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AVIAN INFLUENZA TESTING OF AMERICAN WOODCOCK IN AN AGRICULTURAL LANDSCAPE

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Abstract: The potential for migratory bird species to transfer pathogenic Eurasian strains of avian influenza to the Americas has created international concern over monitoring efforts. Avian influenza has been isolated in multiple migratory shorebird species, and those that spend time in agricultural areas are more likely to share the virus with poultry. *Scolopax minor* (American Woodcock) are migratory and winter in agricultural landscapes throughout coastal North Carolina. Thirty nine woodcock were tested during February 2009 and December–March 2009–2010 for Type A avian influenza virus; all tests were negative. To our knowledge, this is the first study to evaluate woodcock for avian influenza. Wildlife disease surveillance, especially testing of novel species, is critical to monitor and control virus emergence and spread between wild and domestic populations.

Key Words: agricultural landscape; American Woodcock; avian influenza; migratory shorebird; *Scolopax minor*; wintering grounds.

INTRODUCTION

Avian influenza is a disease management challenge of the 21st century because of the virus' capacity to infect diverse mammalian and avian species, and implication in poultry disease and mortality (Arzt et al. 2010). Further, there are global concerns about the transfer of avian influenza strains from Eurasia to the Americas. For example, Makarova et al. (1999) believed Eurasian H2 was transmitted to the Americas by avian hosts. Additionally, migratory birds have contributed to the spread of H5N1 (i.e., a highly pathogenic strain of avian influenza) in Asia and Europe (Dierauf et al. 2006).

Surveillance of multiple species is critical to detect virus spread (Pearce et al. 2010). Since 1961, avian influenza has been documented in at least 88 wild bird species, with most isolations occurring in Anseriformes (ducks, geese and swans) and Charadriiformes (shorebirds) (Stallknecht and Shane 1988). Recently, monitoring of ducks, shorebirds, and gulls has identified several avian influenza strains including H1 through H13 subtypes and a newly described H16 subtype (Krauss et al. 2007). Also, studies in the eastern United States detected Eurasian lineages of avian influenza in virus isolates from shorebirds (Jackwood and Stallknecht 2007; Makarova et al. 1999), highlighting the role of migratory shorebirds in transporting avian influenza strains across geographic boundaries.

Avian influenza virus dispersal has important implications for human health, especially when the virus enters agricultural areas with domestic poultry operations. Wild birds can contract avian influenza from and/or spread it to poultry, and subtypes H5, H7 and H9 can become pathogenic in poultry and infect humans (Arzt et al. 2010; Krauss and Webster 2010). Dormitorio et al. (2009) detected avian influenza in migratory shorebirds in Alabama, Georgia and Florida and suggested further testing in the southeastern United States to ensure that H5 and H7 are not transmitted to poultry. Consequently, avian species that occupy agricultural areas are worthy of influenza monitoring.

Scolopax minor (American Woodcock) (hereafter referred to as woodcock) is a migratory shorebird adapted to living in forested and agricultural habitats. Individuals migrate between breeding grounds in eastern Canada and north central and northeastern regions of the United States to wintering grounds in the southeastern and south central states (Sheldon 1967). Woodcock on the wintering grounds roost and feed in bottomland forests and open fields, including crop fields (Stribling and Doerr 1985a). Since 1968, woodcock have experienced annual population declines of 1.1% (Cooper and Parker 2009), primarily because of the loss of early-successional forest habitat (Dessecker and McAuley 2001). Other documented threats to woodcock include predation (Krementz and Berdeen 1997), hunting mortality (Krementz et al. 1994), parasites (Hiller et al. 2007), and disease (Docherty et al. 1994).

Docherty et al. (1994), to our knowledge, was the only study to test woodcock for diseases and detected woodcock reovirus, which caused mortalities in the late 1980s and early 1990s. As the human population expands and habitat is lost throughout the eastern United States, diseases may become more detrimental to woodcock. Also, because of the capacity to infect wild birds, domestic species, and humans, the potential for avian influenza in woodcock is a threat to humans and other species of wildlife. Additionally, no woodcock population has been tested for avian influenza. Recently, Belant and Deese (2010) emphasized the critical role of wildlife disease surveillance because of human health and safety, economic, and ecological considerations. Therefore, our objective was to test for avian influenza in woodcock wintering in an agricultural landscape of eastern North Carolina.

