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Avian influenza overview February – May 2018

European Food Safety Authority,
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European Union Reference Laboratory for Avian Influenza

Cornelia Adlhoch, Adam Brouwer, Thijs Kuiken, Paolo Mulatti, Krzysztof Smietanka, Christoph Staubach, Irene Muñoz Guajardo, Frank Verdonck, Laura Amato and Francesca Baldinelli

Abstract

Between 16 February and 15 May 2018, three highly pathogenic avian influenza (HPAI) A(H5N6) and 11 HPAI A(H5N8) outbreaks in poultry holdings, one HPAI A(H5N6) and one HPAI A(H5N8) outbreak in captive birds, and 55 HPAI A(H5N6) wild bird events were reported in Europe. There is no evidence to date that HPAI A(H5N6) viruses circulating in Europe are associated with clades infecting humans. Fewer HPAI wild bird cases have been detected than during the same period of previous year. Most of mortality events among wild birds involved single birds and species listed in the revised list of target species for passive surveillance. Raptor species constitute 74% of the HPAI-infected wild birds found dead. Those raptor species probably became infected by hunting or scavenging HPAI virus-positive birds, and so raptor cases may predominate later in the course of an HPAI epidemic. Despite the important HPAI virus incursion via wild birds there have been few associated HPAI A(H5N6) outbreaks in poultry. Fifteen low pathogenic avian influenza (LPAI) outbreaks were reported in three Member States. The risk of zoonotic transmission to the general public in Europe is considered to be very low. The situation in Africa and the Middle East should be closely monitored with regards to HPAI A(H5N1) and A(H5N8). Uncontrolled spread of the virus and subsequent further genetic evolution in regions geographically connected to Europe may increase uncertainty and the risk for further dissemination of virus. Long-distance migrating wild birds from southern Africa, e.g. the common tern (*Sterna hirundo*), may be included in targeted active surveillance schemes at a few priority locations in Europe in order to detect HPAI A(H5)-infected migrating birds early. However, the risk of HPAI introduction from non-EU countries via migratory wild birds to Europe is still considered to be much lower for wild birds crossing the southern borders than for those crossing the north-eastern borders.

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Correspondence: ALPHA@efsa.europa.eu

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Table of contents

1.	Introduction.....	4
2.	Conclusions	4
3.	Suggestions.....	6
4.	Results	7
4.1.	Overview of HPAI and LPAI outbreaks in Europe between 16 February and 15 May 2018 (TOR 1 and TOR 2).....	7
4.1.1.	Description of the AI detections in time and space	7
4.2.	Phenotypic characterisation of AI viruses circulating in the EU	11
4.2.1.	HPAI in domestic birds	11
4.2.2.	HPAI in wild birds.....	15
4.2.3.	LPAI in domestic birds.....	18
4.2.4.	Human cases due to A(H5N8) or A(H5N6) viruses detected in Europe	18
4.3.	Applied prevention and control measures (TOR3).....	19
4.3.1.	In Bulgaria.....	19
4.3.2.	In Italy	19
4.3.3.	In the Netherlands	20
4.3.4.	In Denmark	20
4.4.	The AI situation on other continents between 16 February and 15 May 2018 (TOR 4).....	20
4.4.1.	HPAI A(H5N1).....	20
4.4.2.	HPAI A(H5N6).....	22
4.4.3.	HPAI A(H5N8).....	24
4.4.4.	Human infection due to A(H7N4)	27
4.4.5.	HPAI-LPAI A(H7N9).....	27
4.4.6.	LPAI A(H9N2)	31
4.4.7.	Scientific analysis of AI spread from non-EU countries to poultry in the EU.....	32
4.4.8.	Surveillance and diagnosis of human infections and public health measures for prevention and control	33
4.4.9.	ECDC risk assessment for the general public in the EU	33
	References.....	34
	Abbreviations	37
	Appendix A – Term of references	38
	Appendix B – Data and methodologies	40
	Appendix C – Literature search on phenotypic and genetic characterisation of AI viruses.....	42
	Annex A – Applied prevention and control measures on avian influenza in Bulgaria, Italy, the Netherlands and Denmark	45
A.1	Bulgaria.....	45
A.2	Italy	46
A.3	The Netherlands	49
A.4	Denmark	50

1. Introduction

The present document gives an overview of the highly pathogenic avian influenza (HPAI) and low pathogenic avian influenza (LPAI) outbreaks in poultry and captive birds as well as HPAI events in wild birds detected and human cases due to avian influenza reported in and outside Europe between 16 February and 15 May 2018. The background, terms of reference (TOR) and their interpretation are reported in Appendix A, data and methodologies are reported in Appendix B and C.

2. Conclusions

HPAI and LPAI outbreaks in Europe between 16 February and 15 May 2018 (TOR 1 and TOR 2)

Main observations

- No human infections with HPAI or related LPAI viruses currently circulating in Europe have been reported world-wide.
- In the EU, between 16 February and 15 May 2018 (based on the Animal Disease Notification System (ADNS)):
 - 14 HPAI outbreaks were reported in poultry: 8 A(H5N8) in Bulgaria, 3 A(H5N8) in Italy, 2 A(H5N6) in the Netherlands, 1 A(H5N6) in Germany
 - 2 HPAI outbreaks were reported in captive birds: 1 A(H5N8) in Bulgaria and 1 A(H5N6) in Sweden
 - 55 HPAI A(H5N6) events were reported in wild birds: 26 in Denmark, 3 in Finland, 2 in Germany, 2 in Ireland, 1 in Slovakia, 9 in Sweden, 4 in the Netherlands, and 8 in the United Kingdom
 - 15 A(H5) LPAI outbreaks were reported in poultry: 13 in France, 1 in Denmark and 1 in Italy.
- Mortality of wild birds from HPAI virus A(H5N6) was reported in Denmark, Finland, Germany, Ireland, Slovakia, Sweden, the Netherlands and, the United Kingdom. The vast majority of dead wild bird events involved single dead birds, and involved the species listed in the revised list of target species for passive surveillance.
- Raptor species constituted 74% (50/68) of the HPAIV A(H5N6)-positive wild birds found dead, compared with 3% (3/91) in the previous three-month period; waterbird species constituted 18% (12/68) of HPAIV A(H5N6)-positive wild birds found dead, compared with 79% (72/91) in the previous three-month period.
- Raptor species found positive for HPAIV were those that hunt or scavenge medium-sized to large birds, which include gulls, ducks, geese and, swans. In contrast, raptor species that hunt small birds or small mammals and do not eat carrion were not found to be positive for HPAIV.

Conclusions

- The risk of zoonotic transmission of avian influenza (AI) viruses to the general public in the EU/EEA countries is considered to be very low.
- HPAI A(H5N6) wild bird cases were detected from east to west Europe, as far as Ireland, through the north European regions, suggesting that there were multiple primary introductions of HPAIV into the EU via migrating wild birds.
- Fewer HPAI wild bird cases have been detected this year than during the same reporting period in 2017. Even if there is uncertainty around conclusive reasons to explain this observed difference, it may be the result of a lower AI virus prevalence in wild birds, a smaller susceptible wild bird population (due to an existing population immunity given the antigenic similarity of HPAIV A(H5N8) circulating in 2017 to HPAIV A(H5N6) in 2018) or a later onset of winter.

- As seen in previous years, raptors probably become infected with HPAIV by hunting or scavenging HPAIV-positive birds, and so raptor cases may predominate later in the course of an HPAIV epidemic.
- In this reporting period, the high proportion of raptor and scavenger cases reported may be biased by the heterogeneous implementation of the passive surveillance across years and Member States (e.g. increased proportion of raptor and scavenger species tested compared with previous years; the cut-off value for wild bird mortality events applied to test birds found dead for AI, differing by Member States and wild bird species within Member States).
- Relative to the number of wild bird events there have been few associated HPAI outbreaks in poultry.

Applied prevention and control measures (TOR 3)

Main observations

- Biosecurity has been considered as one of the most important sets of measures to be improved, aiming at preventing contacts between poultry and wild birds.
- In Italy regular assessments of biosecurity at the farm level by official veterinary services, before granting permission to house birds, has been indicated to guarantee an overall high biosecurity level at an area level.

Conclusions

- A standardised approach to evaluate the biosecurity measures on farms is advisable at the country-level.

Avian influenza situation in other continents between 16 February and 15 May 2018 (TOR 4)

Main observations

- Since the beginning of 2017, when HPAI in Africa spread south of the equator for the first time, several wild bird species have been affected and the virus has continued to spread within southern Africa.
- In the reporting period, the common tern (*Sterna hirundo*) was again reported to be infected with HPAI A(H5N8). This species migrates from southern Africa to the breeding regions in Europe up to the sub-Artic areas.
- The wave of HPAI A(H5N8) outbreaks reported from the Middle East since November 2017 continued to evolve in the reporting period.

Conclusions

- The probability of AI virus introductions from non-EU countries via wild birds is decreasing as temperatures increase during spring and summer, whereas introduction into EU poultry holdings is still possible due to the presence of the virus in the environment.
- Close monitoring is required of HPAI of the subtypes A(H5N1) and A(H5N8) in Africa and the Middle East, given the propensity for further genetic diversity as a result of uncontrolled spread in poultry and an increased opportunity for further genetic reassortment increasing uncertainty about the geographical distribution of these viruses.
- There is continuing evidence of the occurrence of intersubtype and interclade reassortants between A(H5N1), A(H5N6), A(H9N2) and A(H7N9) in both poultry and wild birds in several areas of the world and therefore this situation should be closely monitored.
- The risk of HPAI being introduced to Europe from non-EU countries via migratory wild birds is still considered to be much lower for wild birds crossing the southern borders than for birds crossing the north-eastern borders based on species found positive in current surveillance, whereas the introduction via trade is still very unlikely to extremely unlikely.

3. Suggestions

- Continued surveillance for AI virus in wild birds and poultry in Europe and worldwide combined with timely generation of complete viral genome sequences and data sharing among Member States and between animal and human health sectors is crucial to be able to detect and respond early to threats that are relevant to animal and public health.
- Many Member States only test sick or dead wild birds of the target species for HPAI if several of them are found sick or dead at the same location on the same day. However, since most events involve only one or a few sick or dead birds, there is an increased need to include unusual events involving single sick or dead birds of the target species for comprehensive passive surveillance of HPAI A(H5).
- Long-distance migrating wild birds from southern Africa, e.g. the common tern (*Sterna hirundo*), may be included in targeted active surveillance schemes at a few priority locations in Europe in order to detect infected migrating birds early.
- People exposed to birds that are potentially infected with AI should consider taking appropriate personal protection measures following the national guidelines in their territory.

