



## West & Central Africa

# FAO upgrading veterinary laboratory capacity for HPAI diagnosis



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The arrival of H5N1 HPAI in Africa did not catch the continent's veterinary services unawares but it did highlight their shortcomings in terms of surveillance and, in particular, disease diagnosis. Although African veterinary services have responded as best as they can to the emergency, the real presence and distribution of the H5N1 HPAI virus throughout the entire continent might have been significantly underestimated because of the weakness of surveillance and diagnostic capacity of most of them.

In line with its approach to avian influenza and other transboundary animal diseases, based on supporting local and regional initiatives as part of its global programme to prevent and control HPAI and other zoonotic diseases, FAO is actively engaged in supporting the development of veterinary laboratory networks to better monitor and diagnose animal disease, in particular avian influenza.

In 2005, through a series of Technical Cooperation Programmes (TCPs), FAO established sub-regional HPAI laboratory networks in Eastern/Southern Africa, Western and Southern Africa. Following the conclusion of the TCPs, FAO has continued to support African laboratories and, more recently, with support from the Animal Plant and Health Inspection Service (APHIS) of the US Department of Agriculture (USDA), it has strengthened the West and Central Africa Veterinary Laboratory Network for Avian Influenza and Other Transboundary Diseases in Bamako, Mali. A workshop was organized by FAO-ECTAD at the Regional Animal Health Centre (RAHC) for West and Central Africa in the Malian capital. The workshop was attended by heads of virology units and laboratory managers from 13 West African and seven Central African countries.

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During the workshop, FAO-ECTAD presented a proposal for the strengthening of the specific subregional laboratory network for HPAI to improve the HPAI diagnostic capacity of all veterinary laboratories in the subregion through training, technical support and information sharing.

The aim is to enable laboratories with low technical capacity to benefit from the more advanced laboratories and speed up disease confirmation through local processing of samples.

The laboratories of the West and Central Africa region can be classified into three broad categories or groups in terms of avian influenza diagnostic capacity:

#### Group 1

Laboratories unlikely to be able to improve avian influenza diagnostic capacity in the short term and whose staff needs training in autopsy and sampling techniques, and in basic microbiology procedures.

#### Group 2

Laboratories that require upgrading to be able to perform molecular diagnosis.

#### Group 3

Laboratories already performing molecular diagnosis and require upgrading to achieve higher quality functionality.

During the Bamako workshop, it was agreed that the new laboratory network would set itself the target of upgrading the least advanced laboratories of the region within a period of two years.

Coordination of the network was entrusted to FAO-ECTAD at the RAHC in Bamako, with the Istituto Zooprofilattico Sperimentale delle Venezie (IZSve) of Padua, Italy, providing technical support to the network through training, testing, protocols, ring trials and supply of reference reagents, among others.

To date, the West and Central Africa Veterinary Laboratory Network has organised a number of training events:

### Countries represented at the workshop on West and Central Africa Veterinary Laboratory Network for Avian Influenza and Other Transboundary Diseases, December 2007

#### West Africa

Benin  
Burkina Faso  
Côte d'Ivoire  
Gambia  
Ghana  
Guinea  
Guinea-Bissau  
Mali  
Niger  
Nigeria  
Senegal  
Sierra Leone  
Togo

#### Central Africa

Cameroon  
Chad  
Congo  
Democratic Republic of Congo  
Gabon  
Equatorial Guinea  
Sao Tomé and Príncipe

#### Countries unable to attend

Cape Verde  
Central African Republic  
Liberia

- A training workshop for Group 1 laboratories in Dakar (24-27 December 2007), with financial support from USAID-APHIS, covering autopsy, sampling, and sample storage and dispatch procedures, the use of avian influenza rapid detection kits, and good laboratory practices, including biosafety procedures for the handling of suspect samples.

- One-month bench training course in March 2008 for a technician from the Lome Central Veterinary Laboratory, Togo, in avian influenza diagnostic techniques using conventional PCR technology.

- Training in molecular biology and virus characterization for the head of the Vom National Veterinary Research Institute, Nigeria, at IZSve in Padua.

- Two-week training session on avian influenza diagnostic techniques using conventional and real-time PCR technology for five French-speaking staff of the network at IZSve in Padua.

In addition PCR reagents for buffer storage have been sent to FAO-ECTAD at the RAHC in Bamako, autopsy, sampling, AGID/HI serology, and rapid antigen kits have been delivered to most of the network's laboratories, and equipment and consumables have been sent to the Vom National Veterinary Research Institute, Nigeria, and the Laboratoire National de l'Elevage et de Recherche Vétérinaire in Dakar, Senegal, both of which were elected regional laboratories at the Bamako workshop.

## Some avian influenza viruses becoming more like human flu viruses

A new study that has publication received widespread media attention suggests that H7 subtypes of avian influenza may be adapting to human receptor cells. The study appeared in the 27 May 2008 issue of *Proceedings of the National Academy of Science* and *AIDNews* offers its readers the link to the full article: <http://www.pnas.org/cgi/content/full/105/21/7558>.

Scientists from the US Centers for Disease Control and Prevention (CDC), Emory University in Atlanta and the Scripps Research Institute in La Jolla, California, found that avian H7 influenza viruses from both the Eurasian and North American lineage have caused outbreaks in poultry since 2002, with confirmed human infection occurring during outbreaks in The Netherlands, British Columbia, and the United Kingdom. The majority of H7 infections have resulted in self-limiting conjunctivitis, whereas probable human-to-human transmission has been rare.

## USDA releases sequences of 150 avian flu viruses

The US Department of Agriculture (USDA) recently announced the release of complete genetic data for 150 avian influenza viruses in an effort to connect genetic information with the biological effects of the viruses and to improve diagnostic tests, CIDRAP reported June 2.

USDA announced the release of the viral genetic sequences to GenBank, the National Institute of Health's public genetic sequence database, on May 30. The viruses, mostly from North America, represent nearly all avian flu subtypes and were collected from the 1930s to the present, according to David Suarez, research leader of the Exotic and Emerging Avian Viral Diseases Research Unit at the Southeast Poultry Research Laboratory (SEPRL) in Athens, Ga. The laboratory is part of the USDA's Agricultural Research Service.

"This sequence information, deciphered by our large team, will help researchers better understand virus biology and improve diagnostic tests for avian influenza viruses," Suarez said, adding that the goal of SEPRL is to fully sequence 900 avian flu viruses.

The viruses in the latest release include both poultry and wild-bird isolates from many countries, but mostly from North American poultry, Suarez told CIDRAP News.

