

What about antibiotic resistance and dairying?

Currently, antibiotic resistance is not a major issue in control of dairy diseases. But, if we aren't careful, our use of antibiotics may be at stake.

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ANTIBIOTICS are drugs that kill microbes (bacteria and fungi) or prevent their growth. They have contributed greatly to the dairy industry and helped us provide safe and inexpensive milk and food for U.S. consumers.

However, use of antibiotics is not without risk. Exposure of microbes to doses of antibiotic agents that fail to kill the bacteria or stop their growth can result in resistance. Growing concern from government agencies, retailers, and consumers may result in restrictions on use of antibiotics.

Antibiotic resistance is the ability of microbes to overcome the effects of antibiotics and to survive or grow. It is not new. For example, penicillin-resistant bacteria were identified shortly after penicillin was first introduced in the 1940s.

To survive in the presence of drugs, bacteria need to be inherently resistant to antibiotics or to acquire DNA changes which make them resistant. Bacteria may acquire resistance to several antibiotic drugs, leading to development of "superbugs." Such superbugs pose a major threat because they may become uncontrollable.

Some superbugs have already developed. Vancomycin resistant enterococci (VRE) and multi-resistant *Staphylococcus aureus* (MRSA) are a major problem in human hospitals. The addition of growth-promoting antibiotics to animal food favored the survival of resistant enterococci in chickens and pigs. These resistant enterococci were shed in feces. Via contaminated poultry and pork products, they reached humans. In healthy humans they rarely cause problems, but in diseased people VRE infections can be serious.

Similarly, *S. aureus* is a common part of the skin flora of people and animals. It also is a common cause of mastitis in cows. Theoretically, the antibiotics that are used for treatment or prevention of *S. aureus* mastitis could create an environment that favors the survival of drug-resistant or even multi-resistant strains.

S. aureus mastitis is difficult to treat, but if treatment of cows resulted in emergence of MRSA with subsequent transmission to people, we would really be in trouble. Fortunately, this scenario has not played out yet.

Looked at mastitis bugs . . .

Studies performed by mastitis labs in Michigan and Wisconsin have looked at changes in antibiotic resistance over seven years. For *S. aureus*, they found no increase in antibiotic resistance. In fact, the bacteria appear to have become more susceptible to certain penicillin-like drugs.

For other important mastitis pathogens, such as *Streptococcus* species and *E. coli*, the proportion of antibiotic resistant bacteria was stable. These findings were echoed in our Quality Milk Production Services lab. Thus, use of antibiotics for mastitis does not appear to have made major contributions to antibiotic resistance.

Does that mean that the concerns about use of antibiotics and emergence of antibiotic resistance are unjustified? Not at all. There are several mechanisms for the transfer of antibiotic resistance from animals to humans.

We have mentioned the use of drugs which favors the survival of resistant bacteria. Such bacteria can be transferred to people through food, water, or direct contact. Transfer of *E. coli* O157:H7 from well water, goats, or calves to children in petting zoos and on farms has led to cases of a life-threatening

form of the dreaded "hamburger disease." Not all *E. coli* bacteria carry resistance genes, but if resistant bacteria are present on dairy farms, they too potentially can be transferred to farm families, employees, and visitors.

Salmonella also can be transmitted to people. Several species of Salmonella have caused disease outbreaks via raw milk cheese. Multi-drug resistant Salmonella and Campylobacter species also have been isolated from retail ground meats, another "dairy" product.

Isolation of drug-resistant bacteria from pasteurized milk is very rare. Still, the largest outbreak of salmonellosis in American history was caused by an antimicrobial-resistant strain in pasteurized milk!

In this case, the resistance was caused by a plasmid, a small piece of DNA that can be exchanged between bacteria. The ability of bacteria to exchange DNA and resistance genes is another reason to be careful with antibiotics.

Is our routine use of antibiotic mastitis treatment a major culprit in antibiotic resistance? Definitely not. Long-term, low-dose antibiotic administration such as use of growth promoters is more likely to be a problem. Most are used in the poultry, swine, and beef industries.

Subtherapeutic use of antibiotics is prohibited in the U.S. dairy industry, except in the cases of heifers and calves. Milk replacers for calves often include subtherapeutic doses of antibiotics, such as tetracycline. These subtherapeutic doses do contribute to resistance: 79 percent of calves that receive tetracycline in milk replacer carry antibiotic resistant bacteria compared to only 14 percent of lactating cows.

Human medicine also contributes to the problem. Antibiotic treatment of people for infections that may not be bacterial in nature or that would have resolved naturally, such as viral infections, the common cold, or sore throats, contribute to the growing prevalence of antibiotic resistance. Poor compliance of patients with the prescription they have been given, particularly failure to complete a course of medication, is another example of where antibiotics may do more harm than good.

Still, consumers want to be assured that the food they eat is safe. Organizations put pressure on Congress to pass legislation banning the use of certain antibiotics in food animals.

This past June, McDonald's called for its suppliers to phase out use of antibiotics as growth promoters. Similar measures were taken in Europe in 1995 and have led to a drop in the presence of antibiotic resistant bacteria in food of animal origin.

Another sign that consumers are increasingly interested in food from animals that have not been treated with antibiotics is the growth of the organic farming sector. Consumers of these certified antibiotic, pesticide, and hormone-free foods are willing to pay more for this assurance.



MEDICATED MILK REPLACERS are one use of antibiotics on dairy farms that may come into question. Nearly 8 in 10 calves that receive tetracycline in milk replacer carry antibiotic resistant bacteria compared to only 1 in 7 lactating cows.

First and foremost, we ought to prevent disease. The majority of the antibiotics used in dairy cattle are for the treatment and prevention of mastitis. Many cases of mastitis could have been prevented through good milking time hygiene and use of teat disinfectants, detection, and removal of sources of infection. Similarly, many cases of calf diarrhea or respiratory disease can be prevented through good care and the use of vaccines.

There are alternatives . . .

Even vaccines that protect against viral diseases help to reduce the need for antibiotics because a viral disease often leads to bacterial pneumonia. New developments will provide us with alternatives such as probiotics and new vaccines. Proper nutrition, stress reduction to improve immune function, hoof health programs to avoid lameness, and parasitic control also help.

Limiting access of people and other animals to your herd and screening of herd additions are other keys. When disease occurs despite prevention, antibiotic treatment may not always be warranted. Some animals, including cows with non-responsive *S. agalactiae* mastitis or chronic *S. aureus* mastitis, are better culled than treated because the chances of cure are very poor.

When using antibiotics, use the proper drug in the proper dosage for the proper length of time. Keep records so that others can see what you did and why you did it and so that you can evaluate whether the treatment strategy is successful or needs revision. If possible, stay away from antibiotics that are used in humans.

The Dairy Beef and Milk Quality Assurance program has been designed to help producers choose appropriate antibiotics and record antibiotic use and follow withdrawal time. It is up to farmers and veterinarians to follow these recommendations. We believe that banning all use is not the answer for the U.S. dairy industry. Responsible antibiotic use is an important tool that will help us continue to produce inexpensive, safe food of high quality and to keep animals healthy. However, as individuals and as an industry, we need to take the issue of antibiotic resistance seriously. If we show that we are unwilling or unable to do so, we risk losing the option of antibiotic application in food animal production and dairy farming. That would make our dairying lives and the lives of our dairy cattle a lot harder. 🐄

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