



Potential risk of Highly Pathogenic Avian Influenza (HPAI) spreading through wild water bird migration – Updated version

1. Summary

There is a potential risk that HPAI subtype H5N1 might be carried along migration routes of wild water birds to densely populated areas in the south Asian subcontinent and along migratory flyways to Africa and Europe. Recent outbreaks of HPAI in Russia and Kazakhstan (August, 2005) may be suggestive of the role of wild birds in the epidemiology of HPAI. The complex overlapping of major flyways (Fig 1) and the lack of information on migratory species potentially involved in AI disease spread make simple association of wild bird flyways with outbreaks of AI difficult. However, it is plausible that HPAI H5N1 virus could spread from Siberia to the Caspian and Black Sea areas in the foreseeable future. Some birds are currently nesting in the newly HPAI affected areas of Novosibirsk and Altai in Russia and will migrate to the above-mentioned areas for upcoming winter or land to rest areas on their way to Africa and Europe. The exact risk will likely depend on the identification of specific migratory species that carry H5 viruses without

suffering the disease, and knowledge of their resting areas and wintering grounds combined with the existing production poultry systems and husbandry. Bird migration routes run across southwest Asia and some Mediterranean countries, where bird flu outbreaks could possibly occur. India and Bangladesh, which currently have no indication of disease, are at risk. Bangladesh in particular, and to a lesser extent India, harbour large numbers of domestic ducks and the countries are situated along one of the major migratory routes or are known important bird wintering areas. The countries have the potential to become new large endemic foci of H5N1 infection. Additionally, the spring migration of 2006 may result in the spread of HPAI H5N1 virus further across Europe since birds migrating from southern zones will have intermingled with European Russia and Siberia-origin birds during the 2005/2006 winter nesting areas.

2. Background information

Highly Pathogenic Avian Influenza (HPAI), subtype H5N1 has been occurring in poultry in Southeast Asia since 2003. Until recently, the outbreaks were restricted to Indonesia, Viet Nam, Thailand, Lao PDR, Cambodia and China. But since late July 2005, HPAI H5N1 has expanded in a north-westerly direction and both Russia and Kazakhstan have reported outbreaks in poultry as well as in wild birds. The Russian outbreak of HPAI H5N1 has to date, affected six administrative regions, and in the bordering area to Kazakhstan, the disease affected several villages. Mongolia reported the death of some 90 migratory birds at two lakes in the northern part of the country in early August, 2005. Influenza A virus subtype H5 was isolated from samples taken from dead wild water birds. From April to June, 2005 more than 6000 migratory birds have been reported to have died due to H5N1 infection at the Qinghai Lake Nature Reserve in Qinghai Province, China. This included bar-headed geese *Anser indicus*, great black-headed gulls *Larus ichthyaetus*, brown-headed gulls *Larus brunnicephalus*,

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ruddy shelducks *Tadorna ferruginea* and great cormorants *Phalacrocorax carbo*. In China (Tibet), the death of 133 breeding hens was reported and H5N1 was isolated from samples from these birds.

These new outbreaks suggest that this highly pathogenic H5N1 virus is spreading progressively north-westwards and not restricted to the Southeast Asian focus, where the outbreaks of AI started in mid-2003. In Russia and Kazakhstan, contact between domestic poultry and wild waterfowl at open water reservoirs is considered the primary source of infection for poultry.

3. Role of wild birds

AI in wild birds

It has long been known that wild birds represent a reservoir for avian influenza viruses worldwide. This is a concern because many of these birds are migratory and travel over long distances across international borders. Wild birds have been shown to introduce novel influenza gene segments into a population, that when reassorted with existing viruses can generate a dissimilar virus with different antigenic and other biological characteristics. The influenza viruses are easily spread by fomites and survive and spread well in water. Furthermore, certain species of ducks are able to carry influenza viruses without exhibiting any clinical signs of disease. Juvenile ducks have the highest rates of infection and shedding. High titres of virus occur in late-summer, when birds leave their northern breeding areas, although these titres decrease as birds continue southwards.

