

Judicious use of

Antimicrobials

APRIL 2009



AMERICAN VETERINARY MEDICAL ASSOCIATION

GUIDING PRINCIPLES

Global attention is focused on measuring, monitoring, and containing antimicrobial resistance. The U.S. Food and Drug Administration has incorporated a framework for evaluating antimicrobials labeled for use in food-producing animals. Veterinarians can play an integral part in containing resistance by using antimicrobial judiciously. The American Veterinary Medical Association, in cooperation with specific species veterinary organizations, present these guidelines for implementation by veterinarians.

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AMERICAN VETERINARY MEDICAL ASSOCIATION JUDICIOUS THERAPEUTIC USE OF ANTIMICROBIALS

(Approved by the AVMA Executive Board, November 1998; Revised April 2004, November 2008)

Position Statement

When the decision is reached to use antimicrobials for therapy, veterinarians should strive to optimize therapeutic efficacy and minimize resistance to antimicrobials to protect public and animal health.

Objectives

Support development of a scientific knowledge base that provides the basis for judicious therapeutic antimicrobial use.

Support educational efforts that promote judicious therapeutic antimicrobial use.

Preserve therapeutic efficacy of antimicrobials.

Ensure current and future availability of veterinary antimicrobials.

Strategies

Facilitate development and distribution of appropriate antimicrobial use guidelines by practitioner species-interest groups.

Improve scientifically based therapeutic practices through education.

Recognized Needs

Improved monitoring and feedback systems for antimicrobial use and resistance patterns.

Research to improve scientifically based therapeutic practices.

Judicious Use Principles

Preventive strategies, such as appropriate husbandry and hygiene, routine health monitoring, and immunization, should be emphasized.

Other therapeutic options should be considered prior to antimicrobial therapy.

Judicious use of antimicrobials, when under the direction of a veterinarian, should meet all requirements of a veterinarian-client-patient relationship.

Prescription, Veterinary Feed Directive, and extralabel use of antimicrobials must meet all the requirements of a veterinarian-client-patient relationship.

Extralabel antimicrobial therapy must be prescribed only in accordance with the Animal Medicinal Drug Use Clarification Act amendments to the Food, Drug, and Cosmetic Act and its regulations.

Veterinarians should work with those responsible for the care of animals to use antimicrobials judiciously regardless of the distribution system through which the antimicrobial was obtained.

Regimens for therapeutic antimicrobial use should be optimized using current pharmacological information and principles.

Antimicrobials considered important in treating refractory infections in human or veterinary medicine should be used in animals only after careful review and reasonable justification. Consider using other antimicrobials for initial therapy.¹

Use narrow spectrum antimicrobials whenever appropriate.

Utilize culture and susceptibility results to aid in the selection of antimicrobials when clinically relevant.

Therapeutic antimicrobial use should be confined to appropriate clinical indications. Inappropriate uses such as for uncomplicated viral infections should be avoided.

Therapeutic exposure to antimicrobials should be minimized by treating only for as long as needed for the desired clinical response.

Limit therapeutic antimicrobial treatment to ill or at risk animals, treating the fewest animals indicated.

Minimize environmental contamination with antimicrobials whenever possible.

Accurate records of treatment and outcome should be used to evaluate therapeutic regimens.

¹In this context, this principle takes into account development of resistance or cross-resistance to important antimicrobials.

Glossary:

* These terms are to be defined and utilized in the context of Judicious Therapeutic Use, with the intent of focusing on antimicrobials that may be of significance to human health. They are to be applied to the principles of Judicious Use outlined within the context of this document.

Antibiotic -- a chemical substance produced by a microorganism which has the capacity, in dilute solutions, to inhibit the growth of or to kill other microorganisms.

Antimicrobial -- an agent that kills microorganisms or suppresses their multiplication or growth.

Broad Spectrum Antimicrobial -- a type of antimicrobial effective against a large number of bacterial genera; generally describes antimicrobials effective against both Gram-positive and Gram-negative bacteria.

Narrow Spectrum Antimicrobial -- a type of antimicrobial effective against a limited number of bacterial genera; often applied to an antimicrobial active against specific families of bacteria.

Antimicrobial Resistance -- a property of microorganisms that confers the ability to inactivate or elude antimicrobials or a mechanism that blocks the inhibitory or killing effects of antimicrobials.

Extralabel Use -- extralabel use means actual or intended use of a drug under veterinary direction, 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.

Therapeutic -- treatment, control, or prevention of disease.

Veterinarian/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.

Veterinary Feed Directive (VFD) Drug -- The VFD category of medicated feeds was created by the Animal Drug Availability Act of 1996 to provide an alternative to prescription status for certain therapeutic animal pharmaceuticals for use in feed. Any animal feed bearing or containing a VFD drug shall be fed to animals only by or upon a lawful VFD issued by a licensed veterinarian in the course of the veterinarian's professional practice.

**AMERICAN ASSOCIATION OF FELINE PRACTITIONERS
AMERICAN ANIMAL HOSPITAL ASSOCIATION
BASIC GUIDELINES OF JUDICIOUS THERAPEUTIC USE OF
ANTIMICROBIALS**

(Approved by the AVMA Executive Board – November 2006; revised April 2009)

Introduction

The Basic Guidelines of Judicious Therapeutic Use of Antimicrobials in cats and dogs are designed to provide information to aid practicing veterinarians in choosing appropriate antimicrobial therapy to best serve their patients and to help minimize the development of antimicrobial resistance. Presented below are the Principles of Judicious Therapeutic Use of Antimicrobials adopted as a framework document for the recommended guidelines developed for cats and dogs.

Position Statement

Veterinarians agree to protect animal and public health when they pledge the Veterinarian’s Oath. It is the responsibility of veterinarians to maintain patient health by routine examinations, preventative strategies, and client education. When a medical condition exists it is important to obtain an accurate clinical diagnosis whenever possible. Once the decision is reached to use antimicrobial therapy, veterinarians strive to optimize therapeutic efficacy, minimize resistance to antimicrobials, and protect public and animal health.

The American Animal Hospital Association and the American Association of Feline Practitioners are committed to the following objectives as developed by the American Veterinary Medical Association’s Steering Committee on Judicious Therapeutic Antimicrobial Use:

Support research efforts for development of a scientific knowledge base that provides the basis for judicious therapeutic antimicrobial use.

Support educational efforts that promote judicious therapeutic antimicrobial use.

Preserve therapeutic efficacy of antimicrobials.

Continue to develop antimicrobial monitoring systems to determine resistance patterns.

Ensure current and future availability of veterinary antimicrobials.

Judicious Therapeutic Use of Antimicrobials in Cats and Dogs

Preventive strategies, such as appropriate husbandry and hygiene, routine health monitoring, and vaccinations should be emphasized.

Routine preventative health care in cats and dogs includes the following:

- Adhere to the American Association of Feline Practitioner guidelines for feline vaccinations, and American Animal Hospital Association guidelines for canine vaccinations.
- Parasite control, nutritional counseling and dental health care.
- Client education and involvement to successfully adopt good preventative health care programs.
- Appropriate hygiene and husbandry is especially important in multiple pet households.

Therapeutic antimicrobial use should be confined to appropriate clinical indications.

- The definitive diagnosis should be established whenever possible, and empirical use avoided. Practitioners should strive to rule out those viral infections, parasitism, mycotoxicosis, nutritional imbalances, and other ailments that will not respond to antimicrobial therapies.
- Antimicrobial therapy is not indicated in most viral upper respiratory (feline herpesvirus or calicivirus and canine influenza) infections not suspected to be complicated by secondary bacterial infection.
- Most cases of pancreatitis in dogs and cats do not have bacterial involvement.
- Most cases of feline lower urinary tract disease do not involve bacterial infection and in such cases antimicrobials are not indicated.

Therapeutic alternatives should be considered prior to antimicrobial therapy.

This includes supportive care, such as correction of fluid and electrolyte abnormalities, maintaining acid-base balance, and ensuring adequate nutrition. Surgical intervention may be necessary in some cases. The use of antimicrobials to prevent infection can only be justified in cases where bacterial infection is likely to occur.

Culture and susceptibility results aid in the appropriate selection of antimicrobials.

- In suspected urinary tract infection (UTI), urine collected by cystocentesis can help distinguish infection from contamination.

- It is important to note that dilute urine is a risk factor for UTI, and infection may exist despite the lack of pyuria and bacteriuria on microscopic examination. Urine culture may be the only way to identify infection in such cases.
- Ideally, minimum inhibitory concentrations (MIC) sensitivities should be done to identify the best choice of antimicrobials.
- Gram stains can help determine appropriate antimicrobial choice while awaiting culture results.
- Since certain antimicrobials are more effective against gram positive or gram negative organisms, interim antimicrobial decisions can be based on gram stain and the site of infection.

Use narrow spectrum antimicrobials whenever appropriate.

It is best to choose an antimicrobial with a narrow spectrum that is effective against the organism.

