Avian Influenza Surveys in Waterfowl Part II: The Role of Wild and Domestic Waterfowl in Avian Influenza Surveillance Programs

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The mission of the National Surveillance Unit is to prioritize, evaluate, design, analyze, and integrate animal disease surveillance programs. The prioritization of surveillance promotes the most effective use of resources. In the February 2005 edition of the NAHSS *Outlook*, wild waterfowl surveillance studies were used to review what is presently known about the transmission of avian influenza A (AI) virus between wild waterfowl and commercial poultry. The usefulness of wild waterfowl surveys as part of an ongoing, targeted surveillance program for AI is presently in question.

Last month's article reported that there is minimal epidemiological evidence that AI moves directly from wild waterfowl to commercial poultry. It has been demonstrated that AI in wild waterfowl is widely distributed, all identified AI subtypes have been isolated from waterfowl and shorebirds, predominate subtypes vary from year to year and by geographic location (Pacific vs. Atlantic migratory flyways), and certain environmental conditions favor virus transmission. From these facts, one might conclude that the "state of nature" of AI in wild waterfowl reservoirs has been defined and the risk that wild waterfowl pose to commercial poultry operations has been quantified.

However, most of what is presently known about AI transmission from wild waterfowl to commercial poultry operations was derived from epidemiologic studies which were published in the 1970's and 80's and used laboratory techniques much less sophisticated than those employed today. The development of advanced molecular techniques and their use in epidemiologic investigations and surveillance may soon produce a clearer picture of the "state of nature" of AI in wild waterfowl and the threat it poses to commercial poultry operations. Now that these new tools have been developed, the potential for novel AI subtypes to move from wild waterfowl to poultry warrants further investigation.

An active wildlife waterfowl surveillance program could help to identify predominate viral subtypes circulating within a particular year or season. This is similar to human influenza surveillance programs that use active laboratory surveillance to estimate which viral strains will be the predominate subtypes for inclusion in the next seasonal influenza vaccine.[1] Alternatively, outbreaks in commercial poultry might be predicted by studying relationships between circulating subtypes of AI in wild waterfowl and emergence of similar subtypes in commercial poultry flocks.

Live bird markets (LBMs) have served as sources of AI virus that were linked to outbreaks in commercial poultry.[2,3] Surveillance of LBMs has been in effect since 1986. As a result, a low pathogenicity H5N2 AI subtype virus, genetically related to the subtype responsible for the 1983 Pennsylvania outbreak, was isolated in 1986. In LBM surveys conducted from 1993 to 2000, low pathogenicity H5N2 and H7N2 subtypes were demonstrated to be persistently present, despite the control measures implemented such as decontamination of the premises and equipment. Mutational changes occur as AI subtypes circulate over time on LBM premises. Gallinaceous birds (especially quail) have been shown to be an effective host in which viruses can undergo mutational changes.[4] The presence of rabbits in LBMs has also been demonstrated to increase the likelihood of isolating an H7 AI virus subtype from the premises.[3]

Recently, a LPAI H5N2 subtype was isolated from a domestic duck operation in South Korea (not related to the HPAI H5N1 subtype affecting Asia in late 2003 through 2004; awaiting official subtype confirmation as of December 22, 2004).[5] Reports from Thailand indicate that flocks of dead pigeons were found to be infected with AI (subtype not reported).[6] H5N1 was recently isolated from a dead heron in Hong Kong.[7]

Although epidemiological links between circulating subtypes of AI in waterfowl and AI outbreaks in poultry are relatively weak, actions have been taken to mitigate the elevated risk of introduction of novel AI subtypes to commercial poultry operations and transmission to humans. The potential threat of AI introduction to commercial poultry operations has been minimized through a renewed emphasis on biosecurity and an effort to make training tutorials available to producers through industry associations.[8] The Occupational Health and Safety Administration has published an advisory bulletin to assist employers in providing safe workplace practices; they have also recommended specific personal protective measures to minimize the threat of AI to the public's health.[9]

The main objective of active surveillance, as stated by Thurmond, is to "seek out as early as possible the target agent or disease cases or to identify an elevated risk in order to maximize prevention, treatment, control, or the likelihood of eradication and to minimize the impacts of disease."[10] Prioritization of surveillance is presently given to LBM surveillance programs. Surveillance of domestic duck operations, game bird producers (quail & pheasant), and diseased wildlife is currently underway in other countries. Perhaps the use of newer molecular techniques will make data from wild waterfowl surveys more useful in future surveillance programs.

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[7] ProMED-mail, Avian Influenza Eastern Asia (147); Honk Kong OIE; Pro-MED mail; 20 Dec 2004: 20041220:3356. <http://www.promedmail.org>, Accessed 23 Dec 2004.

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[9] U.S. Department of Labor, Occupational Safety and Health Administration. *Avian Influenza Protecting Poultry Workers at Risk.* SHIB 12-13-2004.

[10] Thurmond M.C., 2003. Special Article: Conceptual foundations for infectious disease surveillance. *Journal of Veterinary Diagnostic Investigation*, 15:501-514.