Wise Use of Antibacterial Drugs

Antibiotics and synthetic antibacterial drugs have revolutionized the ability to treat bacterial infections in human and animal patients. These drugs deserve careful use to preserve and optimize their effectiveness. Deciding on a treatment plan should begin with the decision of whether an antibacterial drug is indicated. If indicated, the most appropriate drug should be delivered by the best route at the right dose and duration for the specific type of infection. A veterinarian should play a critical role in this decision making.

Adverse outcomes with antimicrobial drugs are rare but difficult to predict. For example, some horses react to an injection of procaine penicillin by collapsing or becoming hyperexcitable. Others may develop severe diarrhea and toxemia when treated with an antibacterial drug due to disruption of normal intestinal flora and bacterial overgrowth. The cost of treatment, including price of the drug and labor to administer it must be considered along with the horse's behavioral response to treatment. Another important consideration in using antibacterial drugs is the risk of bacterial resistance. Bacteria can become resistant to antimicrobial drugs by a specific non-fatal genetic mutation, or through the transfer of resistance genes from one bacterium to another (within or across genera or families of bacteria).

Transfer of resistance genes, acquired resistance, is much more common than mutation. With the newly acquired resistance genes, the bacteria are more "fit" to survive in an environment where that antimicrobial drug may be present. This leads to a selective advantage over bacteria that do not possess these resistance factors. Resistance genes may be transferred from non-pathogenic bacteria that reside in the animal, for instance in the digestive tract or nasal passages, to pathogenic bacteria which can cause diseases that are more difficult to treat.

Resistance among bacteria to first line antibacterial drugs may require the use of newer and more potent antibacterial drugs in order to treat infections. These newer and more potent drugs can be more expensive and are often the drugs suggested to be reserved for the treatment of human infections that are resistant to first line antibacterial drugs. For example, some isolates of *Staphylococcus aureus* are resistant to methicillin and other related drugs such as penicillin (called methicillin resistant *Spahylococcus aureus*, MRSA). Some gastro-intestinal bacterial isolates of *Salmonella* spp and *Escherichia coli* have also been found to be resistant to multiple antibacterial drugs.

Antimicrobial exposure does appear to select for these resistant populations of bacteria either transiently or long term. In one study, normal fecal flora bacteria were found to be more resistant to several antimicrobial drugs when the horses were being treated with antibiotics for various conditions when compared to other hospitalized horses or horses residing on their home farms. Although these bacteria were not likely to cause disease, they could serve as a source of resistance genes for pathogenic bacteria. The same study found that horses hospitalized but not being treated with antibiotics were more likely to have resistant fecal flora than were horses residing on their home farms. The results of this study would suggest that just being in a hospital can lead to some kind of selection pressure on fecal flora. This study, along

with others, illustrates that antibacterial drugs should be used only when indicated, with appropriate product selection and dosing regimen.

For example, antibacterial drugs are not indicated to treat a horse with a fever due to uncomplicated viral respiratory infection. Viral infections can not be cured with antibiotics. Certainly if the patient has secondary bacterial infection antibiotics would be indicated. Additionally, minor superficial wounds that do not involve the joint or tendon can often be managed with prompt, thorough cleansing and bandaging, and may not require the use of oral or injectable antibiotics.

Without question it is preferable to prevent infections as opposed to having to treat with antibiotics. In the USDA National Animal Health Monitoring System's Equine 2005 study, the most common reason foals and horses were treated with antibiotics was wounds/injury or trauma. Reducing the likelihood of wounds and other traumatic injuries by providing safe housing and fencing, along with optimal hauling and training methods might reduce the need to use antibiotics in the equine population. Use of vaccination and biosecurity procedures can also reduce the risk of many types of equine infectious diseases. Monitoring horses for signs of illness along with prompt diagnosis and implementations of isolation procedures can reduce the risk of spread of contagious disease agents to other horses.

Although antibacterial drugs are generally affordable, available and safe, careful consideration of the pros and cons of their use must be made in order to provide the best possible care to horses. None of those involved in equine care would like to envision the loss of effectiveness of these valuable tools.