Antimicrobials considered important in treating refractory infections in human or veterinary medicine should be used in animals only after careful review and reasonable justification.

- Consider using other antimicrobials for initial therapy.
- Drug side effects or interactions should be considered when choosing an appropriate antimicrobial.

Treat for the shortest effective period possible in order to minimize therapeutic exposure to antimicrobials.

- Culture and sensitivity at the conclusion of therapy will determine if additional therapy is necessary.
- Rechecking complete blood counts and urine analyses may also be indicated.
- For specific conditions, refer to appropriate resources.

Judicious use of antimicrobials in animals requires the oversight of a veterinarian.

Judicious use of antimicrobials and extra-label use of antimicrobials should meet all requirements of a valid veterinarian-client-patient relationship (VCPR – see glossary).

Extralabel antimicrobial therapy must be prescribed in accordance with all federal laws including the Animal Medicinal Drug Use Clarification Act amendments to the Food, Drug, and Cosmetic Act and its regulations.

Appropriate dose form is critical for reliable application of the drug as well as safety for the pet and owner.

Oral medication, when prescribed for aggressive or potentially injurious patients that require restraint, is not appropriate or at the very least will not be reliably administered. Alternative administration techniques, such as hiding medication in treats may allow safe administration.

Veterinarians should work with those responsible for the care of animals to ensure the judicious use of antimicrobials.

- Administration procedures of antimicrobials must be made clear and labeled correctly (e.g., doxycycline capsules or tablets must be followed by liquid to avoid esophageal stricture).
- Clients should be advised to complete the entire course of medication even if signs of illness have abated.
- Clients should be warned of potential adverse reactions, and what to do if any such reactions occur (for example, stop medication and call your veterinarian for further recommendations).

Regimens for therapeutic antimicrobial use should be optimized using current pharmacological information and principles.

The antimicrobial chosen should be effective against the organism and be able to penetrate the affected organ in a proper concentration to eliminate the offending organism.

When combination antimicrobial treatment is advantageous, avoid the use of drugs whose actions are antagonistic.

For example, a drug that inhibits the growth of microbes, e.g. tetracycline, should not be combined with a drug whose efficacy is dependent on rapid bacterial growth, e.g. penicillin.

The routine prophylactic use of antimicrobials should never be used as a substitute for good animal health management.

Sterile technique and proper tissue handling should eliminate the need for prophylactic antibiotics in ovariohysterectomies and most other sterile procedures.

Minimize environmental contamination with antimicrobials whenever possible.

Accurate records of treatment and outcome should be maintained to evaluate therapeutic regimes.

Recognize risk factors for infections in cats and dogs and prevent or correct them whenever possible. These include, but are not limited to:

- Urinary catheterization
- Dilute urine
- Intravenous catheters
- Fight wounds
- Environmental factors (stress, crowding, poor hygiene, transportation, temperature extremes, poor ventilation and high humidity)
- Feline leukemia virus, feline immunodeficiency virus infection, or other debilitating disease
- Immunosuppressive drugs (chemotherapeutic agents, glucocorticoid therapy) Endocrine Diseases (Diabetic cats are more prone to urinary tract, skin and mouth infections; dogs with hyperadrenocorticism are more prone to skin and urinary infections)

Glossary

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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.

Veterinary Feed Directive (VFD) Drug – The VFD category of medicated feeds was created by the Animal Drug Availability Act of 1996 to provide an alternative to prescription status for certain therapeutic animal pharmaceuticals for use in feed. Any animal feed bearing or containing a VFD drug shall be fed to animals only by or upon a lawful VFD issued by a licensed veterinarian in the course of the veterinarian's professional practice.

JUDICIOUS USE OF ANTIMICROBIALS FOR TREATMENT OF AQUATIC ANIMALS BY VETERINARIANS

(Approved by the AVMA Executive Board, November 2002, revised November 2008)

Aquatic veterinarians are expected to use all therapeutants, including antimicrobials, judiciously. Judicious use of antimicrobials for aquatic animals is necessary to:

- Restore aquatic animal health;
- Protect the economic livelihood of commercial facilities;
- Ensure the continued production of foods of animal origin;
- Minimize development of antimicrobial resistance in animal pathogens;
- Minimize development of antimicrobial resistance in human pathogens; and
- Minimize the shedding of zoonotic pathogens into the environment and potentially into the food chain.

In addition to awareness of, and adherence to AVMA's Judicious Therapeutic Use of Antimicrobials guidelines, the following are specific recommendations for the antimicrobial use in aquatic animals.

Judicious Antimicrobial Use Principles

The aquatic veterinarian should:

- **Accept responsibility for helping clients design health management programs, including for individual animals and/or populations or stock general populations, including immunization and nutrition programs, that will reduce the incidence of disease, and the need for antimicrobial treatment.**

Development and implementation of appropriate disease prevention through effective vaccination is likely to reduce the incidence of disease and subsequent need for antimicrobial treatment. When there is an increased disease incidence, efforts to identify and correct immunosuppressive factors should be implemented. Ensuring high quality nutrition is of paramount importance and will provide general as well as immune-related health benefits for all life stages. Optimal nutrition can lead to a reduction in morbidity and mortality with a consequent decrease in the need for antimicrobial treatment. Water source quality should be evaluated, including an assessment of the potential disease transmission risk from feral populations and the related need for biosecurity measures to protect captive populations. This will help to prevent the introduction of additional pathogenic microorganisms that could cause diseases requiring antimicrobial treatment. Veterinarians should work closely with other aquatic animal health experts employed at the facility in the design and implementation of health management programs.

Use antimicrobial drugs only within the confines of a valid veterinarian-client-patient relationship, including both the dispensing and issuing of prescriptions and veterinary feed directives. Extra-label usage should be consistent with regulatory agency laws, regulations and policies.

The veterinarian must:

Be either the person responsible for diagnosis of disease conditions in an aquatic animal facility or be working directly with a fish health professional at the facility;

Be available for questions or concerns following treatment with antimicrobial drugs; and,

Accept responsibility for health care of the aquatic animals on that facility.

Have familiarity with the facility through previous visits to the premises. [see VFD and ELDU requirements]

Under these circumstances, the veterinarian will be able to make a recommendation on appropriate antimicrobial drug treatment and minimize the development of antimicrobial resistance. Veterinarians prescribing, dispensing or administering antimicrobials to aquatic animals should utilize the services of unbiased and reputable sources (e.g., Food Animal Residue Avoidance Databank) to provide scientifically sound withdrawal times for food animal producers.

- **Properly select and use antimicrobials. Veterinarians should participate in continuing education programs that include information on therapeutics and emergence and/or development of antimicrobial resistance.**

Antimicrobial resistance concerns, including the transmission of human safety food borne resistant microorganisms and/or resistance determinants and human pathogen antimicrobial resistance, are discussed at numerous regional, state and national meetings every year. At least some portion of the required continuing education hours should be received on the topic of antimicrobial susceptibility of animal and potential zoonotic pathogens. Material accessible from reliable sources such as the FDA/CVM, FARAD, AVMA home pages, and from the many available additional sources of professional information, should be incorporated into treatment considerations and recommendations. Many aspects of aquatic animal health management, including nutrition and immunology, are topics of active research. Veterinarians should stay current in their knowledge of this research in order to develop effective disease control programs.

- **Have strong clinical evidence of the identity of the disease etiology, based upon history, clinical signs, necropsy, laboratory data, and/or past experience before recommending antimicrobial treatment.**

Records and observations on individual animals or within populations, such as ponds, tanks, pens and raceways within a veterinarian's area of practice may be very helpful in developing antimicrobial treatment recommendations. Historical diagnostic material obtained from post mortem and moribund aquatic animal examinations may also be helpful. Diagnostic data reports are a useful barometer of changes in pathogen sensitivity patterns, although susceptibility profiles may be skewed (perhaps due to prior therapy). The status of the originating facility should be considered when establishing a diagnosis in disease outbreaks and when selecting a treatment protocol. Proven biosecurity measures should be implemented when aquatic animals are introduced to a facility to reduce the need for antimicrobial therapy.

- **Treat aquatic animals with antimicrobial according to the product label (including indication, dosage, frequency, duration, method of administration, species and environmental conditions).**

The product label recommendations are established through sound scientific data. Veterinarians should follow these recommendations instructions (e.g. "top-coating" or "top-dressing" of feed is not among the currently approved formulation methods). Furthermore, the goal of therapy should be to reduce fish mortality and minimize disease recurrence. Veterinarians should strive for the lowest dosage and appropriate frequency and duration of treatment that achieves these goals. Veterinarians should rely on previous medical records and valid published information to support clinical judgments on the proper time to discontinue therapy. The antimicrobial drug label may require specific waste handling, or may limit the concentration allowed in production facility effluent water. The veterinarian should assure that the antimicrobial- containing waste or effluent is handled according to the product label directions. The veterinarian should also assure that the production facility complies with appropriate federal, state and local laws and regulations (e.g., National Pollutant Discharge Elimination System permits) applicable to antimicrobial use and discharge before authorizing antimicrobial administration. Withdrawal times in food animals should also be monitored for compliance.

