

Zoonoses

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[Nina Marano] Welcome to this CDC podcast. I'm your host, Nina Marano. With me today is Dr. Lonnie King, the Director of CDC's Zoonotic Vectorborne and Enteric Diseases Center. Today, we're discussing the December 2008 issue of Emerging Infectious Diseases, which is a special issue on zoonoses. Welcome to the show, Lonnie.

[Dr. King] Thank you for having me, Nina.

[Nina Marano] Dr. King, we've heard you speak about the One Health initiative. Can you please tell us a bit more about it and its contribution to better collaboration between public and animal health sectors on emerging zoonotic diseases?

[Dr. King] It's a one strategy to better understand and to address the contemporary health issues that are created by the convergence of human, animal, and environmental domains, and that really becomes the idea of the concept of One Health. Although the concept of One Health is not new, the theory was supported by William Osler and Rudolf Virchow, the father of comparative pathology, and was rearticulated in Calvin Schwabe's book, *Veterinary Medicine and Human Health*, published in 1984. It's about our increasing interdependence with animals and their products, which has spurred the medical and veterinarian professions to readdress this approach together. This approach would encourage the collaborative efforts of multiple disciplines working locally, nationally, and globally to attain optimal health for people, animals, and our environment. When you think about it, the research in the December issue of Emerging Infectious Diseases is really an example of One Health in action.

[Nina Marano] Dr. King, foxes, raccoons, and bats play an important role in the ecology of infectious diseases, such as rabies. Are there other emerging infectious diseases for which these species might serve as a vector?

[Dr. King] We've all heard a lot in the news over the last few years about avian influenza in humans, poultry, and in wild birds. However, little is known about the role of mammals in the maintenance of influenza viruses in the environment. There are two articles in the December issue that may shed some light on the potential for wild mammals to disperse the virus. For instance, let's take the fox. In one article, "Highly Pathogenic Avian Influenza Virus (H5N1) Infection in Red Foxes Fed Infected Bird Carcasses," the authors discuss that eating infected wild birds may put wild carnivores at risk for infection with highly pathogenic avian influenza virus. So to determine whether foxes were susceptible to infection with highly pathogenic avian influenza virus, the investigators infected three foxes intratracheally. These foxes excreted virus pharyngeally for three to seven days, and they became ill with severe pneumonia, myocarditis, and even encephalitis. To determine whether foxes could become infected by the presumed natural route, the investigators fed infected bird carcasses to three other red foxes. These foxes excreted virus pharyngeally for three to five days, but only mild or no pneumonia developed. The authors' conclusion was that red foxes fed bird carcasses infected with highly pathogenic

avian influenza virus (H5N1) can excrete virus while remaining free of severe disease, thereby potentially playing a role in virus dispersal.

[Nina Marano] Dr. King, can other mammals play a role in the maintenance and spread of influenza viruses in the environment?

[Dr. King] Another article, "Influenza Infection in Wild Raccoons," discusses this very issue. Raccoons are common, widely distributed animals that frequently come into contact with wild waterfowl, with agricultural operations, and with humans. The authors did serosurveys and found that raccoons are exposed to avian influenza viruses. The authors found antibodies to a variety of influenza subtypes, like H10N7, H4N6, H4N2, H3, and H1 viruses, these with wide geographic variation in seroprevalence. Experimental infection studies show that raccoons infected with avian and human influenza A viruses could shed and transmit the virus to virus-free animals and then they would seroconvert. Analysis of cellular receptors shows that raccoons have avian and human type receptors with a similar distribution as found in human respiratory tracts. The potential exists for coinfection of multiple subtypes of influenza virus and with genetic reassortment and the creation of possible new strains of influenza virus. Experimental and field data indicate that raccoons may play an important role in influenza disease ecology and pose a risk to agriculture and human health.

[Nina Marano] Dr. King, that's very interesting. These articles seem to show compelling evidence that wildlife plays a big role in how influenza viruses are dispersed, right?

[Dr. King] One important thing to keep in mind is that while mammals may be able to excrete and carry the virus in nature, other environmental factors may help limit its spread. CDC, in collaboration with investigators in the United States and around the world, is actively researching avian influenza at the human animal interface to learn more about the factors that increase or decrease viral persistence in the environment, factors such as temperature, pH, and salinity.

[Nina Marano] Earlier, we mentioned a third species, the bat. What's in the December issue about bats?

[Dr. King] The bat is a known reservoir for many viruses, such as Ebola, Hendra, and Nipah. Recently, we learned that the bat is also a likely reservoir for SARS, the virus that emerged in Asia in 2003 and led to 8,098 human infections and 774 deaths globally. Now there's even more evidence that the bat is a reservoir for SARS. In "Detection and Phylogenetic Analysis of Group 1 Coronaviruses in South American Bats," the authors discuss these bats. Bats are of particular interest as reservoirs for potentially emergent pathogens. Because of their abundance, wide distribution, and mobility, bats confer a greater risk for zoonotic transmission than other animals. Bats have long been known as the natural hosts for rabies virus and other lyssaviruses, and were more recently identified as reservoirs for emerging viruses. The search for animal reservoir for SARS coronavirus led to an extensive survey of coronaviruses in wild and domestic animal populations in China, which resulted in the detection of a wide variety of novel bat coronaviruses. The data suggests that the progenitor of the SARS coronavirus, and perhaps all other coronaviruses in other animal hosts, originated in bats. Recent reports by other investigators have confirmed the existence of bat coronaviruses outside of China, in the United States, and

Germany. Additionally antibodies reactive with SARS coronavirus have been detected in African bat species. The authors of the EID article report the detection and characterization of coronaviruses in bats from Trinidad, the southernmost island of the Caribbean archipelago.

[Nina Marano] Does that mean SARS is going to come back?

[Dr. King] This doesn't necessarily mean that SARS will come back at all or come back in the same way as it emerged in 2003. SARS was an unusual event in that the virus species jumped from a reservoir, such as the bat, to an amplifying host, in this case the civet cat. At some point, SARS acquired the ability to infect humans and the ability to spread directly from human-to-human. This is quite a series of complex events taking place at the molecular level. What we should do is continue to collaborate worldwide and study these viruses in their environmental niches and in their animal reservoirs and hosts and continue to conduct surveillance in nature to be better able to predict, prevent, and control the ability of viruses and other pathogens to infect human and animal hosts. The EID Journal is a wonderful venue for researchers to disseminate news of their findings on zoonotic emerging infectious diseases.

[Nina Marano] Thank you very much, Dr. King. Our discussion with Dr. Lonnie King was prompted by the December 2008 special zoonoses issue of Emerging Infectious Diseases. These articles, and others on emerging bacterial and viral diseases, can be read online at www.cdc.gov/eid. Again, that's www.cdc.gov/eid. And you can submit your comments on this interview to eideditor@cdc.gov. That's eideditor—one word—@cdc.gov. For Emerging Infectious Diseases, I'm Nina Marano.

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