4. Results

4.1. Overview of HPAI and LPAI outbreaks in Europe between 16 February and 15 May 2018 (TOR 1 and TOR 2)

4.1.1. Description of the AI detections in time and space

4.1.1.1. HPAI A(H5N8) and A(H5N6) in poultry, other captive birds and, wild birds

From 16 February to 15 May 2018, a total of 71 outbreaks of A(H5) HPAI occurred in the EU, as presented in Table 1. The timeline, location and sub-population of A(H5) HPAI outbreaks are reported in Figure 1-4. For wild birds Table 1 displays the number of events, whereas the description of cases by event is reported in Section 4.2.2. The characterisation of HPAI affected poultry holding is reported in Section 4.2.1.

Table 1: Number of A(H5) HPAI outbreaks by country from 16 February to 15 May 2018 in Europe

Country	HPAI A(H5N6)			HPAI A(H5N8)		All HPAI
	Poultry	Captive birds ^a	Wild birds	Poultry	Captive birds ^a	
Bulgaria				8	1*	9
Denmark			26			26
Finland			3			3
Germany	1		2			3
Ireland			2			2
Italy				3		3
Slovakia			1			1
Sweden		1**	9			10
The Netherlands	2		4			6
United Kingdom			8			8
Total (10 countries)	3	1	55	11	1	71

a. According to the Council Directive 2005/94/EC, 'other captive bird' means any bird other than poultry that is kept in captivity for any reason other than production of meat or eggs for consumption, the production of other products, for restocking supplies of game birds or for the purposes of any breeding programme for the production of these categories of birds, including those that are kept for shows, races, exhibitions, competitions, breeding or selling.

* The outbreak occurred in galliformes species (527 cases out of 720 susceptible birds present - partridges and chukar partridges) showing mortality and clinical signs; the most likely source of infection is direct contact with wild birds.

** The outbreak occurred in galliformes, anseriformes, and columbiformes species (19 cases out of 105 susceptibles birds - hens, turkeys, domestic geese, pheasants, pigeons and quail).

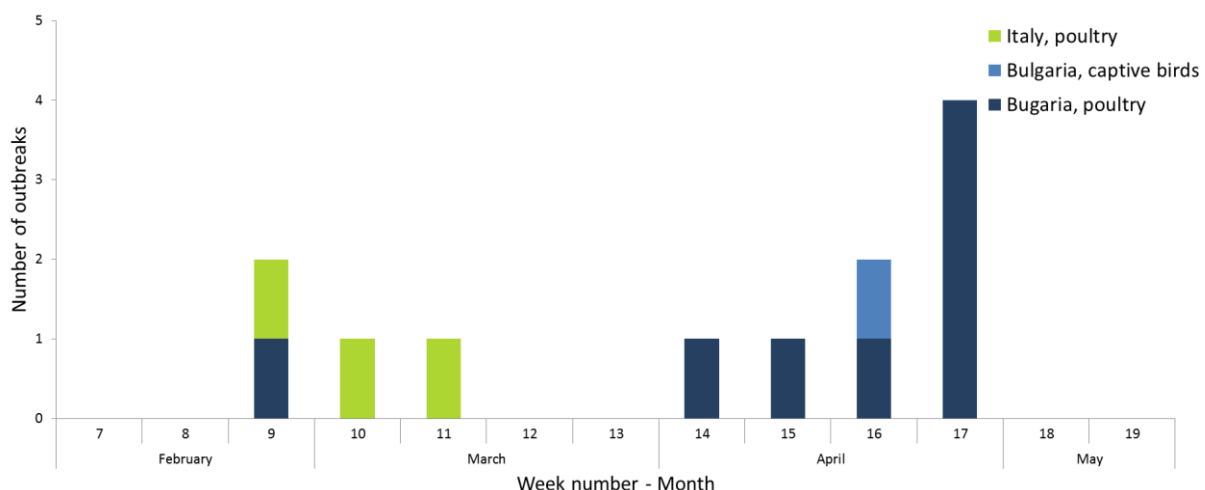


Figure 1: Number of A(H5N8) HPAI outbreaks from 16 February to 15 May 2018 in Europe by host and affected country (n=12)

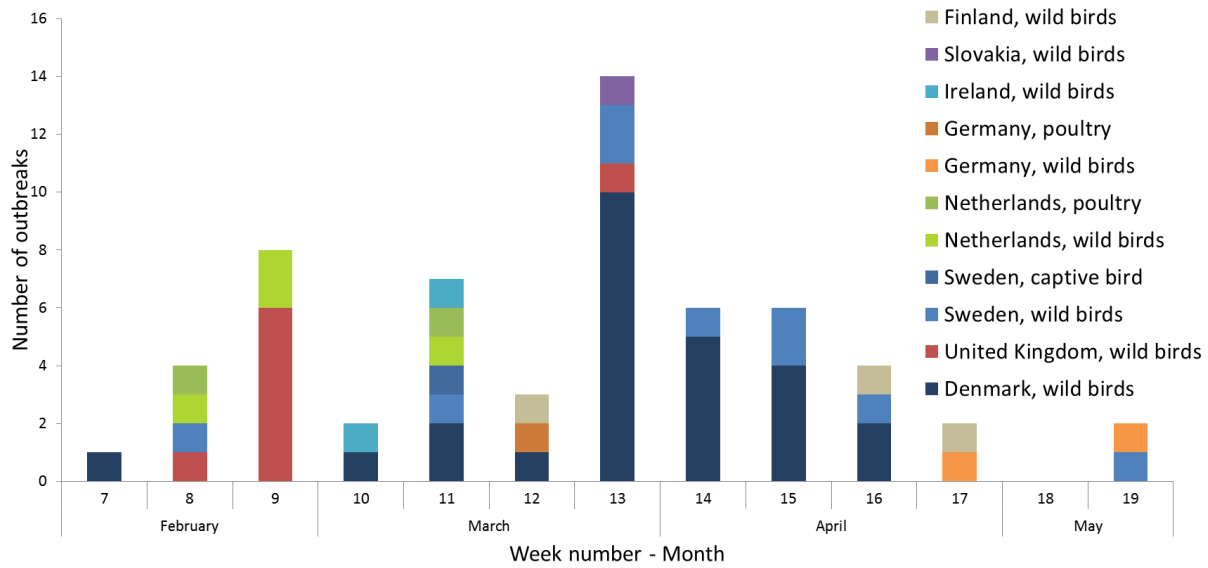


Figure 2: Number of A(H5N6) HPAI outbreaks in poultry and events in wild birds from 16 February to 15 May 2018 in Europe by host and affected country (n=59)

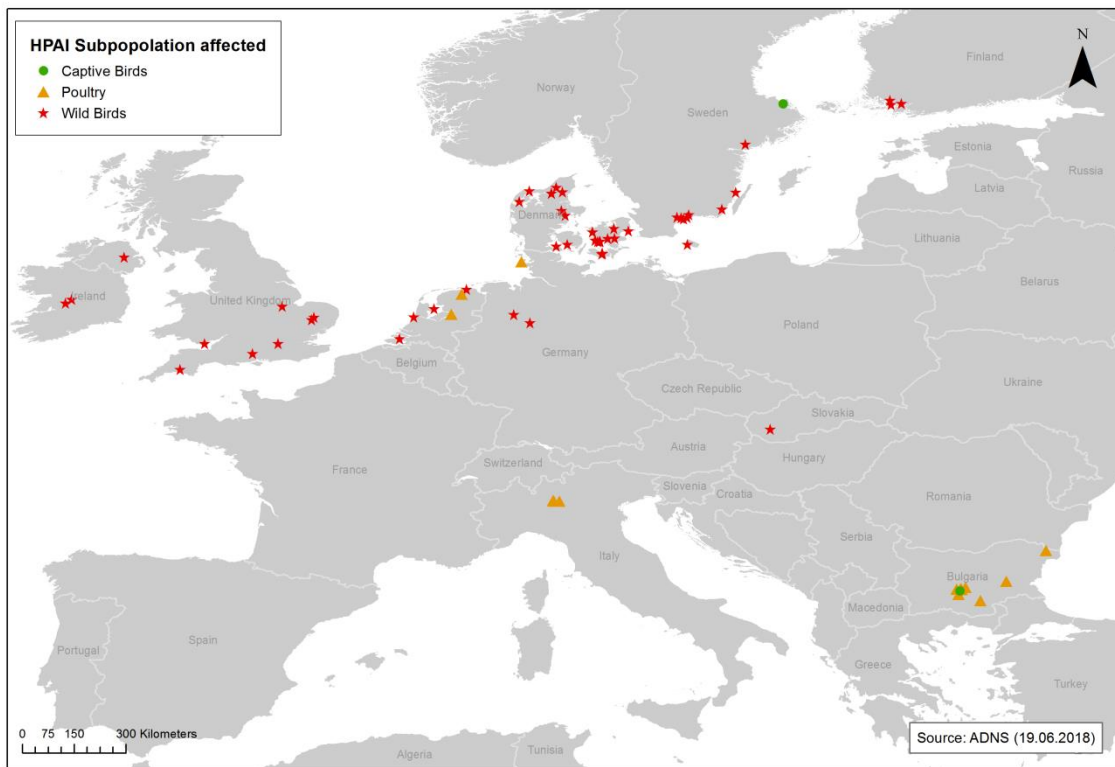


Figure 3: Location of A(H5Nx) HPAI outbreaks from 16 February to 15 May 2018 in Europe by affected sub-population (n=71)



Figure 4: Location of A(H5Nx) HPAI outbreaks from 16 February to 15 May 2018 in Europe by virus subtype (n=71)

4.1.1.2. LPAI in poultry holdings

From 16 February to 15 May 2018, a total number of 15 outbreaks of LPAI occurred in the EU, as presented in Table 2. The timeline and location of LPAI outbreaks are shown in Figures 5 and 6.