- **Choose an antimicrobial and treatment regimen based on available laboratory and label (including package insert) information, additional data in the literature, and with consideration of the pharmacokinetics, spectrum and pharmacodynamics of the antimicrobial.**

When this information is combined with the clinical and laboratory information previously mentioned, prudent and judicious antimicrobial use decisions are possible. The label dose, route, frequency and duration should be followed except where extralabel drug use is necessary and falls within laws, regulations and policies. Familiarity with extra-label drug use requirements is essential given the limited availability of approved antimicrobial drugs for aquatic animal use.

- **Use antimicrobials with a specific clinical outcome(s) in mind, including a specific target for population morbidity and/or mortality rate reduction.**

Specific outcome criteria prevent unnecessarily long therapy and indicate when the current therapy is ineffective. A timeline for expected results should be included in the treatment protocol.

- **Determine population pathogen susceptibility at the first indication of increasing morbidity or mortality and monitor the therapeutic response to detect changes in microbial susceptibility and to evaluate antimicrobial selections.**

If the specific outcome criteria are not being met within the expected timeline, the diagnosis and treatment protocol should be re-evaluated by the veterinarian.

- **Routine necropsy examination of aquatic animal populations should be periodically performed, including antimicrobial susceptibility testing, to update historical information for developing treatment and control protocols.**

This will provide information on changes in pathogens in the population and indications of drug antimicrobial resistance development by the pathogens.

- **Use products that have the narrowest spectrum of activity and known in vivo effectiveness against the pathogen causing the disease problem.**

In clinical situations, the boundary between a narrow and broad spectrum of activity may be difficult to determine. Narrow and broad spectrum levels of activity will vary depending upon the bacteria affected by the antimicrobial drug and the treatment regimen chosen. In spite of the difficulty in confining antimicrobial use to a narrow spectrum of activity, resistance to antimicrobials should be minimized by selecting an antimicrobial with a narrow spectrum of activity whenever possible. The aquatic animal veterinarian presently has access to a very limited armamentarium of antimicrobials. However, this situation may change as new products are developed and approved. The veterinarian needs to be attuned to the potential for change.

- **Choose antimicrobial of lesser importance in human medicine, if these receive future aquatic animal use approval, and do not choose an antimicrobial for which emergence of resistance is expected to be in an advanced stage.**

Antimicrobials that are of lesser importance in human medicine should be chosen when considering extralabel use of newer generation antimicrobials. This is of particular concern if the extralabel drug is in the same class as a human antimicrobial that may be the primary or sole treatment for a human infection. New antimicrobials should be reserved for cases that can be predicted to be refractory to other therapies and should be used according to label directions or extralabel drug use regulations.

- **Use, whenever possible, an antimicrobial labeled to treat the condition diagnosed.**

The veterinarian should work with clients to ensure that appropriate diagnostic procedures are in place to evaluate disease causation and initiate the appropriate antimicrobial therapy when indicated.

- **Ensure proper antimicrobial use at the facility and protect antimicrobial integrity through proper handling, storage and observation of the expiration date.**

Each drug held at a client's facility should be properly labeled, stored in a secure location at the proper temperature, and used according to instructions before its expiration date, and appropriately disposed of if past the expiration date on the drug label.

- **Prescribe, dispense or write a Veterinary Feed Directive for antimicrobial quantities appropriate to the production-unit size and expected need using the approved formulation.**

The amount of a particular antimicrobial prescribed or written in a veterinary feed directive should be consistent with the diagnosed disease and treatment requirements. If the antimicrobial is not dispensed by the veterinarian, then good communication between the veterinarian, animal producer, feed mill and/or pharmaceutical distributor is essential. This communication needs to be coupled with the appropriate prescription or veterinary feed directive and correct medicated feed labeling to ensure proper **antimicrobial** usage. The prescribing veterinarian should seek to review or receive copies of invoices of scripted **antimicrobial** purchases to ensure that appropriate quantities are being purchased for use.

Work with facility aquatic animal health management personnel to ensure that facility personnel receive adequate training on the use of antimicrobials including indications, diagnosis, dosages, withdrawal times, route of administration, storage, handling, and accurate record keeping.

The veterinarian should ensure that labels are adequate to instruct facility personnel on the correct use of antimicrobials. The veterinarian should provide training to facility personnel on proper antimicrobial administration.

Work closely with all other health experts involved in aquatic animal population health management at the facility.

Veterinarians are encouraged to work with clients to develop written standard operating procedures for initiating disease diagnostic activities and implementing treatment. Those protocols should include specific procedures to follow when administering antimicrobials at aquatic animal facilities.

The aquatic veterinarian should also follow the principles of:

Not using combination antimicrobial therapy unless there is information to show that this decreases or suppresses target organism resistance development as there are no scientific data currently available to indicate that combination antibacterial therapy is beneficial with the few antimicrobials labeled for use in aquatic animals.

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PRUDENT DRUG USAGE GUIDELINES FOR CATTLE DEVELOPED BY THE AMERICAN ASSOCIATION OF BOVINE PRACTITIONERS

(Approved by the AVMA Executive Board – November 2000)

The production of safe and wholesome animal products for human consumption is a primary goal of members of the AABP. In reaching that goal, the AABP is committed to the practice of preventive immune system management through the use of vaccines, parasiticides, stress reduction and proper nutritional management. The AABP recognizes that proper and timely management practices can reduce the incidence of disease and therefore reduce the need for antimicrobials; however, antimicrobials remain a necessary tool to manage infectious disease in beef and dairy herds. In order to reduce animal pain and suffering, to protect the economic livelihood of beef and dairy producers, to ensure the continued production of foods of animal origin, and to minimize the shedding of zoonotic bacteria into the environment and potentially the food chain, prudent use of antimicrobials is encouraged. Following are general guidelines for the prudent therapeutic use of antimicrobials in beef and dairy cattle.

1. The veterinarian's primary responsibility to the client is to help design management, immunization, housing and nutritional programs that will reduce the incidence of disease and the need for antimicrobials.
2. Antimicrobials should be used only within the confines of a valid veterinarian-client-patient relationship; this includes both dispensing and issuance of prescriptions.
3. Veterinarians should properly select and use antimicrobial drugs.
 - a. Veterinarians should participate in continuing education programs that include therapeutics and emerging and/or development of antimicrobial resistance.
 - b. The veterinarian should have strong clinical evidence of the identity of the pathogen causing the disease, based upon clinical signs, history, necropsy examination, laboratory data and past experience.
 - c. The antimicrobial selected should be appropriate for the target organism and should be administered at a dosage and route that are likely to achieve effective levels in the target organ.
 - d. Product choices and regimens should be based on available laboratory and package insert information, additional data in the literature, and consideration of the pharmacokinetics and pharmacodynamics of the drug.

- e. Antimicrobials should be used with specific clinical outcome(s) in mind, such as fever reduction, return of mastitic milk to normal, or to reduce shedding, contagion and recurrence of disease.
- f. Periodically monitor herd pathogen susceptibility and therapeutic response, especially for routine therapy such as dry cow intramammary antibiotics, to detect changes in microbial susceptibility and to evaluate antimicrobial selections.
- g. Use products that have the narrowest spectrum of activity and known efficacy *in vivo* against the pathogen causing the disease problem.
- h. Antimicrobials should be used at a dosage appropriate for the condition treated for as short a period of time as reasonable, i.e., therapy should be discontinued when it is apparent that the immune system can manage the disease, reduce pathogen shedding and minimize recurrence of clinical disease or development of the carrier state.
- i. Antimicrobials of lesser importance in human medicine should be used in preference to newer generation drugs that may be in the same class as drugs currently used in humans if this can be achieved while protecting the health and safety of the animals.
- j. Antimicrobials labeled for use for treating the condition diagnosed should be used whenever possible. The label, dose, route, frequency and duration should be followed whenever possible.
- k. Antimicrobials should be used extra-label only within the provisions contained within AMDUCA regulations.
- l. Compounding of antimicrobial formulations should be avoided.
- m. When appropriate, local therapy is preferred over systemic therapy.
- n. Treatment of chronic cases or those with a poor chance of recovery should be avoided. Chronic cases should be removed or isolated from the remainder of the herd.
- o. Combination antimicrobial therapy should be discouraged unless there is information to show an increase in efficacy or suppression of resistance development for the target organism.
- p. Prophylactic or metaphylactic use of antimicrobials should be based on a group, source or production unit evaluation rather than being utilized as standard practice.
- q. Drug integrity should be protected through proper handling, storage and observation of the expiration date.

