* | I | Dosage recommendations for ceftiofur are based on published pharmacokinetic, pharmacodynamic and bacterial MIC studies (9–14). |
| **Enteritis - neonatal** (if signs of systemic illness are present) | *Eschericia coli* (enteropathogenic, invasive) *Salmonella* spp. | **Trimethoprim-sulphadoxine:** 16–30 mg/kg IM or IV twice daily for up to 5 days (1). *Note: Extra-label drug use (dose) - consult CgFARAD for residue avoidance information.* | II | Based on pharmacokinetic and efficacy studies, a dose of 16 mg/kg BID or greater may be necessary to treat infections in cattle that are less than very sensitive to trimethoprim-sulpha (1–5,15). |
| | | **Ceftiofur hydrochloride or sodium:** 2.2 mg/kg IM twice daily for 5 d, or 5 mg/kg IM once daily for 5 d. *Note: Extra-label drug use (indication, dose) — consult CgFARAD for residue avoidance information.* | I | Dosage recommendations for ceftiofur are based on published pharmacokinetic, pharmacodynamic and bacterial MIC studies. Ceftiofur has been used experimentally at the extra-label dose of 5 mg/kg daily in the treatment of Salmonella infection of calves (8–14). |

**Dairy Cattle Antimicrobial Treatment Guidelines for Select Bacterial Diseases**
(Lactating dairy cattle and replacement heifers only – these treatment guidelines are not meant for veal calves)

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Infectious bovine keratoconjunctivitis** (mild clinical signs, no corneal vascularization) | *Moraxella bovis* | **General Note:** *Topical applications of intrammamary antimicrobial preparations have been used to treat IBK, but there are no supportive studies in the literature using intramammary products available in Canada.* *Clinical cases of IBK that progress to moderate or severe (corneal vascularization, ulceration) may require more aggressive veterinary intervention (16).* | | |
| | | **Florfenicol:** 40 mg/kg SC as a single injection or 20 mg/kg IM repeated in 48 h. Meat withdrawal of 55 d after SQ treatment, 36 d after IM treatment. | III | This product must not be used in lactating dairy cattle. Use only in cattle < 20 months of age. |
| | | **Oxytetracycline dihydrate:** 20 mg/kg injectable (route dependent on formulation of individual product used) Meat withdrawal of 28 d. | III | This product must not be used in lactating dairy cattle. Use only in cattle < 20 months of age. |
| | | **Oxytetracycline hydrochloride:** 6.7 mg/kg by injection once daily for 2–3 d (1) (route dependent on formulation of individual product used). *Note: Extra-label drug use (indication) - consult CgFARAD for residue avoidance information.* | III | The bacteriostatic action of oxytetracycline HCl may require ELDU in the form of increased duration of treatment (1). Consult CgFARAD for residue avoidance information. |
| | | **Procaine penicillin G:** 21 000 IU/kg IM daily for up to 5 d (1). *Note: Extra-label drug use (indication) - consult CgFARAD for residue avoidance information.* | II | |
| | | **Tulathromycin:** 2.5 mg/kg SC as a single dose. Meat withdrawal of 44 d. Not to be used in veal calves (17). | II | This product must not be used in lactating dairy cattle. Use only in cattle < 20 months of age. |

**Dairy Cattle Antimicrobial Treatment Guidelines for Select Bacterial Diseases**
(Lactating dairy cattle and replacement heifers only – these treatment guidelines are not meant for veal calves)

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Listeriosis** | *Listeria monocytogenes* | **General Note:** *For clinical listeriosis cases exhibiting nerological signs, extra-label IV oxytetracycline or crystalline penicillin may be the preferred route when treatment is commenced (1).*<br>*Extended duration of therapy (1–2 weeks) may be required to reduce the incidence of recurrence (1). Consult CgFARAD for residue avoidance information.* | | |
| | | **Oxytetracycline dihydrate:** 20 mg/kg injectable (route dependent on formulation of individual product used)<br>*Note: Extralabel drug use (indication) – consult CgFARAD for residue avoidance information.* | III | This product must not be used in lactating dairy cattle. Use only in cattle < 20 months of age |
| | | **Oxytetracycline hydrochloride:** 6.7 mg/kg by injection once daily for 2–3 d (route dependent on formulation of individual product used.<br>*Note: Extralabel drug use (indication) - consult CgFARAD for residue avoidance information.* | III | The bacteriostatic action of oxytetracycline HCl may require ELDU in the form of increased duration of treatment (1). Consult CgFARAD for residue avoidance information. |
| | | **Procaine penicillin G:** 21 000 IU/kg IM daily for up to 5 d (1).<br>*Note: Extra-label drug use (indication) - consult CgFARAD for residue avoidance information.* | II | |

**Dairy Cattle Antimicrobial Treatment Guidelines for Select Bacterial Diseases**
(Lactating dairy cattle and replacement heifers only – these treatment guidelines are not meant for veal calves)

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Mastitis – gram-negative, severe** (signs of systemic illness present) | *Escherichia coli* *Klebsiella* sp. | **General Note:** *Cows with systemic clinical signs of severe gram-negative mastitis should receive other appropriate therapy in addition to antimicrobial therapy under direction of a licensed veterinarian.* | | |
| | | **Oxytetracycline hydrochloride:** 6.7 mg/kg by injection once daily for 2–3 d (route dependent on formulation of individual product used): Milk withdrawal 72 h. Meat withdrawal 18 d. | III | The bacteriostatic action of oxytetracycline HCl may require ELDU in the form of increased duration of treatment (1). Consult CgFARAD for residue avoidance information. |
| | | **Trimethoprim-sulphadoxine:** 16-30 mg/kg IM or IV daily for up to 5 d (1). *Note: Extra-label drug use (indication, dose) — consult CgFARAD for residue avoidance information.* | II | Based on pharmacokinetic and efficacy studies, a dose of 16–30 mg/kg BID or greater may be necessary to treat infections in cattle that are less than very sensitive to trimethoprim-sulpha. In some mastitis research trials doses as high as 48 mg/kg SID to BID have been used (1–5). |
| | | **Ceftiofur hydrochloride:** Infuse intramammary one disposable syringe per affected quarter. Repeat this treatment once after a 24 h interval. Milk withdrawal of 96 h. | I | |
| | | **Ceftiofur hydrochloride:** 2.2 mg/kg IM or SC daily for 5 d. *Note: Extra-label drug use (indication, dose) — consult CgFARAD for residue avoidance information.* | I | Although the efficacy has not been established, there is some evidence to suggest that the extra-label administration of ceftiofur at 2.2 mg/kg daily for 5 d may improve survival rates for cows with severe coliform mastitis by controlling bacteremia (18). |
| | | **Ceftiofur sodium:** 2.2 mg/kg IM daily for 5 d. *Note: Extra-label drug use (indication, dose) - consult CgFARAD for residue avoidance information.* | I | Although the efficacy has not been established, there is some evidence to suggest that the extra-label administration of ceftiofur at 2.2 mg/kg daily for 5 d may improve survival rates of cows with severe coliform mastitis by controlling bacteremia (18). |

**Dairy Cattle Antimicrobial Treatment Guidelines for Select Bacterial Diseases**
(Lactating dairy cattle and replacement heifers only – these treatment guidelines are not meant for veal calves)

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Mastitis – gram-positive** | *Streptococcus agalactiae*<br>*Streptococcus uberis*<br>*Streptococcus dysgalactiae* | **General Note:** *Under specific conditions, ELDU of these listed antimicrobials in the form of increased duration of treatment ("extended therapy") may be more prudent than the labeled duration of therapy (21–25)* | | |
| | | **Cephapirin sodium:** Infuse intramammary one disposable syringe per affected quarter. Repeat only once in 12 h: Milk withdrawal of 96 h. Meat withdrawal of 4 d. | II | |
| | | **Erythromycin:** Infuse intramammary one disposable syringe per affected quarter. Repeat after each milking for a total of three consecutive infusions. Milk withdrawal of 36 h. | II | |
| | | **Pirlimycin hydrochloride:** Infuse intramammary one disposable syringe per affected quarter. Repeat this treatment once after a 24-h interval (1,19,20)<br>*Note: Extra-label drug use (indication) – Consult CgFARAD for residue avoidance information.* | II | |
| | | **Ceftiofur hydrochloride:** Infuse intramammary one disposable syringe per affected quarter. Repeat this treatment once after a 24-h interval. Milk withdrawal of 96 h. | I | |
| | | **Procaine penicillin G/Streptomycin/Novobiocin/ Polymyxin B/Cortisone:** Infuse intramammary one disposable syringe per affected quarter. Repeat once after a 24-h period if necessary: Milk withdrawal of 72 h. Meat withdrawal of 24 d. | I | There is insufficient residue depletion information available to CgFARAD to allow for a meat withdrawal recommendation to be made when this product is used extra-label, and therefore, this practice is discouraged. |

**Dairy Antimicrobial Treatment Guidelines for Select Bacterial Diseases**
(Lactating dairy cattle and replacement heifers only – these guidelines are not meant for veal calves)

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| | *Staphylococcus aureus* | **General Note:** *Under specific conditions, ELDU of these listed antimicrobials in the form of increased duration of treatment ("extended therapy") may be more prudent than the labeled duration of therapy (21-25)* | | |
| | | **Cephapirin sodium:** Infuse intramammary one disposable syringe per affected quarter. Repeat only once in 12 h: Milk withdrawal of 96 h. Meat withdrawal of 4 d. | II | |
| | | **Pirlimycin hydrochloride:** Infuse intramammary one disposable syringe per affected quarter. Repeat this treatment once after a 24-h interval: Milk withdrawal of 48 h (4 milkings if milking 2X daily. Meat withdrawal of 14 d. | II | |
| | | **Procaine penicillin G/Streptomycin/Novobiocin/ Polymyxin B/Cortisone:** Infuse intramammary one disposable syringe per affected quarter. Repeat once after a 24-h period if necessary: Milk withdrawal of 72 h. Meat withdrawal of 24 d. | I | There is insufficient residue depletion information available to CgFARAD to allow for a meat withdrawal recommendation to be made when this product is used extra-label, and therefore this practice is discouraged. |
| **Metritis** (severe, signs of systemic illness present) | *Arcanobacterium pyogenes* *Fusobacterium necrophorum* *Escherichia coli* | **Oxytetracycline hydrochloride:** 6.7 mg/kg by injection once daily for 2–3 d (route dependent on formulation of individual product used): Milk withdrawal 72 h. Meat withdrawal 18 d. | III | The bacteriostatic action of oxytetracycline HCl may require ELDU in the form of increased duration of treatment (1). Consult CgFARAD for residue avoidance information. |
| | | **Procaine penicillin G:** 21 000 IU/kg IM daily for up to 5 d; Milk withdrawal of 96 h. Meat withdrawal of 10 d. | II | |
| | | **Trimethoprim-sulphadoxine:** 16 mg/kg IM or IV daily for up to 5 d (1). *Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | Based on pharmacokinetic and efficacy studies, a dose of 16 mg/kg BID or greater may be necessary to treat infections in cattle that are less than very sensitive to trimethoprim-sulpha (1–5). |
| | | **Ceftiofur hydrochloride:** 2.2 mg/kg IM or SC daily for 5 d. Milk withdrawal of 0 d. Meat withdrawal of 3 d. | I | |

