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SCHOOL OF VETERINARY MEDICINE AND BIOMEDICAL SCIENCES
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Highly Pathogenic Avian Influenza in Mammals: A Case Report of Two Domestic Cats

In January, an outdoor, adult, domestic longhaired cat presented to the University of Nebraska Veterinary Diagnostic Center for postmortem examination after a history of rapid decline with clinical signs of anorexia, recumbency, anisocoria, pyrexia, seizures, tremors, nystagmus, loss of proprioception, and hyperesthesia. Gross necropsy revealed only a few visible changes to the organs including pulmonary congestion and edema, mild pericardial transudative effusion, and a subtle darkening of areas of the cerebrocortical grey matter. Complete histopathology examination revealed necrotizing lesions in the kidney, liver, adrenal gland, and pancreas; encephalitis with patches of extensive neuronal degeneration and necrosis, particularly in the cerebral cortex; and edema, vessel congestion, and mild inflammation in the lung and epicardium. The lesions were recognized as suspicious for highly pathogenic avian influenza virus infection, which was confirmed with molecular diagnostics. The PCR Ct value for avian influenza in the brain of this cat was remarkably low (12), indicating a very large amount of virus in the brain, as consistent with an acute infection. Highly pathogenic avian influenza Eurasian strain H5N1 was verified by molecular assay at National Veterinary Services Laboratories (NVSL).

Three other outdoor domestic cats of this household were noted at risk, and one of them developed clinical signs shortly after the first affected cat. This cat was described as somnolent and had episodes of walking in circles (circling). The cat was responsive to stimuli and seemed to eat and drink normally. It lived 10 days with neurologic impairment, when the cat suddenly became laterally recumbent with continual tremors, necessitating euthanasia. Gross necropsy documented major lesions only in the brain. There was excessive bloody cerebrospinal fluid from the subarachnoid space and obvious areas of malacia and hemorrhage in the cerebral cortex. On histopathology of affected brain, there was extensive loss of neurons with severe vacuolation and collapse of the supporting parenchyma, accompanied by reactive changes including astrogliosis and lymphocytic perivascular cuffs. Avian influenza was detected in the brain, although the PCR Ct value was higher (30), a consequence of the infection being chronic and/or less initial virus burden. Eurasian strain H5N1 was verified at NVSL. Acute hemorrhage from the damaged cortex leading to increased intracranial pressure could have caused the neurological crisis in this second cat. The remaining two cats in the household have been reportedly normal and nasal swabs collected from them did not detect avian influenza virus.

The current outbreak of highly pathogenic avian influenza A (H5N1) virus (HPAI H5N1) has been a disaster for poultry flocks, affecting more than 58 million poultry from commercial and backyard flocks in the United States.[1] Although primarily affecting birds, H5N1 can infect mammals, with many of these other affected species belonging to the order Carnivora. Documented cases of HPAI H5N1-infected carnivores include wild/exotic and domestic felids, bears, seals, coyotes, domestic dog, raccoons, foxes, and skunks.[2, 3,4] Other mammals infected include opossums and dolphins.[2] These infections are sporadic and generally rare, but important as they appear to cause significant morbidity and mortality in the affected individuals. The cats in this case had obvious neurological signs and remarkable brain pathology including extensive neuronal degeneration and necrosis, reactive astrogliosis, and perivascular cuffing, consistent with other cases reported. Other lesions can variably be found in the lung, liver, pancreas, heart, adrenal gland, and kidney, as described in the first cat of this report.[3,5] Therefore, complete necropsy evaluation sampling multiple internal organs and brain is essential to arriving at a timely diagnosis of HPAI H5N1 infection in a cat (or other carnivore) and ruling out other etiologies of neurologic disease. At present, consumption of birds infected with HPAI H5N1 is understood to be the key route of transmission for carnivores naturally infected with the virus, although ingestion of virus-contaminated feces and environmental material is a possible route.[1,6] It has been demonstrated that cats can become infected with H5N1 via the respiratory route and cat-to-cat transmission is possible.[3,6] However, these sporadic H5N1 infection events are still initially precipitated by contact with infected birds.[3] There is no evidence that cats or other infected mammals have a zoonotic role with H5N1.[6,1] It is presumed that the two cats described here became infected from predation of wild birds infected with the virus given the circumstances of the case. Keeping cats indoors to prevent wild bird contact (particularly given the context of the current HPAI outbreak) and avoiding feeding uncooked poultry are recommendations to minimize risk of H5N1 infection. If H5N1 is suspected in a cat, best practice to minimize any risks of transmission would be to isolate the cat, minimize contact, wear

personal protective equipment while handling the cat, and thoroughly decontaminate contact surfaces with appropriate disinfectants (see Thiry et al., 2009, for more detailed discussion[6]).

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