Use of mathematical and statistical modeling for developing control strategies in microbiological food safety and food-animal health

By
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Date: 26 January 2018 (Friday)
Time: 10:30am – 11:30am
Venue: Room 130, 1/F, Block 2, To Yuen Building

Abstract
Transdisciplinary research approaches that incorporate mathematical and statistical modeling enable the development of innovative strategies to mitigate, control, and treat infectious diseases. Applications of such approaches for improving microbiological safety of foods of animal origin, treating foodborne infections, and controlling infectious diseases in industrial food-animal production systems will be discussed. On the food safety side, specific examples will include the applications for reducing prevalence of Salmonella enterica subsp. enterica in broiler chickens and of antimicrobial drug resistant (AMR) bacteria in farmed swine and beef cattle, designing informative metrics of antimicrobial drug use in food animals, and detecting AMR trends and intervention outcomes in food production chains. On the foodborne infection side, an example
will be designing treatments of human infections by nontyphoidal Salmonella enterica that have acquired AMR. On the animal health side, examples will include the applications for risk assessments of regional spread of bluetongue and foot-and-mouth disease, analyzing how control measures affect spread of bovine tuberculosis, and devising strategies to manage foot-and-mouth disease outbreaks on large-scale food-animal production units.

**Biography**

Victoriya Volkova obtained a Doctor of Veterinary Medicine degree in Ukraine in 1996. She researched diagnostics and control of swine viral diseases working in the Ukraine’s governmental research system for 3 years. She obtained a PhD degree majoring in Veterinary Medical Sciences and minoring in Statistics at the College of Veterinary Medicine and Department of Mathematics and Statistics of Mississippi State University in the U.S. in 2007. Her PhD research was focused on pre- and post-harvest risk factors for Salmonella enterica subsp. enterica in broiler chickens. Victoriya did a Post-Doctoral Fellowship in epidemiology at the School of Biological Sciences, Centre for Infectious Diseases at the University of Edinburgh in the United Kingdom in 2007-2011. There she performed epidemiological analyses, risk assessments, and network modeling of food-animal diseases transboundary and endemic for the UK. She held a Research Associate position at the College of Veterinary Medicine at Cornell University in the U.S. in 2011-2014. There she used mathematical modeling to develop strategies to mitigate antimicrobial resistant (AMR) bacteria in foods of animal origin. Victoriya has been an Assistant Professor at the College of Veterinary Medicine at Kansas State University in the U.S. since 2014. Her independent research program has been supported by the U.S. Food and Drug Administration Center for Veterinary Medicine, National Institute of General Medical Sciences, and Kansas Bioscience Authority. In her research, she uses transdisciplinary approaches incorporating field epidemiological studies, laboratory-based studies, and mathematical and statistical modeling. She applies such approaches to devise: strategies to mitigate AMR bacteria in foods of animal origin, treatment regimens overcoming AMR in human and animal infectious diseases, and strategies to manage outbreaks of transboundary diseases in industrial food-animal production systems. Victoriya has served as an editor for BMC Research Notes and is a member of the editorial board of Preventive Veterinary Medicine. She has taught in veterinary-curriculum and graduate courses in Veterinary Public Health, Epidemiology, and Mathematical Modeling in Animal Health and Food Safety at Mississippi State University, Kansas State University, and Cornell University.

ALL ARE WELCOME

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