**Dairy Antimicrobial Treatment Guidelines for Select Bacterial Diseases**
(Lactating dairy cattle and replacement heifers only – these guidelines are not meant for veal calves)

| Disease / condition / clinical diagnosis | Microbial agents | Treatment options | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Neonatal septicemia** (often a complication of FPT, enteritis, omphalophlebitis, etc.) | *Escherichia coli; Salmonella* spp. *multipl species* | **Trimethoprim-sulphadoxine:** 16-30 mg/kg IM or IV twice daily for up to 5 d. *Note: Extra-label drug use (dose) - consult CgFARAD for residue avoidance information.* | II | Based on pharmacokinetic and efficacy studies, a dose of 16 mg/kg BID or greater may be necessary to treat infections in cattle that are less than very sensitive to trimethoprim-sulpha (1–5). |
| | | **Ceftiofur hydrochloride or sodium:** 2.2 mg/kg IM twice daily for 5 d, or 5 mg/kg IM once daily for 5 d. *Note: Extra-label drug use (indication, dose) — consult CgFARAD for residue avoidance information.* | I | Dosage recommendations for ceftiofur are based on published pharmacokinetic, pharmacodynamic, and bacterial MIC studies. Ceftiofur has been used experimentally at the extra-label dose of 5 mg/kg daily in the treatment of *Salmonella* infection of calves (8–14). |
| **Peritonitis Surgical wound infection** | Mixed bacterial population (opportunistic aerobic and anaerobic bacteria). | **Oxytetracycline dihydrate:** 20 mg/kg injectable (route dependent on formulation of individual product used). Meat withdrawal of 28 days. | III | This product must not be used in lactating dairy cattle. Use only in cattle < 20 months of age |
| | | **Oxytetracycline hydrochloride:** 6.7 mg/kg by injection once daily for 2–3 d (route dependent on formulation of individual product used): Milk withdrawal 72 h. Meat withdrawal 18 d. | III | The bacteriostatic action of oxytetracycline HCl may require ELDU in the form of increased duration of treatment (1). Consult CgFARAD for residue avoidance information, |
| | | **Procaine penicillin G:** 21 000 IU/kg IM daily for up to 5 d. Milk withdrawal of 96 h. Meat withdrawal of 10 d. | II | |
| | | **Trimethoprim-sulphadoxine:** 16–30 mg/kg IM or IV twice daily for up to 5 d (1). *Note: Extra-label drug use (indication, dose) — consult CgFARAD for residue avoidance information.* | II | Based on pharmacokinetic studies, a dose of 16–30 mg/kg BID or greater may be necessary to treat infections in cattle that are less than very sensitive to trimethoprim-sulpha (1-5). |

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# CVMA Antimicrobial Prudent Use Guidelines 2008

## Poultry

# CVMA Guidelines on the Prudent Use of Antimicrobial Drugs in Poultry

**1** Veterinarians should concentrate their efforts on assisting clients with the design and implementation of effective and efficient poultry health management programs that will prevent and reduce the incidence of disease, and decrease the requirement for antibiotic use. Specifically, veterinarians should discuss with their clients:

- **a.** Adequate nutrient intake, through feed and/or drinking water.
- **b.** Adequate exposure to light and dark.
- **c.** Clean and comfortable litter or flooring, overall environment and when applicable caging systems.
- **d.** Optimum ventilation.
- **e.** Clean and potable water.
- **f.** Adequate space.
- **g.** Security from stress and exposure to infectious agents.
- **h.** Known source (single or multiple) of incoming birds when applicable (i.e., replacement pullets, breeder males used for spiking...).
- **i.** A clean environment and promote downtime and all-in, all-out management.
- **j.** Optimum immunity, with if necessary the effective use of approved vaccines.
- **k.** Record-keeping that is thorough, accurate, and precise.

**2** Where appropriate, and where scientifically and medically valid, veterinarians should consider alternative therapeutic options prior to initiating antimicrobial therapy, or as an adjunct to antimicrobial therapy to reduce duration of treatment with antimicrobials. Examples include:

- **a.** Acidification of water.
- **b.** Supportive care (electrolyte therapy).
- **c.** Altering barn temperature.

**3** Veterinarians should prescribe antimicrobials only within the confines of a valid veterinarian-client-patient relationship (VCPR). See glossary for definition of VCPR (pg. 2)

**4** Veterinarians should select and use antimicrobial drugs properly.

- **a.** Veterinarians should optimize therapeutic antimicrobial use by using current pharmacological information and principles, including:
  - i. consulting package inserts for information,
  - ii. understanding the pharmacokinetics/pharmacodynamics of the drug, such as bioavailability, tissue distribution, apparent elimination half-life and withdrawal times to optimize usage, and ensure that the selected drug reaches the site of infection.
  - iii. participating in continuing education programs that deal with antimicrobial use and antimicrobial resistance issues,
  - iv. not compounding antimicrobials or using unapproved drug combinations that include therapeutic antimicrobials where there is a lack of supporting scientific data. Cost should not be considered justification for using compounded antimicrobials.
- **b.** Veterinarians should confine therapeutic antimicrobial use to appropriate clinical indications.
  - i. veterinarians should strive to distinguish diseases caused by bacteria from diseases caused parasitism, mycotoxicoses, nutritional imbalances, and viral infections, with the recognition that secondary bacterial infections associated with these conditions may require antimicrobial therapy.
- **c.** Veterinarians should use history, clinical signs, previous on-farm experience, diagnostic tools including gross pathology, microbiology, and other diagnostic tests with culture and sensitivity results where indicated, to aid in the selection of antimicrobials and thereby improve the opportunity for successful treatment together,
  - i. veterinarians should utilize appropriate references for proper procedures and accurate interpretation of susceptibility results, such as the NCCL S publication M3 I–A2, Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated from Animals; Approved Standard.

**d.** Veterinarians should use antimicrobials considered important in human medicine (e.g., category I vs II), only after careful review and justification to treat refractory infections in animals.

**e.** Veterinarians should minimize exposure to therapeutic antimicrobials by treating only for as long as needed and at the dose required to achieve the desired clinical response. The use of antimicrobials in chronic, non responsive clinical cases should be discouraged, unless there is sound indication for their use, e.g., isolation of causative agent, failure of previous dosing regimen explained by resistance, or sub-optimal therapeutic exposure to the drug.

**f.** Veterinarians should limit therapeutic antimicrobial administration to ill animals or those at risk and, treat where possible, the smallest possible number of animals. When deciding whether or not to initiate treatment at the farm, flock, or pen level, veterinarians should consider the following factors:

i. group morbidity and mortality rates, and
ii. history of therapeutic antimicrobial use in the flock/farm.

**g.** Veterinarians should provide information to ensure adequate and uniform treatment as well as to ensure that these antibiotics do not result in environmental contamination. This information would include, but is not limited to:

i. ensuring proper use and adjustment of water medication systems, to deliver the desired dose and avoid spillage and waste;
ii. medicated feed preparation and delivery (proper and adequate flushing methods at the feedmill after the making of a medicated feed batch, avoidance, when possible, of medicated feed transportation along with layers feed in the same delivery truck);
iii. veterinarians should encourage producers and work with feed millers to help ensure that medicated feeds are manufactures and delivered according to ANAC HACCP standard operation procedures, and
iv. potential risk residue related to carcass rendering before the end of the withdrawal period should be evaluated according to the medication used.

**h.** Veterinarians should maintain accurate records of treatments employed, treatment outcomes, and adverse reaction, in order to evaluate the efficacy of selected therapeutic regimens. These records should be available to provide further information necessary for the selection of antimicrobial therapy. Veterinarians should:

i. monitor compliance with recommended treatment regimens by reviewing pertinent records,
ii. ensure accurate animal or group identification within a production system for effective residue avoidance, and
iii. consult appropriate governmental databases reporting antimicrobial resistance trends, such as CIPARS (http://www.phac-aspc.gc.ca/cipars-picra/index.html).

**i.** Veterinarians should prescribe extra-label antimicrobial therapy only in accordance with Health Canada's Food and Drug Regulations.

i. Veterinarians should be aware that certain drugs are expressly prohibited for extra-label use in food animals or animals that are intended for human consumption;

**NOTE: For more information on extra-label drug use, refer to Health Canada's Food and Drug Regulations, Section C.08.012 (Sale of Medicated Feeds) and Section C.01.610.1 (Prohibited Drugs).**

ii. Veterinarians should be aware that every chicken, turkey, spent hen, or culled breeder flock, is shipped to slaughter with a flock information document completed by the producer that provides information about the status and history of health of the flock of origin, veterinary services that have been provided to the birds, and drugs administered to the flock.

