October 2018

Healthy Animals, Healthy Humans

Sarah Caldwell Hancock
Kansas State University

Follow this and additional works at: https://newprairiepress.org/seek

Part of the Higher Education Commons

Recommended Citation
Hancock, Sarah Caldwell () "Healthy Animals, Healthy Humans," Seek: Vol. 8: Iss. 2.
Diseases that spread from animals to people sicken tens of thousands of Americans each year. Some of these diseases are familiar, such as the flu, and others are largely unknown in the U.S., such as Rift Valley fever. Some are transmitted by direct contact with animals, but others are passed along by mosquitoes or ticks.

All of these are described by the same adjective: zoonotic.

Protecting humans from zoonotic diseases requires understanding the complex interactions between animal and human health. One concern is that diseases could spread around the world if the wrong person or animal travels at the wrong time.

Kansas State University researchers are fighting many of the nation’s and the world’s most devastating zoonotic diseases.

"K-State research is crucial to national security and public health," said Peter Dorhout, K-State vice president for research. "We study several diseases that are priorities for the National Bio and Agro-defense Facility, and as we do this work, we are training the workforce needed to provide future biodefense."

"Our work is an example of how collaborative and translational research can result in a tool to control this devastating disease if it ever comes to our shores," said Jürgen Richt, director of CEEZAD and Regents distinguished professor of veterinary medicine.

Rift Valley fever virus, transmitted by mosquitoes, causes abortion in cattle, sheep and goats and can kill young animals. The virus also causes severe fever in infected animals and can cause fatal illness in humans, who contract the disease by handling infected animals or animal products.

Although Rift Valley fever has not reached the U.S., it has devastated other areas of the world. According to the World Health Organization, an outbreak earlier this year killed more than 950 animals in Kenya, Uganda and Rwanda from June 22 through July 2. Human deaths reached the double digits. In 2006, the virus killed 150 people in Kenya.

Ongoing U.S. Department of Homeland Security-sponsored research and training at the K-State Biosecurity Research Institute is helping develop and improve vaccines. A team from the K-State Center of Excellence for Emerging and Zoonotic Animal Diseases, or CEEZAD, collaborated with U.S. Department of Agriculture Agricultural Research Service scientists to develop and patent a safe subunit vaccine. The vaccine uses only a specific protein from the virus rather than the whole particle, and the team has licensed it to a private company. The group also confirmed that the common native white-tailed deer is susceptible to infection by the Rift Valley fever virus. See page 17 for more research on white-tailed deer.

"Our work is an example of how collaborative and translational research can result in a tool to control this devastating disease if it ever comes to our shores," said Jürgen Richt, director of CEEZAD and Regents distinguished professor of veterinary medicine.
Japanese encephalitis

Japanese encephalitis virus is a relative of West Nile virus and is the leading cause of vaccine-preventable brain inflammation in Asia and the western Pacific, according to the Centers for Disease Control and Prevention. The virus thrives in pigs and wading birds and is transmitted to humans by infected mosquitoes. Although most infected people do not develop symptoms, a small percentage experience sudden onset of headache, high fever and other dangerous symptoms. Around 1 in 4 cases is fatal and a total of about 13,000 to 20,000 people die each year.

College of Veterinary medicine researchers Dana Vanlandingham, associate professor of diagnostic medicine and pathology, and So Lee Park, third-year veterinary medicine medical student and collaborator-student in pathology, recently co-authored a study demonstrating that North American domestic pork could be susceptible to Japanese encephalitis virus. That means if the virus is introduced to the U.S., it could take hold and ultimately infect both pigs and humans. This research was supported by the U.S. Department of Agriculture Agricultural Research Service and its scientists in Manhattan.

Finding animal diseases and understanding their transmission cycles is an important way to prevent pandemics, Vanlandingham said. The U.S. learned this lesson the hard way with West Nile virus. Since 1999, West Nile virus has infected more than 3 million people and killed several thousand people.

"This sort of information would have been useful for past introductions such as West Nile virus, which is similar to Japanese encephalitis virus," Vanlandingham said. "Had we studied West Nile virus prior to its arrival in the U.S., we may have been better able to minimize the spread when it came into New York in 1999."

Influenza

Contaminated food is a major source of somatic disease spread. Most consumers have heard of Escherichia coli, or E. coli, and know that it's something to be avoided, but only a few strains sicken people. The types that produce Shiga toxin, known as STEC, can cause illness with symptoms that include stomach cramps, diarrhea, vomiting and fever. Some infections can be life threatening. STEC strains can contaminate 265,000 illnesses in the U.S. each year according to the Centers for Disease Control and Prevention, with 16 percent of illnesses attributed to the worst STEC strain type: O157.

Kendal Phebus, professor of animal sciences and industry in the College of Agriculture and former director of the Food Science Laboratory, said the more than 200 types of STEC are widely distributed in the environment that people share with animals, more than 100 have been linked to human disease.

Validating the effectiveness of commercial antimicrobial technologies to control STEC contamination during meat processing in his area of expertise and the focus of a $2.5 million U.S. Department of Agriculture grant, Phebus serves on the grant’s management team with collaborators from nine other institutions.

The team recently completed a study on real-world processing. Raw veal posed a substantially higher STEC risk than beef, according to the U.S.D.A. and Phebus and colleagues have now validated multiple methods of reducing veal risks and beef risks in commercial meat processing.

Phebus’ team collaborates with several processing companies to demonstrate that lab-generated antimicrobials can translate into effective real-world tools. See page 23 for more on Phebus’ research.

“Working with industry has made this work really powerful,” Phebus said. “We enhance public health by getting the food industry proven antimicrobial intervention technologies to central STEC and other pathogens on their raw and processed products.”

Shiga toxin-producing E. coli

Shiga toxin-producirng E. coli can infect humans when they eat contaminated food, such as contaminated beef orveal. (Photo credits: CDC/Gregory Gradl, CDC/Cynthia Goldsmith; CDC/Janice Haney Carr)