

CONSEQUENCES OF AVIAN INFLUENZA PANDEMIC THREAT

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Abstract

Since December 2004 new human cases of infection by avian influenza have reappeared in South-East Asia. The virus of H5N1 originally resides in poultry but became transmittable to humans causing death in more than 50% of cases. During the early 2005 avian influenza spread quickly in poultry flocks through out Vietnam and into some parts of Cambodia, Laos and Thailand. Later this summer poultry infection moved North and Westwards to the very doorstep of Europe. WHO experts regard the latest developments as warning sings of an upcoming global pandemic. An effective vaccine is in the process of testing but will not be available for public use at least for some months; furthermore the evolution of the virus is yet unpredictable. The world capacity for production of oseltamivir, so far the only effective treatment for humans infected by H5N1, is insufficient if the pandemic breaks out. In any case a substantial restructuring of poultry production, distribution, processing and marketing as well as education strategy is necessary in South-East Asia to lessen the chance of a pandemic outbreak.

Key words: Avian influenza/bird flu; H5N1; pandemics; South-East Asia; animal health; human health; poultry

INTRODUCTION

The potential threat of global pandemics was being discussed in a greater scope since December 2004 as new cases of avian influenza (AI) reappeared in South-East Asia. It seems it is probably the only time since 1968, which was the last pandemic, that we are getting sings of warning from nature. The previous recorded pandemics, in 1918–19 “Spanish Flu“ claimed estimated 40-50 million lives, 1957-58 “Asian flu” and the most recent in 1968-69 “Hong Kong flu” caused some 1 – 4 million deaths¹. All took the world by surprise.

As the issue of avian influenza became a topical one, the sources used for this article combine up-to-date reports, research conclusions and recommendations in this area of international organizations such as World Health Organization (WHO), Food and Agriculture Organization (FAO), United Nations Development Programme, World Organization on Animal Health (OIE) with regional news and author observations, focusing in particular on Vietnam as a country with the highest number of human infections of AI.

Avian influenza virus

The avian influenza a disease is caused by different influenza type A viruses, which can infect people, birds, pigs and other animals². Wild birds worldwide carry the viruses in their intestines but usually do not develop

signs of illness and only rarely die of the disease. However, avian influenza is very contagious with deadly consequences for domesticated birds. Although these viruses usually do not infect humans, more than 100 cases of highly pathogenically influenza A type virus H5N1 have occurred since 1997 in several waves:

- 1997 Hong Kong both poultry and humans, 18 human infections, 6 deaths³
- Dec. 2003 - Feb. 2004 Thailand and Vietnam - both poultry and humans, 34 human infections, 23 deaths
- March – Oct. 2004 Thailand and Vietnam - both poultry and humans, 11 human infections, 10 deaths
- Dec. 2004 – Aug. 2005 Vietnam, Cambodia, Indonesia - both poultry and humans, 69 human infections, 26 deaths⁴

Geographical spread of H5N1 avian influenza in birds (see map)

In late July 2005 in Russia and Kazakhstan outbreaks of H5N1 avian influenza in poultry were reported. In Russia some large farms as well as small backyard flock were involved, with close to 120.000⁵ birds dead or culled, and more than 9.000⁶ affected in Kazakhstan. In early August this year, Mongolia issued an emergency report following the death of 89⁷ migratory birds. Avian influenza virus type A was identified as the cause but the virus strain has not yet been determined. Also in early August, an outbreak of H5N1 in poultry was detected in Tibet, China. Despite progressive control

¹ Ref. 5

² Influenza type A viruses are divided into subtypes based on two proteins on the surface of the virus. These proteins are called hemagglutinin (HA) and neuraminidase (NA). There are 15 different HA subtypes and 9 different NA subtypes. Subtypes of influenza A virus are named according to their HA and NA proteins. Thus H5N1 virus has an HA 5 protein and a NA 1 protein. (ref. 4)

³ Ref. 5

⁴ Ref. 10

⁵ Ref. 6

⁶ Ref. 6

⁷ Ref. 6

efforts, H5N1 virus continues to be detected in many parts of Vietnam and Indonesia, in some parts of Cambodia, China, Thailand, and possibly Laos. The South-East Asian outbreaks have resulted in death or destruction of more than 150 million⁸ birds. Poultry outbreaks of H5N1 avian influenza in Japan (also type H5N2 virus appeared in Japan), Malaysia and the Republic of Korea were successfully controlled, but the possible spread of H5N1 virus to poultry in additional countries cannot be ruled out. The expanding geographical presence of the virus is of concern as it creates further opportunities for human exposure. Each additional human case increases possibility for the virus to improve its transmissibility, through either adaptive mutation or reassortment.