Table 2: Number of LPAI outbreaks by country and virus subtype from 16 February to 15 May 2018 in Europe

Country	Poultry					Total
	A(H5N1)	A(H5N2)	A(H5N3)	A(H5N5)	A(H5Nx)	
Denmark					1	1
France	1	2	4	1	5	13
Italy	1					1
Total (3 countries)	2	2	4	1	6	15

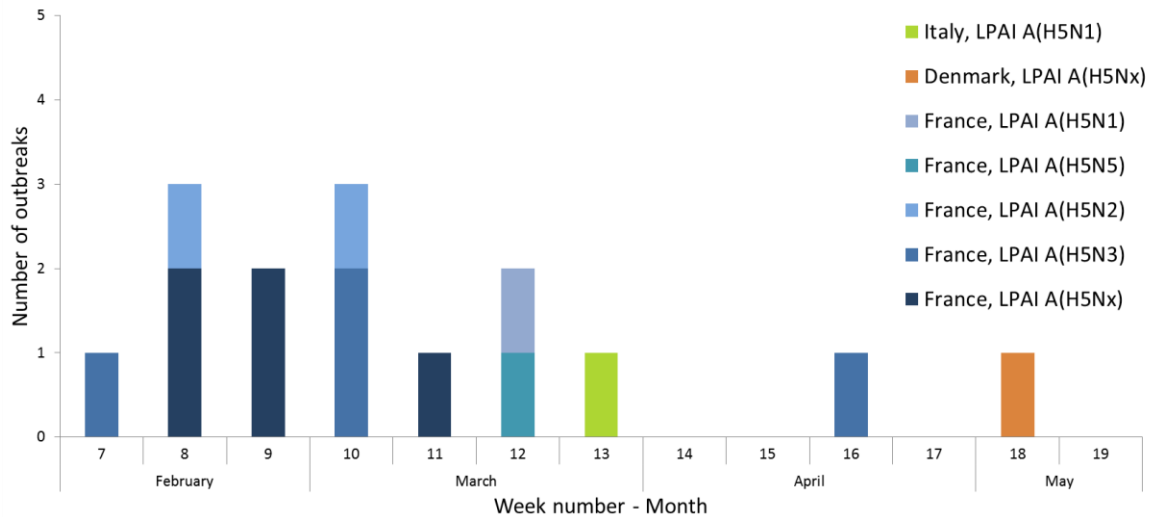


Figure 5: Number of LPAI outbreaks from 16 February to 15 May 2018 in Europe by virus subtype and affected country (n=15)

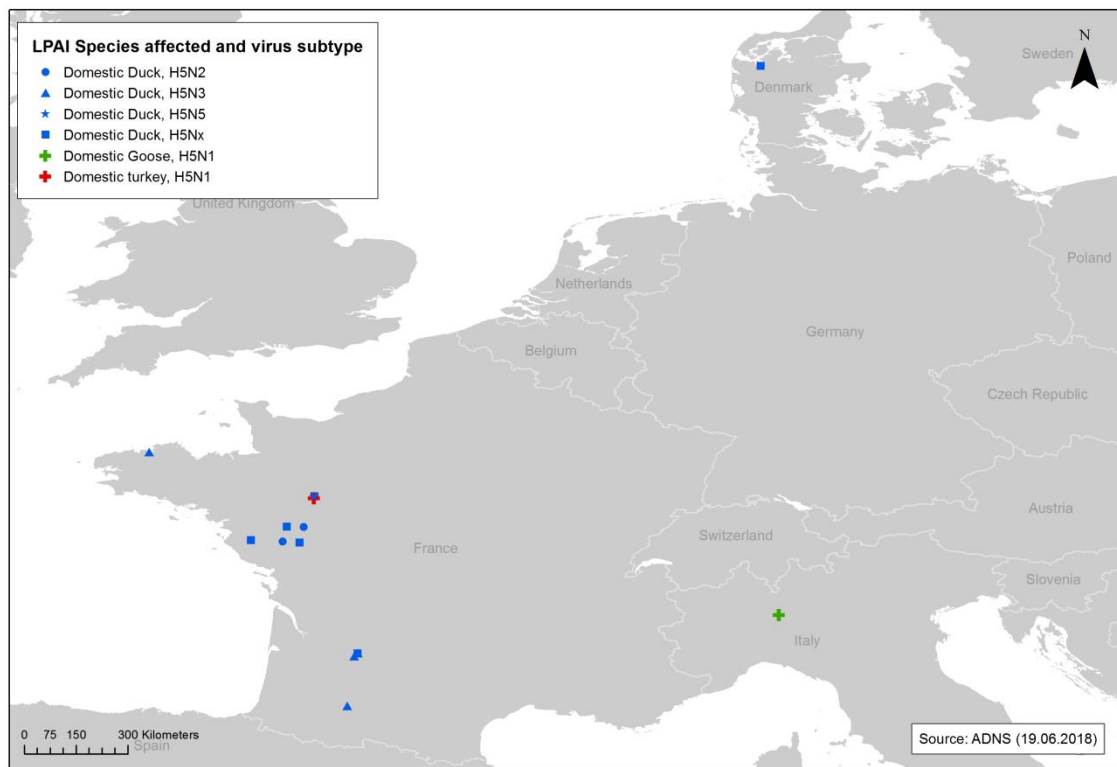


Figure 6: Location of LPAI outbreaks from 16 February to 15 May 2018 in Europe (n=15)

4.2. Phenotypic characterisation of AI viruses circulating in the EU

4.2.1. HPAI in domestic birds

Characterisation of the HPAI-affected poultry holdings

From 16 February to 15 May 2018, 14 HPAI outbreaks were notified in the poultry sector in the EU: 11 A(H5N8) and three A(H5N6). Eight outbreaks were recorded in Bulgaria, three in Italy, two in the Netherlands and one in Germany. All the outbreaks occurred in commercial holdings. Two of the three Italian outbreaks were secondary outbreaks. Poultry species and production categories of the affected holdings are shown in Figure 7. The overall number of domestic birds affected by HPAI A(H5N8) or A(H5N6) in the reporting period is around 508,000¹. The number of susceptible birds and species reared per outbreak is shown in Figure 8 according to the holding commercial type. The sampling programme type leading to the identification of the outbreaks is presented in Figure 9. Characteristics of the affected holdings by affected Member States are reported in Table 3. No additional information on the production category and commercial type of the affected holding, or information regarding the surveillance stream that led to the outbreak detection were reported by Germany.

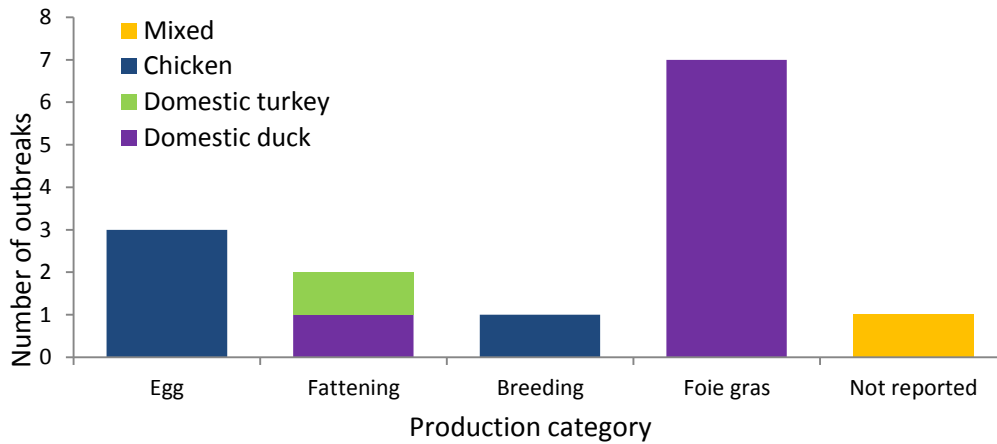


Figure 7: Number of HPAI-affected holdings by poultry species and production category in the EU from 16 February to 15 May 2018 (n=14)

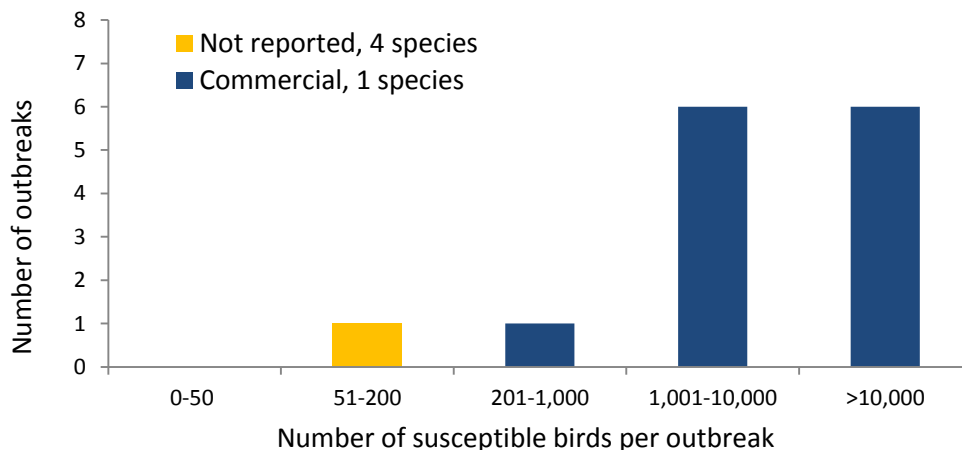


Figure 8: Number of HPAI-affected holdings according to the commercial type and number of species bred, by category of number of susceptible birds per holding in the EU from 16 February to 15 May 2018 (n=14)

¹ Based on the number of susceptible domestic birds reported to EFSA

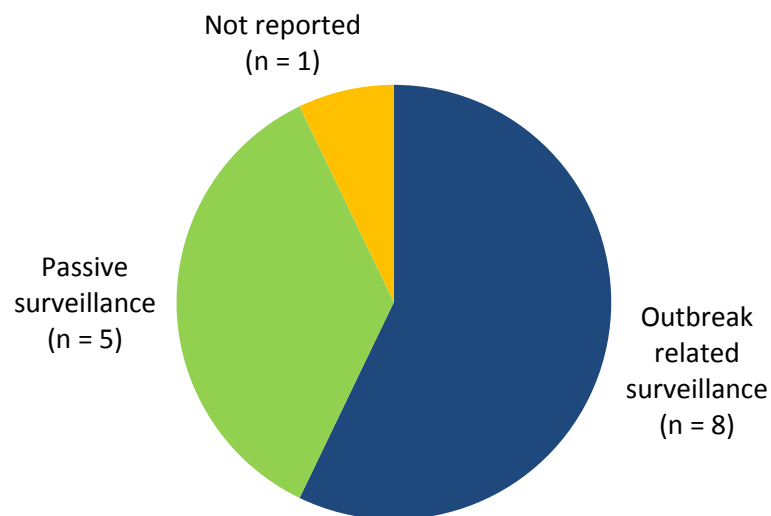


Figure 9: Number of HPAI-affected holdings by sampling programme leading to outbreak detection in the EU from 16 February to 15 May 2018 (n=14).

