WORLDWIDE SITUATION

During November and December 2010, 209 H5N1 HPAI outbreaks in poultry were reported in Egypt, Indonesia, the Republic of Korea, Japan and Viet Nam. Seven outbreaks in wild birds were reported during the same period in Japan and the Republic of Korea. The number of reported outbreaks/cases by country and their location are illustrated in Table 1 and Figure 1.

Table 1
HSN1 HPAI outbreaks/cases in poultry and H5 and H5N1 infection in wild birds in November and December 2010
(Source: FAO EMPRES-I, OIE WAHIS)

<table>
<thead>
<tr>
<th>Month</th>
<th>Country</th>
<th>Domestic poultry</th>
<th>Wild birds</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>November</td>
<td>Egypt</td>
<td>19</td>
<td>-</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Indonesia</td>
<td>46</td>
<td>50</td>
<td>96</td>
</tr>
<tr>
<td></td>
<td>Rep of Korea</td>
<td>-</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Japan</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Viet Nam</td>
<td>3</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>69</td>
<td>2</td>
<td>71</td>
</tr>
<tr>
<td>December</td>
<td>Egypt</td>
<td>39</td>
<td>-</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Indonesia</td>
<td>87</td>
<td>87</td>
<td>174</td>
</tr>
<tr>
<td></td>
<td>Japan</td>
<td>-</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Rep of Korea</td>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Viet Nam</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>129</td>
<td>7</td>
<td>136</td>
</tr>
</tbody>
</table>

FIGURE 1
HSN1 HPAI outbreaks/cases reported in poultry, H5 and H5N1 infection in wild birds and HSN1 infection in humans in November and December 2010
(Source: FAO EMPRES-I, OIE WAHIS)

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 HSN1 occurrences only in wild birds are not considered infected countries according to OIE. The original data have been collected and aggregated at the most detailed administrative level and for the units available for each country.

Figure 2 shows the number of confirmed cases of H5N1 infections in humans reported to the World Health Organization (WHO) by country from November 2003 to December 2010. During the two month reporting period there were eight confirmed cases of H5N1 in humans reported from Indonesia (1), China (1) and Egypt (6), three of whom died. These new human cases increased the number of confirmed human cases of H5N1 reported between November 2003 and December 2010 to 515 in 15 countries with a case fatality rate (CFR) of 59.2% (305 out of 515). Among the countries with more than ten reported cases, Indonesia had the highest CFR of 82.5% (141 out of 171).

The age distribution of the reported human cases ranged from three months to 81 years of age (median: 19 years of age). The highest CFR (73.8%) was in persons 10 to 19 years of age and lowest (25.0%) in persons aged 70 and above. Fifty-percent of the cases were female (258/485). Gender was equally distributed, with females representing 53% of the cases. (Source: Western Pacific Regional Office of WHO, Avian Influenza Update).

Table 2 shows the cumulative number of confirmed human cases and deaths due to HSN1 reported to WHO between January 2008 and December 2010. There was an increase in case numbers from 2008 to 2009 and a decrease in 2010. This was associated with a consistent decrease in deaths attributable to the disease across the three year period. During 2010, (as of 31 December 2010) 48 human cases have been reported worldwide and 23 have died resulting in CFR of 47.9%.

Figure 2
Cases of H5N1 AI infections reported in humans by country and month of onset from November 2003 to December 2010
(Source: World Health Organization - WHO)
household/village poultry free of charge; then vaccination was suspended after an assessment indicated that the programme had limited or no impact on H5N1 HPAI incidence.

In December 2010, there were six human avian influenza (AI) type A H5N1 cases with three fatalities. There were no human A/H5N1 cases reported in the prior month (November 2010). Since the beginning of the A/H5N1 epidemic in 2006, a total of 118 human laboratory-confirmed infections were reported in Egypt. Of these, 39 (33%) have been fatal. While most cases in 2009 were in children under four years of age, in 2010, 78% of human infections have been reported in patients above that age. The CFR in 2010 is higher than in 2009 (43% vs 10%), but similar to the CFR reported in 2008 (50%). The increase in reported H5N1 HPAI outbreaks in poultry (460 outbreaks reported from January to December 2010, compared with 177 in the same period in 2009) is most likely the result of improved surveillance through the effectiveness of the CAHO program.

