

Antibiotics in Cow-Calf Operations: Which, when, and why?

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There is a lot of different opinions regarding which antibiotics are best for treating common infections – for example, pneumonia and footrot. How can a cow-calf producer make the best decision about which product to use and when?

First, a brief clarification of terms: An **antibiotic** is a naturally-occurring drug that has the capacity to inhibit and / or kill bacteria. **Antimicrobials** possess the same capabilities, but this term includes not only naturally-occurring drugs as well as synthetic drugs. I'll use the latter term in the discussion below.

The most appropriate antimicrobial drug to use for any given situation is a very complex matter that will vary according to the animal, its value and intended use, the infection, and the stage of infection. Most importantly, even though a short list of causative bacteria can be defined for many common infections, the truth is, infections do appear to respond differently to different treatments on different premises. This likely reflects differences among premises in management and environment, as well as differences in the relative role that certain bacteria may play on different ranches. Simply put, what works well on Ranch A may not on Ranch B.

My recommendation for each producer is that he or she should sit down with their veterinarian and discuss common “infection scenarios” to determine 1) IF antibiotics are necessary for a given scenario, and if so, then 2) what criteria should be used to select one drug over another, or at least to narrow down the choices for each scenario. . I have developed a list of criteria, all of which begin with the letter S, that I have found useful in these discussions: I call these the “*Six Ss of Antimicrobial Therapy*.”

1) **Scenario**: This is essentially the criteria for a diagnosis of an infection. Is it a visibly ill animal with a fever, but no other signs of disease? Do the signs suggest pneumonia? Are we dealing with an open wound? Is it footrot? You and your veterinarian can discuss the common disease scenarios that occur on your ranch and determine criteria that justify the use of antimicrobials. I find that one way to tackle this problem is to take note of which antibiotics are NOT likely to be effective for a given type of infection – in other words, to *exclude* certain antibiotics from the list of choices for given scenarios. In so doing, one can define which antimicrobials one should **not** to administer for each scenario, which may help shorten the list of choices.

2) **Slaughter withholding period**: This is the legally-mandated duration of time that an animal must be held on the premises until the level of the drug residues in the animal's tissues reaches a predetermined, safe level. If an animal is scheduled for impending sale or slaughter and must be treated with an antimicrobial drug, then selection of the antimicrobial may be strongly swayed by the duration of the slaughter withholding period, which differs markedly among different drugs.

3) **Susceptibility:** Your veterinarian can access data that indicate which bacteria are susceptible to the different types of antimicrobial drugs, and you can discuss with him or her which bacteria are likely to be involved - and their susceptibilities - for common infection scenarios. Obviously, the bacteria involved in a given infection scenario must be susceptible to the effects of the antimicrobial for the treatment to be effective. Here is an example: If you or your veterinarian highly suspect - or have documented with lab tests - infection by a genus of bacteria called *Mycoplasma*, then it is essential that the drug selected has lipid-soluble properties. Why? These bacteria reside inside the animal's cells, and the lipid-rich cell membrane will limit the ability of the water - soluble drugs (such as the sulfonamides) to penetrate the cell and affect these bacteria. Further, *Mycoplasma* are not susceptible to penicillins or cephalosporins because they lack a cell wall, which is the site in other bacteria where these antimicrobials attack.

4) **Spending:** Primarily, this reflects the cost of the antimicrobial drug, which can vary markedly among different products. However, parameters other than the simple cost for the dose needed for the animal must to be factored in when considering how much to spend:

Treatment frequency: If repeated doses are needed over a course of treatment, the labor and time involved in gathering and restraining the animal has to be considered. Handling of animals also can cause them stress, which can adversely affect health. This is where certain long-acting products may offer an advantage.

Estimated efficacy: If a particular antimicrobial drug is inexpensive, it may seem attractive for use, but if it is much less likely to bring about a cure than another, more expensive drug, then you may find yourself with an ineffective treatment and an animal that is still ill days from now. This is a judgment call that your veterinarian can help you estimate.

5) **Safety** - Of utmost importance is to understand that certain antimicrobials can harm the person handling or injecting them. For each antimicrobial that you keep on your ranch, you need to understand if the product represents a health hazard to you or your personnel. This information can be obtained on most product websites as well as described in the package insert that accompanies most products (or is listed on a fold-out document beneath the label on the product bottle). Appropriate education and training of personnel is essential to safe handling of these products. Certain people may be allergic to even casual skin contact with certain drugs, so it is important to ask your personnel about any allergies that they might have to different types of antimicrobial drugs.

Although most commonly - used antibiotics are safe for use by the animal, there are a few that can cause harmful effects in certain species or situations. In many cases where antimicrobials can cause harm to the animal, the drugs involved are not even approved for use in that species or for the disease in question. A good example is the use of aminoglycoside-class antimicrobials such as gentamycin or neomycin in dehydrated animals, which can cause significant kidney damage. These two antimicrobials have very limited approvals for use in certain livestock species, and use outside of those approved parameters can result not only in harm to the animal, but in prolonged slaughter withholding times owing to their characteristic persistence in the animal. Which brings us to the final S:

6) **Statutes:** There are established laws regarding how antimicrobials can be used in livestock. Certain products are illegal for use in food-producing animals under any circumstance. Others have statutes that only allow the drug to be used for particular classes of livestock (e.g. non-lactating cattle), certain ages of cattle, or only allow use for particular diseases. These statutes are intended to protect the consumer from 1) potential harm from chemical residues of the drug in meat and milk products derived from treated livestock 2) potential harm that can arise from indiscriminate use of antimicrobials in livestock, such as induction of resistant strains of bacteria that cause disease in people. Antibiotic use in food-producing animals has come under increased scrutiny in the past 25 years, primarily over concerns of the potential influence that antibiotic use in animals might have on human health.

There is no doubt that antimicrobial drugs are a precious and valuable resource that livestock producers need to keep their animals healthy – in fact, because many infections are painful and stressful, antimicrobials are essential tools that we use to maintain the overall wellbeing of our livestock. However, there is one fairly certain way that we in the livestock industries can bring about greater limitation on our capability to use these products, and that is to use them unlawfully. Spread the word, and continue to set a good example!