"Probably the largest number of them have come from live-bird market surveillance, primarily conducted by APHIS (Animal and Plant Health Inspection Service), through our collaboration with the National Veterinary Services Laboratory," he said.

For the full CIDRAP report, see

<http://www.cidrap.umn.edu/cidrap/content/influenza/avianflu/news/jun0208genes.html>

## South Asia to develop early warning system on bird flu

South Asian countries have decided to work together to fight trans-boundary animal diseases and develop an early warning system to tackle avian influenza.

After a two-day meeting in New Delhi (June 9-10) of chief veterinary officers from seven of the eight member countries of the South Asian Association for Regional Cooperation (SAARC), the participants decided to share "timely information" and go for "progressive harmonisation of veterinary services" in the region. The chief veterinary officers of Afghanistan, Bangladesh, Bhutan, Nepal, Pakistan, Sri Lanka and India participated in the meeting.

"The meeting came out with a set of recommendations on timely information sharing, adopting biosecurity measures in animal production, regional surveillance as an early warning system, capacity-building and progressive harmonisation of veterinary services for effective management of transboundary animal diseases (TADs)," a communiqué said.

The senior SAARC veterinary officers analysed the animal health situation in the region with special focus on TADs such as highly pathogenic avian influenza (HPAI), foot and mouth disease and peste des petits ruminants (PPR). In order to achieve better regional cooperation, a road map was drawn up with special emphasis on "regional disease reporting mechanisms, an early alert system, building up a network of quality diagnostic laboratories as well as harmonisation of veterinary services" through performance evaluation and continuous education, the communiqué said.

## Protect Poultry – Protect People

Do's and don'ts at [www.fao.org/avianflu](http://www.fao.org/avianflu)

## Throwing light on the emergence of avian influenza viruses in wild birds

The avian influenza virus in wild birds forms transient "genome constellations," continually reshuffled by reassortment, in contrast to the spread of a limited number of stable genome constellations that characterizes the evolution of mammalian-adapted influenza A viruses, says a study published in the 30 May issue of *PLoS Pathogens*.

A research team surveyed the genetic diversity among avian influenza viruses in wild birds, comprising 167 complete viral genomes from 14 bird species sampled in four locations across the United States. These isolates represented 29 type A influenza virus hemagglutinin (HA) and neuraminidase (NA) subtype combinations, with up to 26% of isolates showing evidence of mixed subtype infection.

Through a phylogenetic analysis of the largest data set of avian influenza virus genomes compiled to date, the team was able to document a remarkably high rate of genome reassortment, with no clear pattern of gene segment association and occasional inter-hemisphere gene segment migration and reassortment.

For the full report, see

[www.plospathogens.org/article/info%3Adoi%2F10.1371%2Fjournal.ppat.1000076](http://www.plospathogens.org/article/info%3Adoi%2F10.1371%2Fjournal.ppat.1000076).

## MOST RECENT HPAI OUTBREAKS 2006-08

Note: This list has been compiled on the basis of information up to 16 June 2008.

### 2008

<b>June</b>	China (Hong Kong SAR)
<b>May</b>	Bangladesh, Egypt, India, Indonesia, <b>Japan</b> , Korea (Republic of), United Kingdom, Viet Nam
<b>April</b>	China, Russian Federation
<b>March</b>	Lao PDR, Pakistan, Turkey,
<b>February</b>	Myanmar, <b>Switzerland</b> , Ukraine
<b>January</b>	Israel, Saudi Arabia, Thailand

### 2007

<b>December</b>	Benin, Germany, Iran, Poland
<b>November</b>	Romania
<b>October</b>	Afghanistan, Nigeria
<b>August</b>	France
<b>July</b>	Czech Republic, Togo
<b>June</b>	Ghana, Malaysia
<b>April</b>	Cambodia, Kuwait
<b>January</b>	Hungary

### 2006

<b>November</b>	Côte d'Ivoire
<b>August</b>	Sudan
<b>July</b>	<b>Spain</b>
<b>June</b>	<b>Mongolia</b> , Niger
<b>May</b>	Burkina Faso, Denmark
<b>April</b>	Djibouti, Sweden [H5], West Bank & Gaza Strip
<b>March</b>	Albania, Austria, Azerbaijan [H5], Cameroon, <b>Croatia</b> , <b>Greece</b> , Jordan, Kazakhstan, Serbia, <b>Slovenia</b>
<b>February</b>	<b>Bosnia-Herzegovina</b> , <b>Bulgaria</b> , <b>Georgia</b> , Iraq [H5], <b>Italy</b> , <b>Slovakia</b>

*Green: wild birds only*

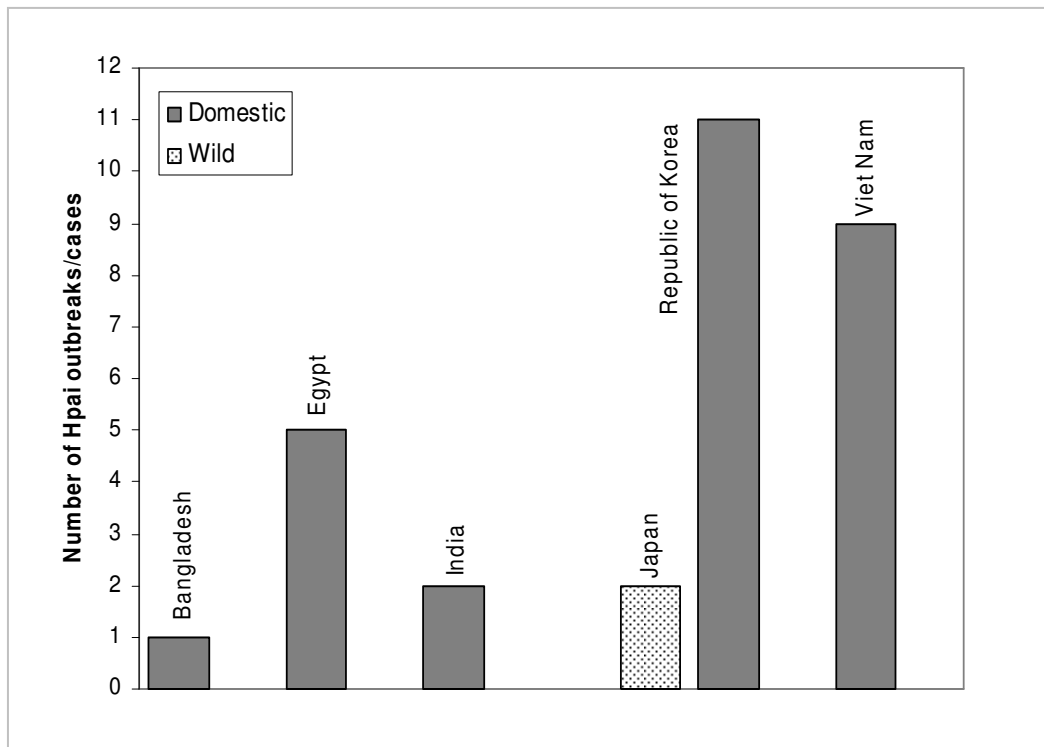
*Sources:* World Organisation for Animal Health (OIE), European Commission (EC), FAO and national governments