Outbreaks of HPAI originating from low pathogenic viruses carried from wild birds, have occurred relatively frequently in domestic poultry in the last decade. But since about 40 years, there have been no large spontaneous outbreaks of HPAI in wild birds. However, recent surveillance studies in Europe showed that several influenza A viruses of subtypes H5 and H7 could be isolated from dead wild birds. These contained virus isolates that are closely related to isolates recovered from each of the recorded H5 and H7 HPAI outbreaks in Europe since 1997. To date, extensive testing of clinically normal migratory birds in the infected countries has not produced any positive results for H5N1 so far. All of the H5N1 viruses isolated from wild birds during the 2003-2004 outbreaks were from dead or dying birds which were located in the vicinity of infected poultry flocks or recently contaminated premises. It appears that the currently circulating strain of H5N1 is also highly virulent for certain wild birds including some species of ducks, as can be shown from the isolation of the virus from numerous dead wild birds and disease outbreaks in bird parks and zoos. In 2004 H5N1 was identified in several species of dead and dying birds including various wild birds in Thailand, magpies in Korea, crows in Japan, a zoo collection in Cambodia and a single heron and peregrine falcon in Hong Kong (Table 1). Similar to the outbreaks in Hong Kong in 2002, all of these birds were moribund or dead and would not have been able to carry the virus over long distances. In the spring 2005, an outbreak was detected in bar-headed geese at Qinghai Lake in central China, which is a protected nature reserve with no poultry farms in the vicinity. Annex 1 shows the distribution of the bar-headed goose population and reported outbreaks of AI in this species.

Table 1. Reported cases of HPAI in wild birds in 2004/2005
(sources: OIE, country reports, GPHIN, ProMED)

COUNTRY	SPECIES	TYPE AI	DATE
Hong Kong	Peregrine Falcon and Grey Heron	H5N1	Jan 2004
Cambodia	Wild birds in a zoo collection	H5N1	Feb 2004
Japan	Crows	H5N1	Mar 2004
Korea	Magpies	H5N1	Mar 2004
Thailand	Pigeons, Open-Bill Storks, Little Cormorant, Red-collar Dove, Scaly Breasted Munia, Black Drongo	H5N1	Dec 2004
China	Grey Heron	H5N1	Dec 2004
China	Bar-headed geese, Great black-headed gulls, Brown-headed gulls. Ruddy shelducks and Great cormorants	H5N1	Apr 2005
Mongolia	Bar-headed geese and Whooper swan near lake.	Influenza A subtype H5	Aug 2005
Russia (Siberia)	Wild birds	H5N1	Aug 2005
Kazakhstan	Wild birds	H5N1	Aug 2005

Migratory routes

Anatidae (ducks, geese and swans) is the family classification of water birds that are ecologically dependent on wetlands for at least part of their annual cycle. Anatidae species use a wide range of wetlands, from the high arctic tundra, rivers and estuaries, freshwater or saline lakes, and ponds or swamps to coastal lagoons and inter-tidal coastal areas such as mud-flats, bays and the open sea. They also utilise man-made wetlands such as rice fields and other agricultural areas. Many of the Anatidae populations migrate between wetlands in the northern breeding areas and southern non-breeding areas and in doing so, regularly cross the borders of two or more countries. Southward migration for the northern-breeding Anatidae starts in July and increases throughout the following months. Most birds would have reached their winter range sometime between November and December. The migration takes them north to reproduction areas at the end of winter, beginning of spring. The winter of 2003-2004 when most of the outbreaks in South East Asia occurred, was when migratory bird densities in South East Asia were at their peak. This appears to implicate wild birds as a possible source for the infection. However, the pattern of the HPAI outbreaks does not coincide with migratory pathway of wild birds for all countries. It is important to note that, if introduced by migratory birds alone, outbreaks of avian influenza would also be expected to have occurred for example in Taiwan Province of China (POC) and the Philippines, or even at the extreme range of the flyway in parts of eastern Australia and New Zealand, if shore birds are shown to be reservoirs. (Shore birds belong to the classification order Charadriiformes and are not Anatidae). Many duck species identified to carry avian influenza viruses, winter in large numbers in Taiwan POC and the Philippines as well as in areas in Southern Asia. Migrating birds also tend to bypass mainland China, where numerous HPAI outbreaks have occurred, in favour of travelling down the coastline or across western China to avoid the Himalayan Mountains. Furthermore, the timing of the Indonesian and Malaysian outbreaks occurred outside the times when migratory birds would have been present in the countries. Therefore, unexplained factors

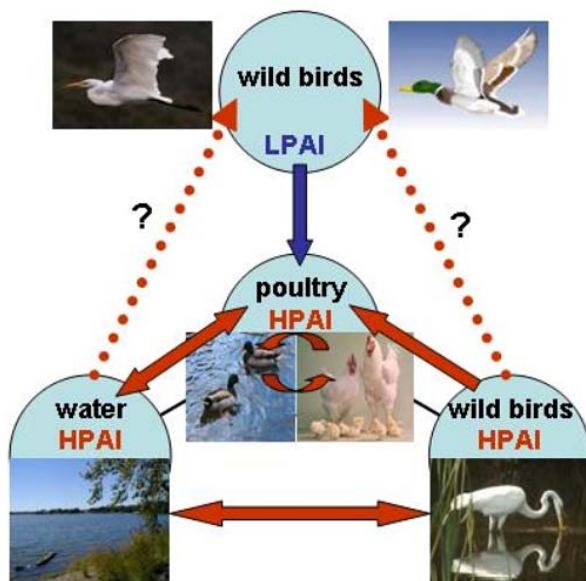
other than shedding of AI viruses by migratory wild birds could possibly be at play in the dissemination of AI viruses.