4. Veterinarians should endeavor to ensure proper on-farm drug use.
 - a. Prescription or dispensed drug quantities should be appropriate to the production-unit size and expected need so that stockpiling of antimicrobials on the farm is avoided.
 - b. The veterinarian should train farm personnel who use antimicrobials on indications, dosages, withdrawal times, route of administration, injection site precautions, storage, handling, record keeping and accurate diagnosis of common diseases. The veterinarian should ensure that labels are accurate to instruct farm personnel on the correct use of antimicrobials.
 - c. Veterinarians are encouraged to provide written guidelines to clients whenever possible to describe conditions and instructions for antimicrobial use on the farm or unit.

AMERICAN ASSOCIATION OF EQUINE PRACTITIONERS PRUDENT DRUG USAGE GUIDELINES

(Approved by the AVMA Executive Board, June 2001)

The health and welfare of horses and their owners is the primary goal of members of the American Association of Equine Practitioners (AAEP). We believe that these guidelines merely reiterate the standard of practice and what is common in equine veterinary medicine. The AAEP provides continuing education for veterinarians that focuses on the appropriate use of antimicrobial drugs. Our members are committed to the practice of preventive immune system management through the use of vaccines, parasiticides, stress reduction, and proper nutritional management. The AAEP recognizes that proper and timely management practices can reduce the incidence of disease and therefore reduce the need for antimicrobials; however, antimicrobials remain a necessary tool to manage infectious disease in horses. In order to reduce animal pain and suffering, prudent use of antimicrobials is encouraged. The following are general guidelines for the prudent therapeutic use of antimicrobials in horses:

1. The veterinarian's primary responsibility is to aid in the design of management, immunization, housing, and nutrition programs that will reduce the incidence of disease and the need for antimicrobials.
2. Antimicrobials should be used only within the confines of a valid veterinarian-client-patient relationship; this includes both dispensing and issuance of prescriptions.
3. Veterinarians should:
 - a. Participate in continuing education programs that include therapeutics and emerging and/or development of antimicrobial resistance.
 - b. Avoid antimicrobial use in transient virus associated conditions.
 - c. Have clinical evidence of the identification of the pathogen associated with the disease based upon history, clinical signs, laboratory data, and experience.
 - d. Select antimicrobials that are appropriate for the target organism and should be administered at a dosage and route that are likely to achieve effective levels in the target organ.
 - e. Make product choices and use regimens that are based on available laboratory and package insert information, additional data in the literature, and consideration of the pharmacokinetic and pharmacodynamic aspects of the drug.

f. Use products that have the narrowest spectrum of activity and known efficacy in vivo and/or in vitro against the pathogen causing the disease problem.

g. Utilize antimicrobials at a dosage appropriate for the condition treated for as short a period of time as reasonable, i.e., therapy should be discontinued when it is apparent that the immune system can manage the disease, reduce pathogen shedding, and minimize recurrence of clinical disease or development of the carrier state.

h. Select antimicrobials of lesser importance in human medicine in preference to newer generation drugs that may be in the same class if this can be achieved while protecting the health and safety of the animals.

i. Utilize antimicrobials labeled for treating the condition diagnosed, and whenever possible, at the labeled dose, route, frequency, and duration if the available scientific information still supports their efficacy.

j. Utilize antimicrobials on an extra-label basis only within the provisions contained within Animal Medicinal Drug Use Clarification Act amendments to the Food, Drug, and Cosmetic Act and its regulations.

k. When appropriate, utilize local therapy over systemic therapy.

l. Be discouraged from using combination antimicrobial therapy unless there is information to show an increase in efficacy or suppression of resistance development for the target organism.

m. Protect integrity through proper handling, storage, and observation of the expiration date.

4. Veterinarians should endeavor to ensure proper on-farm drug use.

Prescription or dispensed drug quantities should be appropriate so that stockpiling of antimicrobials on the farm is avoided.

**GUIDELINES TO JUDICIOUS THERAPEUTICS USE OF
ANTIMICROBIALS IN POULTRY
PREPARED BY THE AMERICAN ASSOCIATION OF AVIAN
PATHOLOGISTS**

(Approved by the AVMA Executive Board, November 2000; Revised April 2005)

Introduction

The guidelines to judicious therapeutic use in poultry are developed to provide information to the field veterinarian regarding intervention strategies for common bacterial diseases affecting both chickens and turkeys. Presented below are the Principles of Judicious Therapeutic Use of Antimicrobials as approved by the American Veterinary Medical Association Executive Board and are used as the framework for the recommended guidelines developed for poultry. This document is a working document and will be updated annually by the American Association of Avian Pathologists Committee on Drugs and Therapeutics with input by the National Chicken Council and National Turkey Federation.

**American Veterinary Medical Association
Principles of Judicious Therapeutic Use of Antimicrobials**

Position Statement

When the decision is reached to use antimicrobials for therapy, veterinarians should strive to optimize therapeutic efficacy and minimize resistance to antimicrobials to protect public and animal health.

Objectives

Support development of a scientific knowledge base that provides the basis for judicious therapeutic antimicrobial use.

Support educational efforts that promote judicious therapeutic antimicrobial use.

Preserve therapeutic efficacy of antimicrobials.

Ensure current and future availability of veterinary antimicrobials.

Strategies

Facilitate development and distribution of appropriate antimicrobial use guidelines by practitioner species-interest groups.

Improve scientifically based therapeutic practices through education.

Recognized Needs

Improved monitoring and feedback systems for antimicrobial use and resistance patterns.

Research to improve scientifically based therapeutic practices.

Judicious Use Principles

Preventive strategies, such as appropriate husbandry and hygiene, routine health monitoring, and immunization, should be emphasized.

Other therapeutic options should be considered prior to antimicrobial therapy.

Judicious use of antimicrobials, when under the direction of a veterinarian, should meet all requirements of a valid veterinarian-client-patient relationship.

Prescription, Veterinary Feed Directive, and extralabel use of antimicrobials must meet all the requirements of a valid veterinarian-client-patient relationship.

Extralabel antimicrobial therapy must be prescribed only in accordance with the Animal Medicinal Drug Use Clarification Act amendments to the Food, Drug, and Cosmetic Act and its regulations.

Veterinarians should work with those responsible for the care of animals to use antimicrobials judiciously regardless of the distribution system through which the antimicrobial was obtained.

Regimens for therapeutic antimicrobial use should be optimized using current pharmacological information and principles.

Antimicrobials considered important in treating refractory infections in human or veterinary medicine should be used in animals only after careful review and reasonable justification. Consider using other antimicrobials for initial therapy.¹

Use narrow spectrum antimicrobials whenever appropriate.

Utilize culture and susceptibility results to aid in the selection of antimicrobials when clinically relevant.

Therapeutic antimicrobial use should be confined to appropriate clinical indications. Inappropriate uses such as for uncomplicated viral infections should be avoided.

Therapeutic exposure to antimicrobials should be minimized by treating only for as long as needed for the desired clinical response.

Limit therapeutic antimicrobial treatment to ill or at risk animals, treating the fewest animals indicated.

Minimize environmental contamination with antimicrobials whenever possible.

Accurate records of treatment and outcome should be used to evaluate therapeutic regimens.

¹In this context, this principle takes into account development of resistance or cross-resistance to important antimicrobials.

Glossary

Antibiotic – a chemical substance produced by a microorganism, which has the capacity, in dilute solutions, to inhibit the growth of or to kill other microorganisms.

Antimicrobial – an agent that kills bacteria or suppresses their multiplication or growth. This includes antibiotics and synthetic agents. This excludes ionophores and arsenicals.

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 – a property of bacteria that confers the capacity to inactivate or exclude antimicrobials or a mechanism that blocks the inhibitory or killing effects of antimicrobials.

Extralabel – Extralabel use means actual use 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.

Therapeutic – treatment, control, and prevention of bacterial disease.

Veterinarian/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.

Veterinary Feed Directive (VFD) Drug – The VFD category of medicated feeds was created by the Animal Drug Availability Act of 1996 to provide an alternative to prescription status for certain therapeutic animal pharmaceuticals for use in feed. Any animal feed bearing or containing a VFD drug shall be fed to animals only by or upon a lawful VFD issued by a licensed veterinarian in the course of the veterinarian’s professional practice.

**Therapeutic Antimicrobials* Available For Use In Poultry
FDA Approved for oral and/or injectable**

***Antimicrobials:** In this document antimicrobials will be defined as any substance given to poultry for the treatment and/or control of bacterial disease within the bird in water or as an injection.

Antibiotic Class	Generic Name	Route
Aminoglycosides	streptomycin	oral
	gentamicin	injectable
	neomycin	oral
Aminocyclitols	spectinomycin	oral
β-Lactams	ceftiofur	injectable
Decapeptides	bacitracin	oral
Lincosamides	lincomycin	oral
Macrolides	erythromycin	oral
	tylosin	oral
Penicillins	potassium-penicillin G	oral
Sulfonamides	sulfadimethoxine	oral
	sulfaquinoxaline	oral
Tetracyclines	chlortetracycline	oral

	oxytetracycline tetracycline HCl	oral oral
Combinations	lincomycin/spectinomycin	oral

Dosages of the above products should be according to the manufacture’s labeled recommendations or based on the clinical experience of attending veterinarian.

