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Zeroing In On Zoonotic Diseases

Jennifer Tidball
Kansas State University

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Nearly 75 percent of recently emerging infectious diseases that affect humans come from animals, according to the Centers for Disease Control and Prevention.

Scientists like Juergen Richt, Regents distinguished professor and Kansas Bioscience Authority eminent scholar at Kansas State University, are fighting these emerging diseases through crucial research being performed at the university’s Biosecurity Research Institute.

Richt’s research focuses on zoonotic diseases, which are diseases that can spread between animal and human populations. Some zoonotic diseases, such as avian influenza and swine influenza, hold great risk to human and animal health as well as the agricultural economy. Richt wants to understand how these diseases adapt and change to develop vaccines and prevent future outbreaks.

Richt is the director of the U.S. Department of Homeland Security’s Center of Excellence for Emerging and Zoonotic Animal Diseases, or CEEZAD, which places Kansas State University as a leader in emerging animal and zoonotic disease research. Through CEEZAD, scientists conduct research, develop technology and train a specialized workforce to defend the United States against agroterrorism, catastrophic events and emerging animal pathogens.

For his research at the Biosecurity Research Institute, Richt is collaborating with Wenjun Ma, assistant professor of diagnostic medicine and pathobiology, and several other researchers, including scientists with the U.S. Department of Agriculture’s Arthropod-Borne Animal Diseases Research Unit. Through the institute’s advanced research capabilities, the scientists are studying important zoonotic diseases, including avian influenza, pandemic H1N1, swine influenza and Rift Valley fever.

Avian influenza

By studying avian influenza, the researchers want to develop vaccines for poultry.

“Only a few studies have been performed with highly pathogenic avian influenza virus in swine, and all these studies have involved older virus isolates,” Richt said. “We are using present-day strains of the virus to study the effects in swine and poultry.”

The research is essential because avian influenza viruses can mutate and cause illness in humans and many other animal species. By improving vaccines, the researchers are protecting animal and human health while preventing a potential avian influenza pandemic.
Pandemic H1N1 and swine influenza

The researchers are studying how specific strains of the H1N1 virus affect swine populations and are addressing issues when some virus strains become drug-resistant.

By characterizing the pandemic H1N1 virus, the researchers are investigating the differences between the 2009 pandemic H1N1 and other H1N1 viruses, including the classical 1918-like H1N1 swine influenza virus.

They have found that the 2009 pandemic H1N1 virus is more easily transmitted in swine populations than the classical swine influenza virus. It is also easily sustained in swine populations, where it can mix and create new influenza viruses with genes derived from pandemic H1N1.

To prevent future swine influenza outbreaks, Richt and Ma are studying how the virus spreads and how to improve vaccines.

They are performing studies involving a detailed genetic analysis of the role of various gene segments of the 2009 pandemic H1N1 virus. They are studying how different genetic combinations affect the virulence and transmissibility of the pandemic H1N1 virus in mice and swine.

“We need to know what the genetic basis is for this virus being virulent and transmissible,” Ma said. “These are critical questions we need to answer.”

All of the projects involve several Kansas State University diagnostic medicine and pathobiology researchers, including: Derek Mosier, professor; Qinfang Liu, postdoctoral fellow; Bhupinder Bawa, research assistant professor; Wenbao Qi, visiting scholar; Huigang Shen, postdoctoral fellow; and Ying Chen, postdoctoral fellow. The projects involve funding and collaboration from a variety of organizations, including CEEZAD, the University of Washington, St. Jude Children’s Research Hospital and Mount Sinai School of Medicine.