



HPAI outbreaks reported in this publication refer to officially confirmed cases only.

The information is compiled from the following sources: World Organisation for Animal Health (OIE), national governments and their ministries, and the European Commission (EC) – these sources are responsible for any errors or omissions.

FAO study on agro-ecological resilience shines light onto the dynamics of persistence of H5N1 HPAI

In late 2003 highly pathogenic avian influenza (A) subtype H5N1 (H5N1 HPAI) emerged in Southeast Asia causing poultry and economic losses on a large scale. Since 2004, the disease has spread to the rest of Asia, Europe and Africa. Despite the ongoing interventions on many fronts, including public education, surveillance sampling, restrictions on livestock movement, improvements in farm biosecurity, live-bird market disinfection, culling rounds, and vaccination campaigns, H5N1 HPAI continues to persist in China, Indonesia, Viet Nam, Bangladesh, and Egypt. Veterinary epidemiologists involved in influenza research recognize that this persistence suggests there are more complex epidemiological risk factors for the transmission and maintenance of this virus than originally identified.



The Food and Agriculture Organization of the United Nations (FAO) commissioned a study to examine the main drivers behind H5N1 HPAI persistence in different agro-ecological contexts across the globe. Previous research identified five variables that helped differentiate areas according to their level of persistence: chicken density, duck density, agricultural population density, purchasing power parity per capita, and chicken production output/input ratio. Localities that host the greatest persistence were characterized by high chicken and duck densities, high agricultural population densities, intermediate purchasing power per capita, and intermediate chicken production output/input ratios. These localities included, among others, Egypt, Viet Nam, Indonesia and several coastal Chinese provinces.

A more recent study indicates that localities may differ in ecological resilience –the capacity to absorb external shocks– including disease outbreaks. Although this study is still a work in progress, preliminary results derived from a stochastic multivariate autoregression model suggest that the agro-ecological variables that define H5N1 HPAI epidemiology may in some countries be more tightly interconnected than in others.

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Editor: Sigfrido Burgos, ECTAD Communications Unit (sigfrido.burgos@fao.org)

Industrialized countries in the West appear to differ from countries undergoing progressive economic transition in the ways in which their agro-ecological variables are interconnected. Ongoing work aims to address the effects such differences may have on the spread and evolution of the virus.

The results so far obtained also suggest that emergence of new influenzas, including pandemic H1N1 2009, may depend on more than just the agricultural sector from which they arose. Influenza dynamics may encompass broader ecological contexts in which livestock farming takes place. If this is indeed the case, effective disease management cannot be achieved by veterinary services alone, thus warranting collaboration from a wide array of stakeholders. Interventions must therefore be directed towards policies and practices that help shape the ways in which agro-ecological variables interrelate across the landscape. Such interventions may help reorganize livestock production systems and their corresponding agro-ecologies in such a way as to minimize the potential impacts of influenza outbreaks.

This study is being carried out by Robert G. Wallace from the University of Minnesota and Lenny Hogerwerf from the Université Libre de Bruxelles, under the overall guidance of Jan Slingenbergh, Senior Animal Health Officer and Head of EMPRES* at the FAO.

Satellite Tracking of Wild Birds in Mongolia

The Food and Agriculture Organization of the United Nations has been actively involved in tracking highly pathogenic avian influenza (A) subtype H5N1 (H5N1 HPAI) spread in wild bird populations in Mongolia through the use of satellite technologies. In 2007 and 2008, as a follow up to previous activities on avian influenza surveillance conducted in the vast fields of Mongolia, wildlife veterinarians returned to the country to work with an international team to carry on fieldwork on bar-headed geese at Terkhiin Tsagaan Lake, Arkhangai Aimag in Western Mongolia.

The study site was 240 km West of an outbreak location that killed nine Whooper Swans at Ogi Lake in late May 2009, and 154 km South of Doroo Tsagaan Lake where 56 water birds died in late July 2009, including two geese marked at Terkhiin Tsagaan in 2008. This year, 215 adult bar-headed geese and 58 additional goslings were successfully captured in six separate molting drives.

This type of fieldwork could not be executed without the valuable contributions of research partners. For example, the logistics and local coordination of the trip was organized by the Wildlife Science and Conservation Centre and the Mongolian Academy of Sciences in Mongolia. The United States Geological Survey (USGS) organized the capture and satellite marking of the geese. Physiology studies were conducted cooperatively with the University of Wales in Bangor, UK, and the University of British Columbia in Vancouver, Canada. Lastly, FAO was responsible for collecting swabs and performing serology for avian influenza surveillance analyses.

Altogether, 215 adults were banded, 156 marked with neck collars, 15 fitted with satellite transmitters, 23 fitted with backpack mounted Global Positioning System (GPS) loggers and 38 geese received surgically implanted heart rate loggers. Additionally, cloacal and oral swab samples were collected from 229 individuals (196 adults and 33 goslings), 98 blood samples taken, and 135 feather samples were obtained for genetic and isotope analyses. The FAO team managed to observe several geese marked in 2008 including one with a satellite transmitter. Also, one goose was recaptured from 2008 and its track tag was recovered, thus demonstrating the feasibility of recapturing a marked/tagged goose.

Duplicate sets of cloacal and oral swabs were collected, with one set to be analyzed in the National Veterinary Laboratory in Mongolia, and the second set at the University of Hong Kong. Similarly, serology samples will be analyzed at the University of Hong Kong.

FAO will continue to conduct satellite tracking of wild bird populations to determine the geographical spread of H5N1 HPAI in Mongolia. These studies are implemented under the overall guidance of Scott Newman, Animal Health Officer and Wildlife Unit Coordinator at FAO.

* Emergency Prevention System for Transboundary Animal and Plant pests and Diseases

MOST RECENT H5N1 AI OUTBREAKS 2006-09

Note: This list has been compiled on the basis of information up to 9 December 2009.