Classification of Antimicrobials Based on Importance and Use in Both Humans and Poultry

Class I: Important in human medicine; to be held in reserve for treatment in poultry;

Class II: Human medicine use where alternatives exist; exposure in poultry is moderate; erythromycin, penicillin, gentamicin, sulfonamides, ceftiofur, tetracycline class;

Class III: No or minimal use in human medicine or low exposure in poultry; bacitracin, streptomycin, tylosin, lincomycin, spectinomycin, neomycin.

The following are general use guidelines for antimicrobial intervention in poultry to be used to aid the veterinarian in making informed decisions regarding therapeutic antimicrobial use.

Antimicrobials in Class III used at labeled instructions should be considered first if farm history, in vitro sensitivity and clinical judgment warrants.

Extra label use of Class III antimicrobials should be considered if labeled use of Class III antimicrobials have failed, farm history and/or in vitro sensitivity dictates, or based on clinical experience of the attending veterinarian. Extra label drug use will be performed with a valid veterinarian-client-patient relationship.*

***(See AVMA principles for judicious therapeutic use of antimicrobials before initiating extra label use)**

When farm history, in vitro sensitivity and/or clinical judgment warrants the use of antimicrobials in Class II, their use should be in accordance with labeled instructions before considering any extra label use.

In the event that antimicrobials in Classes II or III have been carefully considered and all other intervention strategies have failed, labeled use of antimicrobials in Class I should be considered carefully based on all appropriate information.

With any treatment regimen within Classes II or III, using narrow spectrum antimicrobials is recommended to avoid over use of broad-spectrum antimicrobials.

Bacteriostatic drugs should be considered carefully when treating chronic infection due to decreased primary defense mechanisms in the birds. Overall effectiveness of bacteriostatic drugs in chronic infections may be decreased. Likewise, when immunosuppressive agents such as infectious bursal disease and chicken anemia virus are involved, bacteriostatic antimicrobials may not be clinically effective.

When using the tetracycline class of antibiotics and erythromycin in proportioners, the addition of citric acid to lower stock solution pH may increase the stability and availability of these antimicrobials.

When using sulfonamides and penicillin in proportioners, the addition of ammonia to raise the pH of the stock solution may increase the stability and availability of these antimicrobials.

When multiple houses are present on the farm with disease, each flock within each house should be evaluated individually as to the current disease status. Only those birds in the house affected should be treated. Mortality and morbidity should be evaluated closely to determine treatment protocols. The least number of diseased and “at risk” birds should be treated on a farm.

Colibacillosis in Chickens

Colibacillosis in chickens is frequently manifested as a septicemia resulting in a subacute serositis characterized by fibrinoheterophilic infiltration producing a fibrinous pericarditis, perihepatitis, airsacculitis and pneumonia.

Diagnostics: Morbidity and mortality should be used as keys for diagnostic surveillance. Morbidity of >1% and/or mortality of 1 bird per thousand should initiate diagnostic efforts in cases of colibacillosis. If typical lesions are observed at necropsy, prior to initiation of treatment, culture and in vitro sensitivity should be performed at this time. Likewise, appropriate samples should be collected to determine the complete etiology to prevent its reoccurrence (see prevention strategies). Sensitivity tests should be performed before treatment is initiated unless previous sensitivity patterns have demonstrated historic susceptibility to a certain class of antimicrobials. However, in vitro sensitivity monitoring is encouraged to maintain current antimicrobial susceptibility patterns.

Non-Antimicrobial Interventions: The environment should be optimized to reduce morbidity and mortality. Optimum temperature should be achieved based on age and activity of the birds and ventilation should be maximized accordingly. Every effort should be made to reduce ammonia and/or dust concentrations in the house to minimize the negative impact on primary defense mechanisms in the birds. Likewise, ventilation should be optimized for litter moisture control to reduce bacterial exposure. Broilers, in partial house brooding environments, can be moved from brooding chamber provided there is adequate heat and ventilation. To assess the progression of colibacillosis within a flock, culling procedures may be used to better evaluate the impact of this disease.

Antimicrobial Treatment Intervention: Based on in vitro sensitivity, flock or farm history and clinical judgment by the veterinarian, antimicrobial intervention may be warranted. Previously noted antimicrobial classifications and general use guidelines should be considered before antimicrobial intervention.

Suggested Antimicrobials for Colibacillosis Intervention

Class III: streptomycin, neomycin*

Class II: chlortetracycline, oxytetracycline, tetracycline HCl, sulfonamides (Care should be taken when considering sulfonamide use in broilers due to the potential for residues)

Class I: *Neomycin usage in chickens will be under the guidelines outlined in the Animal Medicinal Drug Use Clarification Act (AMDUCA) guidelines

Any antimicrobial selected for use, if not labeled specifically to treat *E. coli* infections in chickens, is extra label use and must be used as outlined in AMDUCA.

Treatment Duration: per labeled instructions or based on the veterinarian's clinical judgment

Treatment Assessment: During and after therapeutic intervention, the flock should be carefully evaluated as to the success of treatment. These evaluations can be performed by the attending veterinarian or by service personnel under the veterinarian's direction. Accurate records should be maintained on all treatment outcomes and included in the farm history records for future reference.

Other Treatment Considerations: Conditions associated with *E. coli* for which treatment may not be appropriate include: hepatic granulomas, inflammatory process, salpingitis, sinusitis, osteomyelitis, meningitis, omphalitis after placement, and panophthalmitis.

Prevention Strategies: *E. coli* is generally considered an opportunistic or secondary bacterial invader. The focus should be placed on prevention strategies. Non-infectious causes of secondary colibacillosis include chilling, heat stress, and increased ammonia levels. Every effort should be made to optimize the birds' environment at all times including a thorough cleaning and disinfection of the house after flock processing.

Immunosuppressive agents such as chicken anemia virus, infectious bursal disease, Marek's disease, and leukosis must be considered as primary factors involved in predisposing chickens to colibacillosis. Serology, virus isolation and identification are warranted. Based on any positive diagnostics tests, appropriate vaccination/control strategies should be implemented.

The most common primary respiratory agents involved in colibacillosis in chickens are field and/or vaccine strains of Newcastle disease and infectious bronchitis viruses. Serological evaluation and subsequent identification of these viruses must be included in a diagnostic work-up of a colibacillosis flock. Any positive identification of the above agents warrants careful consideration and evaluation of current vaccination strategies. Other agents involved in chickens that may result in colibacillosis include avian influenza virus and *Mycoplasma* spp.

Turkey Colibacillosis

Colibacillosis in turkeys occurs commonly as an acute septicemia and/or a subacute serositis. The acute septicemic form results in a sudden increase in mortality with splenomegaly being the predominant post mortem lesion. Subacute serositis characterized by fibrinous pericarditis, perihepatitis, airsacculitis and pneumonia is similar to that which occurs in chickens.

Diagnostics: Morbidity and mortality parameters should be used as keys for diagnostic surveillance. Morbidity of $>1/2\%$ and/or mortality greater than or equal to 1 bird per thousand should initiate diagnostic efforts in cases of colibacillosis. When typical lesions are observed at necropsy, prior to treatment intervention, culture and in vitro sensitivity should be performed at this time. Likewise, appropriate samples should be collected to determine the complete etiology of primary agents involved to prevent reoccurrence of colibacillosis (see prevention strategies). Sensitivity tests should be performed before treatment initiated unless previous sensitivity patterns and farm or flock history have demonstrated susceptibility to certain classes of antimicrobials. In vitro sensitivity monitoring is encouraged to maintain current antimicrobial susceptibility patterns.

Non-Antimicrobial Interventions: Environmental management is an important component to colibacillosis control with or without antimicrobial intervention. Correcting any heat or cold stress and minimizing the effects of increased ammonia levels will aid in controlling mortality associated with colibacillosis. Ventilation should also be optimized for litter moisture control to reduce bacterial exposure. If poults are breaking with *E. coli* in the brooder house, movement of the birds to the grow-out houses may be considered if optimum temperature and ventilation is present. To assess the progression of colibacillosis in a flock, culling procedures may be used to better evaluate the impact of this disease in a flock.

Antimicrobial Treatment Intervention: Based on in vitro sensitivity, flock or farm history and clinical judgment by the attending veterinarian, antimicrobial intervention may be indicated. Previously noted antimicrobial classifications and general use guidelines should be considered before antimicrobial intervention.

Suggested Antimicrobials for Colibacillosis Intervention in Turkeys:

Class III: streptomycin*, neomycin;

Class II: chlortetracycline, oxytetracycline, tetracycline HCl, sulfadimethoxine, sulfaquinoxaline;

Class I: * Streptomycin use in turkeys will be under the guidelines in AMDUCA. Any antimicrobial selected for use, if not specifically labeled to treat *E. coli* infections in turkeys is extra label use and must be used as outlined in AMDUCA.