Where do we stand at the moment?

Patterns of behaviour of the virus do not meet so far all 3 criteria to be able to cause epidemics/pandemics in human population.

1. *New type of virus to which the population has no immunity* – YES
2. *Virus can be transmitted to humans* - YES
3. **Virus is easily transmitted among human – SO FAR NOT** (the transmission mechanism among birds and in particular among humans remains unclear, in case of human-to-human transmission there had to be relatively high exposure to the disease and very close contact with the infected person).

In case of a pandemic estimates, based on epidemic modeling from the previous pandemics, predict more than 25 million hospital admissions and up to 7 million deaths globally within a short period⁹. Only 40 from 192 WHO's member countries have drawn up their emergency pandemic preparedness plans, varying in degrees of scope. Even in the absence of a pandemic, the economic costs of increasing biosecurity are already substantial, and their ultimate incidence is still not well understood.

The conclusions of studies carried out in Vietnam, where during the present outbreak of AI were 63 persons infected of whom 20 died¹⁰, confirmed evolving behaviour of the virus H5N1 from the previous years, but no mutation so far. There are following patterns of viral behaviour:

- Although the numbers of infected poultry decreased, due to forced slaughtering, humans continue to become infected.
- Symptoms and the development of the disease tends to be milder, there were even cases with virtually no apparent symptoms.
- Infected persons are in all age groups as opposed to the previous years when young population and elderly were the most hit groups.

- Clusters begin to appear (e.g. families or nurses).
- The disease remains latent threat through out the whole year, in 2004 and 2003 it was rather seasonal connected to the cold weather but in 2005 human cases continue to occur during summer.

Future outlook for public health

Globally the WHO has registered 113 human cases, with 58 deaths since December 2003¹¹. In Vietnam only, there were 90 human cases in total reported, while 63 in the period Dec. 2004 – Aug. 2005 with 20 fatalities¹². Newly 2 cases of human transmission for the first time appeared in Indonesia in August 2005¹³. Although there was no sustained human-to-human transmission, thus allowing the virus to qualify as a pandemic potential, the new developments may be worrisome. The fact that civet cats in Vietnam and reportedly pigs in Russia were infected by H5N1 proves that the virus has the ability to be transmitted between animal species, not only birds. Critical issue in Vietnam remains the high presence of the virus in the environment. In the tests conducted during the vaccination of poultry in Vietnam, it was found out that over half of the poultry population tested positively to H5N1. The necessity to stop or slow down the circulation of the virus among birds is crucial in order to bring down the probability of the virus getting mixed with other type of influenza virus and its possible mutation. At present the antiviral oseltamivir (Tamiflu), which is so far the only treatment for human infection of AI and is effective only if given to the patient at an early stage of disease, is available through out Asia as well as globally at the moment but supplies would dry out quick if human epidemic should occur. With the pandemic preparedness plan the WHO has secured the donation by Swiss drug producer Roche of enough Tamiflu to treat 3 million people by the mid 2006¹⁴. Still the world's producing capacity in case of a major outbreak of epidemic or pandemic is deemed insufficient.

Vaccines would be the best intervention but which virus will emerge as the pandemic strain is not known yet. The standard annual influenza shots, which are sometimes inappropriately recommended as an AI prevention, are booster doses. A H5N1 vaccine is a primary immunization because, having had no exposure to the virus, people lack any immunity. The testing of a vaccine for present virus H5N1 has already begun, but the clinical results remain mixed. Although the vaccine has the ability to produce immune response, rather high dosage is required, which may cause adversary side effects and would decrease the number of person that could be treated. The additional tests are needed in part to determine the optimal dose of vaccine, how many shots people will need for protection and whether

⁸ Ref. 6

⁹ Reuters

¹⁰ Ref. 10

¹¹ Ref. 10

¹² Ref. 10

¹³ Ref. 6

¹⁴ Ref. 10

adding another ingredient called adjuvant to the vaccine could raise the potency of lower doses, thus stretching the number of people that could be protected. Even when tests are completed, more time will be needed before Food and Drug administration in USA can license the human vaccine for public use¹⁵.