Table 3: Characteristics of the HPAI A(H5) affected poultry holdings by affected Member States in the EU from 16 February to 15 May 2018 (n=14)

Country	Poultry species	Production category	Date of suspicion	Presence of signs due to HPAI infection	Number of susceptible animals
Bulgaria	Domestic duck	Foie gras	02/04/2018	Yes	6 000
			10/04/2018*	No	5 600
			19/04/2018*	No	2 000
			24/04/2018*	No	350
			24/04/2018*	No	2 100
			24/04/2018*	No	2 200
	24/04/2018*	No	4 800		
Chicken	Egg	28/02/2018	Yes	139 000	
	Total				162 050
Germany	Chicken Domestic goose Domestic duck Domestic turkey	Not reported	20/03/2018	Yes	73
	Total				73
Italy	Chicken	Egg	02/03/2018	Yes	96 007
			08/03/2018**	No	30 906
	Domestic turkey	Fattening	12/03/2018**	Yes	152 650
	Total				279 563
Netherlands	Domestic duck	Fattening	12/03/2018	Yes	28 886
	Chicken	Breeding	24/02/2018	Yes	37 866
	Total				66 752
Total					508 438

* Secondary outbreaks; no suspicion was raised so date of confirmation is reported.

** Secondary outbreaks.

4.2.1.1. HPAI A(H5N8)-affected poultry holdings in Bulgaria

From 16 February to 15 May 2018, eight HPAI A(H5N8) outbreaks were detected in poultry holdings in Bulgaria. Characteristics of the affected holdings and species reared are presented in Table 3.

All the outbreaks detected in Bulgaria in the reporting period were primary outbreaks.

Two outbreaks were detected in the course of passive surveillance activities. In one case that occurred at a laying hen holding, mortality, clinical signs, drop in egg production and drop in feed/water intake were recorded and the suspicion was raised by the owner. The birds had had no outdoor access in the 21 days before the outbreak detection. Indirect contact with poultry was highlighted as the most likely source of infection: the holding is located near a drainage channel and 50 m away from a holding that rears ducks. However, these ducks were slaughtered two weeks before the notification of the outbreak. In the other case detected through passive surveillance activities, the suspicion was raised by the owner as mortality, clinical signs and drop in feed/water consumption were detected. The animals, domestic ducks, were 10-15 days old and had been kept indoors all the time. The affected holding had recently been reconstructed following a new national regulation on biosecurity measures in duck farms. The same holding had been affected by another HPAI outbreak in 2017. Before repopulation, sentinels were used and tested negative. The farm is surrounded by one commercial farm for breeding hens (further tested negative) and a number of non-commercial flocks.

The epidemiological investigation of the affected domestic duck holding traced the birds back to a hatchery, and the subsequent controls performed in the holdings supplied by the same hatchery permitted the detection of five outbreaks, all in domestic ducks holdings. However, the hatchery tested negative to AI and no other epidemiological links were found between the hatchery and the positive holdings or between them.

No mortality, clinical signs or drop in feed/water intake were recorded for these five cases. In one of these holdings the animals had had no outdoor access during the 21 days before the outbreak; in another one the animals had outdoor access the whole day and in the remaining three cases outdoor access was available only for part of the day. All the affected holdings (including the one identified through passive surveillance activities) had strict biosecurity measures in place and used their own vehicles for feed and animals transport. The source of introduction of the virus is unknown, but transport means, gaps in the biosecurity measures during transport and workers are considered likely sources of infection.

The last outbreak was detected by the surveillance activities that were triggered by one of the previous five secondary outbreaks. No mortality, clinical signs or drop in feed/water intake were recorded. The animals, domestic ducks, had had outdoor access for part of the day during the 21 days before the outbreak detection. The source of introduction of the virus is unknown, but is most likely transport means or workers.

Two HPAI A(H5N8) outbreaks were identified outside the reporting period for this report in the course of AI surveillance and control programmes: one outbreak affected a commercial duck holding in Stefanovo village (Dobrich region) and was confirmed on 25 May 2018. The other one, confirmed on 13 June, was identified in the same region (Dobrich region) on a farm that rears laying hens.

4.2.1.2. HPAI A(H5N8)-affected poultry holdings in Italy

From 16 February to 15 May 2018, three HPAI A(H5N8) outbreaks were detected in poultry holdings in Italy. The characteristics of the affected holdings and species reared are presented in Table 3.

The first outbreak was identified in a laying hens holding by means of passive surveillance and was a primary outbreak. The birds were showing mortality, clinical signs, drop in egg production and drop in feed/water consumption. The most likely source of infection of this outbreak is unknown.

The other two outbreaks detected were secondary outbreaks related to the first one and were identified through outbreak-related surveillance activities. In one of the secondary outbreaks that affected a holding rearing laying hens, the epidemiological investigation revealed risk contacts with the first outbreak through trucks transporting feed and eggs, and company technicians. No signs of HPAI infection were observed. The other secondary outbreak occurred in a turkey holding divided into two areas by a road frequently used by feed trucks that visited the first two outbreaks. Moreover, the

trucks were kept in a house 500 m away from the holding. In this secondary outbreak, mortality and clinical signs were reported.

Poultry on all the affected holdings had had no outdoor access in the 21 days before the outbreak detections.

4.2.1.3. HPAI A(H5N6)-affected poultry holdings in the Netherlands

From 16 February to 15 May 2018, two HPAI A(H5N6) outbreaks were detected in poultry holdings in the Netherlands. The characteristics of the affected holdings and species reared are presented in Table 3.

The two outbreaks were identified by means of passive surveillance. One of the affected holdings consisted of three houses with 12 000 birds each but only in one house were the animals suffering from mortality, drop in egg production and drop in feed/water consumption, with 40–50% of the birds showing clinical signs; in the other affected holding, rearing domestic duck, mortality, clinical signs (nasal discharge and lameness) and drop in feed/water consumption were also recorded. The two affected premises had no outdoor access in the 21 days before the outbreak detection. The most likely source of introduction is unknown in both cases.

4.2.1.4. HPAI A(H5N6)-affected poultry holding in Germany

From 16 February to 15 May 2018, one HPAI A(H5N6) outbreak was detected in poultry in a holding in Germany. The characteristics of the affected holdings and species are presented in Table 3.

The outbreak was a primary one in which mortality and clinical signs were described. The reason for the introduction is assumed to be that the flock came into contact with wild birds. No additional information on production category and commercial type of the affected holding, or regarding the surveillance stream that led to the outbreak detection, were reported by Germany.

4.2.1.5. Information extracted from the scientific literature

Briand et al. (2018) studied an HPAI A(H5) outbreak that occurred on poultry farms in south-western France from November 2015 to August 2016. The responsible viruses were mainly detected on farms raising waterfowl, but also in chicken and guinea fowl flocks, and did not induce severe signs in waterfowl although they did meet the HPAI criteria. Although several farms with terrestrial poultry experienced clinical disease, the HPAI A(H5) viruses were mostly detected on domestic duck farms, especially at the free-range and subsequent foiegras production stages. Clinical signs were occasionally observed in these ducks. However, most cases (76%) were asymptomatic infections detected through systematic sampling implemented for virological surveillance in duck flocks. This most probably favoured an unapparent but significant spread among duck farms. In support of this statement, most of the detections of French HPAI A(H5) viruses between 3 and 18 December 2015 were linked to the pre-movement testing of duck flocks set up after the first cases were detected, and not to clinical suspicions. Further support was obtained through the retrospective analysis of some archived cloacal swabs (collected from duck farms for other epidemiological purposes in September 2015), which allowed the detection of HPAI A(H5) sequences six weeks before the first case of French HPAI A(H5) was diagnosed, thus confirming silent diffusion of the virus. Together, these results justify efforts towards a more comprehensive monitoring and control of circulating AI viruses in French duck farms.

Gambaryan et al. (2018) used an LPAI virus A/duck/Moscow/4182/2010 (H5N3) for prevention of HPAIV transmission between domestic ducks and chickens. This LPAIV A (H5N3) was a typical duck virus that replicated very well in ducks, but only replicated in chickens after inoculation of a very high dose. Also, the virus failed to transmit from directly inoculated ducks and chickens to contact chickens. Therefore, the authors suggested that the risk of adaptation of this LPAIV to chickens and its spread in chicken population, with potential subsequent acquisition of virulence, was no greater than emergence of HPAIV in chickens from freely circulating LPAIVs. Upon inoculation by aerosol of A/chicken/Kurgan/3/2005 (HPAI A(H5N1) clade 2), 7-day-old Pekin ducks developed torticollis and two of the six birds died, while non of the five 40-day-old Pekin ducks died. Influenza virus was detected in about 50 of the environmental faecal samples collected from these ducks between 3 and 10 day post infection. All chickens that were in contact with the infected ducks became sick, excreted

the virus and, died. In contrast, Pekin ducks that were pre-treated by oral ingestion of a 10^4 median tissue culture infective dose of LPAIV A(H5N3), followed 14 to 90 days later with HPAIV A(H5N1) did not excrete the challenge virus, and did not infect contact chickens. These results suggest that LPAI virus from wild aquatic birds can be used for the prevention of transmission of A(H5N1) viruses between domestic ducks and chickens.

4.2.2. HPAI in wild birds

Pathogenicity in the affected species

Table 4: Cases of HPAI A(H5N6) infection in free-living wild birds, ordered by country and species, occurring from 16 February to 15 May 2018 and reported to the World Organisation for Animal Health (OIE) (OIE, online)

OIE report no.	Country	No. event	Wild bird species	No. of events in which the species was involved	No. of cases/event ^a	Total no. of cases
27011	Denmark	26	Black-headed gull	1	1	1
			Common buzzard	11	1,1,1,1,1,1,1,1,1,1,1,1	11
			Great cormorant	1	1	1
			Herring gull	1	1	1
			Hooded crow	2	1,1	2
			Mute swan	2	1,1	2
			White-tailed eagle	8	1,1,1,1,1,1,1,1	8
26324	Finland	3	White-tailed eagle	3	1,1,1	3
26491						
26585						
26563	Germany	2	White stork	1	1	1
			Common buzzard	1	1	1
26192	Ireland	2	White-tailed eagle	1	1	1
			Common buzzard	1	1	1
26436	Slovakia	1	Black-headed gull	1	3	3
26177	Sweden	9	Common buzzard	2	1,1	2
26780			White-tailed eagle	6	1,1,1,4,1,1	9
			Northern goshawk	1	1	1
26360	The Netherlands	3**	Greater scaup	1	1	1
			Common buzzard	1	1	1
			Peregrine falcon	1	1	1
26346	United Kingdom	8	Common buzzard	5	1, 1, 1, 1, 5	9
			Northern goshawk	1	1	1
			Greylag goose	1	2*	2
			Mute swan	1	2	2
			Common pheasant (wild)	1	2*	2
Total	(8)	54**	(13)	-	-	67**

a. Number of HPAI A(H5N6) positive wild birds per event.