Treatment Duration: Per labeled instruction or based on clinical judgment of the attending veterinarian

Treatment Assessment: During and after therapeutic intervention, the flock should be carefully evaluated as to the success of the treatment. These evaluations can be performed by the attending veterinarian or by service personnel under the veterinarian's direction. Accurate records should be maintained on all treatment outcomes and included in the farm history and records for future reference.

Other Treatment Considerations: Conditions associated with *E. coli* infections for which treatment may not be appropriate include: arthritis, hepatic granulomas, meningitis, salpingitis, panophthalmitis, omphalitis after placement, and osteomyelitis.

Prevention Strategies: Acute colisepticemia in turkeys accompanied by sudden increase in mortality usually suggests a primary enteric infection. The most common enteric insult in turkeys 5 weeks of age or older is infection with hemorrhagic enteritis virus (HE). This exposure can come from either a field or vaccine strain of HE virus. Consideration of maternal antibodies, type of vaccine used and timing of the vaccination can prevent the occurrence of colibacillosis under these conditions. Vaccine strategies for HE control should be evaluated.

Other agents involved in predisposing turkeys to the acute septicemic form of *E. coli* include turkey coronavirus, poult enteritis mortality syndrome, rotavirus, astrovirus, enterovirus, *Eimeria* spp. *Cryptosporidium* spp, *Spironucleus*, and *Hexamita*. After diagnostic evaluation of the primary agent, appropriate preventative measures should be initiated to prevent the reoccurrence of colibacillosis caused by the above agents.

The subacute serositis form of colibacillosis is most commonly associated with a primary respiratory insult and be initiated by both non-infectious and infectious causes. Non-infectious causes include chilling, heat stress, increased ammonia levels, and iatrogenic exposure. Every effort should be made to optimize the birds environment at all times including a thorough cleaning and disinfection of the house after flock processing.

Infectious agents associated with this form are: Newcastle disease virus, *Bordetella avium*, *Mycoplasma* spp., pneumovirus, avian influenza, and *Ornithobacterium rhinotracheale*. Serologic evaluation of the flock and/or isolations of these primary causative agents and implementation of appropriate vaccination and other prevention strategies will minimize the reoccurrence of colibacillosis in turkeys.

Fowl Cholera in Chickens (Pasteurellosis)

Fowl cholera, caused by *Pasteurella multocida* in chickens is most commonly observed in pullets and broiler breeders. It causes a septicemia and lung disease in the acute disease. In the subacute and chronic disease it causes localized lesions producing meningitis, arthritis, and swollen wattles with cellulitis.

Diagnostics: Because of the acute nature of this disease, diagnostic evaluation should be performed at the first onset of clinical signs, morbidity and mortality. At necropsy, prior to initiation of treatment, samples should be collected from organs involved. Most typically, brains, wattles, livers, joints, and bone marrow should be swabbed and samples collected for bacterial isolation and sensitivity testing. Antibiotic sensitivity profiling should be maintained and used for reference and comparison on any future outbreaks occurring on the same farm.

Non-Antimicrobial Intervention: As with many bacterial infections, the environment should be optimized to minimize mortality and morbidity. Strict biosecurity should be implemented to prevent spread to other houses on the same farms. Optimal dead bird disposal should be considered to prevent rodents, wild animals and domestic animals access to mortality.

Antimicrobial Intervention: Based on in vitro sensitivity, flock and farm history and the clinical judgment of the veterinarian antibiotic intervention is warranted due to the potential acute nature of this disease.

Suggested Antimicrobials for Fowl Cholera Intervention:

Class III: No antibiotics effective

Class II: *tetracycline class, sulfaquinoxaline, sulfadimethoxine, erythromycin;

*Any extra label use of this class of drugs should be under the guidelines in the AMDUCA.

Treatment Duration: Per labeled instructions or based on the veterinarian's clinical judgment.

Treatment Assessment: During and after therapeutic intervention, the flock should be carefully evaluated as to the success of the treatment. These evaluations can be performed by the attending veterinarian or by service personnel under the veterinarian's direction. Accurate records should be maintained on all treatment outcomes and included in the farm history and records for future reference.

Other Treatment Considerations: In the chronic form of this disease, i.e. over two weeks in duration, response to antimicrobial therapy is limited and must be critically evaluated before initiation.

Prevention: Vaccination strategies must be evaluated. It is recommended that the organisms be serotyped to determine if a vaccination break has occurred or for the inclusion of any new serotype in future vaccination programs. Live and killed vaccines, alone or in combination usually provides adequate control of this disease. Improved rodent control should be considered. A thorough cleaning and disinfection should be performed between flocks.

Fowl Cholera in Turkeys: (Pasteurellosis)

Fowl cholera in turkeys occurs in both market birds and breeders. Acute, sub-acute and chronic forms of the disease are not uncommon in turkeys. Acute septicemia followed by infections in the joints, lungs and eyes are observed.

Diagnostics: Because of the acute nature of this disease, diagnostic work-ups should be performed when morbidity is present or a clinical diagnosis has been performed. Prior to initiation of treatment, culture and sensitivity should be performed to provide the appropriate antimicrobial therapy. Typically lung, liver and/or bone marrow can be sampled for culture and sensitivity.

Non-Antimicrobial Intervention: Environment should be optimized. Strict biosecurity measures should be in place to prevent spread within a farm. Dead bird disposal should be performed to minimize access to domestic and wild animals and rodents.

Antimicrobial Intervention: Based on in vitro sensitivity, flock and farm history and the clinical judgment of the veterinarian antibiotic intervention is warranted do to the potential acute nature of this disease.

Suggested Antimicrobials for Fowl Cholera Intervention:

Class III: No antibiotics effective

Class II: *tetracycline class, sulfaquinolone, sulfadimethoxine, erythromycin;

Class I: *Any antimicrobial selected for use, if not specifically labeled to treat cholera infections in turkeys is extra label use and must be used as outlined in AMDUCA.

Treatment Duration: Per labeled instructions or based on the veterinarian's clinical judgment.

Treatment Assessment: During and after therapeutic intervention, the flock should be carefully evaluated as to the success of the treatment. These evaluations can be performed by the attending veterinarian or by service personnel under the veterinarian's direction. Accurate records should be maintained on all treatment outcomes and included in the farm history and records for future reference.

Other Treatment Considerations: In the chronic form of this disease, response to antimicrobial therapy is limited and must be critically evaluated before initiation.

Prevention: Vaccination strategies must be evaluated. In breeders, it is recommended that the organisms be serotyped to determine if a vaccination break has occurred or for the inclusion of any new serotype in future vaccination programs. In market turkeys, vaccination strategies may be implemented. A thorough cleaning and disinfection of the affected house is recommended. Rodent control should be evaluated.

Necrotic Enteritis in Chickens

Necrotic enteritis is caused by *Clostridium perfringens*. It causes an acute to chronic enteritis with necrosis of the upper small intestines.

Diagnosis: Necropsy lesions are typical and can be used to diagnose this condition. Cultures are not routinely performed because this organism is difficult to isolate in anaerobic culturing. If culture is performed, an antibiotic sensitivity can be useful in determining appropriate antimicrobial therapy.

Non-Antimicrobial Intervention: Environment should be optimized. Maintain proper ventilation and litter moisture.

Antimicrobial Intervention: Based on in vitro sensitivity, flock and farm history and the clinical judgment of the veterinarian antibiotic intervention is warranted.

Suggested Antimicrobials for Necrotic Enteritis Intervention

Class III: bacitracin, penicillin, lincomycin

Class II: erythromycin

Any antimicrobial selected for use, if not specifically labeled to treat necrotic enteritis in chickens is extra label use and must be used as outlined in AMDUCA.

Treatment Duration: Per labeled instructions or based on the veterinarian's clinical judgment.

Treatment Assessment: During and after therapeutic intervention, the flock should be carefully evaluated as to the success of the treatment. These evaluations can be performed by the attending veterinarian or by service personnel under the veterinarian's direction. Accurate records should be maintained on all treatment outcomes and included in the farm history and records for future reference.

Other Treatment Considerations: Currently, antimicrobial therapy is the treatment of choice for necrotic enteritis.

Prevention: Identifying the predisposing factors is an important component in preventing necrotic enteritis. The anticoccidial program should be evaluated with shuttle and rotational programs considered. A thorough cleaning and disinfection of the affected house is recommended.

Necrotic Enteritis in Turkeys

Necrotic enteritis is caused by *Clostridium perfringens*. It causes an acute to chronic enteritis with necrosis of the upper small intestines.

Diagnosis: Necropsy lesions are typical and can be used to diagnose this condition. Cultures are not routinely performed because this organism is difficult to isolate in anaerobic culturing. If culture is performed, an antibiotic sensitivity can be useful in determining appropriate antimicrobial therapy.

Non-Antimicrobial Intervention: Environment should be optimized. Maintain proper ventilation and litter moisture.

Antimicrobial Intervention: Based on in vitro sensitivity, flock and farm history and the clinical judgment of the veterinarian antibiotic intervention is warranted.