This overview is produced by the FAO-GLEWS team, which collects and analyses epidemiological data and information on animal disease outbreaks as a contribution to improving global early warning under the framework of the Global Early Warning and Response System for Major Animal Diseases including Zoonoses. [glews@fao.org](mailto:glews@fao.org)

### WORLDWIDE

Thirty one outbreaks/cases of HPAI (H5N1) were reported worldwide in May 2008 in seven countries (Bangladesh, Egypt, India, Indonesia, Japan, Republic of Korea and Viet Nam). This compares with 34 the previous month (April 2008), 233 in May 2006 and 55 in May 2007. The geographical location of outbreaks in poultry and cases in wild birds is shown in Figure 1. Only two cases were reported in wild birds. Indonesia reported 44 HPAI events\* between 3 and 17 May.

**FIGURE 1**  
**HPAI (H5N1) outbreaks confirmed during May 2008**  
 (Source: FAO EMPRES-i); (excluding Indonesia's PDS data)



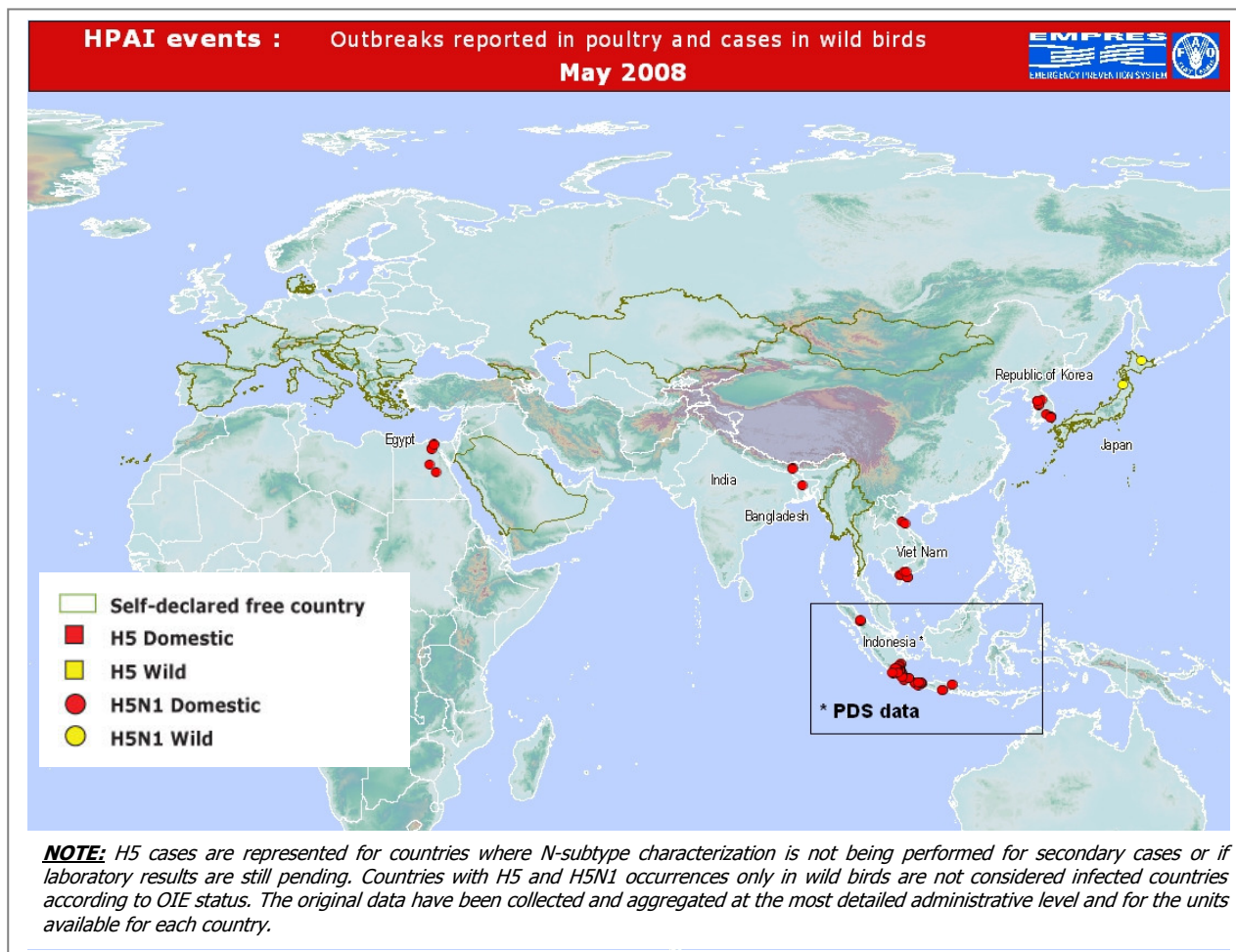
The Indonesia data are not included in Figures 1, 3, 4 and 7 because the outbreak information collected in Indonesia is not comparable with that of other countries; in addition, the case definition changed from "household" to "village" level on 1 April 2008.

\* PDS case definition in Indonesia: When active outbreaks are encountered where severely sick birds, or recently deceased carcasses (within 12 hours of death) are present, the Participatory Disease Surveillance (PDS) teams carry out an influenza type A rapid test (Anigen© test). A mortality event consistent with clinical HPAI and a positive rapid test in affected poultry is considered a confirmed detection of HPAI in areas where HPAI has previously been confirmed by laboratory testing.

The overall HPAI outbreak situation worldwide in May 2008 is represented in Figure 2.