* Common pheasant and greylag goose cases were detected in the same event; therefore the overall number of cases in this event was 4.

** One wild bird event occurring in the Netherlands in a common buzzard has not been reported to the OIE (status: 25.06.2018).

The only HPAIV subtype that was identified in carcasses of wild birds submitted for AI virus testing was A(H5N6) (68 cases) (Table 4). The reports to the OIE provide the numbers of virus-positive dead birds per species, but not the average population size of the affected wild bird species from which wild bird carcasses were obtained, let alone the number of animals at risk in these populations. Therefore it is not possible to make an objective estimate of the mortality rate in order to assess the pathogenicity of infection with these subtypes of HPAIV in wild bird populations. Some information may be gained by data on the number of carcasses of the different wild bird species that tested positive for HPAIV during surveillance activities. However, these figures need to be interpreted with caution, because they need to take various factors into account, including the ease of detection of carcasses of different wild bird species, the selection of carcasses being biased towards certain species, the abundance of species, and species range.

The most noteworthy finding in this table is the dominance of raptors. The number of virus-positive carcasses for the common buzzard (26 cases) and the white-tailed eagle (21 cases) was substantially higher than for the other 11 species (1 to 4 cases per species) (Table 4). If all raptors (common buzzard, white-tailed eagle, northern goshawk, peregrine falcon) are taken together, they constitute 74% (50/68) of all cases. In comparison, all waterbirds (great cormorant, herring gull, mute swan, black-headed gull, greater scaup, greylag goose) constitute 18% (12/68) of all cases. This is a major shift from the previous report (November 2017 to February 2018) (EFSA et al., 2018), where the species for which the highest number of birds were found virus-positive were the mute swan, tufted duck, mallard, great black-backed gull and, greylag goose. In that period, waterbirds constituted the majority of all cases, 79% (72/91), compared with 3% (3/91) for raptors.

It is not known why there has been this species shift in frequency of virus-positive birds. It may be partly explained by the fact that raptors become infected with HPAIV by hunting or scavenging HPAIV-positive birds, and so raptor cases occur later in the course of an HPAIV epidemic. All affected raptor species hunt or scavenge medium-sized to large birds, which include the main virus-positive species found in the period November 2017 to February 2018 (EFSA et al., 2018): gulls, ducks, geese and, swans. In contrast, common raptor species that hunt small (passerine) birds or small mammals and do not eat carrion (e.g. Eurasian sparrowhawks and common kestrels) were not found to be virus-positive. The pattern of affected raptor species in this three-month period corresponds to that found for HPAI A(H5N1) in Germany in 2006 (Brand et al., 2018). The major exception is the White-tailed Eagle, which tested negative for HPAI A(H5N1) in 2006, but was one of the raptor species most frequently to be found positive for HPAI A(H5N6) in the period February to May 2018. The high proportion of raptors and scavenger cases observed in this reporting period may also be explained by an increase in the proportion of these wild bird species sampled compared with the previous year. Actually this proportion has increased from about 8% to 16% from 2016 to 2017 (see Figure 10), and a similar proportion of raptors out of the total wild birds tested for AIVirus can be expected for 2018.

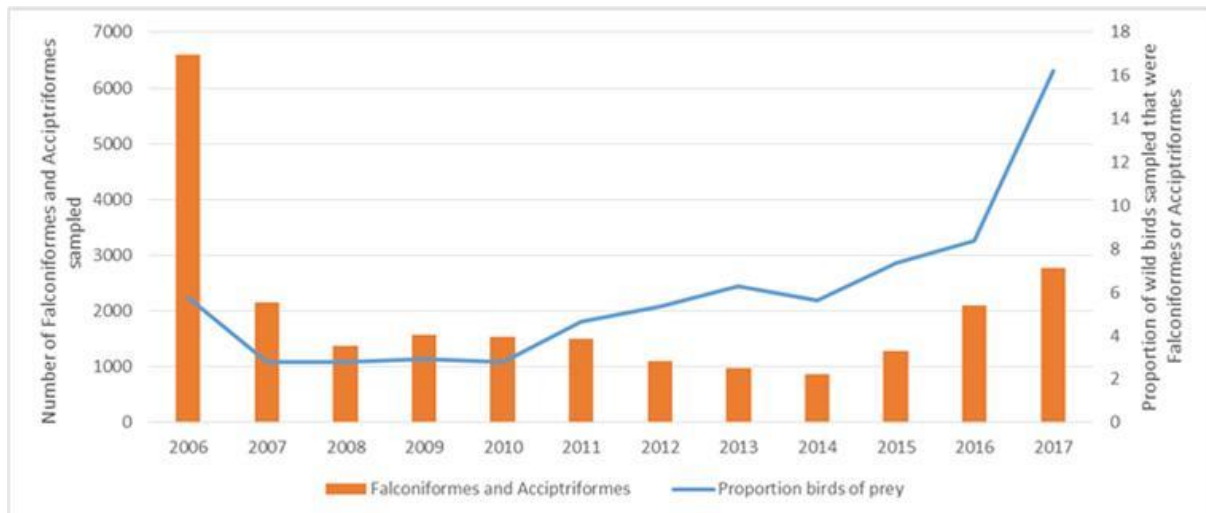


Figure 10: Number and proportion of raptor species sampled in the EU cofounded AI surveillance from 2006 to 2017 (data for 2017 are up to April 2017). All data taken from the EU Avian Influenza surveillance datasets were compiled by the EURL.

Two other findings are noteworthy regarding the mortality of wild birds from HPAI A(H5) in this three-month period, and these are the same as for the previous three-month period (EFSA et al., 2018). First, the vast majority of events involved single dead birds. Second, except for two hooded crows and two common pheasants, all of the species involved were those listed in the revised list of target species for passive surveillance (Table 3 in EFSA et al., 2017a). This indicates that more investigation of unusual events involving single dead birds of target species is important for comprehensive passive surveillance for HPAI A(H5).

A HPAI A(H5N6) event was identified outside the reporting period, it involved a greylag goose (*Anser anser*) found dead on 8 June in the United Kingdom, in the district of Armagh (North Ireland).

4.2.2.1. Information extracted from the scientific literature

In November and December of 2014, the HPAI A(H5N8) GsGd virus (clade 2.3.4.4, Buanlike) was detected in wild birds and poultry in various countries in Asia, Europe, and — for the first time — North America. Van den Brand et al. (2018) performed experimental infections on four key waterbird species — (Eurasian wigeon (*Anas penelope*), common teal (*Anas crecca*), mallard (*Anas platyrhynchos*), and common pochard (*Aythya ferina*)) — in order to determine whether this H5 virus was better adapted to wild birds than an HPAI A(H5N1) GsGd virus (clade 2.2.1) from 2005. For each waterbird species, eight birds were inoculated with 1×10^4 TCID₅₀ virus, and randomly divided into two groups of four birds. One group was euthanised for pathologic examination (histopathology and virus antigen detection in multiple tissues) at 4 days post infection; the other group was monitored for virus excretion by use of cloacal and pharyngeal swabs until 18 days post infection. The results showed that excretion was highest in Eurasian wigeons for the 2014 virus, whereas excretion was highest in common pochards and mallards for the 2005 virus. The 2014 virus infection was subclinical in all four waterbird species, while the 2005 virus caused clinical disease and pathological changes in over 50% of the common pochards. In chickens, the 2014 virus infection caused systemic disease and high mortality, similar to the 2005 virus. In conclusion, the evidence was strongest for Eurasian wigeons as long-distance vectors for HPAI A(H5N8) virus from 2014. The implications of the switch in species-specific virus excretion and decreased disease severity may be that the HPAI H5 virus more easily spreads in the wild waterbird population.

4.2.3. LPAI in domestic birds

From 16 February to 15 May 2018, 15 LPAI outbreaks were notified in the poultry sector in the EU, one in Denmark, 13 in France and one in Italy. Two of the 13 outbreaks reported in France were secondary; one related to an outbreak that occurred in this reporting period and the other related to an outbreak that occurred in late 2017. Information available from the ADNS and the Standing Committee on Plants, Animals, Food and Feed presentations to characterise the LPAI affected holdings is presented in Table 5.

Table 5: Outbreaks of LPAI that occurred in the poultry sector in the EU from 16 February to 15 May 2018 (n=15)

Country	Poultry species	Outbreak type	Surveillance programme	Date of suspicion or sampling	Presence of signs due to LPAI infection	Number of susceptible animals
Denmark	Domestic duck	Primary	Active surveillance	02/05/2018	No	20 900
France	Domestic duck	Primary	Active surveillance	20/02/2018	-	3 600
				27/02/2018	-	6 500
				28/02/2018	-	12 000
				28/02/2018	-	8 500
				01/03/2018	-	10 118
				03/03/2018	-	16 750
				05/03/2018	-	8 160
				07/03/2018	-	7 500
				08/03/2018	-	11 200
			Secondary	Passive surveillance	22/03/2018	Yes*
		Secondary	Outbreak-related surveillance	13/03/2018	-	1 000
	17/04/2018			No	12 240	
	Domestic turkey	Primary	Passive surveillance	22/03/2018	Yes**	8 897
Italy	Mixed	Primary	Active surveillance	22/03/2018	No	1 190
Total						141 555

*Clinical signs in a domestic turkey raised the suspicion of AI infection among other diseases; ducks did not show any sign of disease; both species were sampled and histomonosis was confirmed in the turkey whereas LPAI was confirmed in the ducks.

**Decreased egg production, prostration.

A LPAI A(H5) outbreak was detected on a breeding farm of pheasants for restocking game on 22 May 2018 (outside the reporting period of this report) in Burlov region, Sweden. Animals were tested in accordance with the national surveillance programme and were not showing any clinical signs.

4.2.4. Human cases due to A(H5N8) or A(H5N6) viruses detected in Europe

No transmission of AI viruses A(H5N6) or A(H5N8) viruses to humans has been observed in Europe. Avian influenza A(H5N6) viruses that cause human cases in China are only distantly related to the A(H5N6) viruses detected in Europe.

4.3. Applied prevention and control measures (TOR3)

4.3.1. In Bulgaria

Nine HPAI outbreaks were detected between March and April 2018 in Bulgaria. Awareness was increased by means of regular meetings with poultry and hunting associations and with farmers.