The first report of an outbreak of H5N1 HPAI in Egypt was in February 2006. Despite a vigorous initial response to the disease, including the culling of over 40 million birds, Egypt is considered as an endemic country where outbreaks are regularly reported from different governorates. Circulating viruses belong to Clade 2.2.1 and cluster in two major genetic groups indicating that there have been no new introductions of H5N1 viruses after 2006. The work on gene sequencing depicts that currently there are two major groups of A/H5N1 viruses: i) The classical group: which is closely related to the originally introduced viruses and is circulating mainly in household poultry flocks; and ii) the variant group that has emerged in late 2007 and that is circulating mainly in commercial poultry farms. In 2010, the latter group (variant group) has been further divided into two minor subgroups (1 and 2).

All the human cases in 2010 are caused by viruses genetically similar to those isolated in 2009. Data are not available on the antigenic properties of the recent poultry viruses in Egypt, but the human isolates characterized are antigenically similar to sub group I described above. These viruses did not react well to post-infection ferret antiserum raised against the vaccine reference viruses used in the country.
from 2007 to 2009. These results indicate that the virus is being maintained and unnoticed within the country. The emphasis of the current policy of the government is placed on early detection and containment by culling, as well as the improvement of biosecurity in various production sectors. Poultry vaccination against H5N1 HPAI is prohibited by the government.

As of 31 December 2010, a total of 358 outbreaks had been recorded in 49 out of 64 districts, including 31 outbreaks in 2010, 32 in 2009, 226 in 2008 and 69 in 2007. Out of these outbreaks, 304 were on commercial poultry farms, and only 54 in backyard poultry. Over 1,869 million birds have been culled since 2007. Poultry vaccination against H5N1 HPAI is prohibited by the government. FAO is coordinating and supporting active surveillance that has been expanded to 260 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, in each upazilla, three community animal health workers (CAHW) employed by the active surveillance programme send SMS coded text messages to the Department of Livestock Services, regardless of the presence or absence of disease and deaths in poultry. SMS messages of suspected HPAI events are automatically forwarded to the livestock officer in the area who will respond by initiating an investigation. In November and December, 22,849 and 23,996 SMS messages were received, respectively, including 215 suspected HPAI events in backyard poultry and 467 suspected events on commercial poultry farms. The investigations that followed excluded 636 of these suspect cases and on 46 occasions, diagnostic specimens were collected. Of all specimens collected and reported through the SMS gateway system, none tested positive for H5N1 HPAI.

Eight of 23 migratory waterfowl trapped in Bangladesh in February 2010, as part of an FAO-facilitated satellite tracking project, are still delivering data that will allow further clarification of the role of migratory birds in the spread of H5N1 HPAI. The current location of the birds can be found at http://www.dahd.nic.in/

In Bhutan, no new outbreaks have been reported since February and March 2010. These outbreaks were caused by viruses belonging to Cluster 2.2, similar to those detected in India and Bangladesh.

In India, the last outbreaks of H5N1 HPAI occurred in backyard flocks in January 2010 in West Bengal. The 2010 virus isolates of Cluster 2.2 were similar to those found during 2008 and 2009. India declared itself free from H5N1 HPAI in July 2010.

Surveillance activities conducted at the High Security Animal Disease Laboratory (HSADL), Bhopal, are periodically reported at http://www.dahd.nic.in/, including the number of samples received and tested per state. In addition, the Ministry of Environment and Forests of the Government of India and the Department of Wildlife and Forests of Uttar Pradesh are funding the sampling of wild water birds.

Twelve of sixteen migratory waterfowl trapped in the states of Assam and West Bengal as part of an FAO-facilitated satellite tracking project in January 2010 are still delivering data (http://www.werc.usgs.gov/Project.aspx?ProjectID=60). Diagnostic specimens were collected and laboratory results are still pending.

In Nepal, no new H5N1 HPAI outbreaks have been reported since March 2010. Phylogenetic analyses of virus isolates from these last outbreaks identified H5N1 Cluster 2.2 (samples taken from the Kaski District outbreaks) and H5N1 Cluster 2.3.2 (from all outbreaks). Cluster 2.2 had been previously isolated in 2009 in Nepal’s eastern region, but this was the first detection of Cluster 2.3.2 in the South Asia region. Cluster 2.3.2 viruses were most related to viruses isolated in wild birds in 2009 from the Russian Federation and Mongolia. More distant Cluster 2.3.2 viruses were also isolated in wild birds in Hong Kong SAR (China) and in poultry in Viet Nam.

