Antimicrobial residues in milk and meat from dairy cattle have long been scrutinized by the US public and governmental agencies as well as by the consumer. There are also increased concerns about the presence of elevated levels of antimicrobial resistance in both veterinary medicine and human medicine. Additionally, there is heightened fear that certain antimicrobial use practices in veterinary medicine are leading to decreased treatment efficacy in human medicine. As a result, the US Food and Drug Administration has issued several guidance policies in attempts to protect the effectiveness of medically important antimicrobials in human medicine. Due to the limited number of antimicrobials currently developed, many of these products crossover into veterinary medicine. One of the biggest changes the dairy industry has experienced in recent times related to antimicrobial use is the implementation of the Veterinary Feed Directive. As we move forward, the FDA expects that veterinarians will be more highly involved in decisions regarding antimicrobial stewardship on food production farms. Dairy farmers and their veterinarians must be progressively vigilant to make sure that public health is protected following consumption of products from dairy animals and that perception of milk and dairy beef remains as high as possible.

**Key Words:** Veterinary Feed Directive, antimicrobial stewardship

Concern about antimicrobial usage (AMU) in food animals and development of antimicrobial resistant microorganisms continues to grow and regulators are increasing supervision of AMU on dairy farms. The recently enacted Veterinary Feed Directive is an example of increased restrictions on previously OTC drugs and increased veterinary oversight of antimicrobials given in feed and water. On dairy farms, antimicrobials are used to treat bacterial diseases and treatments for mastitis, lameness, respiratory diseases and reproductive and digestive disorders are the most common reasons dairy cows receive antimicrobials. Studies conducted in North America and Europe have quantified AMU using standardized indices (Defined Daily Doses). While calculations vary, most researchers have reported that dairy cows receive about 5–8 DDD of antibiotics per cow per year and about 35–85% of the doses are given via intramammary (IMM) infusion, with the remainder given parenterally or orally (to calves). In most studies, mastitis is the most common reason for AMU. Increased regulations on AMU on dairy farms are based on assumptions that reduced usage will result in decreased selection of resistant organisms and reduced threats to human health. However, on dairy farms, AMU has been relatively restricted and evolution and maintenance of resistant pathogens in dairy cows or farm environments has not been well described. Increased resistance of fecal *E. coli* has been reported after systemic administration of ceftiofur, but susceptible bacterial populations rapidly rebounded after treatment ended. Similar trends have been noted in farm environments. Some researchers have demonstrated variation among farms and organisms in resistance to some drugs and some associations of resistance with AMU has been noted but these associations have been limited to pathogens recovered from milk. While AMU for mastitis consumes the greatest quantity of antimicrobials, several reviews have stated that there is relatively little evidence to suggest that widespread resistance or lack of efficacy is emerging or progressing. However, more research on how to improve AMU on dairy farms is needed and mechanisms to increase involvement of veterinarians in treatment decisions are warranted.

**Key Words:** antimicrobial usage, antibiotics, dairy

The emergence of infections caused by antimicrobial resistant microorganisms (AMRs) is currently one of the most important challenges to public and animal health. More than 23,000 deaths have been attributed to infections from AMRs in the United States, and an estimated 10 million people may die every year by 2050 around the globe due to increased resistance. With microorganisms acquiring antibiotic resistance, previously potent antibiotics are becoming ineffective and antibiotics are unable to sustain the demand to effectively treat microorganisms. Consequently, the choices of antibiotics used to treat human and animal pathogens are decreasing, leading to a health crisis. The number of AMRs is increasing and will continue to increase due to the slow development of new antibiotics and lack of alternative therapy for infectious diseases. However, developing new antibiotics in the 21st century has slowed down considerably after the over-screening of microorganisms. In addition, advanced antibiotic discovery programs including genomics, high-tech chemical approaches, and high-throughput screening methods have not been successful to develop new antibiotics and many companies have halted their antibiotic research programs. In this presentation, I will summarize major antibacterial targets and pathways and mechanisms by which AMRs survive in the presence of antibiotics. Current efforts to discover and develop antibiotics using unculturable microorganisms and new antibiotic molecular frameworks as well as development of biological therapy with bacterial phages. In addition, I will present some of our own studies that evaluated the efficacy of nanoparticles in antimicrobial activity. Our findings suggested that CM, derived from natural biopolymer chitosan, can treat infectious diseases caused by AMRs and CM harbored strong antimicrobial activity against both gram-positive and gram-negative bacteria in different environments due to broad targets, including OmpA and LPS in gram-negative bacteria and teichoic acid in gram-positive bacteria. Furthermore, risk assessment of CM revealed by the normal function of the rumen indicates that CM unlikely cause side effects. In addition, we found CM exerted antimicrobial activity in cows with metritis, resulting in cure of this disease. These studies emphasize options for alternative treatment to both human and animal disease caused by bacterial infections.

**Key Words:** antibiotics, antimicrobial resistance, alternative antimicrobial agent