2009

December	Egypt
November	Viet Nam
October	Indonesia, Russian Federation
August	Bangladesh, Mongolia
May	China, India
April	China (Hong Kong)
March	Germany
February	Lao PDR, Nepal

2008

December	Cambodia
November	Thailand
September	Togo
July	Nigeria
June	Pakistan
May	Japan, Korea (Republic of), United Kingdom
March	Turkey
February	Switzerland , Ukraine
January	Israel, Saudi Arabia

2007

December	Benin, Iran, Myanmar, Poland
November	Romania
October	Afghanistan
August	France
July	Czech Republic
June	Ghana, Malaysia
April	Kuwait
January	Côte d'Ivoire, Hungary

2006

August	Sudan
July	Spain
June	Niger
May	Bulgaria , Burkina Faso, Denmark
April	Djibouti, Sweden, West Bank & Gaza Strip
March	Albania, Austria, Azerbaijan, Cameroon, Croatia , Greece , Jordan, Kazakhstan, Serbia, Slovenia
February	Bosnia-Herzegovina , Georgia , Iraq, Italy , Slovakia

Green: areas which never had reported outbreaks in poultry

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

AT A GLANCE

The latest HPAI outbreaks for the period 1 November 2009 – 9 December 2009

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

AFRICA

EGYPT

Samples taken from poultry in 6 of the 29 Governorates (Beni Suef, Dakahlia, Fayoum, Menoufiya, Minya and Qalyoubia) were found positive for H5 HPAI.

ASIA

VIET NAM

An outbreak in Ca Mau Province was reported on the Government website on 3 December. The outbreak started on 25 November in a duck farm in Tan Loc Bac Commune, Thoi Binh District; 184 ducklings out of 350 died and the rest were destroyed on 1 December 2009.

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 for Transboundary Animal Diseases (TADs) including Major Zoonoses. glews@fao.org

WORLDWIDE SITUATION

Twenty one outbreaks of H5N1 HPAI in poultry were reported officially worldwide in October 2009. Outbreaks in poultry were reported from Egypt, Indonesia and Viet Nam. A case in a wild bird was detected in the Russian Federation. The number of reported outbreaks/cases by country and their location are illustrated in Figures 1 and 2, respectively.

The evolution of the number of outbreaks/cases over the last six months by species group (wild or domestic) and by geographical area is represented in Figures 3 and 4, respectively. The evolution of the number of confirmed cases of H5N1 avian influenza (AI) infections in humans reported to the World Health Organization (WHO) by country since November 2003 is illustrated in Figure 5.

FIGURE 1
H5N1 HPAI outbreaks/cases reported in poultry and wild birds in October 2009
(Source: FAO EMPRES-i)

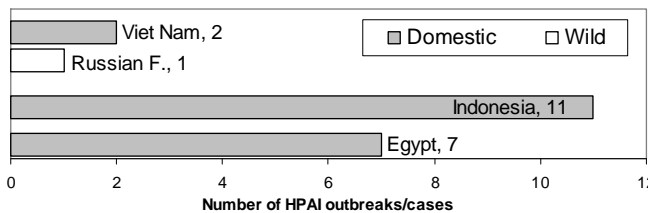
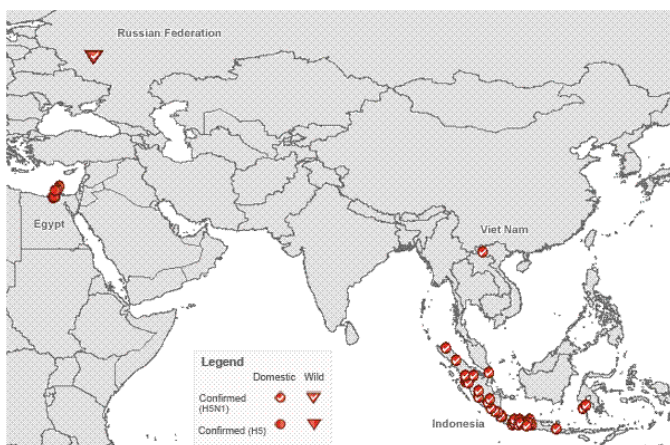


Figure 2
H5N1 HPAI outbreaks/cases reported in poultry and wild birds in October 2009
(Source: FAO EMPRES-i)



NOTE: H5 cases are represented for outbreaks where N-subtype characterization is not being performed for secondary cases or if laboratory results are still pending. Countries with H5 and H5N1 occurrences only in wild birds are not considered infected countries according to OIE status. The original data have been collected and aggregated at the most detailed administrative level and for the units available for each country.

Between November 2003 and 31 October 2009, human cases of AI were reported to WHO from 15 countries around the world and the number

reached 442. In 2008, a total of 44 cases were confirmed by WHO. Indonesia had the highest number of reported cases (24 cases or 54.5%), followed by Egypt (8 cases or 18.2%). In 2009, a total of 47 cases (12 fatal cases [26%]) have been confirmed by WHO so far. Thirty six cases were reported from Egypt, seven from China and four from Viet Nam. From the 442 reported cases, 262 died; case fatality rate (CFR) of 59.3%. Among the countries with more than ten reported cases, Indonesia had the highest CFR of 81.6% (115 out of 141).

Age distribution of the reported cases ranged from three months to 81 years of age (median 18.0 years of age), with 90.1% (402 out of 442) of patients being 39 years of age or younger. The highest CFR was among persons between ten and 19 years of age and the lowest was among persons aged 50 and above. Gender was essentially equally distributed (female cases 229 or 51.8%). (Source: Western Pacific Regional Office of WHO, Nov. 2009, Avian Influenza Update Number 209).