**South East and East Asia**

In Cambodia, no additional poultry or human cases have been reported since April 2010. All available human and animal isolates since 2004, including all those from 2010, are Clade 1 (genotype Z) and are most closely related to Clade 1 animal isolates since 2004, including all those from 2010, are isolated in 29 provinces since 2004 and over 35 million poultry have been culled to control the spread of the disease.

In China, no outbreaks were reported in domestic poultry during November and December 2010. One case of H5N1 in a domesticated poultry flock was reported in December in Hong Kong SAR. The last reported outbreak for 2010 was observed in May in wild birds in Tibet.

China first identified HPAI viruses of the H5N1 subtype in 1996 in geese in Guangdong Province and these viruses have continued to circulate and evolve over time. Almost 200 H5N1 HPAI outbreaks have been reported in poultry and wild birds in 29 provinces since 2004 and over 35 million poultry have been culled to control the spread of the disease.

Between 2004 and 2009 there has been a marked decrease in the number of reported outbreaks in domestic poultry. Despite this decrease in outbreak numbers, official ongoing surveillance activities conducted at national and provincial levels provide evidence that H5N1 viruses are still circulating in many provinces in domestic poultry, as well as in wild biota.

**FIGURE 5**

H5N1 HPAI outbreaks/cases in poultry, H5 and H5N1 infection in wild birds in East and South East Asia, by country (excluding Indonesia and Viet Nam), between June 2009 and December 2010

(Source: FAO EMPRES-I)
birds. Results from the national surveillance system released in December 2010 by the Ministry of Agriculture for activities conducted during January 2010, April 2010 and July 2010 showed that 14 provinces (Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan and Zhejiang) had H5N1 positive samples. Out of 182,362 virological samples collected and tested during those three months, 86 (4.7 per 10,000) were positive. The majority of positive samples came from ducks (52.3%) and chickens (40.4%), and to a lesser extent, geese (2.2%), pigeons (1.16%), and wild birds (1.16%). Sixty-five percent of samples were collected from chickens, 18% from ducks, 6% from geese, 3% from wild birds and the remaining 8% from pigs and other species. In a number of provinces, the proportion of positive samples was higher than expected, particularly for ducks (some over 4%). Sampling results by month confirmed circulation of H5N1 HPAI viruses in domestic poultry at live bird markets during January 2010 and April 2010 and one positive wild bird sample in July 2010. In January, 38 out of 21,892 poultry samples taken from chickens, ducks and geese in 13 provinces were positive for H5N1 HPAI viruses in 29 LBMIs. In April 2010, 46 out of 21,892 samples from similar species were positive for H5N1 HPAI viruses in 31 LBMIs. In July 2010, H5N1 HPAI virus was isolated from one wild bird (Chinesis) out of 686 wild bird samples taken at Dongting lake of Hunan Province. This is added evidence of the presence of the virus in wild birds and the constant risk of virus introduction into domestic poultry. A recent study by Kou et al. (2010) describes the H5N1 virus prevalence in apparently healthy wild birds surveyed between April 2004 and August 2007. Of 14,472 wild birds sampled, covering 56 species of 10 orders in 14 provinces of China tested with RT-PCR using H5 primers, 17 viral strains out of 149 positive samples were isolated. Of the six bird orders affected, Anseriformes had the highest prevalence (2.70%), while Passeriformes had the lowest (0.36%). Among the 24 positive species, mallards (Anas platyrhynchos) had the highest prevalence (3.77%). Of the provinces included in this sampling, Qinghai Province had the highest prevalence (3.88%), particularly in pintails (Anas acuta), mallards (Anas platyrhynchos) and tufted ducks (Aythya fuligula).

An intensive surveillance programme is ongoing in Hong Kong SAR which includes sampling of dead wild birds, wholesale and retail market birds found dead, as well as faecal swabs and pre-sale antibody checks from healthy birds. Results from this programme are not available.

Mass vaccination against H5N1 HPAI has been implemented since November 2005. Vaccination combined with other measures has resulted in improved disease control. Between January 2010 and July 2010, out of 2,093,323 post-vaccination samples, 1,902,142 (90.87%) were sero-positive. AI vaccines are provided free of charge by the government to all poultry manufacturers nationwide. Most birds receive the killed “Re-5” vaccine regardless of species. Most poultry should receive at least two doses of vaccine (primary + booster), except for meat ducks and chickens, which have a very short production cycle.

One human infection of H5N1 influenza A was reported in Hong Kong SAR, China during the reporting period. The last reported human infection for 2010 occurred in June. Since the beginning of the epidemic, China has reported 40 human cases, of which 26 (65%) were fatal.

