

Group B  
2018 ISU CVM SSRP Mentor Abstract #1

Project Title: Mitigation of fluoroquinolone-resistant *Campylobacter* in cattle

Principal Investigator(s): Grant Dewell

Collaborating Investigator(s): Qijing Zhang, Orhan Sahin, Paul Plummer

Abstract: (300 words or less):

Thermophilic *Campylobacter* are major foodborne pathogens and leading bacterial causes of gastroenteritis in the United States and other countries. Clinical treatment of campylobacteriosis requires the use of fluoroquinolone (FQ) or macrolide antibiotics, but antibiotic-resistant *Campylobacter* is becoming increasingly more prevalent. *Campylobacter* is highly prevalent in food producing animals. Our long-term goal is to control antibiotic resistance by reducing the development and transmission of antibiotic-resistant foodborne bacterial pathogens on farms. The main goal of this project is to identify critical control points and mitigation strategies for FQ-resistant *Campylobacter* in ruminants by using an integrated approach. Specifically objective three is to develop outreach and training programs to reduce FQ-resistant *Campylobacter*. For measuring the success and impact of our extension/outreach component, we will utilize pre- and post-extension surveys. We expect that our extension efforts will result in changes in the antibiotic use practices that lead to a better control of antimicrobial resistance on farms. The pre-extension survey will be conducted as a baseline during year one of the project prior to any information dissemination. An identical post-extension survey will be repeated at the end of the third year and the results will be compared to the first survey. The surveys will be conducted by mail and by interview of producers and veterinarians.

The primary objective of the 2017 summer scholar project will be to initiate production of the first survey of feedlot producers and veterinarians to determine current use practices of antibiotics that may lead to antimicrobial resistance. Additionally, the summer scholar will be able to participate in other portions of the larger project which may include the microbiology laboratory and/or animal model research.

Group B  
2018 ISU CVM SSRP Mentor Abstract #2

Project Title: Antimicrobial Resistance – A One-Health Issue that Impacts all Aspects of Veterinary Medicine

Principle Investigator(s): Paul Plummer

Collaborating Investigator(s): Qijing Zhang, Orhan Sahin, Grant Dewell

Veterinary Scholar Focused Abstract: (300 words or less):

Antimicrobial resistance (AMR) is a global threat to animal, human and environmental health. By some estimates AMR could result in more human disease and death than cancer by the year 2050. It is critically important for the veterinary profession to make every effort possible to assure that we are using antimicrobials in a manner that promotes animal health while preserving the efficacy of antibiotics. This research experience will focus on a variety of AMR related research opportunities that include animal studies, research synthesis and development of teaching and outreach materials related to AMR. At the start of the summer the student will identify a particular area on which to concentrate their research project, but will remain involved in a broad range of AMR related experiences in order to assure that they a global view of AMR and the role that it plays in veterinary medicine. This opportunity will allow the student to develop a translational (bench to bedside) clinically applicable experience while developing a deeper understanding of the complex one-health implications of AMR.

Group B  
2018 ISU CVM SSRP Mentor Abstract #3

Project Title: Genetic diversity and mechanism of methicillin resistance in *Staphylococcus* species from companion animals.

Principal Investigator: Orhan Sahin, VDPAM

Co-PIs: Qijing Zhang, Adam Krull, Eric Burrough, Paul Plummer, and Grant Dewell

Abstract:

Methicillin-resistant *Staphylococcus* spp. (MRS) (primarily methicillin-resistant *Staphylococcus pseudintermedius* [MRSP] and coagulase negative *Staphylococcus* spp. [MRCoNS]) are among the leading causes of skin, ear and wound infections in dogs and cats, with zoonotic potential. Resistance to methicillin in Staphylococci is typically mediated by *mecA* gene, carried on the staphylococcal chromosomal cassette *mec* (SCC*mec*) element, which encodes PBP2a that has a low affinity for majority of other beta-lactam antibiotics. Similar to the worldwide trend of increasing methicillin resistance in Staphylococci (up to 50% in some regions), we have also found a high rate of methicillin resistance (over 30%) in *Staphylococcus* spp. isolated from diagnostic submissions of dogs and cats at the Veterinary Diagnostic Laboratory of Iowa State University (ISU VDL) during the last 5 years. Considering the fact that MRS are also frequently resistant to other important veterinary antibiotics such as aminoglycosides, fluoroquinolones, lincosamides, macrolides, tetracyclines, chloramphenicol and trimethoprim-sulfamethoxazole, there is only a limited option to treat such serious infections caused by these pathogens. The goal of this study is to determine prevalence, genetic diversity and resistance mechanisms (including other rare means than *mecA*) of methicillin resistance in *Staphylococcus* spp. isolated from the clinical specimens of dogs, cats and other companion animals submitted to ISU VDL. The mechanism of methicillin resistance will be investigated using phenotypic and genetic tests. Also, the genetic relationship of MRS isolates will be determined. Antimicrobial susceptibility testing (AST), latex agglutination assay, PCR detection for specific resistance genes, and molecular typing (e.g., PFGE and SCC*mec*) methods will be employed to characterize the strains. The findings of this study will generate significant knowledge on the prevalence, mechanisms, and genetic diversity of MRS from pets with severe infections and thus should be valuable for therapeutic and epidemiological purposes.

Group B  
2018 ISU CVM SSRP Mentor Abstract #4

Project Title: Antibiotic resistance in foodborne pathogen *Campylobacter*

Principal Investigator(s): Qijing Zhang

Collaborating Investigator(s): Orhan Sahin, Paul Plummer, and Grant Dewell

Veterinary Scholar Focused Abstract: (300 words or less):

Please answer the following questions:

*Campylobacter* is a major foodborne pathogen and a leading bacterial cause of gastroenteritis in the United States and other countries. Clinical treatment of campylobacteriosis requires the use of fluoroquinolone (FQ) or macrolide antibiotics, but antibiotic-resistant *Campylobacter* is increasingly prevalent, compromising the efficacy of clinical treatment. Because of its significance to public health, CDC has recently identified drug-resistant *Campylobacter* as a serious antibiotic resistance threat in the U.S. *Campylobacter* is highly prevalent in food producing animals, and ruminants are important reservoirs for this pathogenic organism. Ruminant *Campylobacter* can be transmitted to humans via contaminated milk and water, or direct contact. Additionally, ruminants are an important part of *Campylobacter* ecology and may serve as a source of *Campylobacter* transmission to other farm animals, such as poultry. Previously, most efforts on antibiotic-resistant *Campylobacter* were devoted to poultry, which led to withdrawal of FQ antimicrobials from poultry production in the U.S. in 2005. However, national surveillance data indicate that FQ-resistant *Campylobacter* continues to persist and even shows a rising trend after FQ withdrawal in poultry, suggesting that alternative source(s) of FQ-resistant *Campylobacter* may exist. Our recent study on *Campylobacter* isolates from feedlot cattle herds in various geographic regions revealed a sharp increase in proportions of FQ-resistant *Campylobacter* in cattle in the U.S. during the past decade, which coincided with the approved use of fluoroquinolone antimicrobials for control and treatment of respiratory disease in cattle. Using *Campylobacter* isolates collected from cattle farms, this summer research project will focus on analysis of FQ resistance mechanisms and the genetic relationship of the FQ-resistant *Campylobacter* isolates. Antimicrobial susceptibility testing of bacterial isolates and molecular typing techniques will be used in this study. The generated information will provide new insights into the molecular epidemiology of FQ resistance in bovine *Campylobacter* and facilitate the control of this major foodborne pathogen.