Suggested Antimicrobials for Necrotic Enteritis Intervention:

Class III: bacitracin, penicillin, lincomycin

Class II: erythromycin

Any antimicrobial selected for use, if not specifically labeled to treat necrotic enteritis in turkeys is extra label use and must be used as outlined in AMDUCA.

Treatment Duration: Per labeled instructions or based on the veterinarian's clinical judgment.

Treatment Assessment: During and after therapeutic intervention, the flock should be carefully evaluated as to the success of the treatment. These evaluations can be performed by the attending veterinarian or by service personnel under the veterinarian's direction. Accurate records should be maintained on all treatment outcomes and included in the farm history and records for future reference.

Other Treatment Considerations: Currently, antimicrobial therapy is the treatment of choice for necrotic enteritis.

Prevention: Identifying the predisposing factors is an important component in preventing necrotic enteritis. The anticoccidial program should be evaluated with seasonal rotational programs considered. A thorough cleaning and disinfection of the affected house is recommended.

Staphylococcus Infections in Chicken

Staphylococcus spp. infection in chickens causes primarily an arthritis most commonly observed in the hock joints and footpads. It can also be associated with osteomyelitis and swollen head associated cellulitis.

Diagnosis: Necropsy lesions are typical and can be used to diagnose arthritis in chickens. However, cultures should be performed to confirm the etiology as other bacteria may be associated with arthritis. When culture is performed, an antibiotic sensitivity should be used in determining appropriate antimicrobial therapy.

Non-Antimicrobial Intervention: Flock outbreaks are uncommon in chickens. Culling procedures to assess the progression of the disease in a flock before antimicrobial therapy is initiated should be performed.

Antimicrobial Intervention: Based on in vitro sensitivity, flock and farm history and the clinical judgment of the veterinarian antibiotic intervention may be warranted.

Suggested Antimicrobials for Staphylococcus Intervention:

Class III: penicillin, lincomycin

Class II: erythromycin

Any antimicrobial selected for use, if not specifically labeled to treat *Staphylococcus* spp. in chickens is extra label use and must be used as outlined in AMDUCA.

Treatment Duration: Per labeled instructions or based on the veterinarian's clinical judgment.

Treatment Assessment: During and after therapeutic intervention, the flock should be carefully evaluated as to the success of the treatment. These evaluations can be performed by the attending veterinarian or by service personnel under the veterinarian's direction. Accurate records should be maintained on all treatment outcomes and included in the farm history and records for future reference.

Other Treatment Considerations: Often, *Staphylococcus* spp. infections causes low morbidity in a flock and treatment is not cost effective. The use of culling procedures will help assess the progression of this disease within a flock and determine intervention strategies.

Prevention: Identifying the predisposing factors is an important component in preventing *Staphylococcus* spp. infections. Predisposing factors such as litter quality, viral arthritis enteric disease, and upper respiratory infections can lead to *Staphylococcus* spp. infections. Identifying any predisposing factors and implementing preventative vaccination and management practices is imperative to prevent future infections.

Staphylococcus Infections in Turkeys

Staphylococcus spp. infection in turkeys causes primarily an arthritis most commonly observed in the hock joints and footpads. It can also be associated with osteomyelitis.

Diagnosis: Necropsy lesions are typical and can be used to diagnose this condition. However, cultures should be performed to confirm the etiology, as other bacteria may be associated with arthritis. When culture is performed, an antibiotic sensitivity should be used in determining appropriate antimicrobial therapy.

Non-Antimicrobial Intervention: Flock outbreaks are uncommon in turkeys. Culling procedures to assess the progression of the disease in a flock before antimicrobial therapy is initiated should be performed.

Antimicrobial Intervention: Based on in vitro sensitivity, flock and farm history and the clinical judgment of the veterinarian antibiotic intervention may be warranted.

Suggested Antimicrobials for Staphylococcus Intervention:

Class III: penicillin, lincomycin

Class II: erythromycin

Any antimicrobial selected for use, if not specifically labeled to treat Staphylococcus spp. in turkeys is extra label use and must be used as outlined in AMDUCA.

Treatment Duration: Per labeled instructions or based on the veterinarian's clinical judgment.

Treatment Assessment: During and after therapeutic intervention, the flock should be carefully evaluated as to the success of the treatment. These evaluations can be performed by the attending veterinarian or by service personnel under the veterinarian's direction. Accurate records should be maintained on all treatment outcomes and included in the farm history and records for future reference.

Other Treatment Considerations: Often, Staphylococcus spp. infections causes low morbidity in a flock and treatment is not cost effective. The use of culling procedures will help assess the progression of this disease within a flock and determine intervention strategies.

Prevention: Identifying the predisposing factors is an important component in preventing *Staphylococcus* spp. infections. Predisposing factors such as litter quality, trauma, hemorrhagic enteritis, other enteric disease, and upper respiratory infections can lead to *Staphylococcus* spp. infections. Identifying any predisposing factors and implementing preventative vaccination and management practices is imperative to prevent future infections.

Other Bacterial Diseases

The diseases listed previously in this document represent the most common bacterial infections in poultry where therapeutic antimicrobial intervention in water is warranted. However, there are other bacterial or bacteria-like infections that occasionally occur that may warrant antimicrobial therapy.

Erysipelas: Erysipelas is not common today in confinement poultry, however, infections occasionally occur. Due to the acute nature of this disease, antimicrobial therapy is warranted. Penicillin is the antimicrobial of choice for erysipelas control.

Mycoplasma gallisepticum (MG): MG infections in chickens are routinely controlled by serological testing, agent isolation and eradication procedures. Rarely, there are cases where the flock may be treated to minimize MG shedding and reduce condemnations. In these instances, general use principles and guidelines should be incorporated into antimicrobial strategy. Tylosin, tetracyclines, and erythromycin are antimicrobials in which their spectrum includes MG. In turkeys, MG is controlled by similar strategies as in chickens. To minimize condemnations and reduce MG shedding, treatment may be warranted. Tylosin, tetracyclines and erythromycin can be considered in the treatment of MG. Extra-label use of any class of antimicrobials must be in accordance with AMDUCA guidelines. Due to the nature of MG infections (where infected birds act as reservoirs of infections), treatment of active infections should be carefully considered. Strict biosecurity must be initiated to minimize the spread of this disease.

Mycoplasma synoviae (MS): Similar control measures and strategies should be considered for MS as are considered for MG infections. Tetracyclines and erythromycin are effective in treating MS infections.

Salmonellosis: Salmonella spp. infections are occasionally observed, primarily occurring in young turkeys in the brooder house. The vertically transmitted (egg transmitted) salmonellas are controlled through serologic monitoring of breeders and slaughter of carrier birds. Paratyphoid diseases are usually a result of fecal contamination in eggs and subsequent exposure to poults, and occasionally chicks. These infections are usually self-limiting and therapeutic intervention is usually not warranted. Prevention of infections through proper egg collection techniques is recommended to prevent exposure. When paratyphoid infections occur and mortality and morbidity are observed, lincomycin, lincomycin/spectinomycin combination, neomycin and tetracyclines can be used on a limited basis after culture and sensitivity have been performed. Extra label use of antimicrobials for paratyphoid infections must be in accordance with AMDUCA guidelines.

Feed Grade Antimicrobial Therapeutics: An effective follow-up therapy to water antimicrobial use is the use of feed grade antimicrobials. Veterinarians are limited in their use based on guidelines published in the Feed Additive Compendium. Limited cross clearance approvals preclude feed grade antimicrobials to be routinely used as intervention strategies. However, if feed grade antimicrobials are considered, the appropriate feed grade antimicrobial should be used per the Feed Additive Compendium. The veterinarian can refer to specific bacterial disease treatment strategies earlier in this document to assess the potential benefit of feed grade antimicrobials for follow-up therapy.

Injectable Antimicrobial Therapeutics: Injectable antimicrobials are used predominately at day of age and/or in-ovo to control omphalitis in chicks and poults. In-ovo administration to prevent infection when the yolk is withdrawn into the body cavity can be an important intervention strategy at targeting bacterial contamination early. However, veterinarians should strive to maximize sanitation at the hatchery and egg collection levels to minimize the use of antimicrobials at day of age and in-ovo. Injections strategies should be used to support ongoing hatchery sanitation and proper egg collection techniques and not be used in lieu of these procedures. Current antimicrobials cleared for use in day old chicks or poults are extra label in-ovo and AMDUCA guidelines should be followed.

Injectable antimicrobials are occasionally used in an extra label manner for acute outbreaks in diseases in breeders, especially turkeys. Fowl cholera and erysipelas can be treated in this manner. Antimicrobials used in this manner include ceftiofur, long acting oxytetracycline, and penicillin. With extra label administration in breeders, AMDUCA guidelines must be followed.