All the clades of Asian-lineage H5N1 HPAI virus found globally have been detected in China. Of particular interest is the recent expansion of Clade 2.3.2, which was originally detected from a dead Chinese pond heron in Hong Kong SAR in 2004 and has now expanded its geographic range to include Mongolia, the Russian Federation, Nepal, Romania and Bulgaria. In Hong Kong SAR, viruses from Clade 2.3.4 were also detected in wild birds and poultry in 2009. The study by Kou et al. (2001) also provides some information on virus clades in wild birds sampled in China between April 2004 and August 2007. Additional information can be found at http://www.plosone.org/article/info:doi%2F10.1371%2Fjournals.pone.0006926.

Indonesia continues to report a high proportion of H5N1 HPAI outbreaks in poultry worldwide (Figure 6), as it has for the past three years. H5N1 HPAI Clade 2.1 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 village poultry. The programme is supported by FAO with USAID, AusAID and World Bank-implemented Avian and Human Influenza Facility Policy and Human Resources Development Fund (AHIF-PHRD) financial support and is operating in 349 of 496 (70%) disease surveillance centres in 349 districts through 31 Local Disease Control Centres (LDCCs) in 349 districts and is operating in 349 of 496 (70%) disease surveillance centres in 349 districts through 31 Local Disease Control Centres (LDCCs) in 349 districts and serving approximately 20 different licensed vaccines. Vaccination programmes by the central government in the

During November 2010, PDSR officers visited 1,608 villages, of which 46 (2.8%) were infected. Of these, 42 were new infections. In December 2010, PDSR officers visited 1,662 villages, of which 87 (5.2%) were infected. Of these, 83 were new infections. During the previous 12 months, 19,961 (27.9% of 71,547) villages were visited in the 384 PDSR surveillance districts. Since May 2008, the PDSR officers have visited approximately 54.4% of villages under coverage. Approximately 7.0 % of villages visited during the previous 12 months were classified as newly infected. Cases over the past 12 months were concentrated in Sumatera and Java.

The Indonesian Government introduced vaccination in small flocks in mid-2004. Vaccines containing either an Indonesian H5N1 antigen (e.g. A/chicken/Legok/2003) or HS2 viral antigen have been used in government programmes and there are now approximately 20 different licensed vaccines. Vaccination programmes by the central government in the

* In the event that more than one bird dies suddenly in a flock, with or without clinical signs, Participatory Disease Surveillance and Response (PDSR) teams carry out an influenza type A rapid 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.
backyard poultry sector were implemented until 2008, when they stopped as a result of concern over the efficacy of registered vaccines. 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 on 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 widely practiced and the epidemiologic role of ducks in Indonesia remains poorly understood.

Japan has reported one outbreak in poultry during November and three cases in wild birds during December 2010. This follows the recent isolation of H5N1 HPAI virus belonging to subclade 2.3.2. in wild bird faecal material in October 2010. The virus responsible for the outbreaks during this reporting period was similar to that found in October 2010.

Lao People’s Democratic Republic has reported no outbreaks since April and May 2010 in Vientiane, the capital, when the country experienced its first HPAI outbreaks since February 2009. Samples sent to the Australian Animal Health Laboratory (AAHL) in Geelong were identified as Clade 2.3.4, clustering together with viruses seen in Lao PDR previously.

The 2010 active surveillance programme is carried out in the nine highest-risk provinces in Lao PDR, based on the location of historical HPAI outbreaks. The surveillance is focused on ducks in live bird markets, high duck concentrated villages of historical HPAI outbreaks. The surveillance is focused on ducks in live bird markets, high duck concentrated villages and farms. A total of 30 markets, 35 villages and 28 farms have been visited. Three samplings of active surveillance (March, June and September 2010) have been completed. A total of 3,695, 3,227 and 3,148 swab samples and 1,899, 2,064 and 1,943 serum samples were collected from the first, second and third rounds respectively. From all the three samplings, 565 (5.61%) swab samples were tested positive to avian influenza type A/H5N1 RT-PCR, but all were negative to the HI test. Laboratory results from the fourth sampling conducted in December 2010 is pending.

In Mongolia, no HPAI event has been reported since the wild bird outbreak reported in May 2010, affecting whooper swans (Cygnus cygnus) and greylag geese (Anser anser) in Ganga Lake, on the south-eastern border with China. Phylogenetic analyses placed them in the 2.3.2 Clade.