**FIGURE 2**  
**HPAI (H5N1) outbreaks in poultry and cases of H5N1 infection in wild birds reported in May 2008**

(Source: FAO EMPRES-i)

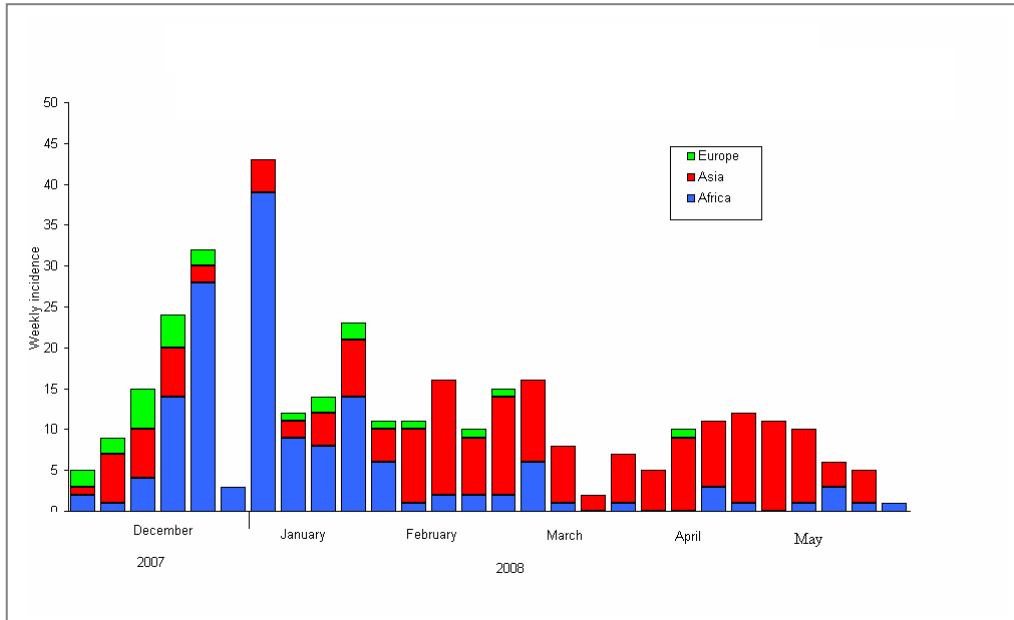


The evolution of the number of reported cases over the last six months by continent and by species group (wild or domestic) is represented in Figures 3 and 4, respectively.

**FIGURE 3**

**Weekly combined numbers of HPAI (H5N1) outbreaks in poultry and cases of H5N1 infection in wild birds per continent reported between December 2007 and May 2008**

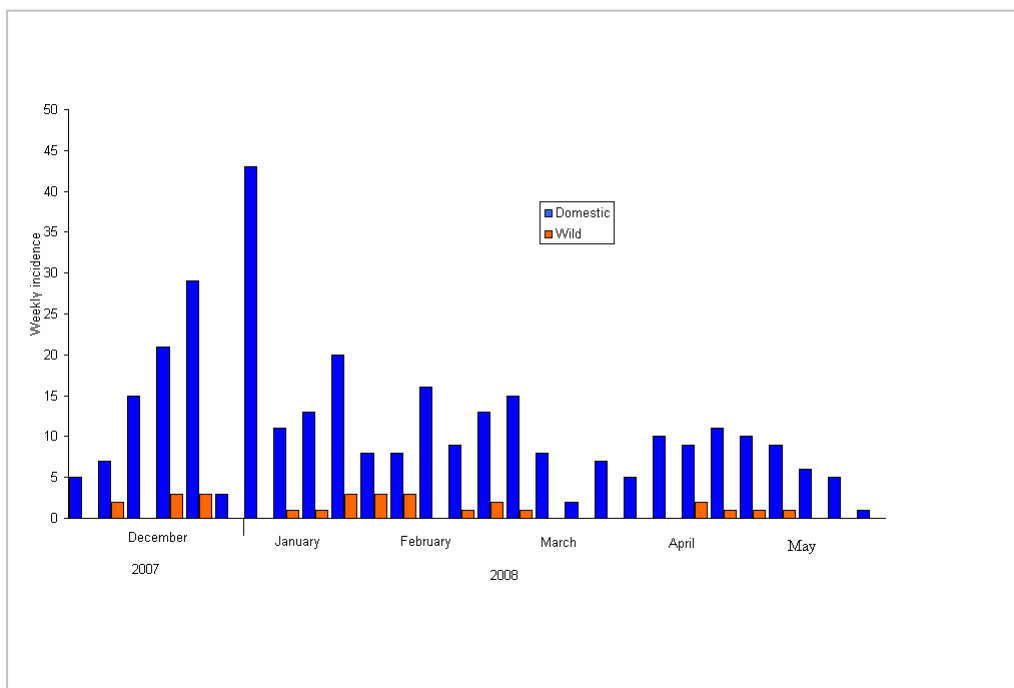
(Source: FAO EMPRES-i) (excluding Indonesia's PDS data)



**FIGURE 4**

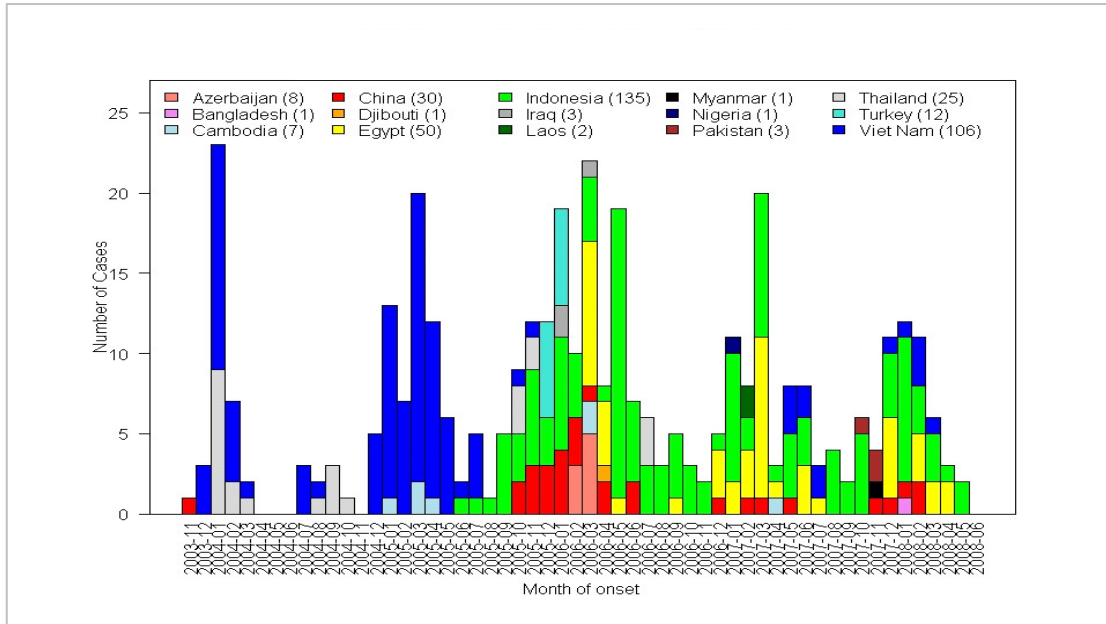
**Weekly numbers of HPAI (H5N1) outbreaks in poultry compared with cases of H5N1 infection in wild birds reported between December 2007 and May 2008**

(Source: FAO EMPRES-i) (excluding Indonesia's PDS data)



For the same period, the number of human cases reported to the World Health Organization is illustrated in Figure 5.