AMERICAN ASSOCIATION OF SWINE VETERINARIANS BASIC GUIDELINES OF JUDICIOUS THERAPEUTIC USE OF ANTIMICROBIALS IN PORK PRODUCTION

(Approved by the AVMA Executive Board – November 1999; Revised November 2004; April 2009)

Veterinarians agree to protect animal and public health when they pledge the Veterinarian's Oath. This oath is applicable today as it was when it was written many years ago. Swine practitioners are committed to "the use of scientific knowledge and skills for the benefit of society." This commitment remains the core of veterinarians' efforts to achieve "the protection of animal health, the relief of animal suffering, the conservation of livestock resources, the promotion of public health, and the advancement of medical knowledge."

Position Statement

When a condition exists that threatens or impairs animal health and well being, it is essential that appropriate diagnostic techniques be applied and an accurate clinical diagnosis be obtained. Appropriate diagnostic techniques and clinical experience should substantiate a presumptive diagnosis. Once the decision is reached to use antimicrobials for therapy, veterinarians strive to optimize therapeutic efficacy, minimize resistance to antimicrobials, and protect public and animal health.

The American Association of Swine Veterinarians supports and is committed to the following objectives as developed by the American Veterinary Medical Association's Steering Committee on Judicious Therapeutic Antimicrobial Use:

- Support development of a scientific knowledge base that provides the basis for judicious therapeutic antimicrobials use.
- Support educational efforts that promote judicious therapeutic antimicrobials use.
- Preserve therapeutic efficacy of antimicrobials.
- Ensure current and future availability of veterinary antimicrobials.

Judicious Therapeutic Use of Antimicrobials Principles for Swine Veterinarians

Preventive strategies, such as appropriate husbandry and hygiene, routine health monitoring, and immunization, should be emphasized.

Establish the definitive diagnosis.

Recognize the roles played by the following factors in the course of the disease(s):

- Genetics
- Genetic sources
- Genetic predisposition

Nutrition

- Water availability and quality
- Protein
- Energy
- Micronutrients

Housing

- Air space per pig
- Temperature extremes beyond the thermal comfort zone of swine
- Meteorological conditions (eg., seasonal patterns)
- Ventilation

Management

- Stocking density
- Appropriate biosecurity controls of animals and humans
- Isolation and acclimatization of incoming breeding swine.
- Appropriate and timely use of cleaning disinfection and drying of premises.
- Depopulation/repopulation to eliminate a disease organism.

Health

- Immune status of the animals
- Herd dynamics and health status of the sow herd
- Presence and importance of concurrent infections
- Source of pigs (eg., single source or multiple sources)

Other therapeutic options should be considered prior to or in conjunction with antimicrobial therapy.

Examples include acidification of feed or water, electrolyte therapy, supportive care (e.g., antipyretic therapy).

Judicious use of antimicrobials, when under the direction of a veterinarian, should meet all requirements of a veterinarian-client-patient relationship.

Antimicrobials represent a powerful therapeutic option. Specific guidelines on the use of prescription antimicrobials and the extralabel use of any antimicrobial must involve a VCPR. We believe that judicious use requires the oversight of a veterinarian at some point in the decision making process.

(See glossary for definition VCPR as it appears in AMDUCA)

Prescription, Veterinary Feed Directive, and extralabel use of antimicrobials must meet all the requirements of a veterinarian-client-patient relationship.

The law prohibits extra label use of antimicrobials in the feed.

Extralabel antimicrobial therapy must be prescribed only in accordance with the Animal Medicinal Drug Use Clarification Act amendments to the Food, Drug, and Cosmetic Act and its regulations.

The following drugs are expressly prohibited for extralabel use in food animals: chloramphenicol, clenbuteral, diethylstilbestrol, dimetridazole, ipronidazole, other nitroimidazoles, furazolidone, nitrofurazone, sulfonamide drugs in lactating dairy cows (except approved use of sulfadimethoxine, sulfabromomethazine, and sulfaethoxyypyridazine), fluoroquinolones, and glycopeptides (e.g., vancomycin), and phenylbutazone in female dairy cattle 20 months of age or older. (Current as of October 7, 2004. Check for updates on the FDA web site at www.fda.gov/cvm).

For more information on extralabel drug use, see the AMDUCA guidance brochure entitled Extralabel Drug Use (ELDU), published by the AVMA.

Veterinarians should work with those responsible for the care of animals to use antimicrobials judiciously regardless of distribution system through which the antimicrobial was obtained.

Judicious use requires the oversight of a veterinarian at some point in the decision making process.

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

Veterinarians must accurately communicate written, adequate directions to the client for antimicrobial use.

The Pork Quality Assurance (PQA) program of the National Pork Board provides a basis for the judicious use of antimicrobials.

The AASV recognizes the legal availability of antimicrobials obtained through over-the-counter (OTC) distribution channels.

The extra label uses of OTC antimicrobials fall within the regulatory constraints of the Animal Medicinal Drug Use Clarification Act and thus requires the oversight of a veterinarian.

Regimens for therapeutic antimicrobial use should be optimized using current pharmacological information and principles.

Package inserts should be considered as sources of information for the practitioner.

Continuing education is an important component of maintaining and enhancing the veterinarian's pharmacological knowledge.

AASV supports the development of a veterinary antimicrobial decision system for swine to improve accuracy in the selection of therapeutics.

The compounding of antimicrobials should be avoided in those instances where there is a lack of supporting scientific pharmacological data.

Combinations that do not currently have FDA approval should not be used in the absence of supporting scientific pharmacological data.

Cost is not a factor when considering the use of compounded therapeutic antimicrobials.

For more information on compounding, see the FDA Compliance Policy Guide entitled Compounding of Drugs for Use in Animals.

Antimicrobials considered important in treating refractory infections in human or veterinary medicine should be used in animals only after careful review and reasonable justification. Consider using other antimicrobials for initial therapy.¹

Utilize culture and susceptibility results to aid in the selection of antimicrobials when clinically relevant.

Clinical outcomes, history, and experience should also be used in the selection of antimicrobials.

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

Therapeutic antimicrobial use should be confined to appropriate clinical indications.

An accurate diagnosis includes characterization of etiology.

Practitioners should strive to rule out parasitisms, mycotoxicoses, nutritional imbalances, and viral infections.

Secondary bacterial pathogens may require antimicrobial therapy.

Therapeutic exposure to antimicrobials should be minimized by treating only for as long as needed for the desired clinical response.

Therapeutic exposure involves both dose and duration.

Continued use of antimicrobials in chronic, non-responsive clinical cases should be discouraged.

Withdrawal times must always be considered during the selection of antimicrobials.

Limit therapeutic antimicrobial treatment to ill or at risk animals, treating the fewest animals indicated.

Consider group morbidity and mortality rates when deciding whether or not to initiate herd, group, or individual therapy.

Consider the herd health history for the therapeutic use of antimicrobials in the control and prevention of disease.

When these factors are appropriately considered, preventative therapy is a judicious use of antimicrobials.

Minimize environmental contamination with antimicrobials whenever possible.

Water medicators and feeders need to be properly adjusted to deliver the desired dose and to avoid spillage and waste.

Accurate records of treatment and outcome should be used to evaluate therapeutic regimens.

AASV recommends the use of treatment records such as those proposed by the Pork Quality Assurance (PQA) program of the National Pork Board.

Compliance to treatment regimens can be monitored by the review of pertinent records.

Accurate animal or group identification must be employed within a production system for effective residue avoidance.

¹In this context, this principle takes into account development of resistance or cross-resistance to important antimicrobials.

Glossary

* These terms are to be defined and utilized in the context of Judicious Therapeutic Use, with the intent of focusing on antimicrobials that may be of significance to human health. They are to be applied to the principles of Judicious Use outlined within the context of this document.

Antibiotic – a chemical substance produced by a microorganism which has the capacity, in dilute solutions, to inhibit the growth of or to kill other microorganisms.

Antimicrobial – an agent that kills microorganisms or suppresses their multiplication or growth.

Broad Spectrum Antimicrobial – a type of antimicrobial effective against a large number of bacterial genera; generally describes antimicrobials effective against both Gram-positive and Gram-negative bacteria.

Narrow Spectrum Antimicrobial – a type of antimicrobial effective against a limited number of bacterial genera; often applied to an antimicrobial active against specific families of bacteria.

Antibiotic Resistance – a property of microorganisms that confers the ability to inactivate or elude antimicrobials or a mechanism that blocks the inhibitory or killing effects of antimicrobials.

Extralabel Use – Extralabel use means actual use or intended use of a drug under veterinary direction, 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.

Therapeutic – treatment, control, or prevention of disease.

Veterinarian/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 judgements 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.

Veterinary Feed Directive (VFD) Drug – The VFD category of medicated feeds was created by the Animal Drug Availability Act of 1996 to provide an alternative to prescription status for certain therapeutic animal pharmaceuticals for use in feed. Any animal feed bearing or containing a VFD drug shall be fed to animals only by or upon a lawful VFD issued by a licensed veterinarian in the course of the veterinarian’s professional practice.



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