



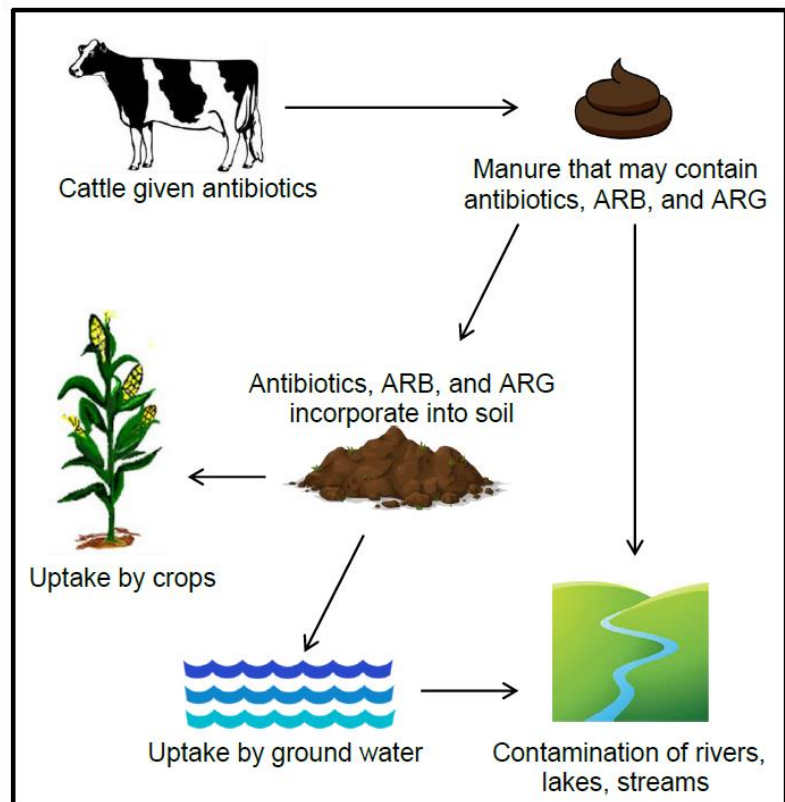
Battling Resistance: Judicious Antibiotic Use in Beef and Dairy Cattle

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The issue of antibiotic resistance has come to the forefront in recent years due to its serious implications for human and animal health. Antibiotic resistance is a natural phenomenon in which bacterial populations develop the ability to grow and even thrive in the presence of antibiotic drugs. Many misconceptions surround this issue, mostly centered on who bears the blame. While any antibiotic use can contribute to resistance, the misuse and overuse of these drugs has greatly accelerated its development. Resistance poses a serious threat to both humans and animals since it results in antibiotics becoming ineffective against bacterial infections. Growing public concern has led to increased focus by the FDA and others on use of antibiotics in animal agriculture. Fortunately, there are strategies that beef and dairy producers can employ to help mitigate this serious animal and public health challenge.

How Resistance Occurs and Spreads

Antibiotic use, especially at low doses, selects for bacteria with genes that help them survive the exposure. These genes are referred to as antibiotic resistance genes (ARG). As the selection process continues, the number of antibiotic resistant bacteria (ARB) within a bacterial population will increase. These bacteria are ultimately excreted with manure. When an animal receives antibiotics, it also excretes antibiotic residues in manure. The duration of residue excretion after the initial dose is dependent on which antibiotic is used and the health status of the animal. When antibiotic residues, resistant bacteria, and resistance genes are excreted, they can enter soil and waterways, and may be taken up by crops used for human consumption. The resistant bacteria present in the environment then have the potential to cause untreatable infections in humans and animals.



The Importance of Fighting Antibiotic Resistance

As resistance against a certain antibiotic increases, the antibiotic becomes less effective until it is inadequate for fighting infections. Antibiotics are an important tool for animal husbandry as they prevent and alleviate animal suffering and reduce death loss. Losing these economic and welfare benefits would adversely impact animal agriculture so taking measures to preserve antibiotic efficacy is crucial. Measures have already been taken at the federal level to help avoid the overuse of antibiotics in the form of the Veterinary Feed Directive (VFD), which regulates antibiotics of human importance that are administered through feed and water. As the antibiotic resistance problem continues, it is likely that federal oversight of antibiotic use will increase. Voluntarily scaling back on antibiotic use could reduce the need for more regulation in the future.

Active Strategies to Combat Resistance

The growing problem of resistance has increased attention on ways of mitigating its spread and reducing the reliance on antibiotics. While antibiotics can be an essential part of good management, they cannot be used *in place* of it. The following strategies to help fight resistance center primarily on *disease prevention* to avoid situations where antibiotic use is required.

