Research update

Welcome to the second installment of the Foreign Animal Disease Surveillance Newsletter. At the time of this writing we have tested 500 cattle sampled from beef herds and 200 collected from markets throughout Texas. As you are aware, we are testing these samples for Bovine Viral Diarrhea Virus (BVDV), Bovine Leukosis Virus (BLV), Johne's disease (JD), and West Nile Virus (WNV). We are employing an antigen capture ELISA for BVDV, an ELISA for BLV, IDEXX ELISA for JD, and hemagglutination inhibition for WNV. We have received 36 samples from you and your colleagues participating in the research program and their distribution is shown to the right (**Figure**). Current results for all sample types are summarized below (**Table**). These preliminary findings suggest that samples submitted by you are more likely to be positive for these model diseases. We hypothesize that the sick animals you see in practice will also be a more sensitive detector of a foreign animal disease should one be introduced. We hope to collect 1000 samples from each method and therefore need your continued support in reaching this goal.

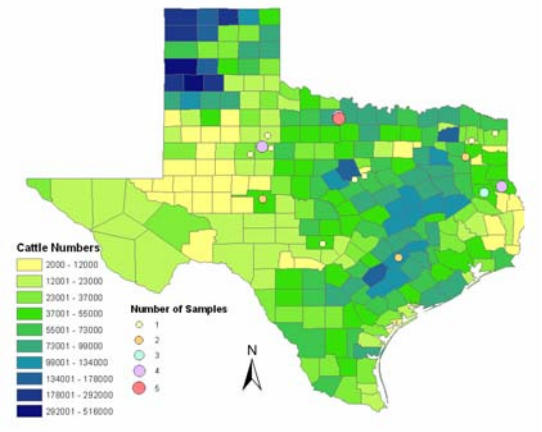


Figure. Distribution and number of submitted serum samples from participating veterinarians through June 29, 2006.

Table. Prevalence of the four study diseases based on sample source.

	Disease agent prevalence			
	BVD	**BLV**	**JD**	**WNV**
Herd tests	0.4% (2/500)	1.8% (7/400)	5.0% (25/500)	0% (0/500)
Market cattle	0% (0/200)	21.6% (43/199)	1.5% (3/200)	0% (0/200)
Veterinarian submitted	5.9% (2/34)	40.6% (13/32)	12.5% (4/32)	8.8% (3/34)
Overall	0.5% (4/734)	10.0% (63/631)	4.4% (32/732)	0.4% (3/734)

Avian Influenza

Etiology

Avian Influenza (AI) is a disease caused by infection with Type A influenza virus, affecting domestic poultry, wild and pet birds. Type A influenza virus belongs to the family, Orthomyxoviridae, and consists of eight segments of single-stranded RNA (ssRNA). The virus' envelope contains the glycoprotein hemagglutinin (HA) and the glycoprotein enzyme, neuraminidase (NA). These surface antigens enable serological identification of the different strains of the virus and are designated by the letters H and N, respectively. Two groups of AI strains exist, low pathogenicity (LPAI) and high pathogenicity (HPAI). LPAI occurs in the United States and causes few clinical signs in infected birds. HPAI, on the other hand, is considered a foreign animal disease and causes a systemic and highly contagious infection with high mortality among avian species. To date, four HPAI strains pose a public health threat due to their ability to cause illness in people and these are H5N1, H7N3, H7N7, and H9N2.

