Intestinal Diseases of Pigs and Cattle

This project has enhanced animal welfare and public health while maintaining efficient pork, beef, and dairy production through interventions that reduce the incidence of intestinal diseases in animals and transmission to humans.

Who cares and why?

Intensive farming practices, the movement of livestock between farms, and the overuse of antimicrobials may facilitate the emergence of drug-resistant diseases. Photo by Scott Bauer/USDA.

Intestinal diseases are major causes of sickness and death among livestock, racking up huge costs for the livestock industry. Furthermore, many of the bacteria, viruses, and parasites that cause these diseases in livestock can be transmitted easily to humans when animal feces contaminate foods or water supplies. Foodborne illness is a serious public health concern in the U.S. Each year, roughly 48 million Americans get sick, 128,000 are hospitalized, and 3,000 die from foodborne diseases. Costs associated with medical treatment, productivity losses, and premature deaths total billions of dollars each year. Interventions including vaccines, antibiotic treatments, farming practices, and producer and consumer education have spurred a decline in foodborne illness incidence; however, some diseases still have no effective treatments, some strains have developed drug-resistance, and new strains continue to emerge. As livestock production systems grow larger and more complex, disease control is becoming more necessary. On the other hand, special disease control and food safety techniques may be needed for natural, grass-fed, and organic livestock production due to constraints on acceptable drug use and farming practices. To develop precise detection methods and effective treatments, scientists need to fully understand the causes, effects, and patterns of intestinal diseases. Given the wide range of intestinal pathogens and types of livestock production systems in which they occur, scientists from across the U.S. and multiple disciplines must share expertise and resources to pursue solutions that protect and optimize animal welfare and food safety.

What has the project done so far?

NC-1041 has encouraged collaborative, innovative research. Participating scientists have shed light on the biology and virulence of existing and emerging diseases, offering a better understanding of the origins of intestinal diseases in livestock. For example, studies have indicated that *Salmonella* are more prevalent during warm months. NC-1041 scientists have also identified hosts—like birds, flies, and wild animals—that can transmit pathogens to livestock. Studies have also identified and monitored ways that these pathogens are transmitted from livestock to humans. Using this information, scientists have designed more specific and reliable pathogen detection methods and have developed new and improved vaccines, antimicrobials, and other therapies that prevent and treat intestinal infections. In particular, scientists have shown that feeding beneficial microbes to feedlot cattle is a good option for controlling the amount of *E. coli* that is shed in feces. Other studies have found that multiple doses of a vaccine containing certain secreted proteins of *E. coli* can also significantly reduce the amount of *E. coli* that is shed in cattle feces. Researchers have even identified natural products that could be utilized as nutritious feed additives to inhibit or reduce parasite infections. Research has also demonstrated that beneficial bacteria—probiotics—can be used to stimulate the immune system of newborn pigs, helping them ward off intestinal diseases. Probiotics can also have profound impacts on vaccine

efficacy when administered to mothers late in gestation or to infants upon initial breastfeeding. In addition, scientists have shed light on genetic susceptibility of animals to certain diseases, providing a basis for breeding disease-resistant livestock. Other work has determined that vegetative filter strips (or buffer strips) can be used to block the overland run-off of pathogens. Project members have shared this research with and provided training to researchers, veterinarians, producers, and consumers.

Impact Statements

Improved ability to diagnose, monitor, and treat diseases in a timely manner.

Reduced potential food and water contamination and foodborne illness risk.

Protected animal health and food safety through new and improved vaccines, antibiotics, and other treatments that are effective worldwide.

Reduced livestock producer costs associated with sick animals.

Raised awareness and increased adoption of effective disease prevention and treatment strategies among livestock producers, veterinarians, and health care professionals.

Enhanced options for disease control for organic and natural farmers.

Researchers and food inspectors are on the lookout for *Salmonella Newport*. Researchers have found that this strain is increasingly resistant to multiple antimicrobial drugs, and illness due to this pathogen tends to be more severe. Photo by Michael J. Ermarth/FDA.

What research is needed?

Complex issues, such as resistance to antimicrobials, require an integrated approach to figuring out how to use drugs judiciously on different types of farms and how to communicate these best practices to livestock producers. Another challenge is the development of effective vaccines that provide broad protection against pathogens. Additionally, the ecology and pathogenesis of various pathogens need to be better understood.

Fruits and vegetables can pick up pathogens if they come into contact with animal feces or contaminated water run-off from livestock facilities. NC-1041 has tested ways to keep plants from coming into contact with pathogens. Rigorous inspection is also needed to catch contaminated food before it reaches consumers. Photo by Michael J. Ermarth/FDA.

Want to know more?

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Compiled and designed by Sara Delheimer