HPAI and Wild Birds

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A highly pathogenic avian influenza (HPAI) virus (H5N1) recently has been reported among domestic poultry in Cambodia, China, Indonesia, Japan, Laos, South Korea, Thailand, and Vietnam. This virus also has been responsible for 23 confirmed human cases, including 18 deaths. A report on this outbreak is available through the Morbidity and Mortality Weekly Report (MMWR 53:97-100) from the Centers for Disease Control and Prevention (CDC), which can be accessed through their website (www.cdc.gov).

Associated with this outbreak are increasing but unconfirmed reports of HPAI mortality in wild birds, which has raised questions relating to both direct wild bird mortality and the possibility that wild birds could be involved in the maintenance or transmission of this virus. Although there is no direct evidence to support either possibility at this time, two events during the last 2 years suggest that we might want to keep an open mind. The first and most recent event is the isolation of an H5N1 virus from a peregrine falcon found dead in Hong Kong during January 2004. The second event occurred during the winter of 2002-2003, with confirmed outbreaks of an H5N1 HPAI in two waterfowl parks in Hong Kong. During these outbreaks, mortality was documented in captive wild ducks and flamingos and in free-flying gray herons and a black-headed gull.

It is well established that wild birds represent the reservoir for avian influenza viruses (AIV) worldwide. This is especially true for numerous species in the orders Anseriformes (ducks, geese, and swans) and Charadriiformes (shorebirds, gulls, and terns), from which a diversity of influenza viruses has been isolated. These viruses have included all of the currently known AIV hemagglutinin (H) and neuraminidase (N) subtypes that are used to classify these viruses. AIV is transmitted within these avian populations through a fecal/oral transmission route via cloacal shedding of virus and by contaminated water. Infection rates in wild birds are dependent on season, location, age, and species. In North American ducks, for example, high infection rates (which can exceed 30%) are primarily associated with juvenile mallards during pre-migration staging in late summer, when birds are migrating from northern breeding areas. With shorebirds, consistent isolations of AIV have been reported only from ruddy turnstones during spring migration stopovers at Delaware Bay. In short, the epidemiology of these viruses in wild birds is complex and dependent on behavior as well as species susceptibility to infection.

AIV diversity within these populations also presents a complex picture with regard to both subtype and virulence. Subtype diversity in wild bird populations does not occur randomly. In duck populations in North America, for example, H3, H4, and H6 subtypes represent the majority of isolates, and this has been a consistent finding for more than 30 years. The H5 and H7 AIV subtypes have been isolated from wild birds, but they are uncommon and, with a single exception, have been nonpathogenic viruses. HPAI H5 and H7 viruses from wild birds are extremely rare, *if they exist at all*. Of the thousands of viruses isolated from wild birds worldwide, only one has been previously associated with either domestic or wild bird mortality. This virus, an H5N3, represented the first AIV

reported from a wild bird species and was responsible for mortality in common terns in South Africa in 1961. It is relevant to point out that there is no evidence that this particular virus persisted in any wild bird population following this single outbreak, and its origin remains unknown. There are no reports of direct transmission of any AIV from wild birds to humans.

There are some unique observations associated with the Hong Kong waterfowl park outbreaks that deserve attention. At these waterfowl parks, mortality attributable to a HPAI virus (H5N1) was reported from numerous species of ducks and geese. Although captive, these species represent a group of wild birds (ducks and geese) that have not been previously associated with clinical disease or mortality attributable to AIV infection. In addition, HPAI mortality was documented in captive flamingos and from several free-living birds, including gray herons and a black-headed gull. This is not the first time that an AIV has been isolated from gray herons or black-headed gulls, but, as with ducks, it is the first time that mortality was associated with infection.

With influenza the basic rule is “never say never.” The current H5N1 HPAI outbreaks in domestic poultry in Southeast Asia, the zoonotic potential of this virus, unconfirmed reports of wild and zoo bird mortality associated with this virus, and previous reports of wild bird mortality associated with a closely related H5N1 virus in Hong Kong certainly deserve attention. Mortality associated with the HPAI outbreaks in the Hong Kong waterfowl parks indicates that some H5N1 HPAI viruses may be pathogenic to some species of wild birds. However, these results provide little insight into either transmission or maintenance of HPAI in wild bird populations or transmission between wild and domestic avian populations. These unfolding events dramatically underscore the need to further understand the epidemiology of AIV in our wild bird populations and to identify mechanisms for both interspecies transmission and the emergence of HPAI viruses. (Prepared by David Stallknecht)