FIGURE 3
Weekly number of reported H5N1 HPAI outbreaks/cases in poultry and wild birds between May and October 2009
(Source: FAO EMPRES-i)

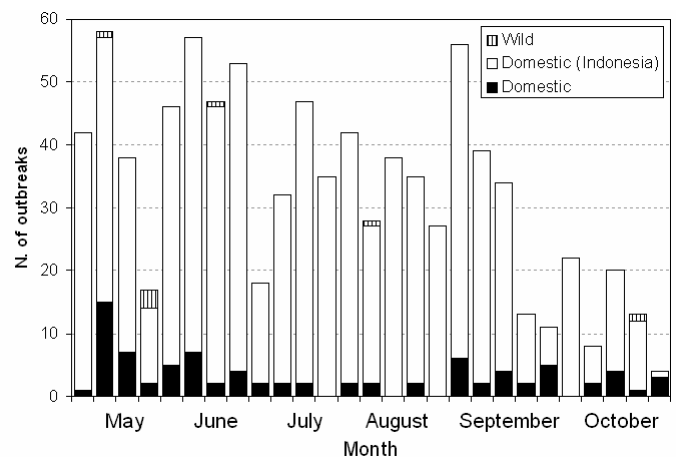


FIGURE 4

Weekly number of H5N1 HPAI outbreaks/cases reported by region between May 2009 and October 2009
(Source: FAO EMPRES-i)

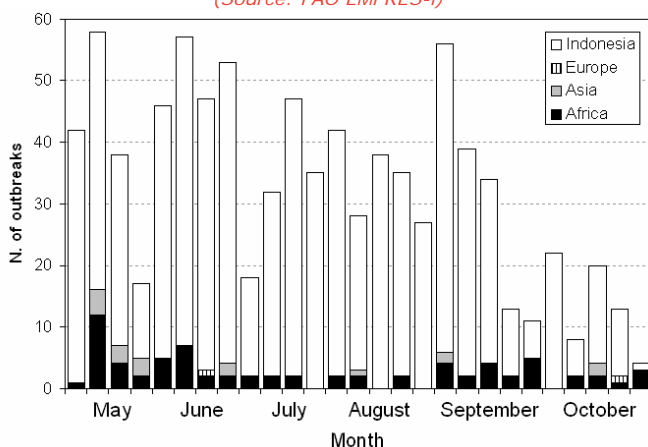


FIGURE 5

Confirmed cases of H5N1 AI infections reported in humans by country and month of onset since November 2003 (Source: World Health Organization)

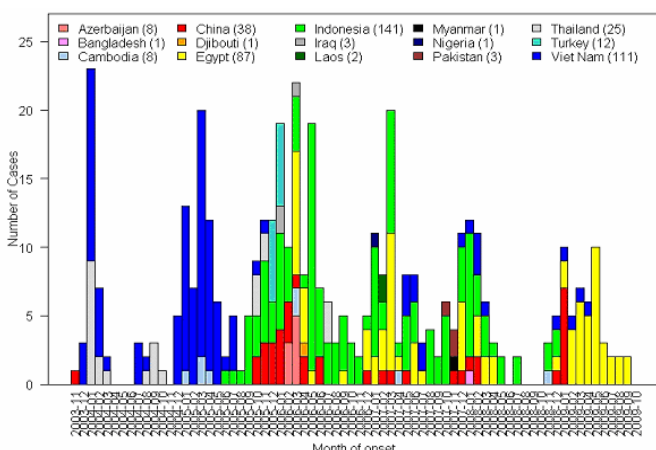
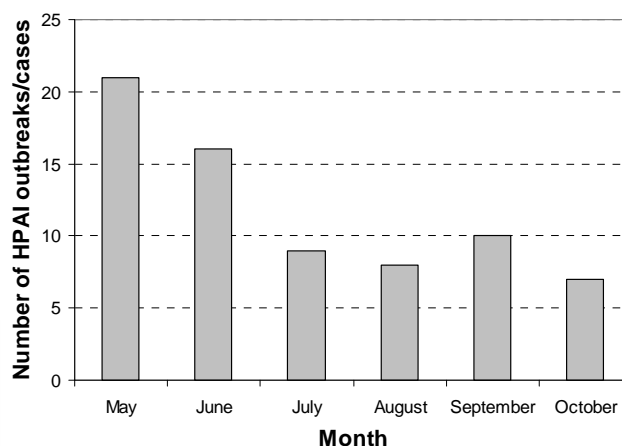


FIGURE 6

Number of reported H5N1 HPAI outbreaks in poultry in Africa (Egypt) between May and October 2009
(Source: FAO EMPRES-i)



An assessment study conducted in the framework of the SAIDR (Strengthening Avian Influenza Detection and Response) project revealed that vaccination coverage in the household sector is very low (<20%) and that the flock immunity level is also less than 10%.

Surveillance activities are being undertaken targeting both poultry and migratory wild birds around selected important bird areas (IBAs) during winter. Poultry farms are required to test their birds and receive certification (HPAI infection negative status) prior to any planned transportation. During October 2009, 2,232 samples were collected for this purpose without any positive cases detected. Compliance with certification for poultry transportation is sub-optimal as only registered farms seek such services. In terms of surveillance on commercial farms during October 2009, active surveillance did not detect any HPAI infections on farms (27 farms tested from six governorates), and passive surveillance detected one outbreak in Fayoum Governorate (out of two samples from two governorates). In terms of surveillance in the backyard/household sector, no HPAI outbreak was detected in households through active or passive surveillance (out of 111 samples from ten governorates). Forty three samples were also collected at road check points without any testing positive for HPAI.

SITUATION BY CONTINENT/REGION

Africa

Confirmed outbreaks of H5N1 HPAI in Africa (Egypt) over the last six months are presented in Figure 6.