Maintain a Strong Relationship with a Vet. Maintaining a relationship with a trusted veterinarian is now more important than ever. One of the foundations of the Veterinary Feed Directive is the requirement for a valid veterinarian-client-patient-relationship. Even if you are not impacted by the VFD, your veterinarian can provide invaluable guidance on proper antibiotic use and disease treatment and prevention. Work closely with him or her to develop a comprehensive herd health plan with appropriate treatment protocols.

Precondition Calves Prior to Transport or Sale. Trailering, co-mingling with new cattle, and adjusting to different surroundings can be stressful for calves and put them at risk for getting sick. While this discussion is more relevant for beef producers selling calves to be sold to a stocker or backgrounder, it is also relevant for dairies that have their heifers custom raised. Develop a good preconditioning program for calves destined for sale to help minimize stress and cope with changes. Make sure calves have been successfully weaned, castrated (if relevant), dehorned, and vaccinated well in advance. Be sure calves are trained to eat from feed bunks and drink from troughs. These measures yield healthy and robust calves that are ready to enter the next phase of production. Healthy cattle greatly reduce the amount of antibiotics feedyards must use for disease prevention and treatment. In the beef industry, preconditioning also adds value to calves and may qualify them for premium marketing channels.

Maintain a High Quality Nutrition Program. Proper nutrition is important not just for growth and reproductive performance; it is also critical for disease prevention. Ensuring rations are balanced for energy, protein, minerals and vitamins helps strengthen the immune system of mothers and calves, which can help protect against disease. Additionally, nutritional deficiencies may worsen a disease if it is already present. Working with a nutritionist can help you develop rations specifically balanced for your herd.

Keep Up-to-Date on Vaccines. Keep the herd up-to-date on vaccines, especially for respiratory diseases, since these are some of the most common illnesses affecting cattle. While many vaccines given to livestock are against viral diseases (which are unresponsive to antibiotics), limiting an animal's chances of becoming ill in general will help avoid secondary bacterial infections and, thus, reduce the need for antibiotics.

Use Best Practices to Manage Manure. Handling manure using best practices is always critical, and it is even more so when antibiotics are administered. If manure is applied to grow crops for consumption by the herd, precautions mostly focus on reducing potential for runoff. When used to grow human food crops, manure must be adequately composted to minimize the potential for human pathogens. There are no parallel guidelines for degrading antibiotic resistant bacteria. However, there are barriers in place to prevent the spread of harmful bacteria, such as the Food Safety Modernization Act (FSMA), which may also help limit the spread of antibiotic resistance. According to FDA regulations, static composted manure (manure actively composted in an aerated static pile) must maintain a temperature of 131°F for three consecutive days followed by curing. Turned composted manure must maintain this temperature for 15 days (not necessarily consecutive), with at least five turnings, followed by curing. Measures should also be taken to ensure nearby waterways are not in danger of manure contamination as this is another way that resistance can spread.



Added Benefits

Cutting down on antibiotic use not only helps with the battle against resistance but it also comes with the following benefits:

- ✓ Less time and effort spent handling livestock
- ✓ Less dumped milk for dairymen due to milk discard time
- ✓ Less delayed marketing due to slaughter withdrawal period
- ✓ Lower overall expenditures on drugs

The Future of Antibiotics

Livestock producers, doctors, and people misusing antibiotic prescriptions have all been blamed for the rise of resistance. However, all who use antibiotics are affected by resistance and have an equal responsibility to use them appropriately and judiciously. Battling resistance must be a collective effort between all livestock producers as well as those in the human health field, veterinary medicine, scientific research, and environmental engineering. By taking steps to limit antibiotic use and prevent the spread of resistance, both animal agriculture and human medicine may continue to reap the benefits of these drugs for many years to come.

The Bottom Line: Using antibiotics sparingly and judiciously will help to preserve their future efficacy.

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The Phenomenon of Antimicrobial Resistance: A One-Health Issue

<https://pubs.ext.vt.edu/HORT/HORT-259NP/HORT-259NP.html>

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<https://pubs.ext.vt.edu/HORT/HORT-260NP/HORT-260NP.html>

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<http://www.who.int/mediacentre/factsheets/antibiotic-resistance/en/>. Accessed July 27, 2017.

For more information related to dairy and animal science programs in Virginia Cooperative Extension or at Virginia Tech, please consult the following links:

<https://ext.vt.edu/agriculture/dairy-cattle.html>

<https://ext.vt.edu/agriculture/beef-cattle.html>

<https://www.dasc.vt.edu/resources.html>

<http://www.apsc.vt.edu/extension/index.html>