**NOTE: For more information refer to the Canadian Food Inspection Agency Regulations: Examination, inspection, humane treatment and slaughter, packaging and labelling.**

**SOR/94-683, s.4; SOR/2001-167, s.10 antemortem examination, antemortem inspection and humane treatment and slaughter of food animals SOR/2001-167, s.10, Sections 66(1), 66(2)(C) and the Canadian Food Inspection Agency, Meat Hygiene Manual of Procedures, Chapter 19. — Poultry Inspection Programs, Sections 19.3, 19,5 and 19,8.**

iii. Veterinarians should be aware of the testing live birds/flocks policy after extra-label use of drugs

**NOTE: For more information refer to the Canadian Food Inspection Agency, Meat Hygiene Manual of Procedures, Chapter 19. — Poultry Inspection Programs, Sections 19.3.4.4.6 (http://www.inspection.gc.ca/english/anima/meavia/mmopmmhv/mane.shtml)**

iv. When prescribing extra-label use of drugs, veterinarians shall supply the producer with a prescription that includes the withdrawal time and the CAPP (Canadian Association of Poultry Practitioners) or CgFARAD reference number for recording on the advance copy of the flock sheet. Veterinarians prescribing extra-label use of drugs may obtain a withdrawal period consistent with Canadian regulatory requirements from the CAPP reference table or by contacting CgFARAD at 1.866. CGFARAD by emailing cgfarad@umontreal.ca or through the website at cgfarad@usask.ca

**NOTE: For more information refer to the Canadian Food Inspection Agency, Meat Hygiene Manual of Procedures, Chapter 19. — Poultry Inspection Programs, Sections 19.3.4.4.3 (http://www.inspection.gc.ca/english/anima/meavia/mmopmmhv/table19e.shtml)**

**j.** Veterinarians should work with those responsible for the care of animals so that antimicrobials are used judiciously regardless of the distribution system through which the antimicrobial was obtained.

i. Proper farm use requires the oversight of a veterinarian in the decision-making process. Veterinarians should prescribe or dispense drug quantities appropriate to the production-unit size and expected need so that stockpiling of antimicrobials on the farm is avoided.

ii. Veterinarians are the primary source of information on the use of poultry antimicrobials. Veterinarians should instruct farm personnel who use antimicrobials on indications, dosages, withdrawal times, route of administration, precautions, storage, handling, record keeping and accurate diagnosis of common diseases. Veterinarians should ensure that labels are accurate and instruct farm personnel on the correct use of antimicrobials.

iii. Veterinarians should provide accurate written guidelines to clients whenever possible to describe conditions and instructions for antimicrobial use on the farm or barn.

**k.** Veterinarians should participate in continuing education opportunities, including monitoring current scientific publications regarding antibiotic resistance and residue.

| Poultry Type | Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — injectable | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| ***In ovo* or day-old broiler chick** | Omphalitis | *Escherichia coli* | **General Note:** *In the case of recurring omphalitis related to a breeder flock or poor shell quality in times of very hot weather, the use of antibiotics in the hatchery is judicious.* | | |
| | | | **Gentamycin:**<br>*In ovo* or SC injection<br>0. 2 mg/per chick as a single dose.<br>*Note: Extra-label drug use - consult CgFARAD for residue avoidance information* | **II** | |
| | | | **Lincomycin-spectinomycin:**<br>2.5–5.0 mg of L/S SC per chick as a single dose (1).<br>*Note: Extra-label drug use - consult CgFARAD for residue avoidance information* | **II** | **Ceftiofur:**<br>In Canada, ceftiofur has been labelled for use in certain food-producing animals but has not been labelled for use in chickens (or eggs). Use of ceftiofur in chicken eggs is considered to be extra-label drug use.<br>Given the concern with the development and dissemination of antimicrobial resistance with such mass-medication in an extra-label manner, the labels of ceftiofur products in Canada have been updated with warning statements to include that extra-label drug use of ceftiofur products is not recommended (2).<br>However, the CVMA recognizes that in an outbreak situation, and for a short- term use, Ceftiofur, a VDD category I antimicrobial, might be used. |

## Poultry Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Poultry Type | Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — feed | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **5-wk-old chicken** | Airsacculitis | *Eschericia coli* | **Trimethoprim-sulphadiazine:** (active ingredient: each 37.5 g contains 2.5 g trimethoprim and 12.5 g sulphadiazine): 750 ppm (3,4).<br>*Note: Extra-label drug use (indication, dose) — consult CgFARAD for residue avoidance information* | **II** | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| **Broiler chicken** | Airsacculitis | *Eschericia coli* | **Ormetoprim-sulphadimethoxine premix** (active ingredient: each kg contains 250 g of sulphadimethoxine and 50 g of ormetoprim): 125 ppm.<br>*Note: Extra-label drug use (indication, dose) — consult CgFARAD for residue avoidance information* | **II** | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| | | | **Trimethoprim-sulphadiazine:** (active ingredient: each 37.5 g contains 2.5 g trimethoprim and 12.5 g sulphadiazine): 500–750 ppm (3, 4).<br>*Note: Extra-label drug use (indication, dose) — consult CgFARAD for residue avoidance information* | **II** | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |

| Antimicrobial options — drinking water (DW) | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|
| **Amoxicillin trihydate:**<br>Up to 4 weeks of age:<br>6–12 g in 100L of DW for 3–5 d<br>Older than 4 weeks of age:<br>10–20 g in 100L of DW for 3–5 d<br>Withdrawal time: 2 d | II | |
| **Sulfamethazine 25% solution:**<br>35 mL in 9L of DW for 2 d.<br>*Note: Extralabel drug use (indication) — consult CgFARAD for residue avoidance information)* | III | |
| **Sulfaquinoxaline 19.2% solution:**<br>90 mL in 45.4 L of DW for 2 to 3 d<br>*Note: Extra-label drug use (indication) — consult CgFARAD for residue avoidance information)*<br>Withdrawal time is 12 d when using the drug according to label. | III | |
| **Tetracycline hydrochloride:** (active ingredient: 250mg/g)<br>100 g per 500 L of DW for 3–5 d. Meat withdrawal of 5 d. | III | The label dosage of tetracycline hydrochloride can differ depending on the manufacturer. |
| **Tetracycline hydrochloride – Neomycin sulphate:**<br>400 g to 450 L of DW. Meat withdrawal of 7 d. | II | |
| **Amoxicillin trihydrate:**<br>Up to 4 weeks of age:<br>6–12 g in 100 L of DW for 3-5 d<br>Older than 4 weeks of age:<br>10–20 g in 100 L of DW for 3–5 d.<br>Meat withdrawal of 2 d. | II | |

| Poultry type | Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — feed | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Broiler chicken** | Arthritis | *Escherichia coli* | **Ormetoprim-sulphadimethoxine premix** (active ingredient: each kg contains 250 g of sulphadimethoxine and 50 g of ormetoprim): 125 ppm<br>*Note: Extra-label drug use: – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| | | | **Trimethoprim-sulphadiazine:** *(active ingredient: each 37.5 g contains 2.5 g trimethoprim and 12.5 g sulphadiazine): 500 to 750 ppm (3,4).*<br>*Note: Extra-label drug use: – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| **Broiler chicken** | Arthritis | *Staphylococcus aureus* | **Erythromycin thiocyanate:** 220 g per tonne of complete feed.<br>Meat withdrawal of 24 h. | II | |
| | | | **Ormetoprim-sulphadimethoxine premix (**active ingredient:<br>each kg contains 250 g of sulphadimethoxine and 50 g of ormetoprim): 125 ppm<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | |

## Poultry Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Antimicrobial options — drinking water (DW) | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|
| **Oxytetracycline hydrochloride:**<br>(active ingredient: 250mg/g) 100 g per 500 L of DW for 3–5 d. Meat withdrawal of 7 d. | III | Oxytetracycline is more poorly absorbed than tetracycline. |
| **Tetracycline hydrochloride:**<br>(active ingredient: 250 mg/g) 100 g per 500 L of DW for 3–5 d. Meat withdrawal of 5 d. | III | |
| **Amoxicillin trihydrate:**<br>Up to 4 weeks of age:<br>6–12 g in 100 L of DW for 3–5 d<br>Older than 4 weeks of age:<br>10–20 g in 100 L of DW for 3–5 d<br>Meat withdrawal of 2 d | II | |
| **Tetracycline hydrochloride:**<br>(active ingredient: 250 mg/g) 100 g per 500 L of DW for 3–5 d. Meat withdrawal of 5 d. | III | The label dosage of tetracycline hydrochloride can differ depending on the manufacturer. |
| **Gallimycin:**<br>(active ingredient: 115.6 mg/g) 200 g per 200 L of DW for 5 d. Meat withdrawal of 1 d. | II | |
| **Penicillin G potassium:**<br>100 000 000 I.U. per 337 L of DW for 5 d.<br>*Note: Extra-label drug use (indication and species) – consult CgFARAD for residue avoidance information* | II | |

## Poultry Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Poultry type | Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — feed | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Broiler chicken** | Coccidiosis | *Eimeria* sp. | | | |
| **Broiler chicken** | Necrotic enteritis | *Clostridium perfringens* | **Tetracycline:** 220 ppm<br>Meat withdrawal of 5 d. | III | |
| | | | **Bacitracin Methylene Disalicylate (BMD):** 200 ppm<br>*Note: Extra-label drug use (indication, species) — consult CgFARAD for residue avoidance information* | III | |
| | | | **Tylosin:** *200 ppm for 7 d*<br>Meat withdrawal of 0 d. | II | |
| | | | **Trimethoprim-sulphadiazine:** (active ingredient: each 37.5 g contains 2.5 g trimethoprim and 12.5 g sulphadiazine): 500–750 ppm (3,4).<br>*Note: Extra-label drug use (indication, dose) — consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |

## Poultry Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Antimicrobial Options — drinking water (DW) | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|
| **Amprolium 9.6% Solution:**<br>500 mL in 200 L of DW for 5 to 7 d. | **Not applicable** | |
| **Pyrimethamine-Sulfaquinoxaline:** 30 ml in 20 L of DW for 2 d. Meat withdrawal of 4 d. | **Not applicable** | |
| **Lincomycin:**<br>80 g (1 pack) per 2000 L of DW for 7 d.<br>Meat withdrawal of 0 d. | **II** | |
| **Neomycin:**<br>(active ingredient: 81.25 mg/g)<br>Up to 2 weeks of age:<br>100 g per 1,125 L of DW for 3 d<br>2 weeks of age to adulthood:<br>200 g per 1,125L of DW for 3 d<br>Meat withdrawal of 7 d. | **II** | |
| **Penicillin G potassium:**<br>100 000 000 I.U. per 337 L of DW for 5 d.<br>*Note: Extra-label drug use(species) – consult CgFARAD for residue avoidance information.* | **II** | Penicillin is best given in the water since a longer stay in the proventriculus (i.e., when administered in the feed) speeds up its degradation. |
| **Tylosin:** 0.4–0.6 g per 4 L of DW for 5 d.<br>Meat withdrawal of 1 d. | **II** | |

| Poultry type | Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — feed | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Broiler chicken** | Omphalitis | *Escherichia coli* | None<br>Feed consumption is insufficient to achieve adequate antimicrobial MICs | | |

| Antimicrobial Options — drinking water (DW) | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|
| **Sulfamethazine 25% solution:**<br>35 mL in 9 L of DW for 2 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | III | Sulfamethazine 25% will reach the infection site. Sulfamethazine should not be used if chicks have received a live coccidial vaccine. |
| **Amoxicillin trihydrate:** 8–16 mg/kg<br>Up to 4 weeks of age:<br>6–12 g in 100 L of DW for 3–5 d.<br>Older than 4 weeks of age:<br>10–20 g in 100 L of DW for 3-5 d.<br>Meat withdrawal of 2 d. | II | |