Egypt, which reported its first H5N1 HPAI outbreak in February 2006, is considered endemic with regular reporting of outbreaks in almost all of the 29 governorates. In October 2009, Egyptian veterinary authorities reported seven confirmed H5 HPAI outbreaks in poultry (chickens, ducks, turkeys and geese) from Dakahlya (2), Fayoum (4) and Menufia (1) Governorates. Six outbreaks (86%) were reported in backyard poultry and one (14%) on a poultry farm. All outbreaks, either in households or farms, occurred in non vaccinated birds. During October 2009, 22 Participatory Disease Surveillance (PDS) teams visited 72 villages in ten governorates,

The current government policy is to allow commercial companies to vaccinate their flocks with registered vaccines of their choice. The government was providing vaccination of household/village birds free of charge. However, since July 2009, vaccination in backyard/household settings has been provisionally suspended until a new vaccination strategy is adopted. This decision was made after three years of a mass avian influenza vaccination programme, with an apparently limited impact on disease incidence. Although there are no official vaccination data, especially from commercial farms, it is assumed that vaccines are widely used in the commercial poultry sectors. All AI vaccines used in Egypt are imported and there are at least 21, all inactivated and mostly the H5N1 Re-1 Chinese vaccine for household poultry and the H5N2 vaccine for commercial farms.

In October 2009, no human avian influenza A/H5N1 cases were reported in Egypt. The total number of avian influenza A/H5N1 human infections is 87, of which 27 (31%) were fatal.

In **Ghana**, with regard to H5N1 HPAI active surveillance, 660 samples (538 tracheal and cloacal swabs and 122 sera) collected between April and June 2009 from regions of the country bordering Côte d'Ivoire were tested at the Accra Veterinary Laboratory. No H5 subtype was detected by conventional RT-PCR. All the negative samples were analyzed by passages through eggs twice and again tested by the RT-PCR. Testing is still in progress to determine if other subtypes are present. The sera samples will be tested by blocking ELISA for the detection of antibodies to the Influenza type A virus.

In **Nigeria**, surveillance activities for AI in ducks are expected to start before the end of the year. In addition, wild bird capture and sampling organized by FAO is currently in progress at the Dagona Wild Bird Sanctuary.

An active surveillance programme for AI in ducks will be organized under FAO's supervision in five countries previously infected with HPAI (Benin, Burkina Faso, Cote d'Ivoire, Ghana, and Niger).

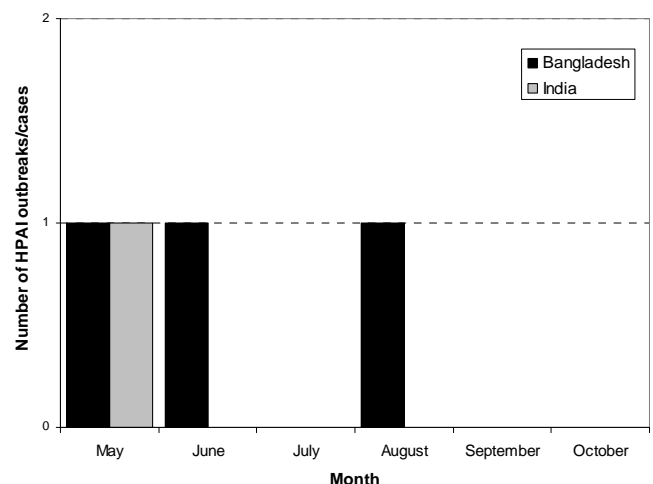
South and Central Asia

Confirmed outbreaks/cases of H5N1 HPAI in South Asia over the last six months are presented in Figure 7.

In **Bangladesh**, although no H5N1 HPAI outbreak was reported during October 2009 for the second consecutive month the country is still believed to be endemic with active circulation of the virus. Poultry

vaccination against H5N1 AI is prohibited by the government. As of 30 October 2009, a total of 326 outbreaks were recorded in 47 out of 64 districts on both commercial farms and in backyard holdings and nearly 1.7 million birds had been culled. FAO is coordinating and supporting active surveillance that is currently conducted in 150 upazillas (sub-districts) across the country, including the innovative use of the Short Message Service (SMS) gateway (method of sending and receiving SMS messages between mobile phones and a computer) as a reporting tool. Daily, 450 community animal health workers employed by the active surveillance programme send SMS coded text messages to the Department of Livestock Services, reporting disease and death in poultry. SMS messages of suspected AI events are automatically forwarded to the livestock officer in the area, who starts an investigation.

FIGURE 7
Number of reported H5N1 HPAI outbreaks in poultry in South Asia, by country, between May and October 2009
(Source: FAO EMPRES-i)



A paper by Biswas et al. (2009) recently evaluated the risk factors for HPAI infection in backyard chickens in Bangladesh, through a matched case-control study. The following factors were found to be associated: offering slaughter remnants of purchased chickens to backyard chickens, having a nearby water body, and having contact with pigeons. Separating chickens and ducks at night was found to be protective. The study is at <http://www.cdc.gov/eid/content/15/12/1931.htm>.

In **India**, no outbreaks have been reported since the last outbreak of H5N1 HPAI was notified on 27 May 2009 in West Bengal. The control measures adopted were stamping out of the entire poultry population, including destruction of eggs, feed, litters and other infected items.

During October 2009, 4,956 active surveillance samples were received at the High Security Animal

Disease Laboratory (HSADL), Bhopal. Testing was completed on 6,152 samples (some from the previous month), all with negative results, and another 4,155 were under test or pending. The periodical reports (available at <http://www.dahd.nic.in/birdflue.htm>) also include the number of samples received and tested per state. A three-year long Uttar Pradesh Forest and Wildlife Department project on "Migratory Movements of Waterbirds and Surveillance of Avian Diseases" has collected about 240 samples since January 2009, mostly from migratory bird species. Another 150 wild bird samples have been submitted from samples collected at Chilika Lagoon, Orissa and Koothankulam Reserve, Tamil Nadu, from birds trapped as part of an FAO-facilitated satellite tag marking project (http://www.fao.org/avianflu/en/wildlife/sat_telemetry_india.htm). Samples were tested at HSADL and all were negative for H5N1. The project will collect additional samples from migratory species this winter in Assam and West Bengal, in areas which have had historical HPAI H5N1 poultry outbreaks.