Enhanced control measures were applied at the national level following the identification of the first case, on 2 March, including:

- a housing order for poultry
- a ban on live-bird markets, and exhibitions
- enhanced active surveillance (with a focus on backyards)
- enhanced passive surveillance measures for wild birds
- a ban on restocking of game birds.

A minimum set of biosecurity measures was indicated in the national legislation, aimed at preventing any possible contact (direct and indirect) between poultry and wild birds.

No preventive culling was performed in the period of reference.

Details on the control measures applied in Bulgaria are given in Annex A.

4.3.2. In Italy

Three HPAI outbreaks were detected on poultry holdings from 16 February to 15 May in Italy. Most of the control measures applied in this period were already in force from the previous epidemic wave. These measures were extended accordingly on the detection of A(H5N8) HPAI cases in March 2018.

The further restriction zone (FRZ), approved on 21 November 2017, was extended up to the end of February 2018, in order to regulate the restocking and movement of birds in the most affected area, and to guarantee an increase in the overall biosecurity measures. Measures applied in the FRZ included:

- a census of industrial poultry holdings
- a housing order, to reduce the risk of direct or indirect contact with wild birds
- pre-movement clinical inspection and virological testing
- increased biosecurity measures regarding the vehicles and the personnel entering and exiting farms
- a ban on bird fairs and exhibitions, and on live-bird markets
- a ban on restocking fattening turkey farms; derogations were granted following biosecurity assessments made by the local veterinary authorities.

As indicated in the Provision of the Ministry of Health of 31 January 2018, the FRZ and the measures applied within it were revoked with effects from 1 March 2018.

The Ministerial Provision approved on 19 February 2018 identified the high-risk areas within the most affected regions where specific biosecurity measures had been implemented (as reported in Annex A), aimed at reducing any direct and indirect contacts with wild birds. Identification of high-risk areas accounted for the recent epidemiological situation, risk factors for the introduction of novel HPAI viruses (e.g. the presence of wetlands used as wintering areas by migratory birds, the density of the wild waterfowl population, the location along the main migratory pathways), risk factors for a further spread of HPAIV (density and poultry production categories of holdings), and the outcome of the active surveillance plan. Furthermore, fattening turkey housing was only granted following a positive assessment of biosecurity carried out by the official veterinary services. Due to the occurrence of the three A(H5N8) HPAI cases in March 2018, the application of enhanced biosecurity measures was further extended up to the end of June 2018, by a provision of the Ministry of Health approved on 27 April 2018.

Preventive culling was applied in Italy, after assessing the potential risk of AI spread from a detected outbreak (i.e. location in close proximity to the outbreak, contacts via vehicles, sharing of personnel and equipment).

The last A(H5N8) HPAI case was extinct on 23 March 2018; no further evidence of HPAIV circulation has been detected since then.

Details on the control measures applied in Bulgaria are given in Annex A.

4.3.3. In the Netherlands

The Netherlands experienced two HPAI A(H5N6) outbreaks in the reference period, both occurrences led to the implementation of measures at the local level and at the national level. The latter included a housing order, restriction on movements of poultry and poultry products, and increased biosecurity measures to limit direct and indirect contacts with wild waterfowl and applying more strict hygiene protocols.

The housing order was lifted in April following the results of a risk assessment performed by the Commission of Animal Disease.

Specific arrangements have been put in place with suppliers in order to be able to provide a prompt response in the event of disease notification. In particular, contractors will be able to intervene within four hours of being called by the Dutch government, delivering cleansing and disinfection 24/7.

Awareness was increased by means of publishing information on official government websites, as well as providing official phone centre for questions, and putting communication departments in contact with the press. Meeting with stakeholders and the general public were also held throughout the emergency period.

Details on the control measures applied in the Netherlands are given in Annex B.

4.3.4. In Denmark

After the confirmation of the first HPAI A(H5N6) case in wild bird in Denmark, an awareness campaign started on 1 March 2018. Press releases warned the poultry sector, particularly owners of hobby poultry and non-commercial holdings, that HPAI-infected wild birds had been found and recommended sharpened attention on the implementation of biosecurity measures. The poultry industry was contacted and informed about the finding of several HPAI- infected dead wild birds. The poultry industry informed all their members and focused on the implementation of biosecurity measures.

Details on the control measures applied in Bulgaria are given in Annex A.

4.4. The AI situation on other continents between 16 February and 15 May 2018 (TOR 4)

4.4.1. HPAI A(H5N1)

4.4.1.1. Domestic and wild birds

Detections

From 16 February 2017 to 15 May 2018 outbreaks of the Asian lineage HPAI A(H5N1) in poultry were observed in Africa in a large commercial chicken farm in Togo. Single outbreaks on small poultry farms were reported from Cambodia and Bangladesh. Bhutan and Nepal reported new outbreaks of the Asian lineage HPAIV A(H5N1) in backyard poultry and on a commercial farm. The only wild bird case (house crow *Corvus splendens*) so far in 2018 was reported from northern India in March (see Figure 11).

Since November 2015, the European avian lineage of HPAI A(H5) with three different subtypes (A(H5N1), A(H5N2) and A(H5N9)) emerged in southwestern France and caused severe outbreaks in domestic ducks and domestic geese until March 2017 (Briand et al., 2017).

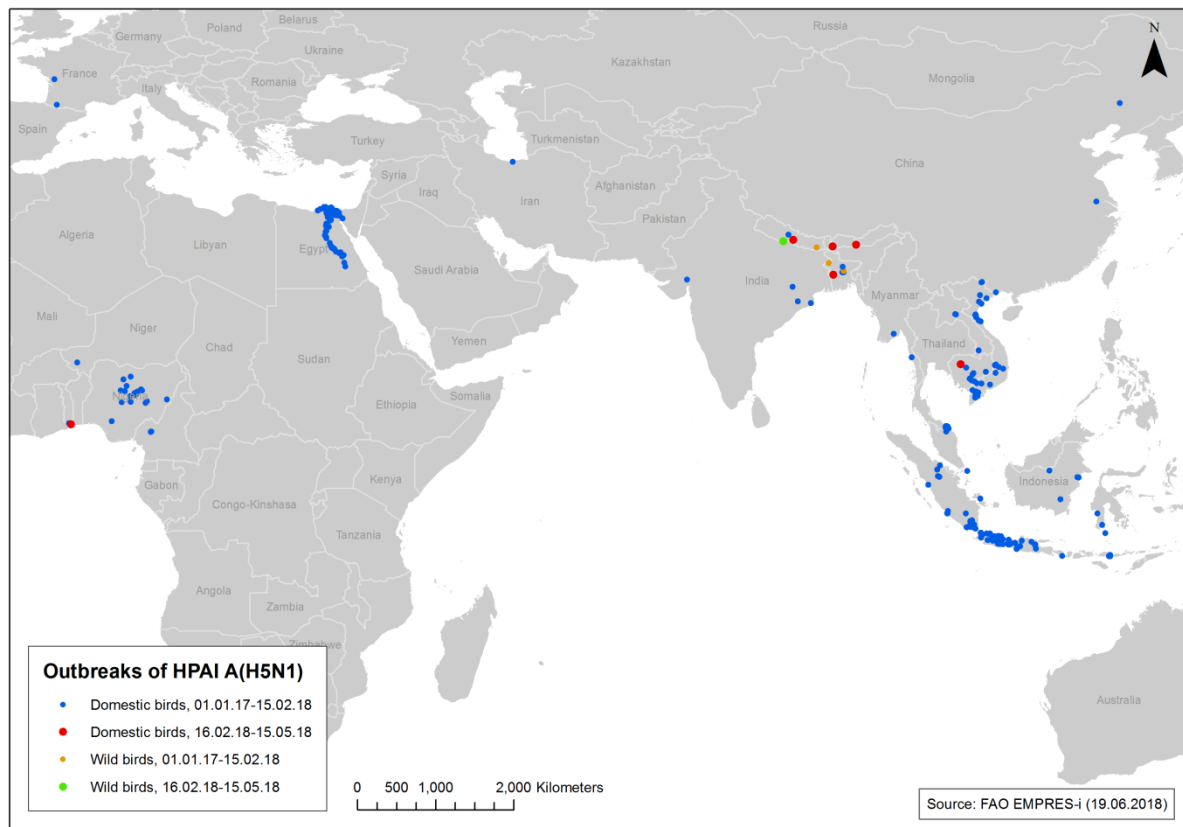


Figure 11: Distribution of confirmed HPAI A(H5N1) outbreaks in birds by place of reporting between 1 January 2017 and 15 May 2018 (FAO, online-a)

Genetic information

Based on satellite tracking data, outbreak locations and phylogenetic analysis of the Asian lineage A(H5N1) clade 2.3.2.1c viruses, it was suggested that whooper swans (*Cygnus cygnus*) might have played a role in the long-distance dissemination of the virus between China and Mongolia (Li S et al., 2018).

Phenotypic characterisation

Northern pintails (*Anas acuta*) infected with an Asian lineage A(H5N1) HPAI clade 2.3.2.1 virus did not develop clinical signs or mortality and the virus was detected only in swabs collected from the oropharynx (cloacal swabs were negative). The infected birds seroconverted. On the other hand, none of the direct and indirect contact birds were found positive by real-time RT-PCR nor had they seroconverted (Kwon JH et al., 2018).

4.4.1.2. A(H5N1) in mammals (excluding humans)

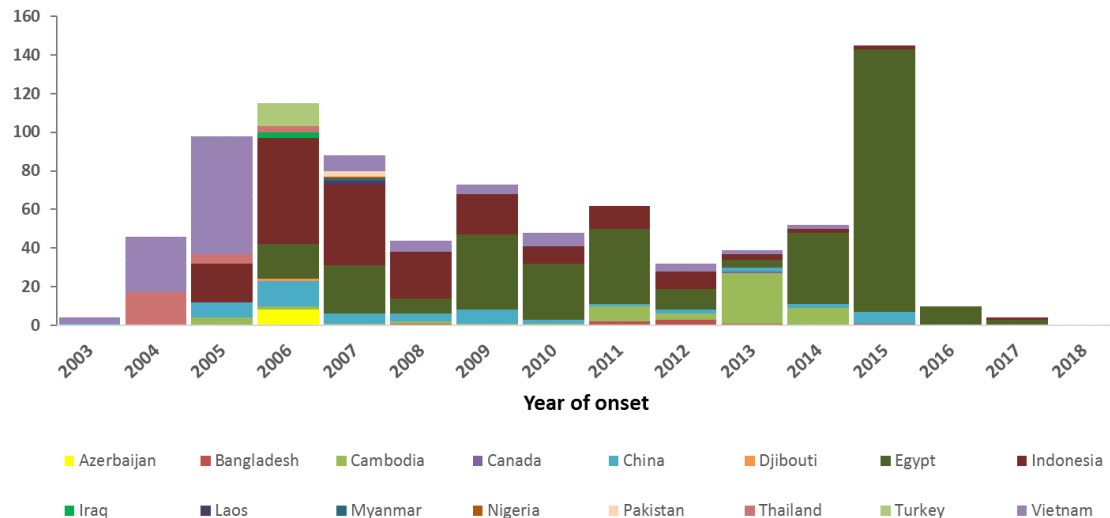
During the circulation of A(H5N1) in the Nigerian poultry population in 2015-2016, 22 out of 129 samples taken from pigs in Nigerian slaughterhouses were shown to be seropositive to A(H5N1) and the human seasonal influenza virus A(H1N1)pdm09 (Meseko et al., 2018). Phylogenetic analysis demonstrated that the detected viruses clustered closely to AI A(H5N1) clade 2.3.2.1c found in poultry in Nigeria and other African countries at that time. This highlights the risk of reassortant events as well as further adaptation processes towards increased transmissibility to mammals of those emerging viruses through close contact of all different species, birds, humans and pigs.