Myanmar is currently compiling a national database of commercial poultry farms with population and geo-location data, to support disease control programmes. Myanmar is implementing an expanded surveillance programme in 78 townships (out of a total of 334). The programme is based on surveillance by community animal health workers (CAHW), suspect outbreak investigations by veterinary staff, and longitudinal studies of 100 poultry flocks. In the longitudinal studies, sera are collected monthly from ducks and backyard chickens in contact with ducks. To date, there have been no reports of diseases which have required investigation, but the longitudinal studies show that the virus continues to circulate among duck flocks.

The Republic of Korea reported two outbreaks in domestic poultry during December 2010 and six wild bird events during November and December 2010. In Thailand, a country that has not experienced any outbreak since 2008, a recent study by Amosin et al. (available at http://www.virologyj.com/content/pdf/1743-422x-7-233.pdf) reported on the genetic characterization of the viruses isolated from the outbreaks reported in four provinces. Eight influenza A H5N1 viruses, recovered and characterised, displayed genetic drift characteristics (less than 3% genetic differences).

In Viet Nam, four outbreaks were reported in poultry and none in humans for the reporting period. Two outbreaks were reported in Nam Dinh (North) and one outbreak in Nghe An (Center) provinces of Viet Nam in November 2010. In early December 2010, one outbreak was reported in Ca Mau province (South). H5N1 was first identified in poultry in 2003 and in humans in 2004. Altogether in 2010, the Department of Animal Health of the Ministry of Agriculture and Rural Development officially reported 46 poultry outbreaks in 20 provinces and the Ministry of Health declared seven human cases (with two fatalities).

However, there is evidence that there is virus circulation without severe clinical signs, particularly in ducks. Increased stress in poultry and increased movement of poultry due to higher demand in the winter months, including the Tet festival period, possibly help in the transmission of the disease in which these silent carriers possibly play a key role. Consistent outbreak investigations are not undertaken on infected farms and key information is often missing from the field. FAO is assisting the government to improve the outbreak investigation procedures through the development and updating of standard operating procedures (SOPs) and through Applied Veterinary Epidemiology Training (AVET).

Disease control measures include stamping out on infected farms, movement restrictions for 21 days, compensation and vaccination. Mass vaccination with an H5N1 inactivated vaccine started in 2005 and 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. The objective is to vaccinate 50% of the flocks in order to reduce the size of the susceptible population.

Post-vaccination monitoring is routinely carried out after each vaccination campaign. For the first round of 2010 (implemented in May to July 2010, a total of 12,854 samples were collected from randomly selected flocks in 18 targeted provinces for sero-monitoring. Results showed that vaccinated poultry have a protection rate† of 72.10 % at bird level. The protection rates of Muscovy ducks, Turkey, other ducks, chickens and geese were 80%, 80%, 78.90%, 68.05% and 50%, respectively.

Desvaux et al. (2010) reported at the “Options for the control of influenza VII” meeting on the “H5N1 avian influenza seroprevalence in North Viet Nam under a mass vaccination context”. Around 1,000 birds were sampled for four campaigns (mid-December 2008, end-January 2009, end-March 2010 and early June 2010), from randomly selected poultry farms or villages (for backyard poultry) in the Red River Delta Northern provinces. The global seroprevalence

† HI ≥ 1/16

FIGURE 7

HSN1 HPAI outbreaks in poultry in Viet Nam, between June 2009 and October 2010

(Source: FAO EMPRES-I)
was 18.3%. Muscovy ducks are not usually vaccinated, so if excluded from the calculation, the percentage increases to 22.4%. Broilers, with a short cycle, presented a lower seroprevalence than breeder-layers (11.6% vs. 20.5%). These levels of protection are much lower than the coverage expected from mass vaccination and may be explained by the high turnover of the poultry population, the low duration of the immunity induced by an inactivated vaccine, and practical issues in the field implementation of the vaccination. Some non-vaccinated animals showed seroconversion, which was considered to be due to virus circulation during the study period.

Similarly, Henning, J., et al. (2010) conducted a longitudinal study from May 2007 to May 2008, monitoring, through bi-monthly testing, 80 flocks of ducks and in-contact chickens in the Mekong Delta of Viet Nam. Serum and swab samples from 5,409 birds were analyzed, showing a bird-level seroprevalence of 17.5% among unvaccinated ducks and 10.7% among unvaccinated, in-contact chickens. The paper can be downloaded at: http://www.ncbi.nlm.nih.gov/pubmed/20594693.