There has been a genetic study recently published by Chakrabarti et al. (2009) analysing the whole genome sequence of three isolates from West Bengal, one isolate from Tripura, and the hemagglutinin (HA) and neuraminidase (NA) genes of 17 other isolates. In the HA gene phylogenetic tree, all the 2008-09 Indian isolates belonged to EMA3 sublineage of clade 2.2. The 2007-09 isolates from Bangladesh were found to have the closest phylogenetic relationship, rather than the earlier 2006 and 2007 Indian isolates. This implies a third introduction of H5N1 HPAI into India at cross border. The study is available at <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0007846>.

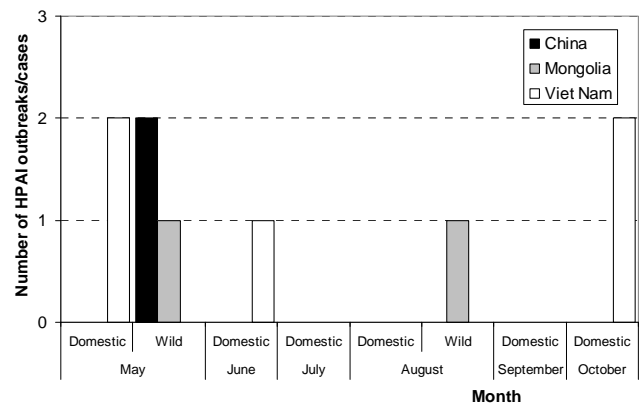
South East Asia

Confirmed outbreaks/cases of H5N1 HPAI in South East Asia over the last six months are presented in Figures 8 and 9.

In **Cambodia**, no additional H5N1 HPAI events have been reported since the human case and poultry outbreak reported in Kandal Province in December 2008. Cambodia routinely reports results obtained from surveillance activities through two hotlines supported by FAO at the National Veterinary Research Institute (NaVRI). During October 2009, the hotlines received 46 calls, of which four reported sick and dying poultry. After investigation, they were ruled out as being H5N1 HPAI. There is also ongoing duck market surveillance in 12 live bird markets in 11 provinces conducted by NaVRI (and supported by

FAO) since 2007. None of the samples collected so far have tested positive for H5N1 HPAI.

FIGURE 8
Number of H5N1 HPAI outbreaks/cases in poultry and wild birds in South East Asia, by country (excluding Indonesia), between May and July 2009
(Source: FAO EMPRES-i)



In 1996, **China** first identified HPAI viruses of the H5N1 subtype in geese in Guangdong Province, and H5N1 HPAI viruses have continued to circulate and evolve since then. Almost 200 H5N1 HPAI outbreaks have been reported in poultry and wild birds in 29 provinces since 2004 and a total of over 35 million poultry have been culled to control the spread of the disease. Official surveillance programmes have demonstrated that H5N1 HPAI viruses continue to circulate in poultry, despite the low number of reported outbreaks. No poultry outbreaks have been reported since April 2009 and the last wild bird case dates from May 2009. However, the Official Veterinary Bulletin released by the Ministry of Agriculture covering surveillance activities in July 2009 shows that the virus was detected in seven chickens, 19 ducks and two geese in Guangdong (including Shenzhen), Fujian (Xiamen) and Chongqing.

There is an intensive on-going surveillance programme being conducted in Hong Kong SAR that covers dead wild birds, wholesale and retail market dead birds and faecal swabs and pre-sale antibody checks. The last positive virus sample was detected in a dead feral pigeon in May 2009. Vaccination has been an important strategy for controlling H5N1 HPAI since 2004.

Virtually all of the identified clades of Asian-lineage H5N1 HPAI virus found so far globally have been detected in China. The main threats from wild birds include Clade 2.2 and Clade 2.3.2. Clade 2.2 viruses have circulated in wild birds predominantly in the north west of the country since 2005, although such viruses were also found in the Republic of Korea and Japan in the winter of 2006-07. Clade 2.3.2 viruses

have also been isolated from pikas (*Ochotona curzoniae*), a wild mammal, in Qinghai, China (as well as Clade 2.2 viruses). Clade 2.3.2 viruses have also been detected in the Republic of Korea (in poultry), Japan (in wild birds), the Russian Federation (in poultry exposed to viscera from wild birds in April 2008) and in dead wild birds in Tyva Republic, bordering Mongolia (in 2009). An outbreak Clade 2.3.2 was also observed in Mongolia, resulting in the death of many wild birds during the summer of 2009. Sequence information from isolates from Qinghai Lake in 2009 is still awaited. It is highly likely that a cycle of infection with Clade 2.3.2 viruses has become established in wild birds and could pose a threat to poultry in areas where wild birds and poultry are in close association. Viruses in other clades have also been detected in wild birds, including Clade 2.3.4 viruses from Hong Kong SAR.

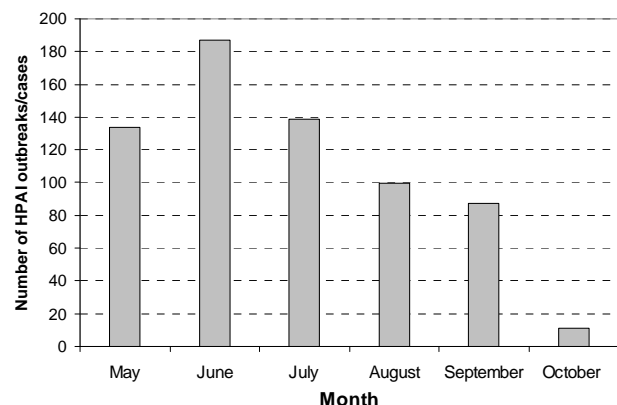
No human cases were reported during October 2009. China has reported 38 cases, of which 25 have been fatal (65.8%). The latest case confirmed by WHO was on 2 February 2009. On average, fewer than ten human cases are reported each year (range 0 to 13 cases annually since 2003).