Recommendation for animal health

Influenza virus affecting Southeast Asian poultry represents a significant global human and animal risk. In order to decrease the risk factors significant restructuring of poultry (chicken and duck) production is needed, in particular in Vietnam and Thailand where the highest incidence of avian and human cases have been reported. In both these countries, poultry production is an essential economic activity for rural poor, and their livelihoods could be adversely affected by control strategies implemented to mitigate disease risks. There are changes necessary to the traditional ways of production, distribution, processing and marketing the poultry. The Asian habit of preference for “warm meat”, thus selling and buying live animals in markets increases the risk of virus transmission substantially. Furthermore the sector 4¹⁶ farming practices are prevalent in the South-East Asia, especially in Vietnam, Cambodia and Laos. The majority of infected humans reported across the three countries since 2003 were people closely associated with these sectors 4 farms.

If there is existing active infection of AI, the control strategies have to be put in place: stamping out and culling the infected flocks, quarantine in order to protect virus free poultry, movement control, screening, zoning, vaccination of birds coupled with surveillance promptly detecting any virus circulation, compensation for farmers whose infected poultry had been slaughtered.

In short term the following risk practices should be avoided or brought under control: farming multiple species of animals (poultry and waterfowl) within one farm unit, the keeping chickens over fish ponds, the use of untreated chicken faeces as fertilizer or livestock feed, inappropriate disposal of dead birds, the use of surrogate birds to incubate eggs of different species,

¹⁵ Ref. 8

¹⁶ **Sector 1:** Industrial integrated system with high level biosecurity and birds/products marketed commercially (e.g. farms that are part of an integrated broiler production enterprise with clearly defined and implemented standard operating procedures for biosecurity)

Sector 2: Commercial poultry production system with moderate to high biosecurity and birds/products usually marketed commercially (e.g. farms with birds kept indoors continuously, strictly preventing contact with other poultry or wildlife).

Sector 3: Commercial poultry production systems with low to minimal biosecurity and birds/products usually entering live bird markets (e.g. a caged layer farm with birds in open sheds, a farm with poultry spending time outside the shed, a farm producing chickens and waterfowl)

Sector 4: Village or backyard production with minimal biosecurity and birds/products consumed locally.

Ref. 2

lack of adoption of “all-in, all-out” husbandry systems. Furthermore, the marketing practices should improve to increase biosecurity by better hygiene at market places, cleaning and disinfection, avoiding keeping multiple species together and in confined spaces, poor ventilation, the lack of pre-market health checks, lack of training and education of stall owners, lack of protective equipment for stall owners. It is also high-risk practice for birds that have been held for selling in markets (but which have not been sold) to be returned to the farm from which they came from¹⁷.

In medium term sector 1 and 2 farms should be certified, and biosecurity measures increased in both sector 3 and 4 farms (e.g. exclusion of contact of domesticated birds with the wild ones, introducing barriers between farm and their outside environment, closer control over the movement of people, animals and inanimate objects entering and leaving farms, using safe (uncontaminated by wild birds) drinking water for animals, during transport reducing the risk of fecal contamination of roads and market areas. Introduce a biosecure and hygienic slaughtering process as well as product processing, which is essential for avian influenza control.

In long term where deficiencies in regulatory control are identified, legislation should be drawn up in order to provide a framework to effectively contain AI outbreaks once they occur, to maintain the biosecurity standards by farmers/producers, distributors and markets. In a number of countries in South-East Asia region remains significant gap between legislation and efficacy of regulatory enforcement, which should be tackled.

Nevertheless, all the above-mentioned measures are costly; in some countries there are limited human resources, infrastructure and financial resources. Neither local authorities nor the governments of the most affected countries have sufficient financial resources to cover even the expenses in case of imminent infection, and so less to spend on farm restructuring towards increased biosecurity. The incentives for farmers to do so by themselves are too insufficient. Farm restructuring is thus closely interconnected with poverty alleviation in the region. In addition to financial costs, some risk reduction may require changes in well established habits at Asian markets such as feeling (by touching and handling) the condition of a bird before purchase.

Recommendations for public health

Parallely with the animal health measures, risk to human health should be reduced by an education strategy especially in sectors of 3 and 4 farms, as well as in the whole production, distribution, processing and marketing chain of birds. The public awareness should also be raised on the avian influenza issue in order to improve the prevention measures and the reporting (and the willingness to report at the grassroots level as well

¹⁷ BEF. 2

as on the governmental one) of AI cases in poultry and among humans.

Without substantial national and international financial and technical support, avian influenza will continue to be a significant public health and animal production issue in many countries in Asia and the risk of a human influenza pandemic occur will remain¹⁸.