**FIGURE 5**  
**Current situation of H5N1 in humans**  
*(Source: World Health Organization)*



## SITUATION BY CONTINENT/REGION

### Africa

#### Egypt

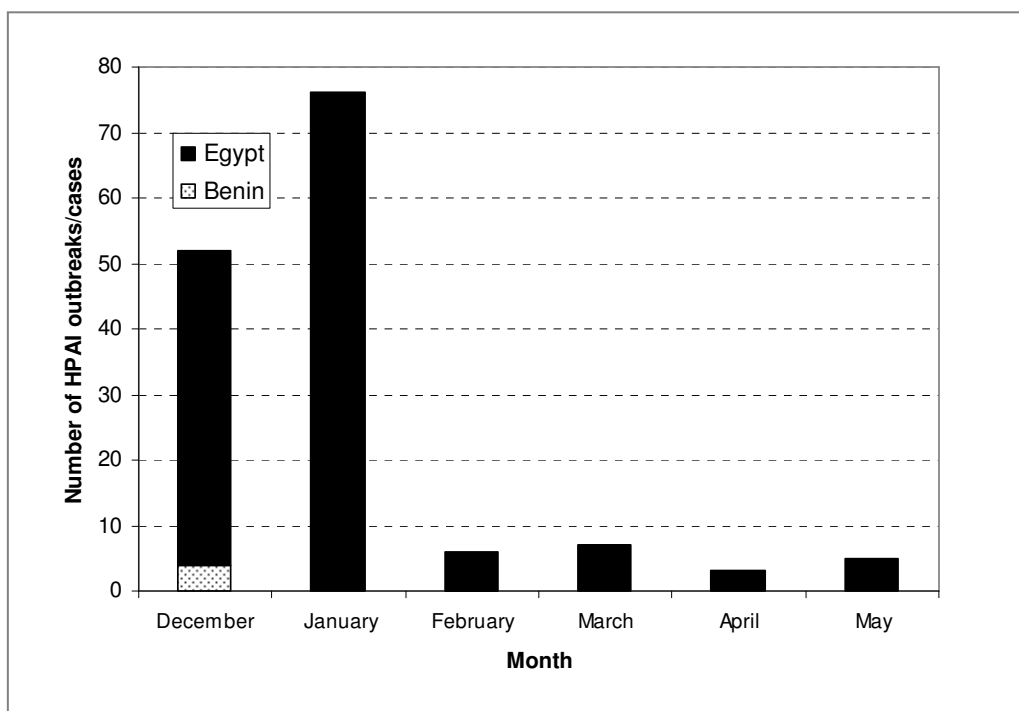
Five HPAI outbreaks were reported during May 2008, affecting different species (chickens, geese and ducks) and types of production systems (backyard, broilers, breeders and layers). The outbreaks were detected through active and passive surveillance activities

#### Nigeria

Has not recorded any HPAI outbreak since 8 October 2007. Overall, between January and the end of April 2008, a total of 186 samples from suspected poultry in 17 states were examined by the NVRI and none resulted positive for the H5N1 virus using and the fixation complement test (FCT).

**FIGURE 6**  
**Number of outbreaks/cases of HPAI (H5N1) confirmed between**  
**December 2007 and May 2008 in Africa**

(Source: FAO EMPRES-i)



## Asia

### Indonesia

Still experiencing a high number of cases of HPAI type H5N1 in poultry. HPAI remains endemic in Java, Sumatra, Bali and South Sulawesi with sporadic outbreaks reported from other areas. Infection has continued to spread during the year with outbreaks occurring in many of the remaining free areas. The high figure of reported cases for Indonesia in 2007-08 is largely due to the ongoing 'participatory disease search' (PDS) programme that uses participatory techniques combined with an influenza type A rapid test to identify cases of HPAI in backyard village-type poultry production environments (Figure 2). The programme is supported by FAO and is operating in 193 out of 448 districts and nine provinces in Java, Sumatra and Bali. Outbreaks have been reported infrequently from the eastern provinces where it is likely that H5N1 HPAI is more sporadic in the smaller more dispersed poultry populations.

The new database for the PDSR system in Indonesia has been modified since 1 April 2008 and is now based on the village as the epidemiology unit. A decrease in the number of outbreaks reported is therefore expected from the PDSR programme.

Indonesia reported two confirmed human cases in a 16-y-old female from South Jakarta with onset on 7 May, who died on 14 May and a 34-y-old female from Banten Province with onset on 26 May and who died on 3 June 2008. Of the 133 human cases confirmed to date in Indonesia, 108 have been fatal.

### Bangladesh

A single outbreak occurred in May 2008 in a commercial layer farm in Tangail district. The outbreak was reported on 20 May 2008. As of 31 May 2008, a total of 287 outbreaks had been recorded in 47 out of 64 districts. These included outbreaks in 245 commercial farms and 42 outbreaks in backyard poultry production systems. The total number of birds culled as of 31 May 2008 was approximately 1.64 million.

The first human case was confirmed by the Ministry of Health on 22 May 2008. A 16-month-old child was infected in January 2008 and subsequently recovered. The case was confirmed retrospectively. According to the epidemiological investigation, the boy was exposed to live and slaughtered chickens at his home.

### India

HPAI re-emerged in March in West Bengal. During May, a new state (Tripura) also became affected, with three HPAI outbreaks, one of them within 500 metres of the border with Bangladesh.

### Viet Nam

Six outbreaks in May were reported, mainly in unvaccinated duck production systems. No human cases were reported to WHO during this period.

### Republic of Korea

Experienced a new introduction of HPAI with almost 24 outbreaks confirmed throughout the country, all but one in commercial poultry. Before May 2008, the last reported outbreak in the country was in June 2006. More than five million chickens and ducks have been slaughtered and culling is continuing. The origin of this new introduction remains unknown.