Indonesia continues to report a high number of H5N1 HPAI outbreaks in poultry (Figure 9), as it has for the past three years. HPAI is confirmed to be endemic on the islands of Java, Sumatra and Sulawesi, and probably Bali, with sporadic outbreaks reported elsewhere. H5N1 HPAI prevalence by village varies widely. Only two of Indonesia's 33 provinces have never reported the occurrence of H5N1 HPAI. The high number of reports each month is partially explained by the implementation of the 'participatory disease surveillance and response' (PDSR) programme that targets village poultry production systems (mainly backyard) and reports evidence of virus circulation in the village. The programme is supported by FAO with USAID, AusAID and World Bank-implemented AHIF-PHRD financial support and is operating in 349 (70%) districts through 31 Local Disease Control Centres (LDCCs) in 27 (82%) of 33 provinces in Bali, Java, Kalimantan, Sumatra, Bali, Sulawesi and Sumatra including all known endemic areas. Larger and less densely-populated provinces report HPAI outbreaks less often than more densely populated provinces.

During October, PDSR officers visited 1,746 villages, of which 55 (3.2%) were infected (11 were newly found, while the remaining 44 carried over the infection status from the previous month). The infection rate was lower than the September 2009 infection rate of 6.7%. During the previous six months, PDSR officers visited 10,968 villages

(17.0%) in the 349 districts under PDSR surveillance. Since May 2008, they have visited about 42.3% of villages under coverage. An average of 8.5 % of the villages visited during the previous six months were classified as infected at the time of visit. Bali continued to have infected villages. Cases over the last six months were concentrated in provinces on Java (especially DI Yogyakarta and West Java) and Sumatra (Lampung).

FIGURE 9
Number of reported outbreaks/cases of H5N1 HPAI in poultry in Indonesia, between May and October 2009
(Source: FAO EMPRES-i)



The Indonesian Government introduced vaccination in small flocks in mid-2004. Vaccines containing either an Indonesian H5N1 antigen (A/chicken/Legok/2003) or H5N2 viral antigen have been used in government programmes, and there are now approximately 20 different licensed vaccines. Vaccination programmes in the backyard poultry sector were implemented until, as a result of concern over the efficacy of registered vaccines, vaccination by the central government stopped in 2008. In the commercial sectors, vaccination is not coordinated by government, thus vaccination practices there are based on risk as perceived by the farmer. Today, preventive vaccination is practiced in all breeder facilities and nearly all layer farms nationwide. Single dose vaccination of broilers with inactivated vaccine is practiced sporadically during the wet season on Java. Vaccination of ducks is not practiced.

In **Viet Nam**, two outbreaks were detected from 21 to 23 October 2009 in seven small raising households in Group No.2, Noong Luong Commune and two households in Group No.12b, Thanh Yen Commune, Dien Bien District. As of 24 October 2009, 2,283 poultry in the affected area have died or been culled. These are the first H5N1 HPAI outbreaks officially reported in the country since 22 June 2009. From January 2009, the Department of Animal Health (DAH) officially reported 49 HPAI outbreaks in 15 (24%) of 63 provinces, mostly on

duck farms (65%) and in the small-scale commercial sector (69% of outbreaks in flocks with 50 to 1,000 birds). Consistent outbreak investigations are still not undertaken on infected farms and key information is usually missing from the field, so that it is difficult to have a good understanding of the way the virus is spreading throughout widely distributed regions of the country.

Disease control measures include stamping out of infected farms, movement restrictions for 21 days, compensation (up to 70% of market value; around USD 1.3/bird) and vaccination. Vaccination is implemented throughout the country in two annual campaigns (March/April and October/November), but in some areas, vaccination between the seasonal campaigns is also practiced.

Post-vaccination monitoring is routinely carried out after each vaccination campaign. For the first round of 2009, a total of 32,597 samples from 1,090 flocks were collected in 28 provinces for sero-monitoring and about 1,866 swab samples were taken to monitor HPAI virus circulation in slaughter-houses/-points or at live bird markets of 16 provinces. Results of the post-vaccination monitoring programme for this first round of 2009 showed that around 58% of vaccinated birds were protected, while around 77% of vaccinated flocks were protected, i.e. flocks with more than 70% of birds showing protective titres $HI \geq 1/16$. Chicken samples showed a higher protection level of 62.29% compared with duck samples, which had a protection rate of 55.19%. However, it is likely that sampled flocks are not really selected at random from the entire poultry population, so this assessment of the vaccination programme is more a monitoring of the immune response on vaccinated flocks rather than a monitoring of the vaccine coverage.

Virus circulation surveillance was carried out in 16 target provinces and cities. Out of 448 unvaccinated flocks (selected from slaughterhouses, slaughter points or even from households) tested, only one 500-bird duck flock in Soc Trang Province tested positive for H5N1 virus.

Surveillance for AI is a component of numerous projects currently being implemented in Viet Nam, including:

- ACIAR (Australian Centre for International Agricultural Research) project started in June 2006 for three years and includes longitudinal studies to determine the prevalence of past and present infection in smallholder farms in the Mekong River Delta–South Viet Nam (ongoing).

- NZAID (New Zealand's International Aid & Development Agency) project will run for two years and includes longitudinal studies on nomadic ducks in the Mekong River Delta–South Viet Nam (ongoing).
- CIRAD (French Agricultural Research Centre for International Development) project started in 2007 and includes epidemiological studies in the Red River Delta–North Viet Nam (ongoing).
- VAHIP (Vietnam Avian and Human Influenza Control and Preparedness Project) project is being funded by the World Bank for three years and includes various surveillance activities, including market surveillance for virus circulation and outbreak investigations (ongoing).
- A new cycle of the USAID (United States Agency for International Development) project by FAO Viet Nam was launched in September 2009 in five new pilot provinces with a surveillance component focusing on enhancing the reporting system, strengthening the outbreak investigation and response, and developing an active surveillance model at commune level with local USAID partners.

Based on the monitoring of surveillance activities, three currently circulating virus clades have been isolated: 1) HA clade 1 (predominant in southern Viet Nam and also isolated in Cambodia); 2) HA clade 2.3.4 (predominant in northern Viet Nam and also circulating in China); and 3) HA clade 7 (detected in poultry seized at the Chinese border and at markets near Hanoi). So far in 2009, ten viruses isolated from outbreaks have been sent to the U.S. Centers for Disease Control and Prevention (CDC) for sequencing, and to date, no new circulating clade has been detected.