| Poultry type | Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — feed | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Broiler breeder** | Arthritis | *Escherichia coli* | **General Note:** *Young broiler breeders may require treatment better suited to their skip-a-day diet. Ormetoprim-sulfadimethoxine is a good choice since it is long-acting.* | | |
| | | | **Ormetoprim-sulphadimethoxine premix** (active ingredient: each kg contains 250 g of sulphadimethoxine and 50 g of ormetoprim): 125 ppm<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | **II** | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| | | | **Trimethoprim-sulphadiazine:** (active ingredient: each 37.5 g contains 2.5 g trimethoprim and 12.5 g sulphadiazine): 500 to 750 ppm (3, 4).<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | **II** | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| | | | **Lincomycin hydrochloride/ Spectinomycin sulfate premix** (active ingredient: each kg contains 22 g lincomycin hydrochloride and 22 g of spectinocycin sulfate):<br>1 kg of premix per tonne of complete feed (results in 44 g of antibiotic activity per tonne of complete feed).<br>*Note: Extralabel drug use (indication, dose) — Consult CgFARAD for residue avoidance information* | **II** | |

| Antimicrobial options — drinking water (DW) | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|
| | | |
| **Sulfamethazine 25% solution:** 35 mL in 9L of DW for 2 d, then 17.5 mL in 9 L of DW for 5 d<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | III | |
| **Tetracycline hydrochloride:** (active ingredient: 250 mg/g) 100 g per 500 L of DW for 3–5 d. Meat withdrawal of 5 d. | III | The label dosage of tetracycline hydrochloride can differ depending on the manufacturer. |
| **Lincomycin hydrochloride / Spectinomycin sulphate:** 150 g package (100 g active ingredient) per 120 L of DW for 5 to 7 d (8). Meat withdrawal of 3 d. | II | |
| **Amoxicillin trihydrate:**<br>Up to 4 weeks of age:<br>6–12 g in 100 L of DW for 3–5 days<br>Older than 4 weeks of age:<br>10–20 g in 100 L of DW for 3–5 days.<br>Meat withdrawal of 2 d. | II | |

| Poultry type | Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — feed | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Broiler** | Arthritis | *Staphylococcus aureus* | **Erythromycin thiocyanate:** 220 g per tonne (1000 kg) of complete feed.<br>Meat withdrawal of 24 h. | II | |
| | | | **Ormetoprim-sulphadimethoxine premix** (active ingredient: each kg contains 250 g of sulphadimethoxine and 50 g of ormetoprim): 125 ppm<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information.* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| | | | **Trimethoprim-sulphadiazine:** (active ingredient: each 37.5 g contains 2.5 g trimethoprim and 12.5 g sulphadiazine):<br>500 to 750 ppm (3,4).<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |

| Antimicrobial options — drinking water (DW) | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|
| **Tetracycline hydrochloride:**<br>(active ingredient: 250 mg/g)<br>100 g per 500 L of DW for 3–5 d.<br>Meat withdrawal of 5 d. | III | The label dosage of tetracycline hydrochloride can differ depending on the manufacturer. |
| **Gallimycin:**<br>(active ingredient: 115.6 mg/g)<br>200 g per 200 L of DW for 5 d<br>Meat withdrawal of 1 d. | II | |
| **Penicillin G potassium**<br>100 000 000 I.U. per 337 L of DW for 5 d.<br>*Note: Extra-label drug use (indication and species) – consult CgFARAD for residue avoidance information* | II | |

## Poultry Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Poultry type | Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — feed | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Broiler breeder** | Fowl cholera | *Pasteurella multocida* | **Chlortetracycline:** 440-660 ppm.<br>Meat withdrawal of 7 d. | III | |
| | | | **Tetracycline:** 440 ppm.<br>Meat withdrawal of 5 d. | III | |
| | | | **Ormetoprim-sulphadimethoxine premix** (active ingredient: each kg contains 250 g of sulphadimethoxine and 50 g of ormetoprim): 125 ppm<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| | | | **Trimethoprim-sulphadiazine:** (active ingredient: each 37.5 g contains 2.5 g trimethoprim and 12.5 g sulphadiazine): 500 to 750 ppm (3,4).<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| | | | **Tilmicosin premix:** (active ingredient: each kg contains 200 g tilmicosin phosphate): 200 ppm for 5 d (9,10).<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | |

| Antimicrobial options — drinking water (DW) | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|
| **Florfenicol:** 30 mg/kg<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | III | The manufacturer of florfenicol does not recommend its use in breeder males as it has been linked to testicular degeneration. |
| **Tetracycline hydrochloride:**<br>(active ingredient: 250 mg/g) 100 g per 500 L of DW for 3–5 d:<br>Meat withdrawal of 5 d. | III | The label dosage of tetracycline hydrochloride can differ depending on the manufacturer. |
| **Penicillin G potassium:**<br>100 000 000 I.U. per 337 L of DW for 5 d.<br>*Note: Extra-label drug use (indication and species) – consult CgFARAD for residue avoidance information* | II | |

| Poultry type | Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — feed | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Layer** | Mycoplasmosis | *Mycoplasma synoviae* | **Chlortetracycline:** Do not exceed 110 ppm in laying hens (11,12).<br>Meat withdrawal of 7 d.<br>*If using 440ppm: Consult CgFARAD for residue avoidance information in eggs.* | **III** | |
| | | | **Tylosin: 100 ppm (13)**<br>*Note: Extra-label drug use (indication, dose) — consult CgFARAD for residue avoidance information in eggs.* | **II** | |
| **Layer** | Peritonitis | *Escherichia coli* | **Oxytetracycline:**<br>Up to 200 ppm there is no egg withdrawal period.<br>Meat withdrawal 7 d. | **III** | |
| | | | **Tylosin:** 100 ppm<br>for 7 d (13).<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information in eggs* | **II** | |

| Antimicrobial Options — drinking water (DW) | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|
| **Tylosin:** 2 g per 4 L of DW for 3 d (13).<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information in eggs.* | II | |
| **Oxytetracycline hydrochloride:** (active ingredient: 250 mg/g) 100 g per 500 L of DW for 3–5 d<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information in eggs.* | III | |
| **Tetracycline hydrochloride:**<br>(active ingredient: 250 mg/g)<br>100 g per 500 L of DW for 3–5 days:<br>*Note: – Extra-label drug use (indication) – consult CgFARAD for residue avoidance information in eggs.* | III | The label dosage of tetracycline hydrochloride can differ depending on the manufacturer. |
| **Tylosin:** 2 g per 4 L of DW for 3 d (13).<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information in eggs.* | II | |

## Poultry Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Poultry type | Disease / condition / clinical diagnosis | Microbial agents | | | |
|---|---|---|---|---|---|
| **Day-old turkey poult** | Omphalitis | *Escherichia coli* | **General Note:** *In the case of recurring omphalitis problems related to a breeder flock or in time of very hot weather and poor shell quality, the use of antibiotics in the hatchery is judicious.* | | |
| **Poultry type** | **Disease / condition / clinical diagnosis** | **Microbial agents** | **Antimicrobial options — feed** | **Veterinary Drug Directorate category based on importance in human medicine (Appendix)** | **Comments** |
| **Turkey** | Airsacculitis | *Escherichia coli* | **Ormetoprim-sulphadimethoxine premix:** (active ingredient: each kg contains 250 g of sulphadimethoxine and 50 g of ormetoprim): 125 ppm<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| | | | **Trimethoprim-sulphadiazine:** (active ingredient: each 37.5 g contains 2.5 g trimethoprim and 12.5 g sulphadiazine): 500–750 ppm (4,16).<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |

## Poultry Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Antimicrobial options – injectable | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|
| | | |
| **Gentamycin:** 1.0 mg per chick SC as a single dose (14). Withdrawal time 63 d from hatching *Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information in eggs.* | II | |
| **Ceftiofur sodium:** 0.5 mg/poult (15,16). Withdrawal time 28 d from hatching *Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information in eggs.* | I | |
| **Antimicrobial Options — drinking water (DW)** | **Veterinary Drug Directorate category based on importance in human medicine (Appendix)** | **Comments** |
| **Sulfamethazine 25% solution:** 45 mL in 4.5 L of DW for 2 d, then 20 ml in 4.5 L of DW for 7–10 d *Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information)* | III | |
| **Sulfaquinoxaline 19.2% solution:** 30 mL in 20 L of DW *Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information)* | III | |
| **Tetracycline hydrochloride:** (active ingredient: 250 mg/g) 400 g per 1000 L of DW for 3–5 d: *Note: Extra-label drug use ( dose) – consult CgFARAD for residue avoidance information* | III | The label dosage of tetracycline hydrochloride can differ depending on the manufacturer. |

## Poultry Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Poultry type | Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — feed | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Turkey** | Arthritis | *Escherichia coli* | **Chlortetracycline:** 440–880 ppm.<br>Meat withdrawal of 7 d. | III | |
| | | | **Lincomycin hydrochloride/ Spectinomycin sulfate premix:** 1 kg of premix per tonne of complete feed (results in 44 g of antibiotic activity per tonne of complete feed).<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information.* | II | |
| | | | **Ormetoprim-sulphadimethoxine premix:** (active ingredient: each kg contains 250 g of sulphadimethoxine and 50 g of ormetoprim): 125 ppm<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| | | | **Trimethoprim-sulphadiazine:** (active ingredient: each 37.5 g contains 2.5 g trimethoprim and 12.5 g sulphadiazine): 500 to 750 ppm (4,16).<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| **Turkey** | Arthritis | *Staphylococcus aureus* | **Erythromycin thiocyanate:** 220 g per tonne (1000 kg) of complete feed.<br>Meat withdrawal of 24 h. | II | |
| | | | **Ormetoprim-sulphadimethoxine premix:** (active ingredient: each kg contains 250 g of sulphadimethoxine and 50 g of ormetoprim): 125 ppm<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| | | | **Trimethoprim-sulphadiazine:** (active ingredient: each 37.5 g contains 2.5 g trimethoprim and 12.5 g sulphadiazine): 500 to 750 ppm (4,16).<br>*Note: Extra-label drug use (indication, dose) - consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |

## Poultry Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Antimicrobial options — drinking water (DW) | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|
| **Oxytetracycline hydrochloride:** (active ingredient: 250 mg/g) 100 g per 500 L of DW for 3–5 d.<br>Meat withdrawal of 7 d | III | |
| **Tetracycline hydrochloride:** (active ingredient: 250 mg/g) 100 g per 500 L of DW for 3–5 d.<br>Meat withdrawal of 5 d. | III | The label dosage of tetracycline hydrochloride can differ depending on the manufacturer.. |
| **Gallimycin:** (active ingredient: 115.6 mg/g). 200 g per 200 L of DW for 5 d.<br>Meat withdrawal of 1 d. | II | |
| **Penicillin G Potassium:**<br>100 000 000 I.U. per 337 L of DW for 3–5 d.<br>Withdrawal time 1 d | II | |