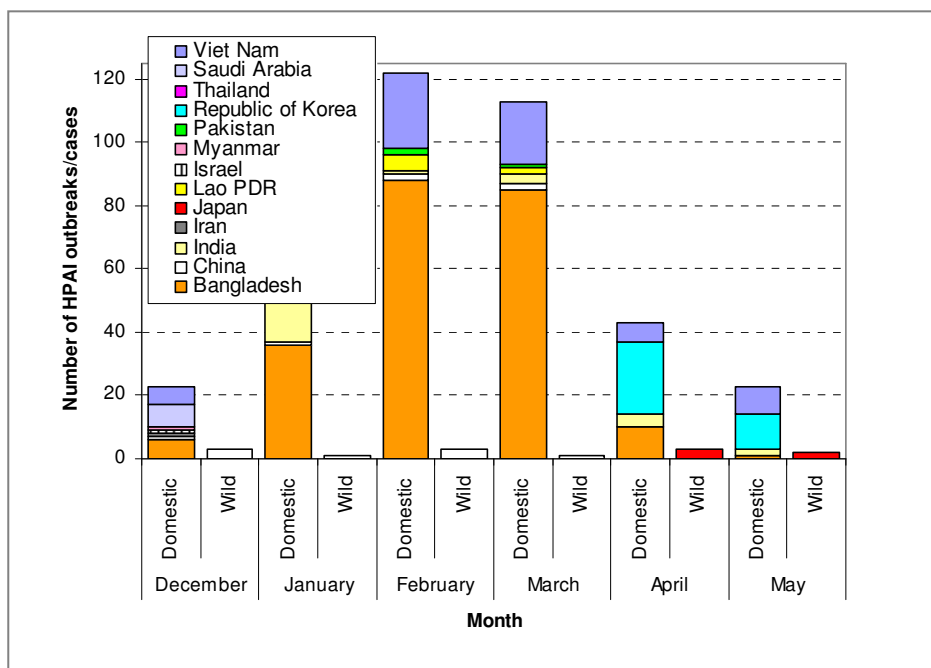
### Japan

During May, two wild swans tested positive for H5N1 infection in Akita and Hokkaido Island. No outbreaks were detected in poultry.

Other Asian countries such as **Cambodia, Thailand and Laos** did not experience outbreaks of HPAI in May 2008, but they report regularly about the negative results obtained from all samples submitted from suspect cases.

**FIGURE 7**  
**Number of outbreaks/cases of HPAI (H5N1) confirmed between December 2007 and May 2008 in Asia**

(Source: FAO EMPRES-i) (excluding Indonesia's PDS data)



## Middle East

### Iraq

Reported the laboratory results of surveillance activities for the month of April. These data referred to all governorates except Kurdistan Province, in the north of the country. All samples taken were negative [poultry farms (15,535), backyard poultry (4,248), game and wild birds (363), and markets and slaughterhouses (6,007)]. The only avian influenza virus identified was H9 in samples collected from poultry farms.

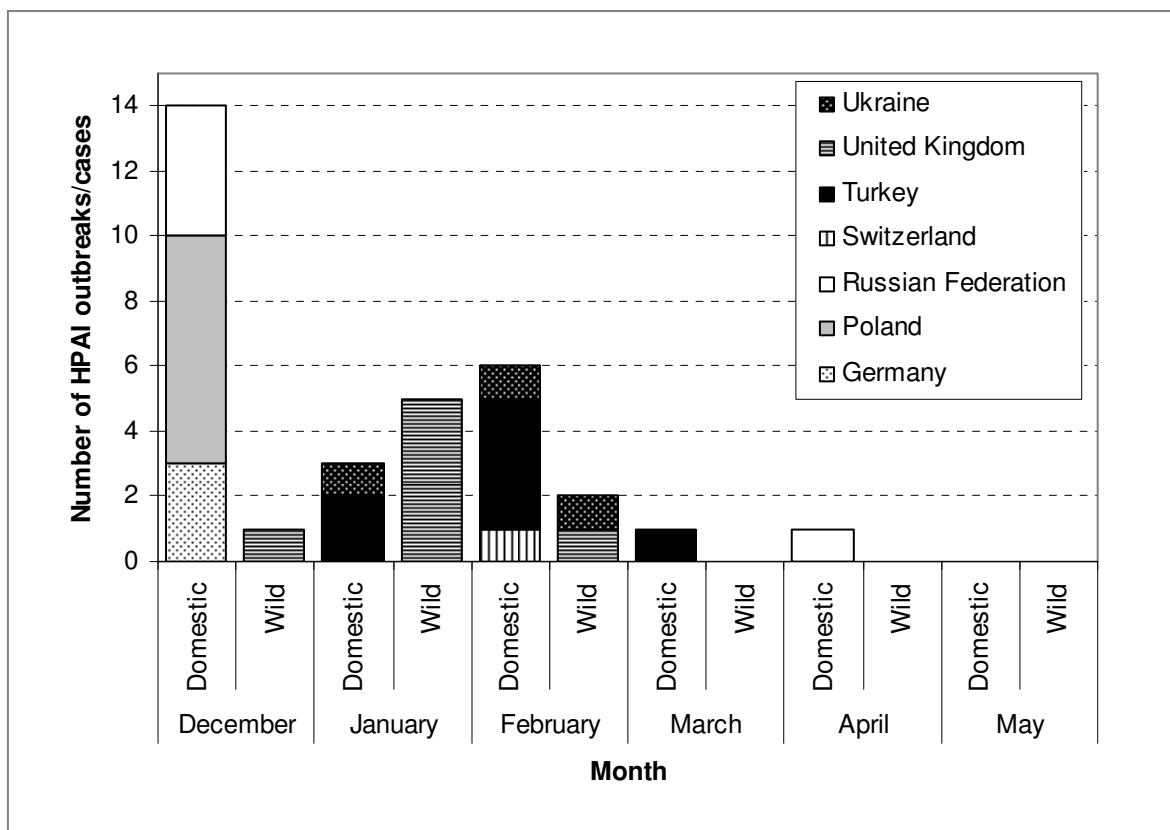
## Europe

No HPAI outbreak has been reported in domestic poultry and no cases were reported in wild birds during May 2008.

