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 major problems in human hospitals. The addition of growth-promoting antibiotics to animal feed has 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 demonstrated that resistance to a broad range of antibiotics in S. aureus has been increasing over several 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.

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

We have mentioned the use of drugs that favor the survival of resistant bacteria. Such bacteria may be transferred to people through food, water, or direct contact. Transfer of E. coli O157:H7 from well water, goats, or calves 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 again 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 carry resistant bacteria compared to only 14 percent of lactating cows.

Some medicine manufacturers contribute 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.

A major problem in human hospitals is the growing prevalence of antibiotic-resistant S. aureus. This pathogen can cause 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 nonresponsive 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 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 mean less dairy living on the lives of our dairy cattle a lot harder.