## Poultry Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Poultry type | Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — feed | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Turkey** | Bordetellosis | *Bordetella avium* | **Chlortetracycline:** 440 ppm. Meat withdrawal of 7 d. | III | |
| | | | **Ormetoprim-sulphadimethoxine premix:** (active ingredient: each kg contains 250 g of sulphadimethoxine and 50 g of ormetoprim): 125 ppm<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| | | | **Trimethoprim-sulphadiazine:** (active ingredient: each 37.5 g contains 2.5 g trimethoprim and 12.5 g sulphadiazine): 500–750 ppm (4,14).<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| **Turkey** | Coccidiosis | *Eimeria* sp. | | | |
| **Turkey** | Erysipelas | *Erysipelothrix rhusiopathiae* | **Erythromycin thiocyanate:** 220 g per tonne (1000 kg) of complete feed.<br>Meat withdrawal of 24 h. | II | |
| | | | **Lincomycin hydrochloride:** 220 ppm<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | |

## Poultry Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Antimicrobial options — drinking water (DW) | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|
| **Tetracycline hydrochloride:** (active ingredient: 250 mg/g) 100 g per 500 L of DW for 3–5 days: Meat withdrawal of 5 d. | III | The label dosage of tetracycline hydrochloride can differ depending on the manufacturer. |
| **Amprolium 0.024%:** (Amprol 9.6% solution) (500 mL in 200 L of DW) for 5 to 7 d Withdrawal time: 0 d | **Not applicable** | |
| **Sulfaquinoxaline 19.2%:** 60 mL per 45.4 L of DW for 2 d, skip 3 d and treat for 3 more d. Meat withdrawal of 12 d. | **Not applicable** | |
| **Penicillin G Potassium:** 100 000 000 I.U. per 337 L of DW for 3–5 days. Meat withdrawal of 1 d. | II | |

## Poultry Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Poultry type | Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — feed | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Turkey** | Fowl cholera | *Pasteurella multocida* | **Chlortetracycline :** 440 ppm.<br>Meat withdrawal of 7 d. | III | |
| | | | **Ormetoprim-sulphadimethoxine premix** (active ingredient: each kg contains 250 g of sulphadimethoxine and 50 g of ormetoprim): 125 ppm<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| | | | **Trimethoprim-sulphadiazine:** (active ingredient: each 37.5 g contains 2.5 g trimethoprim and 12.5 g sulphadiazine): 500 ppm<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | Compounded formulations of this antimicrobial cannot be used in poultry. Use only products that are approved for food-producing animals. |
| | | | **Tilmicosin premix:** (active ingredient: each kg contains 200 g tilmicosin phosphate): 200 ppm for 5 d (9,10).<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | |
| **Turkey** | Mycoplasmosis | *Mycoplasma synoviae*<br>*Mycoplasma meleagridis* | **Chlortetracycline:**<br>440-660 ppm.<br>Meat withdrawal of 7 d. | III | |

## Poultry Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Antimicrobial options — drinking water (DW) | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|
| **Florfenicol:** 30 mg/kg (17).<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | III | |
| **Oxytetracycline hydrochloride:** (active ingredient: 250 mg/g) 100 g per 500 L of DW for 3–5 days. Meat withdrawal of 7 d. | III | |
| **Tetracycline hydrochloride:** (active ingredient: 250 mg/g) 100 g per 500 L of DW for 3–5 days: Meat withdrawal of 5 d. | III | The label dosage of tetracycline hydrochloride can differ depending on the manufacturer. |
| **Penicillin G Potassium:** 100 000 000 I.U. per 337 L of DW for 3–5 days. Meat withdrawal of 1 d. | II | |
| **Oxytetracycline hydrochloride:** (active ingredient: 250 mg/g) 100 g per 500 L of DW for 3–5 days. Meat withdrawal of 7 d. | III | |

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# CVMA Antimicrobial Prudent Use Guidelines 2008

## Swine

# CVMA Guidelines on the Prudent Use of Antimicrobial Drugs in Swine

**1** Antibiotics are an important component of the general strategy for controlling bacterial diseases. Because misuse can contribute to antimicrobial resistance as significantly as overuse, antibiotics must be used in a carefully designed dosing regimen where drug, dose, dosing route, dosing frequency, dosing duration, and dosing conditions are adjusted to the targeted pathogen and host. In addition, antibiotic use should be restricted to treating conditions where bacteria are actively involved in the clinical portrait of disease. Moreover, antibiotic dosing regimens must be preceded or accompanied by management, health, housing, nutritional, or genetic selection programs that reduce the incidence of disease. Specifically, veterinarians should discuss with their clients:

- **a.** Management, including stocking density, isolation, and acclimatization of incoming breeding stock, appropriate and timely washing and disinfection of premises, and depopulation/repopulation in order to eliminate infectious disease agents.
- **b.** Health status of the herd, including immune status of animals, herd dynamics and health of the sow herd, presence and importance of concurrent infections, and source (single or multiple) of incoming swine.
- **c.** Housing, including airspace/pig, temperature extremes beyond the thermal neutral zone of swine, and ventilation.
- **d.** Nutrition, including the importance of water, protein, energy, and micronutrient intake.
- **e.** Genetics, including genetic sources and genetic predisposition.

**2** Where appropriate, and where scientifically and medically valid, veterinarians should consider the use of supportive therapeutic options prior to initiating antibiotic therapy. Examples include:

- **a.** Acidification of feed or water.
- **b.** Antipyretic or electrolyte therapy.

**3** Veterinarians should dispense and prescribe antibiotics only within the confines of a valid veterinary–client–patient relationship (VCPR). See glossary (pg. 2) for definition of VCPR as it appears in the CVMA Guidelines on the Prudent Use of Antibiotic Drugs.

**4** Veterinarians should properly select antimicrobial drugs.

- **a.** Veterinarians should optimize therapeutic antibiotic use by using current pharmacological information and principles. Steps veterinarians should consider in this regard include:
  - i. consulting as many relevant sources of information as required, among which are package inserts, results of antibiotic sensitivity testing, and pharmacokinetic and pharmacodynamic data of available antibiotics;
  - ii. participating in continuing education programs that focus on antibiotic therapy and/or antimicrobial resistance issues;
  - iii. avoiding the use of therapeutic products lacking adequate scientific supporting data, such as compounded drugs of unknown purity or potency, unapproved/untested drug combinations, or some alternative remedies. Cost is not a justification for using sub-standard therapeutic products or for devising dosing regimens that provide sub-therapeutic antibiotic exposure.

**NOTE: The CVMA supports the development of a veterinary antimicrobial decision system for swine to improve accuracy in the selection of therapeutics.**

- **b.** Veterinarians should confine therapeutic antibiotic use to appropriate clinical indications.
  - i. Veterinarians should strive to distinguish diseases caused by bacteria from diseases caused by parasites, mycotoxins, nutritional imbalances, and viral infections, with the recognition that secondary bacterial infections associated with these conditions may require antibiotic therapy.

**c.** Veterinarians ideally should use culture and sensitivity results coupled with relevant pharmacokinetic data to guide the selection of antibiotics. History, clinical signs, and previous experience on the farm are other useful data in the antibiotic selection process.

i. Veterinarians should utilize appropriate references for proper procedures and accurate interpretation of susceptibility results, such as the NCCLS publication M31 –A2 "Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated from Animals; Approved Standard – Second Edition."

**d.** Veterinarians should use antibiotics considered important in treating refractory infections in humans or animals only after careful review and justification.

**e.** Veterinarians should minimize the exposure of animals to therapeutic antibiotics by treating only for as long as needed and at the dose required to achieve the desired clinical response. The use of antibiotics in chronic, non-responsive clinical cases should be discouraged unless there is a sound indication for their use, e.g., isolation of causative agent, failure of previous dosing regimen explained by resistance, or sub-optimal therapeutic exposure to the drug. In cases of chronic, non-responsive illness, veterinarians should consider resubmitting samples from the case to evaluate the effectiveness of therapy.

**f.** Veterinarians should limit therapeutic antibiotic administration to ill or at risk animals, treating the fewest animals indicated. When deciding whether to initiate treatment at the herd, group, or individual animal level veterinarians should consider the following factors:

i. group morbidity and mortality rates,

ii. dynamics of disease spread in the herd,

iii. history of therapeutic antibiotic use in the herd.

**g.** Veterinarians should minimize environmental contamination with antibiotics by:

i. ensuring that water medicators and feeders are properly adjusted to deliver the desired dose and to avoid spillage and waste.

**h.** Veterinarians should maintain accurate records of treatments employed and treatment outcomes, which is a first step in monitoring the efficacy of selected therapeutic regimens (note: swabbing for bacterial culture and isolation is a more sensitive and accurate method for determining the efficacy of a therapeutic regimen).

i. Veterinarians should monitor compliance with recommended treatment regimens by reviewing pertinent records (where available, feed and water intake records may provide some information with respect to oral dosing regimens).

ii. Veterinarians should ensure accurate animal or group identification within a production system for effective residue avoidance.

**NOTE: The CVMA recommends the use of treatment records such as those proposed by the Canadian Quality Assurance (CQA) program of the Canadian Pork Council.**

**i.** Veterinarians should prescribe extralabel antibiotic therapy only in accordance with Health Canada's Food and Drug-Regulations.

i. Veterinarians should be aware that certain drugs are expressly prohibited for extra-label use in food animals or animals that are intended for consumption.