4.4.1.3. Human infections due to A(H5N1)

No new human cases due to AI A(H5N1) have been reported since the last report and within the reporting period (EFSA et al., 2018).

Since 2003 and as of 15 May 2018, 860 laboratory-confirmed cases of human infection with AI A(H5N1) virus, including 454 deaths, have been reported from 16 countries outside the EU/EEA. The latest case was reported in September 2017 by Indonesia (Figure 12).

Number of cases



Source: Data from WHO (CHP, 2018; WHO, 2018a).

Figure 12: Distribution of confirmed human cases of A(H5N1) by country of reporting 2003–2018 (n=860)

4.4.2. HPAI A(H5N6)

4.4.2.1. Domestic and wild birds

Detections

The four genetic groups (a, b, c, d) of clade 2.3.4.4 introduced by Lee et al., (2018) that are not officially designated by WHO, are used in this section to give a better insight on the characteristics of the HPAI viruses A(H5N6) detected in domestic and wild birds.

As mentioned in the previous report (EFSA et al., 2018) two novel HPAI A(H5N6) reassortants are co-circulating in Asia: (1) the zoonotic reassortant belonging to clade 2.3.4.4c which was detected in domestic and wild birds in China, Japan, Myanmar, the Philippines, South Korea, Taiwan and Vietnam, and (2) a reassortant closely associated with clade 2.3.4.4b mainly circulating in Eurasia (Kwon HI et al., 2018; Lee et al., 2018).

In the relevant time period for this report South Korea confirmed three outbreaks of A(H5N6) HPAIV on medium-sized chicken and duck farms as well as one outbreak on a very large chicken farm in Kyonggi-do province. The Chinese authorities reported one new case of the zoonotic reassortant of HPAI A(H5N6), clade 2.3.4.4c, on a duck farm in Guangxi province. Single outbreaks of HPAIV A(H5N6), clade 2.3.4.4c, have also recently been reported from medium-sized poultry farms in Hong Kong Special Administrative Region (SAR) and northern Vietnam (see Figure 13). In the relevant time period only one outbreak in wildbirds was notified by Japan, which affected a great number of large-billed crows (*Corvus macrorhynchos*) in Itami city and Itamisi province in March 2018.

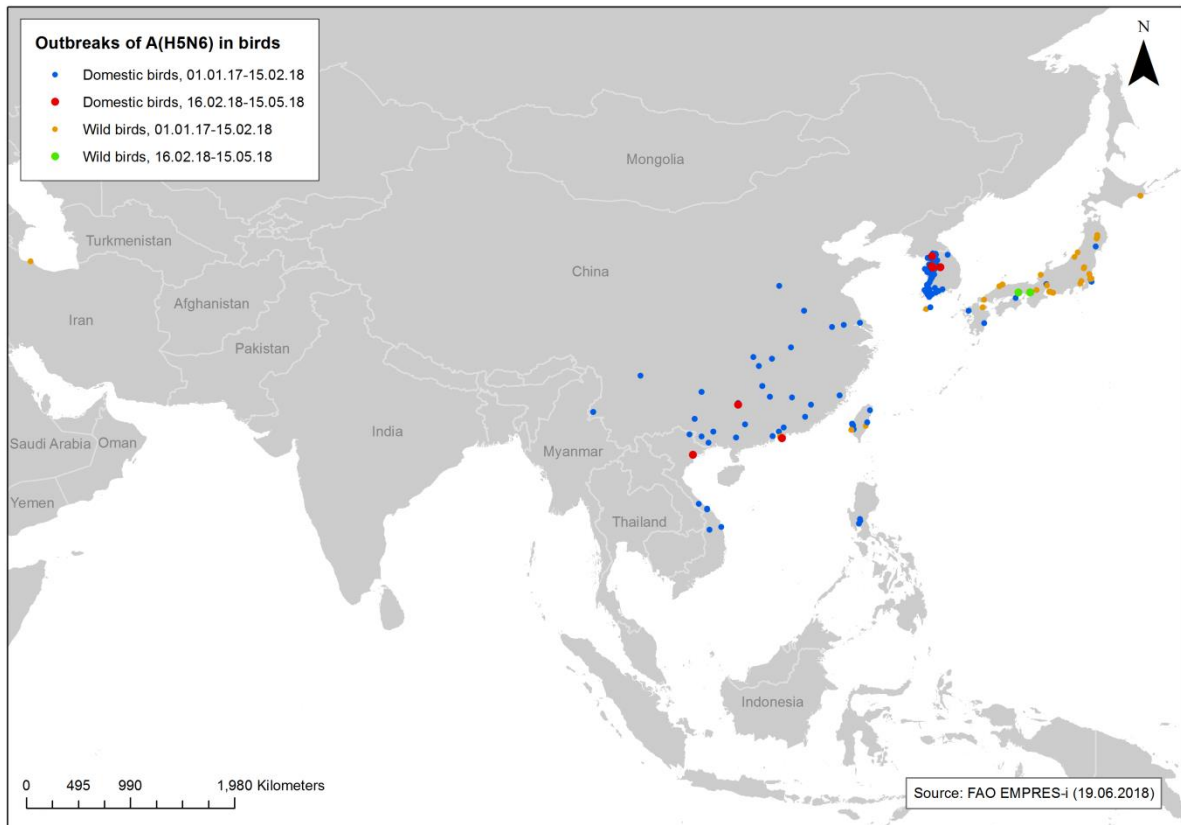


Figure 13: Outbreaks of A(H5N6) HPAIV in birds by place of origin between 1 January 2017 and 15 May 2018 (FAO, online-a)

Genetic characterisation

No new relevant information was published during the reporting period.

Phenotypic characterisation

The intravenous pathogenicity index of an A(H5N6) clade 2.3.4.4 virus detected in South Korea in 2016 was 2.66 (Kwon HI et al., 2018). The same virus inoculated oronasally into susceptible 5-week-old chickens and 4-week-old domestic ducks was highly lethal to both species and exhibited broad tissue dissemination. However, the 50% lethal dose was higher for chickens ($3.2 \log_{10}$) than ducks ($5.5 \log_{10}$).

4.4.2.2. A(H5N6) in mammals (excluding humans)

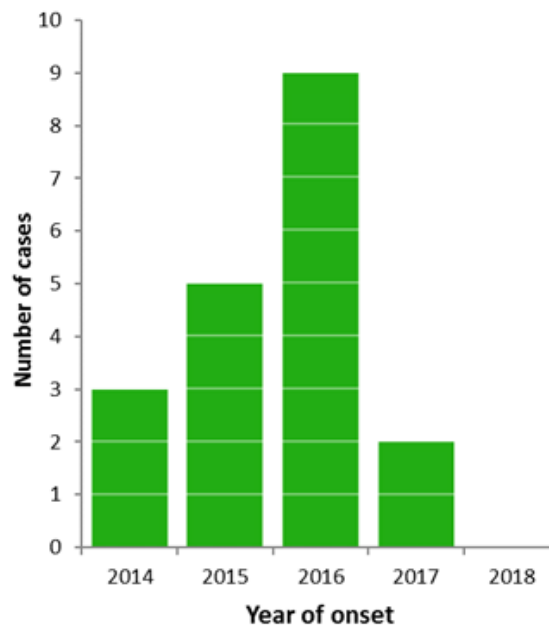
Ferrets inoculated with a Korean A(H5N6) clade 2.3.4.4 virus (derived from an environmental sample from 2016) showed wheezing and sneezing, had elevated body temperature and lost >5% of their body mass. The virus was detected in nasal wash samples, lungs, brain, heart, colon and spleen and was transmitted to co-housed ferrets but not to the respiratory-droplet contact animals (Kwon HI et al., 2018). In another study, a Korean A(H5N6) clade 2.3.4.4 virus (isolated from a mandarin duck in late 2016) was used for another experiment in ferrets (Noh et al., 2018). The animals had slightly increased body temperature but did not show any respiratory symptoms. Low-titer virus excretions from the upper respiratory tract were observed but no transmission to contact ferrets occurred.

4.4.2.3. Human infections due to A(H5N6)

No new human cases due to AI A(H5N6) have been reported since the last report and within the reporting period (EFSA et al., 2018).

Since 2014 and as of 15 May 2018, 19 laboratory-confirmed cases of human infection with AI A(H5N6) virus of clade 2.3.4.4 circulating in Southeast Asia, including six deaths, have been reported

globally (Figure 14). All cases occurred in mainland China. According to an article in 2017, 12 deaths due to A(H5N6) have been reported since 2014 (Jiang et al., 2017a). The latest case was reported in January 2018 with disease onset on 19 December 2017.



Source: Data used from WHO, the Hong Kong Centre for Health Protection of the Department of Health of the Government of Hong Kong SAR and Jiang et al. 2017 (Jiang et al., 2017b; CHP, 2018; WHO, 2018d)

Figure 14: Number of human cases due to A(H5N6), clade 2.3.4.4, infection by year of onset, 2014–2018 (n=19)

H5N6 virus of clade 2.3.4.4 from South Korea showed a higher pathogenicity and viral replication in the upper respiratory tract in ferrets than a H5N8 virus (Kwon HI et al., 2018). H5N6 was transmitted between ferrets through direct contact, whereas H5N8 did not transmit between ferrets. Both viruses had strong α -2,3 sialic acid receptor specificity with low α -2,6 sialic acid receptor specificity indicating an avian receptor preference. Unlike H5N8, the H5N6 virus had a NA stalk deletion and an 80 to 84 residue deletion in the NS1 gene. This study indicates a higher potential for H5N6 than for H5N8 to infect humans.