4. Conclusions

Looking at the epidemiological data currently available, evidence is mounting that wild water fowl may play an important role in the avian influenza cycle and could be the initial source for some HPAI viruses, which may be passed on through contact with resident water fowl or domestic poultry, particularly domestic ducks. In the event of Low Pathogenic viruses, the virus can undergo mutations or re-assort with viruses in the domestic and possibly resident bird populations until a HPAI virus arises. This new virus is pathogenic to poultry and possibly to the wild birds that it arose from (Fig. 2). Wild birds found to have been infected with HPAI were either sick or dead. This could possibly affect the ability of these birds to carry HPAI for long distances. However, the findings in Qinghai Lake-China, suggest that H5N1 viruses could possibly be transmitted between migratory birds. Additionally, the new outbreaks of HPAI in poultry and wild birds in Russia, Kazakhstan, Western China and Mongolia may indicate that some migratory species probably act as carriers for the transport of HPAI over longer distances. Short distance transmission between farms, villages or contaminated local water bodies is likewise a distinct possibility.

The AI virus has adapted to the environment in ways such as i) the use of water for survival and to spread ii) has evolved in a reservoir (ducks) strictly tied to water. The water in turn influences movement, social behaviour and migration patterns of water bird species. It is therefore of great importance to know the ecological strategy of influenza virus as well, in order to fully understand this disease and to control outbreaks when they occur. There remains a body of data and analysis missing on the collection and detection of HPAI viruses in wild birds. Finding HPAI viruses in wild birds may be a rare event, but if the contact with susceptible species occurs it can cause an outbreak at the local level or in distant areas.

Figure 2. Model of an HPAI spreading cycle



5. EMPRES actions & recommendations

To prevent further spreading of H5N1, surveillance in domestic poultry as well as in wild birds should be strengthened in countries at immediate risk, especially along migrating bird routes. Resources should be focused on the reduction of close contacts between humans, domestic poultry and wildlife through better management practices and improved biosecurity practices in poultry production enterprises, especially those that are small and 'open-air' - where domestic poultry and waterfowl are allowed to mingle with wild birds.

Officials would also need to monitor 'wet' and wildlife markets, where wild and domesticated species are kept in close proximity, which are at risk of exposure to a wide range of pathogens. Limiting contact with wild birds should therefore be part of any avian influenza control strategy. To protect domestic poultry, vaccination should be considered as a tool for the prevention and control of HPAI in at risk situations.

The control of avian influenza infection in wild bird populations at this stage, is not feasible – from a logistical, environmental and biodiversity point of view. Indiscriminate culling of wild migratory bird populations would be ineffective in preventing further spread of avian influenza and their hunting would likely cause dispersion of the birds.

Monitoring, sampling and analysis of the viral subtypes of avian influenza found in wild birds need to be done in order to fully understand their role in the propagation and spread of highly pathogenic avian influenza viruses. Multidisciplinary research is required that brings in the competencies of veterinarians, wildlife specialists, ornithologists, virologists, molecular biologists and other resource avenues.

Besides the current regional and country specific AI projects being implemented by FAO, Mongolia has been assisted through a regional technical co-operation programme project in reviewing emergency preparedness and surveillance activities for HPAI since the outbreak in wild birds were reported.

A Global Strategy for the prevention and control of HPAI has been prepared by FAO and OIE under the umbrella of the Global Framework for the Control of Transboundary Diseases (GF TADs). This Global Strategy addresses country level activities as well as the indispensable regional and international coordination.

Within the epidemiological context of the current HPAI outbreaks, there is an urgent need to strengthen the joint FAO/OIE/WHO Global Early Warning System (GLEWS) so as to improve the regional capacity for early detection and response to AI incursions. Immediate support to the Animal Health Services for emergency preparedness, surveillance and early response activities will be required in the Middle East, Africa, South Asia/South West Asia and parts of Eastern Europe.

6. Sources of information

EMPRES group

(<http://www.fao.org/ag/aga/agah/empres>)

FAO/AGAH service

(<http://www.fao.org/ag/againfo/subjects/en/health/default.html>)

Wetlands International

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