**NOTE: For more information on extra-label drug use, refer to Health Canada's Food and Drug Regulations, Section C.08.012 (Sale of Medicated Feeds) and Section C.01.610.1 (Prohibited Drugs).**

**j.** Veterinarians should work with those responsible for the care of animals to use antibiotics judiciously regardless of the distribution system through which the antibiotic was obtained.

i. Proper farm use requires the oversight of a veterinarian in the decision-making process. Veterinarians should prescribe or dispense drug quantities appropriate to the production-unit size and expected need so that stockpiling of antibiotics on the farm is avoided.

ii. Veterinarians are the only persons who possess the skills to 1) correctly identify a disease in swine that requires antibiotic therapy, and 2) to design an antibiotic dosing regimen according to the sensitivity of the targeted bacterium and the pharmacokinetic properties of the chosen drug. Veterinarians should train the farm personnel who use antibiotics how to recognize common diseases that require antibiotic therapy, and on dosages, withdrawal times, administration routes, injection site precautions, storage, handling, and record-keeping. Veterinarians should ensure that labels are accurate, and instruct farm personnel on the correct use of antibiotics, and provide additional information if required.

iii. Veterinarians should provide accurate written guidelines to clients whenever possible to describe conditions and instructions for on-farm antibiotic use.

| Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — injectable | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Broncho-pneumonia, pleuritis** – all ages | *Pasteurella multocida* | **Florfenicol:** 15 mg/kg IM once daily for 3 d.<br>Meat withdrawal of 15 d. | III | |
| | | **Oxytetracycline hydrochloride:** 6.7 mg/kg IM once daily for 2–3 d.<br>Meat withdrawal of 18 d. | III | |
| | | **Oxytetracycline dihydrate:** 20 mg/kg IM as a single dose.<br>Meat withdrawal of 28 d. | III | |
| | | **Penicillin G Procaine:** 15000 IU/kg IM once daily for 3–5 d.<br>Meat withdrawal of 8 d. | II | |
| | | **Trimethoprim - sulfadoxine:** 2.7 + 13.3 mg/kg IM once daily for 3-5 d.<br>Meat withdrawal of 10 d. | II | |
| | | **Tulathromycin:** 2.5 mg/kg IM as a single dose.<br>Meat withdrawal of 8 d. | II | |
| | | **Ceftiofur crystalline free acid:** 5 mg/kg IM as a single dose.<br>Meat withdrawal of 49 d. | I | |
| | | **Ceftiofur hydrochloride:** 3 mg/kg IM once daily for 3 d.<br>Meat withdrawal of 2 d. | I | |
| | | **Ceftiofur sodium:** 3 mg/kg IM once daily for 3 d.<br>Meat withdrawal of 1 d. | I | |

| Antimicrobial options – feed (amount of active ingredient)<br>*Note: Extra-label use of feed grade antimicrobials requires a veterinary prescription* | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments | Antimicrobial options - water | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Chlortetracycline hydrochloride:**<br>660 g/tonne for 10–14 d.<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information.* | III | 96% of *P. multocida* isolates were sensitive to chlortetracycline at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). In the US, chlortetracycline (feed grade) has a label claim for the treatment of bacterial pneumonia caused by *P. multocida* at the dosage of 22 mg/kg bodyweight(BW) | **Florfenicol**, 2.2 L per 582 L for 5 d.<br>Meat withdrawal of 21 d. | III | |
| | | | **Tetracycline hydrochloride (1000 mg/g):**<br>500 g/2000 L for 4–5 d.<br>Meat withdrawal of 5 d. | III | |
| | | | **Amoxicillin trihydrate:** Pigs younger than 4 months: 20 g/100 L for 3–5 d.<br>Meat withdrawal of 3 d. | II | |
| | | | Pigs older than 4 months: 30 g/100 L for 3–5 d.<br>Meat withdrawal of 3 d. | II | |
| **Tiamulin + chlortetracycline hydrochloride:**<br>100 g/tonne + 300 g/tonne for 10–14 d.<br>*Note: Extra-label drug use (combination therapy, indication, dose) – consult CgFARAD for residue avoidance information.* | III | In 2 field trials in the UK, there was a marked synergism between tiamulin and chlortetracycline against 8 isolates of *P. multocida* and against 7 of 9 isolates of *A. pleuropneumoniae* (2). Swine being treated with tiamulin should not have access to feeds containing ionophores, e.g., salinomycin. | **Penicillin G Potassium:**<br>500 000 000 IU/1700 L for 5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information* | II | |

| Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — injectable | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Enteritis –** pre-weaning, nursery | *Escherichia coli* | **Oxytetracycline hydrochloride:** 6.7 mg/kg IM once daily for 2–3 d. Meat withdrawal of 18 d. | III | |
| | | **Gentamicin sulfate:** 5 mg per piglet as a single dose. Meat withdrawal of 42 d. | II | Gentamicin sulfate is indicated: for use only in 1–3 d old piglets. |
| | | **Trimethoprim - sulfadoxine:** 2.7 + 13.3 mg/kg IM once daily for 3–5 d. Meat withdrawal of 10 d. | II | |
| | | **Ceftiofur hydrochloride:** 3 mg/kg IM once daily for 3 d. *Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | I | In 2006, 99% of Canadian generic *E. coli* isolates were sensitive to ceftiofur (3). |
| | | **Ceftiofur sodium:** 3 mg/kg IM once daily for 3 d. *Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | I | In 2006, 99% of Canadian generic *E. coli* isolates were sensitive to ceftiofur (3). |
| | | **Oral products:** | | |
| | | **Neomycin:** 7 mg/mL once daily for 3–5 d. Meat withdrawal of 14 d. | II | |
| | | **Spectinomycin:** pigs under 4.5 kg: 50 mg twice daily for 3–5 d. Pigs greater than 4.5 kgBW: 100 mg twice daily for 3–5 d. Meat withdrawal of 21 d. | II | Oral spectinomycin is labeled for use only in piglets less than 4 weeks of age. |

| Antimicrobial options – feed (amount of active ingredient)<br>Note: Extralabel use of feed grade antimicrobials requires a veterinary prescription | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments | Antimicrobial options - water | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Chlortetracycline hydrochloride:** 660 gm/tonne for 10-14 days.<br>*Note: Extralabel drug use (indication, dose) – Consult CgFARAD for residue avoidance information.* | III | In the UK, lincomycin HCl and spectinomycin sulfate premix is labeled for use in the treatment of enteritis in pigs caused by *E. coli*. | **Tetracycline hydrochloride (1000 mg/gm):** 500 gm/2000 litres for 4-5 days.<br>Meat withdrawal of 5 days. | III | |
| **Lincomycin hydrochloride + spectinomycin sulfate:** 22 g/tonne + 22 g/tonne for 10–14 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | | **Apramycin sulfate:** 84 g/500 L for 7 d.<br>Meat withdrawal of 28 d. | II | |
| | | | **Neomycin:** 500 g/2700 L for 3–5 d.<br>Meat withdrawal of 14 d. | II | |
| | | | **Neomycin + tetracycline:** 400 g/900 L for 4–5 d.<br>Meat withdrawal of 14 d. | II | |

## Swine Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — injectable | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Enteritis** – all ages | *Salmonella* spp. | **Trimethoprim - sulfadoxine:** 2.7 + 13.3 mg/kg IM once daily for 3–5 d.<br>Meat withdrawal of 10 d. | **II** | In 2006, 93.1% of Canadian *Salmonella* isolates were sensitive to trimethoprim-sulphamethoxazole (3). |
| | | **Ceftiofur hydrochloride:** 3 mg/kg IM once daily for 3 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | **I** | In 2006, 98.6% of Canadian *Salmonella* isolates were sensitive to ceftiofur (3). |
| | | **Ceftiofur sodium:** 3 mg/kg IM once daily for 3 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | **I** | In 2006, 98.6% of Canadian *Salmonella* isolates were sensitive to ceftiofur (3). |
| **Enzootic pneumonia –** all ages | *Mycoplasma hyopneumoniae* | **General Note:** *Enzootic pneumonia is preferably controlled with a combination of vaccination, improved environmental management and antimicrobials (if required).* | | |
| | | **Florfenicol:** 15 mg/kg IM once daily for 3 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | **III** | |
| | | **Oxytetracycline hydrochloride:** 6.7 mg/kg IM once daily for 2–3 d.<br>Meat withdrawal of 18 d. | **III** | |

## Swine Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Antimicrobial options – feed (amount of active ingredient)<br>Note: Extralabel use of feed grade antimicrobials requires a veterinary prescription | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments | Antimicrobial options - water | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Salinomycin sodium:** 417 g/tonne for 10–14 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | IV | Swine receiving feeds containing salinomycin. should not be treated with tiamulin. | **Apramycin sulfate:** 84 g/500 L for 7 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | |
| | | | **Neomycin:** 500 g/2700 L for 3–5 d.<br>Meat withdrawal of 14 d. | II | |
| | | | **Neomycin + tetracycline:** 400 g/900 L for 4–5 d.<br>Meat withdrawal of 14 d. | II | |
| **Chlortetracycline hydrochloride:** 660 g/tonne for 10–14 d.<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information.* | III | Feed grade chlortetracycline is licensed in the US for use in swine at the dose of 22 mg/kg BW. | **Florfenicol:** 2.2 L/582 L for 5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | III | |
| **Tiamulin:** 178.1 g/tonne for 14d.<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information.* | III | Swine being treated with tiamulin should not have access to feeds containing ionophores, e.g., salinomycin. | **Tetracycline hydrochloride (1000 mg/g):** 500 g/2000 L for 4–5 d.<br>Meat withdrawal of 5 d. | III | |
| **Lincomycin hydrochloride:** 220 g/tonne for 21 d.<br>Meat withdrawal of 24 h. | II | | | | |
| **Tylosin phosphate:** 110 g/tonne for 10–14 d.<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information* | II | | | | |

| Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — injectable | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Enzootic pneumonia –** all ages *(continued)* | *Mycoplasma hyopneumoniae (continued)* | **Oxytetracycline dihydrate:** 20 mg/kg IM as a single dose. Meat withdrawal of 28 d. | III | |
| | | **Tiamulin:** 11 mg/kg IM once daily for 3–4 d. *Note: Extra-label drug use (indication) – Consult CgFARAD for residue avoidance information.* | III | Swine being treated with tiamulin should not have access to feeds containing ionophores, e.g., salinomycin. |
| | | **Lincomycin hydrochloride:** 10 mg/kg IM once daily for 3–7 d. *Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | Lincomycin HCl is labeled for use against *M. hyopneumoniae* in the US. |
| | | **Tulathromycin:** 2.5 mg/kg IM as a single dose. Meat withdrawal of 8 d. | II | |
| | | **Tylosin:** 2.2–8.8 mg/kg IM once daily for 3 d. *Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | |

| Antimicrobial options – feed (amount of active ingredient)<br>Note: Extralabel use of feed grade antimicrobials requires a veterinary prescription | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments | Antimicrobial options - water | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| | | | **Tiamulin:** 946 mL/1930 L for 5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | III | Swine being treated with tiamulin should not have access to feeds containing ionophores, e.g., salinomycin. |
| | | | **Lincomycin hydrochloride:** 80 g/960 L for 5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | Lincomycin HCl is labeled for use against *M. hyopneumoniae* in the US. In a US study, 93% of the *M. hyopneumoniae* isolates demonstrated MICs ≤ 1 μg/mL (5). In a Belgian study, the final MIC90 of lincomycin for 21 *M. hyopneumoniae* field strains was 0.12 μg/mL (4). |
| | | | **Tylosin Tartrate:** 100 gm/1200 L for 7 d.<br>No meat withdrawal. | II | |

| Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — injectable | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Exudative epidermitis** – piglets, weaners | *Staphylococcus hyicus* | **Trimethoprim - sulfadoxine:** 2.7 + 13.3 mg/kg IM once daily for 3-5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | |
| | | **Ceftiofur hydrochloride:** 3 mg/kg IM once daily for 3 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | I | |
| | | **Ceftiofur sodium:** 3 mg/kg IM once daily for 3 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | I | |

| Antimicrobial options – feed (amount of active ingredient)<br>*Note: Extra-label use of feed grade antimicrobials requires a veterinary prescription* | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments | Antimicrobial options - topical | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| | | | **Chlorhexidine acetate:** 30 mL/10 L water for 3–5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | **Not applicable** | There are no antimicrobials labeled for treatment or prevention of exudative epidermitis. |
| | | | **Iodine complex (povidone-iodine):** 1.7 ml/L water for 3–5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | **Not applicable** | |
| | | | **Light mineral oil:** undiluted, spray to run off for 3–5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | **Not applicable** | |
| | | | **Potassium monopersulfate**, 0.5% solution, spray to run off for 3–5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | **Not applicable** | |

| Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — injectable | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Ileitis** – nursery, growers, finishers, adults | *Lawsonia intracellularis* | **General Note:** *Ileitis is preferably controlled with a combination of vaccination, improved environmental management, and antimicrobials (if required).* | | |
| | | **Oxytetracycline hydrochloride:** 6.7 mg/kg IM once daily for 2–3 d.<br>Meat withdrawal of 18 d. | III | |
| | | **Oxytetracycline dihydrate:** 20 mg/kg IM as a single dose.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | III | |
| | | **Tiamulin:** 11 mg/kg IM once daily for 3–4 days.<br>*Note: Extra-label drug use (indication) – Consult CgFARAD for residue avoidance information.* | III | Swine being treated with tiamulin should not have access to feeds containing ionophores, e.g., salinomycin. |
| | | **Lincomycin hydrochloride:** 10 mg/kg IM once daily for 3–7 days.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | |
| | | **Tylosin:** 2.2–8.8 mg/kg IM once daily for 3 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | |

| Antimicrobial options – feed (amount of active ingredient)<br>*Note: Extra-label use of feed grade antimicrobials requires a veterinary prescription* | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments | Antimicrobial options - water | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Chlortetracycline hydrochloride:** 660 g/tonne for 10–14 d.<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information.* | III | | **Tetracycline hydrochloride (1000 mg/gm):** 500 g/2000 L for 4–5 d.<br>Meat withdrawal of 5 d. | III | |
| **Lincomycin hydrochloride:** 110 g/tonne for 21 d.<br>No meat withdrawal. | II | | **Tiamulin:** 946 mL/1930 L for 5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information* | III | Tiamulin in the water at 49 ppm/L (Canadian label dose) is effective in treating ileitis (6). Swine being treated with tiamulin should not have access to feeds containing ionophores, e.g., salinomycin. |
| **Tylosin phosphate:** 110 g/tonne for 10–14 d.<br>No meat withdrawal. | II | | **Lincomycin hydrochloride:** 80 g/960 L for 5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | |
| | | | **Tylosin Tartrate:** 100 g/1200 L for 7 d.<br>No meat withdrawal. | II | |

| Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — injectable | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Meningitis, pneumonia, arthritis –** all ages | *Streptococcus suis* | **Tiamulin:** 11 mg/kg IM once daily for 3-4 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | III | 93% of *S. suis* isolates were sensitive to tiamulin at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). Swine being treated with tiamulin should not have access to feeds containing ionophores, e.g., salinomycin. |
| | | **Ampicillin:** 6 mg/kg IM once daily for 3–5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | 99% of *S. suis* isolates were sensitive to ampicillin at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). |
| | | **Penicillin G Procaine:** 15000 IU/kg IM once daily for 3–5 d.<br>Meat withdrawal of 8 d. | II | |
| | | **Penicillin G Procaine (oil formulation):** 20 mg/kg IM as a single dose.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information* | II | |
| | | **Trimethoprim + sulfadoxine:** 2.7 + 13.3 mg/kg IM once daily for 3–5 d.<br>Meat withdrawal of 10 d. | II | |
| | | **Ceftiofur crystalline free acid:** 5 mg/kg IM as a single dose.<br>Meat withdrawal of 49 d. | I | 99% of *S. suis* isolates were sensitive to ceftiofur at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). |
| | | **Ceftiofur hydrochloride:** 3 mg/kg IM once daily for 3 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | I | 99% of *S. suis* isolates were sensitive to ceftiofur at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). |
| | | **Ceftiofur sodium:** 3 mg/kg IM once daily for 3 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | I | 99% of *S. suis* isolates were sensitive to ceftiofur at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1) |

| Antimicrobial options – feed (amount of active ingredient)<br>*Note: Extra-label use of feed grade antimicrobials requires a veterinary prescription* | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments | Antimicrobial options - water | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Tiamulin:** 178.1 g/tonne for 14d.<br>*Note: Extra-label drug use (indication) – Consult CgFARAD for residue avoidance information.* | III | Swine being treated with tiamulin should not have access to feeds containing ionophores e.g. salinomycin. | **Florfenicol,** 2.2 L/582 L for 5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | III | In the US, water-soluble florfenicol has a label claim for swine respiratory disease (SRD) associated with *S. suis*. This claim is based on a challenge study in which *S. suis* was isolated from some of the study animals with SRD (7). |
| | | | **Tiamulin:** 946 ml/1930L for 5 days.<br>*Note: Extra-label drug use (indication) – Consult CgFARAD for residue avoidance information.* | III | Swine being treated with tiamulin should not have access to feeds containing ionophores e.g. salinomycin. |
| | | | **Amoxicillin trihydrate:** Pigs younger than 4 months: 20 g/100 L for 3–5 d.<br>Meat withdrawal of 3 d.<br>Pigs older than 4 months: 30 g/100 L for 3–5 d.<br>Meat withdrawal of 3 d. | II | |
| | | | **Penicillin G Potassium:** 500 000 000 IU/1700 L for 5 d.<br>Meat withdrawal of 1 d. | II | |

## Swine Antimicrobial Treatment Guidelines for Select Bacterial Diseases

| Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — injectable | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Pleuro-pneumonia and necrosis, fibrinous pleuritis** – all ages | *Actinobacillus pleuropneumoniae* | **Florfenicol:** 15 mg/kg IM once daily for 3 d.<br>Meat withdrawal of 15 d. | III | |
| | | **Oxytetracycline hydrochloride:** 6.7 mg/kg IM once daily for 2–3 d.<br>Meat withdrawal of 18 d. | III | |
| | | **Oxytetracycline dihydrate:** 20 mg/kg IM as a single injection.<br>Meat withdrawal of 28 d. | III | |
| | | **Tiamulin:** 11 mg/kg IM once daily for 3–4 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | III | 97% of *A. pleuropneumoniae* isolates were sensitive to tiamulin at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). Swine being treated with tiamulin should not have access to feeds containing ionophores, e.g., salinomycin. |
| | | **Penicillin G Procaine**: 15000 IU/kg IM once daily for 3–5 d.<br>Meat withdrawal of 8 d. | II | |
| | | **Penicillin G Procaine (oil formulation):** 20 mg/kg IM as a single injection. Meat withdrawal of 10 d. | II | |
| | | **Trimethoprim - sulfadoxine:** 2.7 + 13.3 mg/kg IM once daily for 3–5 d.<br>Meat withdrawal of 10 d. | II | |
| | | **Tulathromycin:** 2.5 mg/kg IM as a single dose.<br>Meat withdrawal of 8 d. | II | |
| | | **Ceftiofur crystalline free acid:** 5 mg/kg IM as a single dose.<br>Meat withdrawal of 49 d. | I | |
| | | **Ceftiofur hydrochloride:** 3 mg/kg IM once daily for 3 d.<br>Meat withdrawal of 2 d. | I | |
| | | **Ceftiofur sodium:** 3 mg/kg IM once daily for 3 d.<br>Meat withdrawal of 1 d. | I | |

| Antimicrobial options – feed (amount of active ingredient)<br>*Note: Extra-label use of feed grade antimicrobials requires a veterinary prescription* | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments | Antimicrobial options - water | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Chlortetracycline hydrochloride:** 660 g/tonne for 10–14 d.<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information.* | III | Feed grade chlortetracycline is licensed in the US for use in swine at the dose of 22 mg/kg BW. | **Florfenicol:** 2.2 L per 582 L, 5 d, Meat withdrawal of 21 d. | III | |
| | | | **Tetracycline HCl (1000 mg/g):** 500 g/ 2000 L for 4–5 d.<br>Meat withdrawal of 5 d. | III | |
| **Tiamulin + chlortetracycline hydrochloride:** 100 g/tonne + 300 g/ tonne for 10–14 d .<br>*Note: Extra-label drug use (combination therapy, indication, dose) – consult CgFARAD for residue avoidance information.* | III | In 2 field trials in the UK, there was a marked synergism between tiamulin and chlortetracycline against 8 isolates of *P. multocida* and against 7 of 9 isolates of *A. pleuropneumoniae* (2). | **Tiamulin:** 946 mL/ 1930 L for 5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | III | 97% of *A. pleuropneumoniae* isolates were sensitive to tiamulin at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). Swine being treated with tiamulin should not have access to feeds containing ionophores, e.g., salinomycin. |
| **Tiamulin:** 178.1 g/tonne for 14d.<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information.* | III | Swine being treated with tiamulin should not have access to feeds containing ionophores, e.g., salinomycin. | **Amoxicillin trihydrate:** pigs younger than 4 months: 20 g/100 L for 3–5 d.<br>Meat withdrawal of 3 d.<br>Pigs older than 4 months: 30 g/100 L for 3–5 d.<br>Meat withdrawal of 3 d. | II | |
| | | | **Penicillin G Potassium:** 500 000 000 IU/1700 L for 5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | |

| Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — injectable | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Polyserositis** – all ages | *Haemophilus parasuis* | **Oxytetracycline hydrochloride:** 6.7 mg/kg IM once daily for 2–3 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | III | 91% of *H. parasuis* isolates were sensitive to oxytetracycline at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). |
| | | **Florfenicol:** 15 mg/kg IM once daily for 3 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | III | 100% of *H. parasuis* isolates were sensitive to florfenicol at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). |
| | | **Tiamulin:** 11 mg/kg IM once daily for 3–4 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | III | Swine being treated with tiamulin should not have access to feeds containing ionophores, e.g., salinomycin. |
| | | **Penicillin G Procaine:** 15 000 IU/kg IM once daily for 3–5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | 98% of *H. parasuis* isolates were sensitive to penicillin at the University of Minnesota's Veterinary Diagnostic Laboratory in 2006 (8). |
| | | **Penicillin G Procaine (oil formulation):** 20 mg/kg IM as a single dose.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | 98% of *H. parasuis* isolates were sensitive to penicillin at the University of Minnesota's Veterinary Diagnostic Laboratory in 2006 (8). |

| Antimicrobial options – feed (amount of active ingredient)<br>*Note: Extra-label use of feed grade antimicrobials requires a veterinary prescription* | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments | Antimicrobial options - water | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|---|
| **Chlortetracycline hydrochloride:** 660 g/tonne for 10–14 d.<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information.* | III | 99% of *H. parasuis* isolates were sensitive to chlortetracycline at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). Feed grade chlortetracycline is licensed in the US for use in swine at the dose of 22 mg/kg BW. | **Tetracycline HCl (1000 mg/gm):** 500 g/4000 L for 4–5 d.<br>*Note: Extra-label drug use (indication) – Consult CgFARAD for residue avoidance information.* | III | |
| **Tiamulin:** 178.1 g/tonne for 14d.<br>*Note: Extra-label drug use (indication, dose) – consult CgFARAD for residue avoidance information.* | II | Swine being treated with tiamulin should not have access to feeds containing ionophores, e.g., salinomycin. | **Tiamulin:** 946 mL/ 1930 L for 5 d<br>*Note: Extralabel drug use (indication) – consult CgFARAD for residue avoidance information.* | III | 84% of *H. parasuis* isolates were sensitive to tiamulin at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). Swine being treated with tiamulin should not have access to feeds containing ionophores, e.g., salinomycin. |
| | | | **Amoxicillin trihydrate:** Pigs younger than 4 months: 20 g/100 L for 3–5 d.<br>Meat withdrawal of 3 d.<br>Pigs older than 4 months: 30 g/100 L for 3–5 d.<br>Meat withdrawal of 3 d. | II | |
| | | | **Penicillin G Potassium:** 500 000 000 IU/1700 L for 5 d.<br>*Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | |

| Disease / condition / clinical diagnosis | Microbial agents | Antimicrobial options — injectable | Veterinary Drug Directorate category based on importance in human medicine (Appendix) | Comments |
|---|---|---|---|---|
| **Polyserositis** – all ages *(continued)* | *Haemophilus parasuis* *(continued)* | **Tulathromycin:** 2.5 mg/kg IM as a single dose. *Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | II | |
| | | **Ceftiofur crystalline free acid:** 5 mg/kg IM as a single dose. Meat withdrawal of 49 d. | I | 99% of *H. parasuis* isolates were sensitive to ceftiofur at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). |
| | | **Ceftiofur hydrochloride:** 3 mg/kg IM once daily for 3 d. *Note: Extra-label drug use (indication) – consult CgFARAD for residue avoidance information.* | I | 99% of *H. parasuis* isolates were sensitive to ceftiofur at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). |
| | | **Ceftiofur sodium:** 3 mg/kg IM once daily for 3 d. *Note: Extra-label drug use (indication) -consult CgFARAD for residue avoidance information.* | I | 99% of *H. parasuis* isolates were sensitive to ceftiofur at Iowa State University's Veterinary Diagnostic Laboratory in 2007 (1). |

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# Appendix

Categorization of antimicrobial drugs used in this table was taken from the Veterinary Drug Directorate's (VDD) Categorization of Antimicrobial Drugs Based on their Importance in Human Medicine (Table 23).
See: http://www.hc-sc.gc.ca/dhp-mps/consultation/vet/consultations/amr_ram_hum-med_e.html

*Note: This document is a revised draft of the original document from 2003.*

## Categorization of Antimicrobial Drugs Based on Importance in Human Medicine

**(Version - November 30, 2006)**

### Preamble

Antimicrobial drugs are used primarily in human and veterinary medicine for the treatment, control and prevention of bacterial diseases. In addition, some of these drugs are used for the purpose of growth promotion and improvement of feed efficiency in the agri-food industry. It is well recognized that many of the chemical classes of antimicrobial drugs used in animals are also used in humans. Some of these antimicrobials are essential for treatment of serious life-threatening infections in humans. If these drugs become ineffective due to the development of bacterial resistance, alternative antimicrobials may not be available to treat infections caused by resistant bacteria. Therefore, it is imperative to develop measures to mitigate the loss of effectiveness of these life-saving drugs. In this context, careful attention needs to be directed on how these drugs are used both in humans and animals, and on how to facilitate their prudent and judicious use.

Health Canada recognizes that all available antimicrobial drugs are important. However, some drugs are considered more important than others in the treatment of serious bacterial infections, and resistance development against those antimicrobials might have more serious consequences in human health. This document uses pre-defined criteria to group antimicrobials into different categories based on the implications of resistance to these drugs to human medicine. This categorization is expected to assist the regulatory risk assessment process during pre- and post-market evaluation of veterinary antimicrobials.

For the sake of simplicity, antimicrobial drugs have been ranked according to their chemical class and have been placed in a category where the majority of the drugs within the class may fall. It is understood that some of the individual drugs in a particular class may not fall in the same category as other drugs of the same class and such exceptions will be treated on a case-by-case basis.

As this categorization system serves as a guide for the evaluation of veterinary new antimicrobial drug submissions, sponsors are encouraged to take it into consideration when preparing their submissions. As a general rule, resistance to drugs of higher importance may be expected to have greater consequences to human health than resistance to drugs of lesser importance. Therefore, drugs of higher importance will receive more rigorous scrutiny for microbiological safety assessment, such as antimicrobial resistance-related issues, compared to the drug of a less important category. However, overall risks to human health will be assessed separately considering the specific application of each antimicrobial during the pre-market evaluation. This risk assessment will include drug categorization and other relevant information.

Currently this document focuses on the antibacterial drug products. Other antimicrobials, e.g., antifungal or antiviral drugs which are less frequently used in animals, are not included in this document, but may be considered in future.

### Complexity and dynamics of antimicrobial categorization

It is understood that antimicrobial categorization is a complex issue influenced by multiple factors related not only to the characteristics of an antimicrobial agent but also to the variability in existing medical practice and guidelines in antimicrobial chemotherapy. In an attempt to make this categorization process transparent, predefined criteria, based on consultation with experts, are applied to rank antimicrobial drugs. It is also recognized that the categorization scheme presented here is part of a dynamic process. The relative importance of a drug and its use pattern may be altered over time due to changes in factors that determine the drug efficacy, e.g., emergence of resistance or the availability of new drugs in the market, or due to identification of a new indication. Therefore, this categorization will be periodically updated on the basis of new scientific evidence or emerging information on resistance trends and/or changing patterns of antimicrobial use.

### Criteria for categorization

The principal criteria for this categorization are the indication and the availability of alternative antimicrobials for the treatment of infections in human medicine. The use of antimicrobials in veterinary medicine and the impact of

such use on human medicine are not considered during this categorization. Such considerations would be part of a separate human health risk assessment process.

The two major categorization criteria are briefly described below:

**Indication :** This includes the use of drugs in human medicine and the spectrum of activity as well as the efficacy of drugs. A drug which is preferred for treatment of serious bacterial infections will be considered more important than those that are not used for this purpose. It is noted that development and increased occurrence of antimicrobial resistance, including cross- and co-resistance to other classes of antimicrobials, can alter the usefulness and hence the indications of a drug.

**Availability of alternative antimicrobial drugs:** Drugs with limited or no alternatives for treatment of infections, or where alternatives available are within the same class, will be considered more important than others. A drug used generally as a last resort treatment will be considered more important. Acquired resistance, including multidrug resistance, may make a drug ineffective and limit the availability of effective alternative antimicrobials.

The following table provides general application of criteria for antimicrobial categorization in an attempt to make the process transparent.

## Table. Application of criteria for antimicrobial categorization

| Category | Preferred option for treatment of serious human infections* | No or limited alternatives available |
|---|---|---|
| I – Very High Importance | Yes | Yes |
| II – High Importance | Yes | No |
| III – Medium Importance | No | No/Yes |
| IV – Low Importance | Not applicable | Not applicable |

*Serious infections are considered those which if left untreated would lead to significant morbidity requiring emergency care including hospitalization and/or mortality.

### 1. Category I: Very High Importance

These antimicrobials are considered of very high importance in human medicine as they meet the criteria of being essential for the treatment of serious bacterial infections and limited or no availability of alternative antimicrobials for effective treatment in case of emergence of resistance to these agents. Examples include:

1.1 Carbapenems
1.2 Cephalosporins – the third and fourth generations
1.3 Fluoroquinolones
1.4 Glycopeptides
1.5 Glycylcyclines
1.6 Ketolides
1.7 Lipopeptides
1.8 Monobactams
1.9 Nitroimidazoles (metronidazole)
1.10 Oxazolidinones
1.11 Penicillin – lactamase inhibitor combinations
1.12 Polymyxins (colistin)
1.13 Streptogramins
1.14 Therapeutic agents for tuberculosis (e.g., ethambutol, isoniazid, pyrazinamide and rifampin)

## 2. Category II: High Importance

Antimicrobials in this category consist of those that can be used to treat a variety of infections including serious infections and for which alternatives are generally available. Bacteria resistant to drugs of this category are generally susceptible to Category I drugs which could be used as the alternatives. Examples include:

2.1 Aminoglycosides (except topical agents)
2.2 Cephalosporins – the first and second generations (including cephamycins)
2.3 Fusidic acid
2.4 Lincosamides
2.5 Macrolides
2.6 Penicillins
2.7 Quinolones (except fluoroquinolones)
2.8 Trimethoprim/sulfamethoxazole

## 3. Category III: Medium Importance

Antimicrobials in this category are used for treatment of bacterial infections for which alternatives are generally available. Infections caused by bacteria resistant to these drugs can, in general, be treated by Category II or I antimicrobials. Examples include:

3.1 Aminocyclitols
3.2 Aminoglycosides (topical agents)
3.3 Bacitracins
3.4 Fosfomycin
3.5 Nitrofurans
3.6 Phenicols
3.7 Sulphonamides
3.8 Tetracyclines
3.9 Trimethoprim

## 4. Category IV: Low Importance

Antimicrobials in this category are currently not used in human medicine. Examples include:

4.1 Flavophospholipols
4.2 Ionophores