STUDY AREA AND METHODS

Our study was conducted during February 2009 and December–February 2009–2010 across 73 crop fields south of Lake Mattamuskeet National Wildlife Refuge and US 264 near New Holland, Hyde County, North Carolina (35°26′36.61″N, 76°10′10.69″W). At night, we spotted woodcock eye shine using halogen bulb headlamps and captured birds on foot using hand-held fishing nets strung with mist netting (Stribling and Doerr 1985a).

Following the protocol established by Loth et al. (2008), the Avian Influenza Virus Type A Antigen Test kit (FluDetect) (Synbiotics Corporation, Kansas City, MO, USA) was used to test for H antigen types and samples were collected using oropharyngeal swabs. Only type A, and not B or C, was tested because type A virus is known to cause infection in wild birds (Alexander 2000). The FluDetect antigen test is a rapid and reliable method of avian influenza detection with high sensitivity and specificity. It is critical for detecting and controlling avian influenza outbreaks in wild birds and domestic poultry, and is a useful screening method for avian influenza (Loth et al. 2008). We collected one oropharyngeal swab (25–800 D 50 sterile polyester tipped applicators, Puritan Medical Products Company, Guilford, ME, USA) from each bird and placed eight drops of extraction buffer in a test tube, swirling the swab in the buffer 5–10 times, and pressing the swab against the test tube to remove all liquid. We placed the samples on ice and tested all samples within 24 hrs of collection.

Table 1. Number of positive and negative results by sex for American Woodcock avian influenza testing near New Holland, Hyde County, North Carolina, February 2009 and December–February 2009–2010.

	# American Woodcock	Positive Results	Negative Results
Males	23	0	23
Females	16	0	16

Test strips were used immediately upon removal from the vial and results were read within 15 minutes, as recommended by the manufacturer.

RESULTS AND DISCUSSION

Thirty nine woodcock (n = 23 males and 16 females) were tested during February 2009 (n = 9) and December–February 2009–2010 (n = 30). All samples were negative for type A avian influenza virus (Table 1). Our study was conducted on the wintering grounds and likely represents woodcock breeding populations from diverse geographic areas of northeastern North America. Stribling and Doerr (1985b) captured woodcock in the same study area we sampled and recovered bands from Louisiana, North Carolina, New Jersey, Pennsylvania, New York, Massachusetts, New Hampshire, Vermont, Maine, Quebec, Ontario, and Nova Scotia. Thus, disease testing on the wintering grounds is useful for efficiently obtaining health information on the woodcock population as a whole. Additionally, many states (e.g., Alabama, Georgia, and Virginia) within woodcock wintering grounds contain areas of high poultry production in the United States (Carter et al. 2007).

Although our results were negative, it is critical to test populations for avian influenza infection to monitor disease spread (Belant and Deese 2010). Additionally, Dormitorio et al. (2009) specifically recommended increased testing of migratory shorebirds in areas with nearby poultry production. Further, the antigen test kit we used was shown to have a diagnostic sensitivity of 0.71 and a specificity of 0.98 indicating the test is reliable for detecting type A avian influenza from oropharyngeal swabs (Loth et al. 2008). In 1992, North Carolina was ranked 7th in the United States for egg production, 4th for broilers, and 1st for turkey production (Carter et al. 2007). The poultry and caged bird trade, human movements, and migrations by wild birds are the most common means of avian influenza transmission (Alexander 2000). Avian influenza infections have increased in global poultry from 23 million cases between 1959–1998 to over 200 million cases between 1999–2004 (Capua and Alexander 2006). Therefore, wild bird species that spend time in agricultural areas (e.g., woodcock) have an increased likelihood of transmitting avian influenza to nearby poultry farms, or contracting the virus from already infected poultry. Additional testing of woodcock for avian influenza on other wintering grounds, especially in agricultural areas, is recommended.

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