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Date of onset	Indonesia		Cambodia		Thailand		Vietnam	
	c	d	c	d	c	d	c	d
Dec '03 -Feb '04	0	0	0	0	11	7	22	15
Mar	0	0	0	0	1	1	1	1
Jul-Aug	0	0	0	0	1	1	4	4
Sep	0	0	0	0	3	2	0	0
Oct	0	0	0	0	1	1	0	0
Dec04-Aug '05	2	2	4	4	0	0	63*	20
Total	2	2	4	4	17	12	90	40

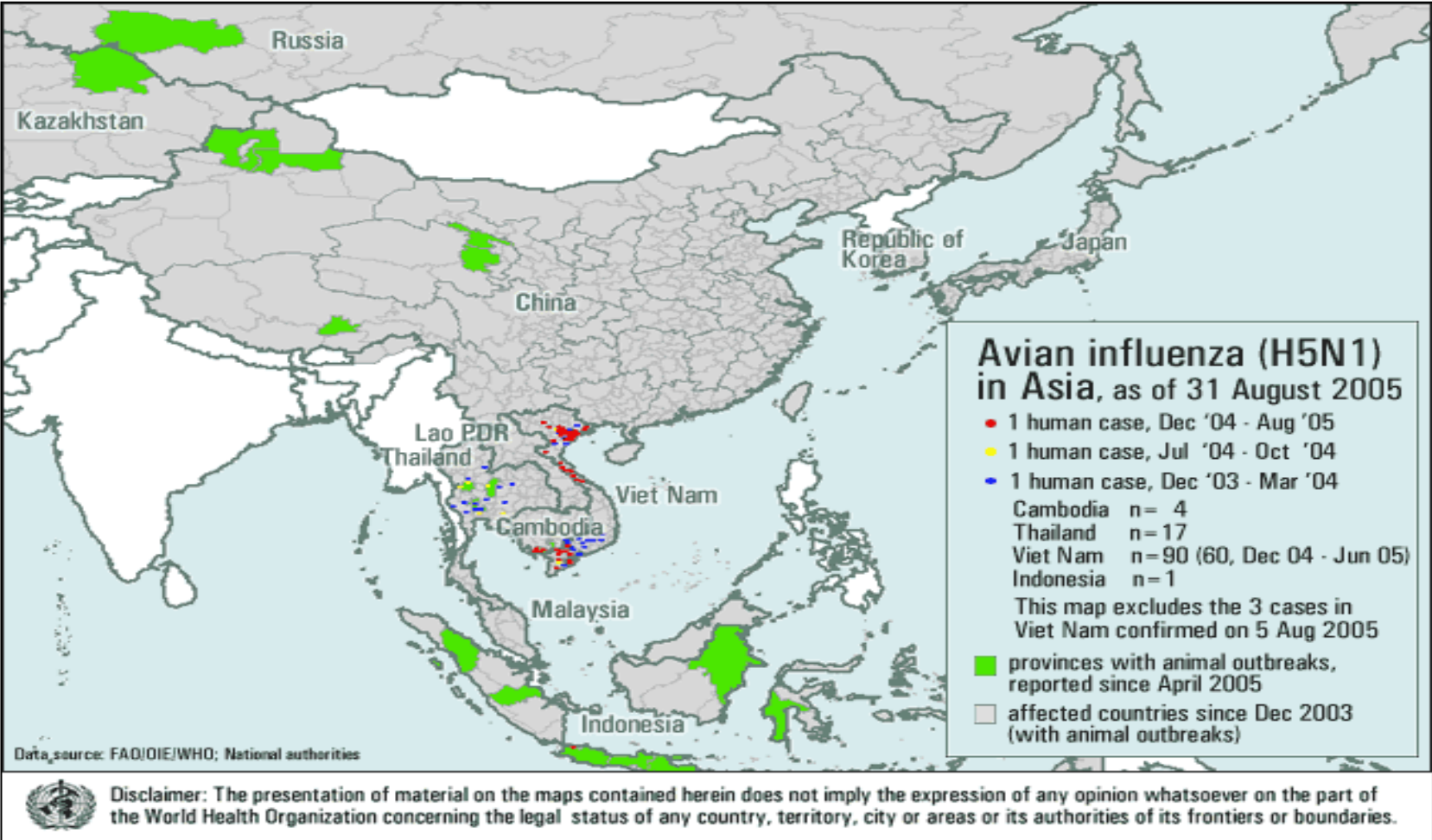
* 3 cases awaiting confirmation
 Source: WHO, Vietnam statistical data

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¹⁸ Ref. 2

Geographical spread of H5N1 avian influenza in birds and humans



Source: WHO, Vietnam