Europe

In the **Russian Federation**, on 26 October 2009, a *Columba livia* (rock dove) was found sick on a balcony of a block of flats in Pushchino, Serpukhov, Moskovskaya Oblast. It was sent to the Central Veterinary Laboratory, Moscow, where it tested positive for H5N1 AI.

The last H5N1 HPAI event in poultry was detected in October 2008 on a mixed poultry farm in **Germany**.

Non-infected countries/territories

There have been no HPAI outbreaks reported in **Australia, New Zealand, the Pacific Community, Papua New Guinea** (outbreaks have occurred in the Indonesian province of West Papua) or **the Philippines**. To date, no outbreaks have been reported in **Timor-Leste**, but here

surveillance capacity is weak. In South Asia, **Sri Lanka, Maldives, and Bhutan** have not experienced disease. Some Asian countries regularly report negative results obtained from their surveillance activities and suspected cases. Bhutan produces a clinical surveillance report weekly (available at <http://www.moa.gov.bt/birdflu/main/reports.php?show=all>).

Iraq, where the last H5N1 HPAI outbreak was in February 2006, reported recent laboratory results of their surveillance activities for September 2009 for all governorates except Kurdistan Province, in the north of the country. All samples taken were negative for H5N1 [poultry farms (64), backyard poultry (356), game and wild birds (15), and markets and slaughterhouses (60)]. A poultry farm in Babel Governorate tested PCR-positive to H9N2 low pathogenic avian influenza.

CONCLUSIONS

Since 2003, 62 countries/territories have experienced outbreaks of H5N1 HPAI. Effective control measures for outbreaks in poultry have been associated with reduced incidence of human infections in several countries. However, H5N1 HPAI remains entrenched in poultry in parts of Asia and Africa (Egypt) and thus the risk of human infection remains, as suggested by the two human cases reported in Egypt in September 2009.

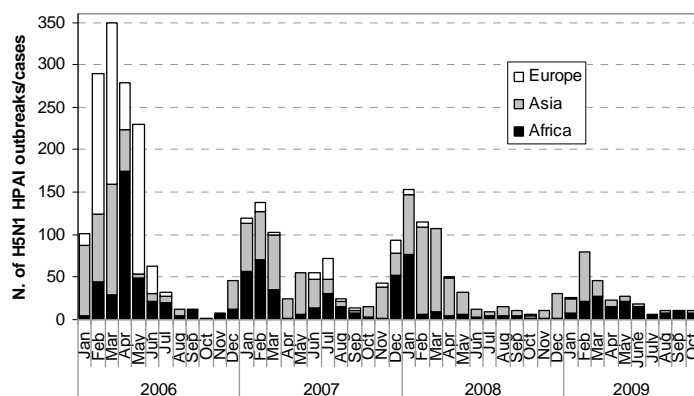
Data from previous years have shown a peak in the number of outbreaks/cases during the January-March period in both poultry outbreaks (Figure 10) and human cases (Figure 5), with February 2009 representing the peak. A secondary peak was shown in 2007 and 2008 during the June-August period, which has not been observed this year. Countries considered endemic, such as Bangladesh or China, have not reported any H5N1 HPAI activity for a few months now. In those countries, major efforts may be needed to strengthen surveillance systems. In any case, we will need to wait longer to see if this trend of no reports and no detection of virus activity continues, before we can consider these countries to be no longer endemic.

In the case of Egypt, the situation in terms of human infections has worsened since last year. There have been 36 human cases, mainly in children under four years of age, which is a four-fold increase compared to the seven human cases reported during the same period in 2008. However, the situation seems similar in terms of poultry outbreaks.

FIGURE 10

Number of reported H5N1 HPAI outbreaks/cases by continent, by month since January 2006

(Source: FAO EMPRES-i; Indonesia data are not included, because the epidemiological unit definition for the PDSR data was modified from household level to village level in May 2008 and is not comparable)



When comparing the number of affected countries, October 2009 showed lower activity than October 2008 and October 2007, (4 vs. 7 and 8 - Figure 11). However, in terms of number of outbreaks, the activity was similar to October 2008 and October 2007 (10 vs. 6 & 16 - Figure 12). HPAI activity in October 2006 was particularly low, with only two countries reporting two outbreaks. Although there has been an improvement in disease awareness, outbreaks/cases of H5N1 HPAI are still likely to be under-estimated and under-reported in many countries and regions because of limitations in the capacity of veterinary services to implement sensitive and effective disease surveillance and outbreak investigations for H5N1 HPAI, and because of the weakness of compensation schemes.

FIGURE 11

Number of countries by continent that reported H5N1 HPAI in October 2006, 2007, 2008 and 2009

(Source: FAO EMPRES-i)