**FIGURE 8**

**Number of outbreaks (domestic poultry)/cases (wild birds) of HPAI (H5N1) confirmed between December 2007 and May 2008 in Europe**

(Source: FAO EMPRES-i)



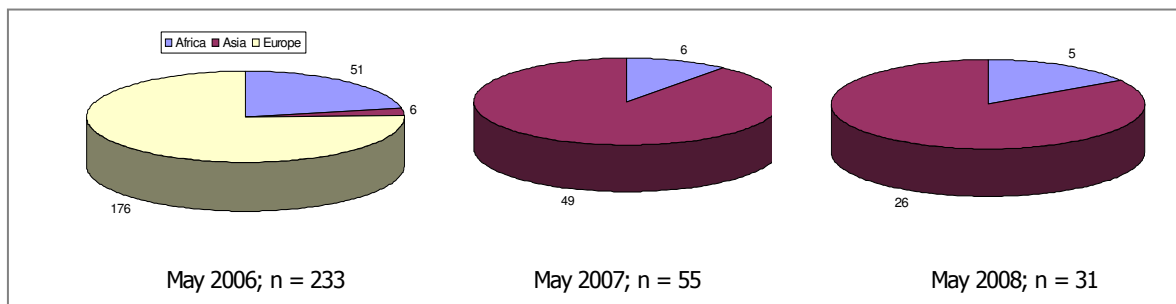
## CONCLUSIONS

Considering the number of outbreaks reported worldwide, the global HPAI situation can be said to have improved markedly in the first part of 2008. HPAI endemic countries continue to report HPAI outbreaks (Indonesia, Viet Nam, Egypt). Bangladesh has not reported outbreaks in the last five weeks. Other countries have been affected again after a period with sporadic outbreaks in other countries, particularly the Republic of Korea. Only two wild bird cases were reported (Japan) without connection to domestic outbreaks.

Overall, in the month of May 2008, the number of reported outbreaks was similar to May 2007 but differed significantly from May 2006, when ten times more outbreaks were reported (Figure 9). Although there has been an improvement in disease awareness, outbreaks/cases of HPAI are still under-estimated and under-reported in many countries because of insufficient disease surveillance systems, which may affect considerably the shape of the distribution of outbreaks by region. The variability and sensitivity in space and time of disease surveillance systems for HPAI makes difficult to draw correct conclusions on the results and performance of countries affected in their fight against HPAI type H5N1.

An animated map showing the evolution of outbreaks over the last six months including May 2008 is available at: [www.fao.org/ag/aqainfo/programmes/en/empres/maps.html](http://www.fao.org/ag/aqainfo/programmes/en/empres/maps.html).

**FIGURE 9**  
**Number and distribution of outbreaks of HPAI (H5N1) confirmed in May 2006, 2007 and 2008**  
(Source: FAO EMPRES-i) (excluding Indonesia's PDS data)



# AT A GLANCE

*The latest HPAI outbreaks for the period 17 May – 16 June 2008*

## **Note**

AIDEnews publishes reports of **confirmed HPAI cases** using the following sources: OIE, European Commission, FAO and national governments.

## **AFRICA**

### **Egypt**

In its latest report on the HPAI epidemiological status of Egypt on 29 May, FAO notes that in the period between 27 April and 29 May, the country experienced six HPAI outbreaks affecting different species (chickens, geese and ducks) and different types of production system (backyard, broilers, breeders and layers). The outbreaks were detected through active and passive surveillance.

## **ASIA**

### **Bangladesh**

On 11 June, the government notified the OIE of an HPAI outbreak in Tangail on 21 May. The outbreak occurred on a commercial farm in Eshan Agro Complex, Digholia, Tangail, and affected a flock of 4600 chickens, of which 3642 died.

The Ministry of Fisheries and Livestock reported an HPAI outbreak that occurred on 19 May on a farm in Sadar upazila, Tangail, affecting a flock of chickens.

### **China (Hong Kong SAR)**

As part of routine surveillance carried out by the Food and Environmental Hygiene Department (FEHD), swabs taken 3 June from three chicken stalls in Po On Road Market in the Shamshuipo District of Hong tested positive for H5N1. None of the other six poultry stalls were affected. Four days later, the Director of Agriculture, Fisheries and Conservation declared the market an infected area, suspended all trading in live poultry, and culled all 2,700 live chickens in the market. The FEHD has inspected 64 other markets in Hong Kong and no disease was detected.

### **India**

Two HPAI outbreaks in Darjeeling, West Bengal, among backyard poultry in two villages on 1 and 11 May were reported to the OIE on 3 June.

### **Indonesia**

The weekly report of FAO's Participatory Disease Surveillance (PDS) programme for the period 19 April-17 May indicated that out of a total of 1,858 interviews, 27 positive cases of HPAI were detected in Java (15) and Sumatra (12). Since the beginning of 2006, the PDS programme has conducted over 160,500 interviews, with 3.3 percent resulting in positive detection of HPAI.

**Note:** *these data are not to be taken as representative of the overall incidence of HPAI in Indonesia because the PDS system has spatial and temporal biases and not all districts and provinces are completely covered by PDS activities.*

The weekly report of FAO's Participatory Disease Surveillance (PDS) programme for the period 5 April-3 May indicated that out of a total of 2,708 interviews, 55 positive cases of HPAI were detected in Java (14) and Sumatra (41).

### **Japan**

The Ministry for the Environment officially announced on 22 May that H5N1 virus had been detected on 22 May in two swans, one of which was found in a weakened state on 18 April (death followed two days later) and the other dead on 8 May, both on the shores of Lake Towada in Aomori Prefecture.

### **Republic of Korea**

On 21 May, The Korean authorities officially notified the OIE of 22 cases of HPAI that occurred during April and May 2008. Twenty-one of the cases occurred among commercial poultry and one among backyard poultry. All chickens and ducks on the infected farms and on farms within a 3-km-radius were stamped out.

The Ministry for Food, Agriculture, Forestry and Fisheries reported outbreaks of HPAI 13 May in Seoul and Pusan.

### **Viet Nam**

The Department of Animal Health (DAH) reported a number of HPAI outbreaks during the latter 26 May: in a mixed chicken-duck poultry flock of 450 in Luong Hoa A commune, Chau Thanh district, Tra Vinh province.

26 May: in a 2-month-old duck flock in village No 11, Hung Trung commune, Hung Nguyen district, Nghe An province.

25 May: in a 3.5-month-old chicken flock in Tan Hiep A commune, Tan Hiep district, Kien Giang province.

24 May: in a 2-month-old unvaccinated duck flock in hamlet No 7, Cam Trung commune, Cam Xuyen district, Ha Tinh province;

17 May: in a 180-day-old duck flock with no quarantine or vaccination certificates in Tan Quy hamlet, Truong Lac, O Mon district, Can Tho city.

## **EUROPE**

### **United Kingdom**

An outbreak of H7N7 HPAI in a flock of layer chickens was reported on 22 May in Shenington, Oxfordshire, England.