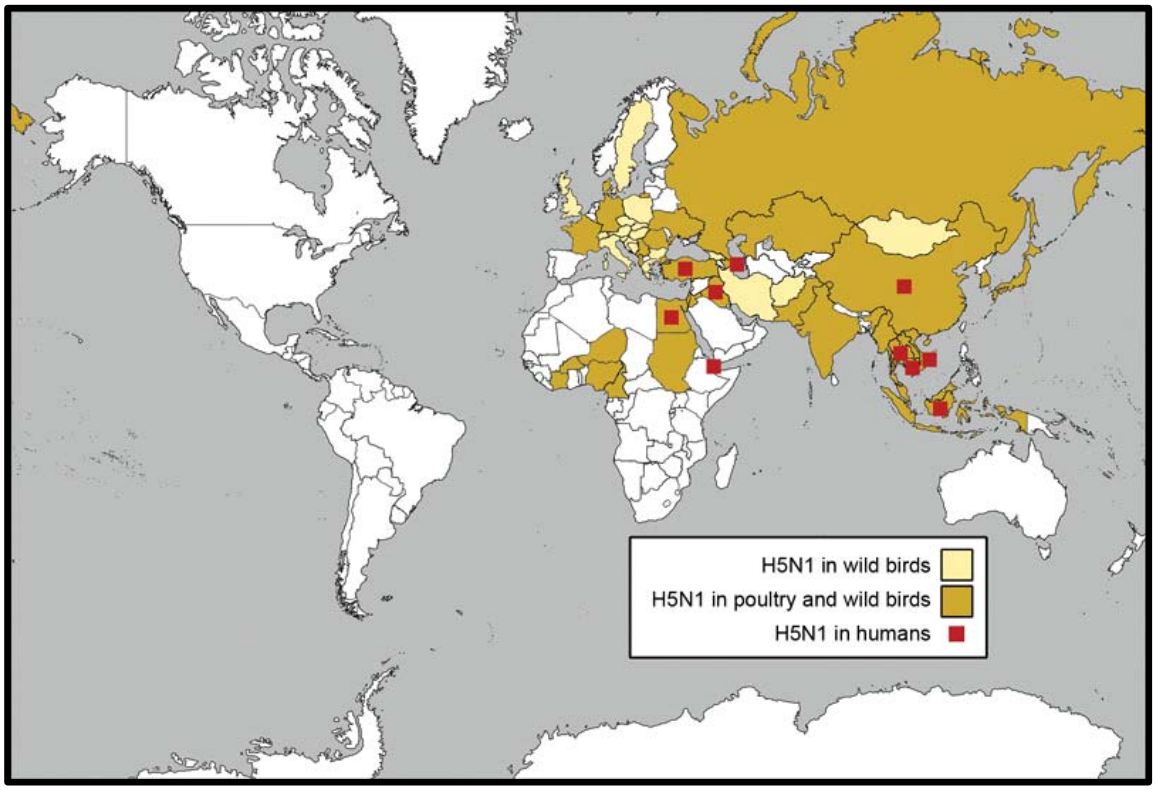
Transmission

The transmission of Avian Influenza from migratory waterfowl to poultry remains controversial. However, AI is spread to uninfected birds by direct contact with infected birds, and by indirect contact with contaminated environments, fomites, and in close proximity, by aerosol transmission. Infected birds shed the virus in high concentrations in their feces, as well as nasal and ocular discharges. Once introduced into a flock, the virus spreads rapidly to other flocks by the movement of infected birds, contaminated equipment, trucks, and people carrying it on their clothing. Swine are also susceptible to infection with AI and human strains of influenza and serve as a reservoir for transmission to birds and people. In addition, horses and marine mammals are at risk for contracting AI, but at this time they are not considered a threat for spreading the virus to people.

Hosts & Distribution

Most avian species are susceptible to AI viruses. Migrating waterfowl, sea birds, and shore birds are considered

responsible for introducing the virus into domestic poultry, but this theory remains debatable. Swine have been documented to spread influenza viruses to turkeys and humans. Furthermore, humans can contract AI from extensive direct contact with birds infected with the H5N1 strain. H5N1 has sporadically occurred in several countries around the world. It originated in southeast Asia and has spread throughout Asia and into Europe and Africa. The rapid spread of H5N1 brings about new threats to the world's bird populations, poultry markets, and increases the risk for transmission to people.



Nations with confirmed cases H5N1 Avian Influenza (May 19, 2006)
source: www.pandemicflu.gov

Clinical Signs

The incubation period of AI ranges from 3 to 7 days. Birds infected with HPAI exhibit signs of depression, ruffled feathers, edematous to necrotic combs and wattles, inappetence, sinusitis, diarrhea, and cyanotic combs and legs. Abnormal neurological signs may or

may not be present. Laying hens can produce misshapen eggs, and egg production can decrease or stop completely. Pathological lesions include, but are not limited to, hemorrhage throughout the body and visceral organs, congestion of organs with mucus, and urate deposits in the tubules of the kidneys. Pulmonary edema and congestion, accompanied with hemorrhages in the trachea and lungs, are common signs of AI. Hemorrhages of the intestines, epicardium, cecal tonsils, and pancreatitis complicate the disease further in affected animals. AI viruses are classified as HPAI by the amino acid sequence of the hemagglutinin cleavage site. Not all HPAI viruses cause high mortality. For example, the H5N2 strain recognized in Gonzales Texas during 2004 was classified as HPAI despite the fact that the predominant clinical sign was reduced production and not high mortality. This and other AI viruses will be classified as HPAI if a simple genetic mutation in the cleavage site would produce a new virus capable of causing high mortality in gallinaceous species.

Diagnosis

AI should be considered a differential diagnosis in all cases of birds exhibiting illness and acute morbidity. Clinical signs and gross lesions are not pathopneumonic for HPAI because they can be present with other avian diseases. Therefore, it is imperative to confirm a diagnosis by enzyme-linked immunosorbent assay (ELISA) or agar-gel immunodiffusion (AGID). Specimens collected for laboratory diagnostics should include dry swabs from the trachea, lung tissue, spleen, cloaca and brain from affected birds. Fecal samples may also be submitted for virus detection using PCR techniques.

Treatment and Vaccination

Currently no treatment exists for birds infected with HPAI, and infected birds are culled to prevent the spread of HPAI. Inactivated oil-emulsion vaccines have some efficacy in reducing mortality and preventing disease in chickens and turkeys, but they may not prevent infection and some vaccinated birds might still shed virulent virus. Other vaccines using avirulent or attenuated

strains have been evaluated, but complications arose with reassortment of the influenza viruses. Currently, a recombinant fowl pox virus vaccine containing the gene coding for the H5 antigen has been licensed. Influenza vaccines are not protective against all strains and a lack of cross-protection remains a major concern. The US at this time does not permit vaccination for AI.

Control and Eradication

Proper sanitation of facilities and maintaining biosecurity procedures can help prevent HPAI. Birds of unknown health status should not be introduced into flocks. Precautions regarding human contact, equipment, and trucks need to be taken into account, and appropriate sanitation and disinfectant procedures must be followed. Open range poultry can have direct and indirect contact with migratory waterfowl and other birds and therefore have a theoretically greater risk of contracting HPAI.

Public Health Significance

Humans are at risk for contracting AI when exposed to high doses of HPAI virus particles in close confines. Co-infection of a person or pig with avian, swine, and human viruses may allow for genetic reassortment of viruses. This reassortment may produce strains capable of causing transmissible infections among mammalian species and pose a great threat to human health.

References

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