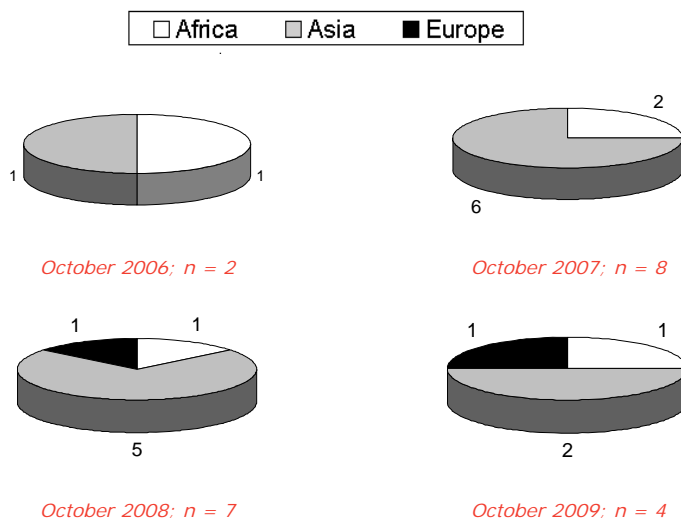
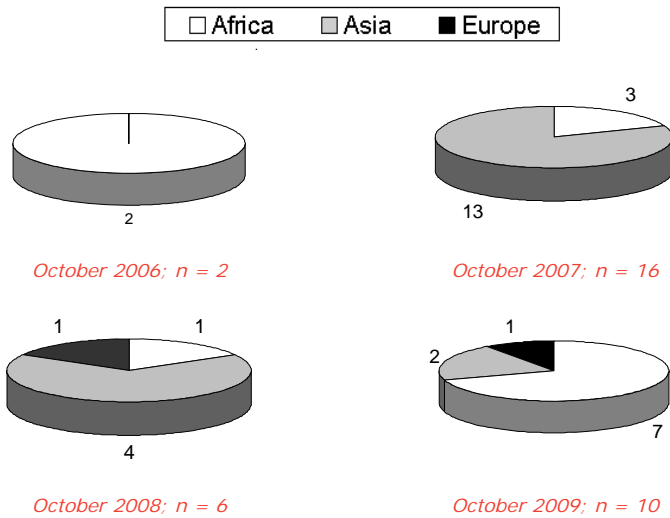


FIGURE 12

Number and distribution of H5N1 HPAI outbreaks/cases by continent in October 2006, 2007, 2008 and 2009

(Source: FAO EMPRES-i; Indonesia data are not included, because the epidemiological unit definition for the PDSR data was modified from household level to village level in May 2008 and is not comparable)



An animated map showing the evolution of outbreaks over the last six months including June 2009 is available at:

www.fao.org/ag/againfo/programmes/en/empres/maps.html.

EMPRES welcomes information on disease events or surveillance reports on H5N1 HPAI (and other TADs), both rumours and official information. If you want to share any such information with us, please send a message to glews@fao.org.

SUMMARY OF CONFIRMED HPAI OUTBREAKS (as of 9 December 2009)

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

Note: H5N1 unless otherwise indicated. Highlighted countries indicate those in which there has been only one officially confirmed H5N1 outbreak or occurrence. Dates of the last outbreak within this year are in bold.

AFRICA	First outbreak	Latest outbreak	Animals affected to date	Human cases / deaths to date
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	31 January 2007	Domestic poultry – wild birds	-
Djibouti	6 April 2006	6 April 2006	Domestic poultry	1 / 0
Egypt	17 February 2006	1 December 2009	Domestic poultry – wild birds	89 / 27
Ghana	14 April 2007	13 June 2007	Domestic poultry	-
Niger	6 February 2006	1 June 2006	Domestic poultry	-
Nigeria	16 January 2006	22 July 2008	Domestic poultry – wild birds	1 / 1
Sudan	25 March 2006	4 August 2006	Domestic poultry	-
Togo	6 June 2007	8 September 2008	Domestic poultry	-

ASIA	First outbreak	Latest outbreak	Animals affected to date	Human cases / deaths to date
Afghanistan	2 March 2006	2 October 2007	Domestic poultry – wild birds	-
Bangladesh	5 February 2007	29 August 2009	Domestic poultry	1 / 0
Cambodia	12 January 2004	16 December 2008	Domestic poultry – wild birds	8 / 7
China	20 January 2004	27 May 2009	Domestic poultry – wild birds	38 / 25
China (Hong Kong SAR)	19 January 2004	27 April 2009	Wild birds	-
India	27 January 2006	20 May 2009	Domestic poultry	-
Indonesia	2 February 2004	October 2009	Domestic poultry – pigs (with no clinical signs)	141 / 115
Japan	28 December 2003	7 May 2009 (raccoons, seropositive)	Domestic poultry – wild birds – raccoons (with no clinical signs)	-
Kazakhstan	22 July 2005	10 March 2006	Domestic poultry – wild birds	-
Korea, Rep. of	10 December 2003	12 May 2008	Domestic poultry – wild birds	-
Lao PDR	15 January 2004	25 February 2009	Domestic poultry	2 / 2
Malaysia	7 August 2004	2 June 2007	Domestic poultry – wild birds	-
Mongolia	10 August 2005	1 August 2009	Wild birds	-
Myanmar	8 March 2006	23 December 2007	Domestic poultry	1 / 0
Nepal	8 January 2009	17 February 2009	Domestic poultry	-
Pakistan	23 February 2006	17 June 2008	Domestic poultry – wild birds	3 / 1
Thailand	23 January 2004	10 November 2008	Domestic poultry – wild birds – tiger	25 / 17
Viet Nam	9 January 2004	25 November 2009	Domestic poultry	111 / 56

NEAR EAST	First outbreak	Latest outbreak	Animals affected to date	Human cases / deaths to date
Iran	2 February 2006	10 December 2007	Domestic poultry - wild birds	-
Iraq	18 January 2006	1 February 2006	Domestic poultry – wild birds	3 / 2
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	-

EUROPE	First outbreak	Latest outbreak	Animals affected to date	Human cases / deaths to date
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	Wild birds – domestic poultry – dogs	8 / 5
Bosnia-Herzegovina	16 February 2006	16 February 2006	Wild birds	-
Bulgaria	31 January 2006	30 May 2006	Wild birds	-
Croatia	21 October 2005	24 March 2006	Wild birds	-
Czech Republic	20 March 2006	11 July 2007	Wild birds – domestic poultry	-
Denmark	12 March 2006	22 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	10 January 2009 mallard, wild	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	22 December 2007	Wild birds – domestic poultry	-
Romania	7 October 2005	6 December 2007 (cat)	Wild birds – domestic poultry – cat	-
Russian Federation	15 July 2005	26 October 2009 rock dove	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	9 October 2009 (H7)	poultry	-
Sweden	28 February 2006	26 April 2006	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	12 / 4
Ukraine	2 December 2005	11 February 2008	Wild birds – domestic poultry – zoo birds	-
United Kingdom	30 March 2006	22 May 2008 (H7N7)	Wild birds – domestic poultry	-

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