## **AMERICAS**

### **United States of America**

An outbreak of H7N3 HPAI was identified 3 June among commercial hens in a production unit in northwest Arkansas run by Tyson Foods Inc. All 15,000 birds were destroyed.

## SUMMARY OF CONFIRMED HPAI OUTBREAKS (as of 16 June 2008)

**Sources:** OIE, European Commission (EC), FAO and national governments – WHO for human cases/deaths

**Note:** Highlighted countries indicate those in which there has been only one officially confirmed outbreak or occurrence

<b>AFRICA</b>	<b>First outbreak</b>	<b>Latest outbreak</b>	<b>Animals affected to date</b>	<b>Human cases / deaths to date</b>
Benin	7 November 2007	15 December 2007	Domestic poultry	-
Burkina Faso	1 March 2006	20 May 2006	Domestic poultry - wild birds	-
Cameroon	21 February 2006	28 March 2006	Domestic poultry – wild birds	-
Côte d'Ivoire	31 March 2006	9 November 2006	Domestic poultry – wild birds	-
Djibouti	6 April 2006	6 April 2006	Domestic poultry	<b>1 / 0</b>
Egypt	17 February 2006	16 May 2008	Domestic poultry – wild birds	<b>50 / 22</b>
Ghana	14 April 2007	13 June 2007	Domestic poultry	-
Niger	6 February 2006	1 June 2006	Domestic poultry	-
Nigeria	16 January 2006	6 October 2007	Domestic poultry – wild birds	<b>1 / 1</b>
Sudan	25 March 2006	4 August 2006	Domestic poultry	-
Togo	6 June 2007	20 July 2007	Domestic poultry	-

<b>ASIA</b>	<b>First outbreak</b>	<b>Latest outbreak</b>	<b>Animals affected to date</b>	<b>Human cases / deaths to date</b>
Afghanistan	2 March 2006	2 October 2007	Domestic poultry – wild birds	-
Bangladesh	5 February 2007	19 May 2008	Domestic poultry	-
Cambodia	12 January 2004	6 April 2007	Domestic poultry – wild birds	<b>7 / 7</b>
China	20 January 2004	4 April 2008	Domestic poultry – wild birds	<b>30 / 20</b>
China (Hong Kong SAR)	19 January 2004	3 June 2008	Wild birds	-
India	27 January 2006	9 May 2008	Domestic poultry	-
Indonesia	2 February 2004	May 2008 (PDS data)	Domestic poultry – pigs (with no clinical signs)	<b>133/ 108</b>
Japan	28 December 2003	8 May 2008	Domestic poultry – wild birds	-
Kazakhstan	22 July 2005	10 March 2006	Domestic poultry – wild birds	-
Korea, Rep. of	10 December 2003	13 May 2008	Domestic poultry – wild birds	-
Lao, PDR	15 January 2004	2 March 2008	Domestic poultry	<b>2 / 2</b>
Malaysia	19 August 2004	2 June 2007	Domestic poultry – wild birds	-
Mongolia	10 August 2005	5 June 2006	Wild birds	-
Myanmar	8 March 2006	23 December 2007	Domestic poultry	<b>1 / 0</b>
Pakistan	23 February 2006	3 March 2008	Domestic poultry – wild birds	<b>1 / 1</b>
Thailand	23 January 2004	18 January 2008	Domestic poultry – wild birds – tiger	<b>25 / 17</b>
Viet Nam	9 January 2004	2 May 2008	Domestic poultry	<b>106/ 52</b>

<b>NEAR EAST</b>	<b>First outbreak</b>	<b>Latest outbreak</b>	<b>Animals affected to date</b>	<b>Human cases / deaths to date</b>
Iran	2 February 2006	10 December 2007	Domestic poultry - wild birds	-
Iraq (H5)	18 January 2006	1 February 2006	Domestic poultry – wild birds	<b>3 / 2</b>
Israel	16 March 2006	1 January 2008	Domestic poultry	-
Jordan	23 March 2006	23 March 2006	Domestic poultry	-
Kuwait	23 February 2007	20 April 2007	Domestic poultry – wild birds - zoo birds	-
Saudi Arabia	12 March 2007	29 January 2008	Domestic poultry	-
West Bank & Gaza Strip	21 March 2006	2 April 2006	Domestic poultry	-
<b>EUROPE</b>	<b>First outbreak</b>	<b>Latest outbreak</b>	<b>Animals affected to date</b>	<b>Human cases / deaths to date</b>
Albania	16 February 2006	9 March 2006	Domestic poultry	-
Austria	10 February 2006	22 March 2006	Wild birds – cats	-
Azerbaijan	2 February 2006	18 March 2006 (H5)	Wild birds – domestic poultry – dogs	<b>8 / 5</b>
Bosnia-Herzegovina	16 February 2006	16 February 2006	Wild birds	-
Bulgaria	31 January 2006	9 February 2006	Wild birds	-
Croatia	21 October 2005	24 March 2006	Wild birds	-
Czech Republic	27 March 2006	11 July 2007	Wild birds – domestic poultry	-
Denmark	12 March 2006	26 May 2006	Wild birds – domestic poultry	-
France	17 February 2006	14 August 2007	Wild birds – domestic poultry	-
Georgia	23 February 2006	23 February 2006	Wild birds	-
Germany	8 February 2006	25 December 2007	Wild birds – domestic poultry – cats – stone marten	-
Greece	30 January 2006	27 March 2006	Wild birds	-
Hungary	4 February 2006	23 January 2007	Wild birds – domestic poultry	-
Italy	1 February 2006	19 February 2006	Wild birds	-
Poland	2 March 2006	16 December 2007	Wild birds – domestic poultry	-
Romania	7 October 2005	6 December 2007 (cat)	Wild birds – domestic poultry – cat	-
Russian Federation	15 July 2005	8 April 2007	Domestic poultry – wild birds	-
Serbia	28 February 2006	16 March 2006	Wild birds – domestic poultry	-
Slovakia	17 February 2006	18 February 2006	Wild birds	-
Slovenia	9 February 2006	25 March 2006	Wild birds	-
Spain	7 July 2006	7 July 2006	Wild birds	-
Sweden	28 February 2006	26 April 2006 (H5)	Wild birds – domestic poultry - game birds - mink	-
Switzerland	26 February 2006	22 February 2008	Wild birds	-
Turkey	1 October 2005	9 March 2008	Domestic poultry – wild birds	<b>12 / 4</b>
Ukraine	2 December 2005	11 February 2008	Wild birds – domestic poultry – zoo birds	-
United Kingdom	30 March 2006	22 May 2008	Wild birds – domestic poultry	-