Virus circulation surveillance was carried out at the same time as post-vaccination monitoring in 16 target provinces and cities. A total of 1,511 tracheal swabs of poultry (742 samples from ducks, 743 samples from chickens and 26 samples from Muscovy ducks) were collected from farms randomly selected in eight high-risk provinces to monitor H5N1 virus circulation. Prevalences of Type A and H5N1 avian influenza viruses in ducks were 0.94% and 0.67% respectively while in chickens, respective prevalences were 0.54% and 0%. There was no evidence of AI virus persistence found with the samples taken from Muscovy ducks. The AI positive samples were from Khanh Hoa and Quang Ngai provinces (Center).

Molecular surveillance has indicated the presence of four circulating virus clades in Viet Nam since 2003. These are: (1) Clade 2.3.1.2 (prevalent in northern Viet Nam since 2005 and also circulating in China); (2) Clade 2.3.4 (predominant in southern Viet Nam and also isolated in Cambodia); (3) Clade 7 (detected in poultry seized at the Chinese border and at markets near Hanoi); and (4) Clade 2.3.2 in 2007 and 2009. Limited sequence data from 2010 indicate that Clade 2.3.2 continues to circulate in Viet Nam. Interestingly, the Clade 2.3.2 HA genes were nearly identical to A/Hubei/1/2010, which was isolated recently from poultry in Nepal. Prior to April 2010, the last H5N1 HPAI event in poultry had been detected in October 2008 on a mixed poultry farm in Germany.

**CONCLUSIONS**

During the reporting period, 198 domestic poultry outbreaks were reported in five countries (Egypt, Indonesia, Republic of Korea, Japan and Vietnam), eight confirmed reports of human cases in three countries (Indonesia, Egypt and China) and confirmed wild bird events were reported in Japan and the Republic of Korea.

Japan detected Clade 2.3.2 H5N1 HPAI viruses in domestic poultry during November and December 2010, despite the early warning provided by virus detection in wild birds in October 2010. This implies possible difficulties associated with the implementation of adequate biosecurity measures at the farm level (http://www.yomiuri.co.jp/dy/national/T10120805348.htm). The finding of another virus positive poultry carcass on the southern China region raises concern that the virus may have reappeared in poultry in the region.

In November and December 2010 showed the same trends as previous years in terms of the increases observed in the number of countries reporting outbreaks (Figure 8) and the number of outbreaks (Figure 9) reported globally. This period is generally associated with high virus activity and over the years the number of reports has consistently been higher during these two months than during any of the other months.

In November and December 2010, there were no new countries reporting outbreaks. During 2010, H5N1 HPAI has reoccurred in a number of countries where the disease had not been reported for a number of months, including Cambodia, Israel, Lao PDR, Myanmar, Nepal, Romania and the Republic of Korea. In some cases, molecular evidence suggests introduction of a new strain of virus (e.g. Clade 2.3.2 virus to Romania, Clade 2.2.1 virus to Israel). In other instances, e.g. in southeast Asia, it remains unknown whether the new cases resulted from reintroduction of virus or from detection of outbreaks caused by virus that was circulating at low level within the country without reports of disease or positive findings from surveillance studies.

Since 2003, 63 countries/territories have experienced outbreaks of H5N1 HPAI. The last newly infected country was Bhutan in February 2010 (Figure 8 – upper right corner). Effective control measures for outbreaks in poultry have been associated with a reduced incidence of human infections in several countries. However, H5N1 HPAI continues to be present in poultry in parts of Asia and Africa (Egypt) and thus the risk of human infection remains.

H5N1 HPAI continues to be a global threat for poultry and also humans therefore vigilance needs to be maintained by governments in endemic countries and countries at risk. The evolution of virus Clade 2.3.2 during 2010 is a significant epidemiological event since, for the first time, this Clade spread to Europe (Romania and Bulgaria) probably by the migratory movement of wild birds.
FIGURE 8
Number of countries by continent and by month and year that reported H5N1 HPAI outbreaks since December 2003
(Source: FAO EMPRES-i)

FIGURE 9
H5N1 HPAI outbreaks/cases by continent, by month, since December 2003
(Source: FAO EMPRES-i; Note 1: 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); Note 2: Months with more than 380 outbreaks (Jan 04: 1 311, Feb 04: 1 175 and Oct 04: 741), and years with more than 650 outbreaks (2004: 4 189) have been truncated so that rest of the graph is not distorted

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