Experiments with H5Nx viruses of clade 2.3.4.4 suggested that the lack of glycosylation could be involved in the induction of a T160A mutation in the HA protein, which exhibits binding to the α -2,3 and α -2,6 receptors (Gao et al., 2018).

4.4.3. HPAI A(H5N8)

4.4.3.1. Domestic and wild birds

Detections

The four genetic groups (a, b, c, d) of clade 2.3.4.4 introduced by Lee et al., (2018) that are not officially designated by WHO are used in this section to give a better insight on the characteristics of the HPAI viruses A(H5N6) detected in domestic and wild birds.

Between 16 February and 15 May 2018 HPAI A(H5N8) clade 2.3.4.4b was detected on one ostrich and two poultry farms in South Africa. Furthermore, the national authorities in South Africa notified outbreaks on three farms with captive wild birds in North-West province (swans) and Limpopo national park (Anatidae). In the Eastern and Western Cape province HPAI A(H5N8) was also detected in cape cormorant (*Phalacrocorax capensis*), spotted eagle-owl (*Bubo africanus*), Hartlaub's gull (*Chroicocephalus hartlaubi*), greater crested tern (*Thalasseus bergii*), African black oystercatcher

(*Haematopus moquini*) and common tern (*Sterna hirundo*) in the relevant time period (see Figure 15). The latter, the common tern is a strongly long-distance migrating seabird breeding in temperate and subarctic regions of Europe, Asia and North America (Avibirds, online).

Since November 2017 Iraq and Saudi Arabia were hit by a wave of outbreaks of HPAI A(H5N8) clade 2.3.4.4b on medium-sized to very large poultry farms. In the relevant time period the outbreaks continued to evolve and underreporting is suspected.

No outbreaks of HPAI A(H5N8) in poultry or wild birds were reported from China, Japan, the Korean Peninsula or South-east Asia (see Figure 15 and Figure 16).

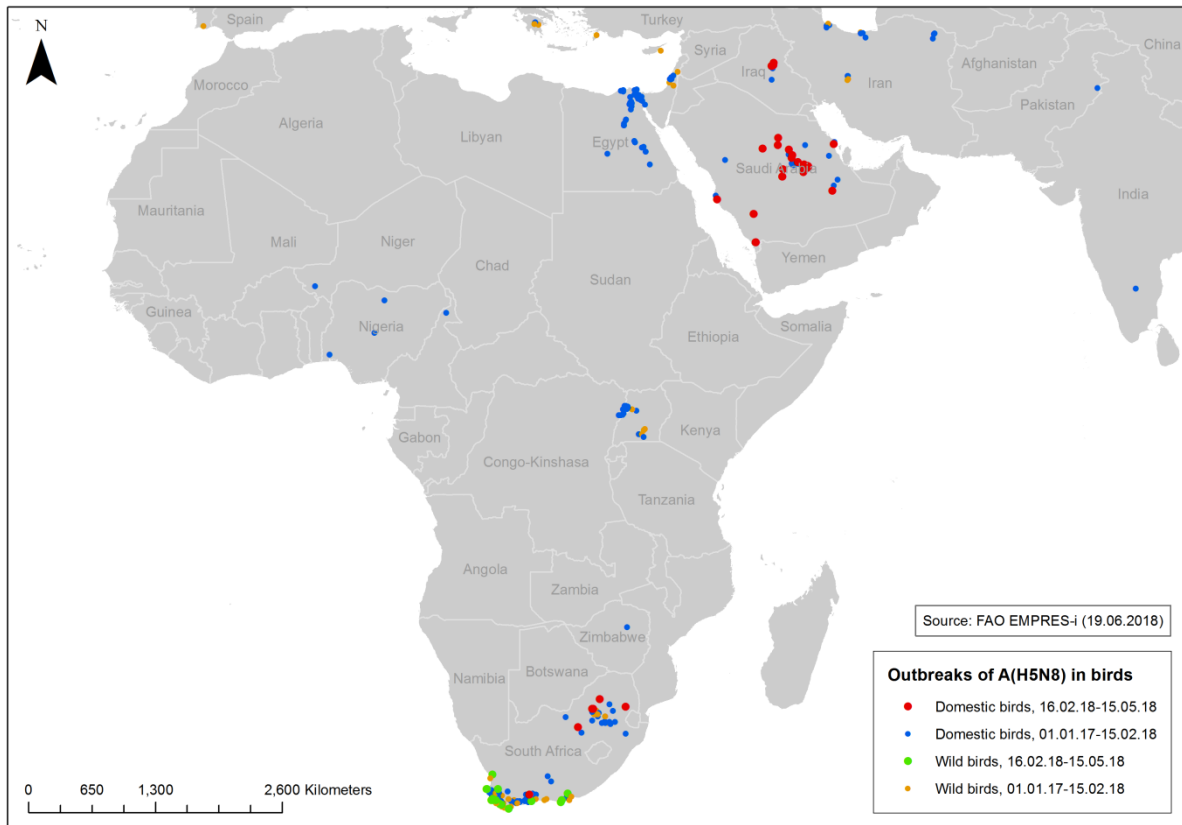


Figure 15: Distribution of confirmed HPAI A(H5N8) outbreaks in birds by place of reporting in Africa and the Middle East between 1 January 2017 and 15 May 2018 (FAO, online-a)

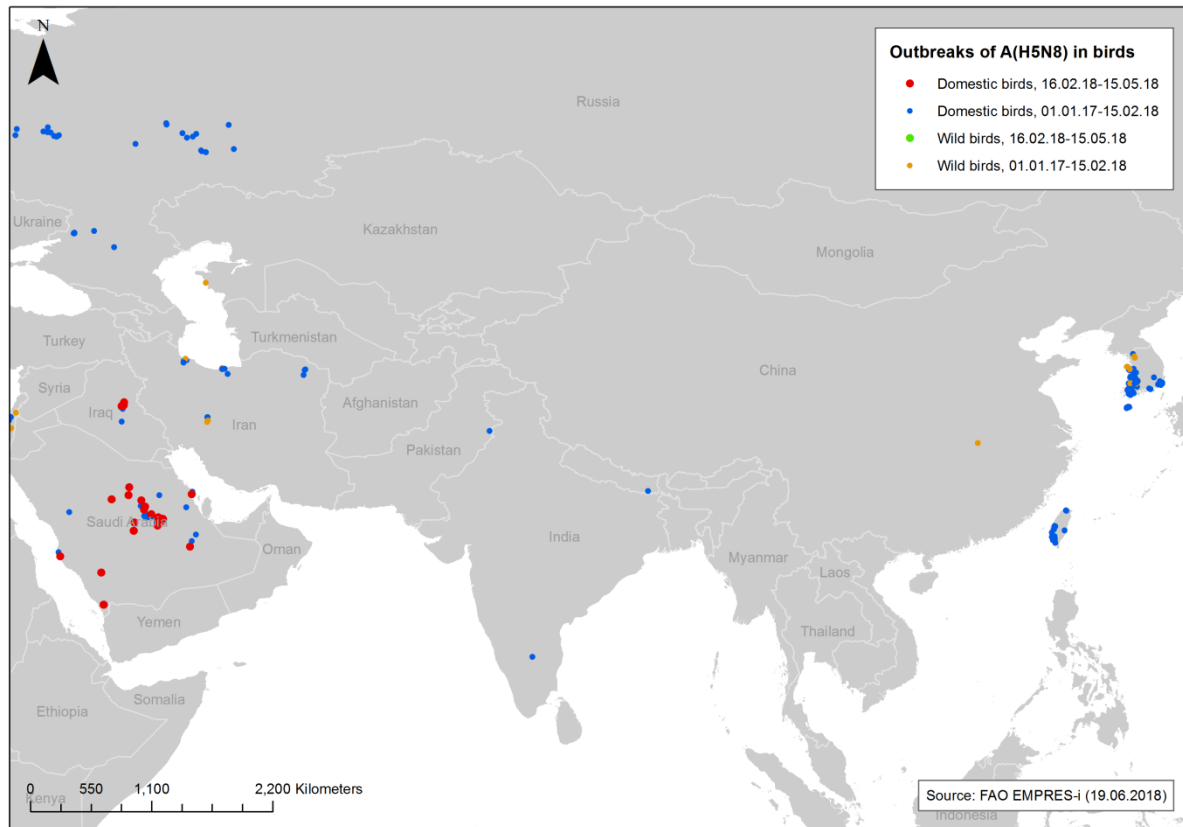


Figure 16: Distribution of confirmed HPAI A(H5N8) outbreaks in birds by place of reporting in Asia and the Middle East between 1 January 2017 and 15 May 2018 (FAO, online-a)

Genetic characterisation

Phylogenetic analysis of A(H5N8) clade 2.3.4.4b viruses detected in Egypt in February–March 2017 demonstrated the existence of at least four different genotypes (Salaheldin et al., 2018). Some of the genome segments of the characterized viruses shared a high homology with A(H5N8) viruses identified in Europe during the epidemic in 2016/2017 while other segments were most similar to AI virus of various subtypes detected in central and east Asia (Bangladesh, India, China).

Phenotypic characterisation

Field observations of HPAI A(H5N8) clade 2.3.4.4 in hybrid ducks (breeding Muscovy duck male with Pekin duck female) in Egypt in 2017 revealed lethargy, tremors and torticollis (Anis et al., 2018). At necropsy, petechial hemorrhages on the surface of the cerebellum, swelling of the cerebellum and multifocal areas of necrosis in the pancreas were found.

An A(H5N8) clade 2.3.4.4 virus isolated from a common teal in South Korea in 2017 was used to inoculate chickens and ducks (Kwon HI et al., 2018). The virus caused high mortality and systemic replication in 5-week-old specific-pathogen-free chickens but no apparent clinical illness in 4-week-old domestic ducks. The 50% lethal dose in chickens was 4.7.

Northern pintails (*Anas acuta*) experimentally infected with an A(H5N8) clade 2.3.4.4a remained healthy but shed the virus via oral cavity and cloaca (higher amounts from the oropharynx). The virus was transmitted to contact-exposed and indirectly-exposed birds. All the birds seroconverted (Kwon JH et al., 2018). The virus replicated and was transmitted more efficiently than the A(H5N1) clade 2.3.2.1 used in the parallel experimental study.

4.4.3.2. A(H5N8) in mammals (excluding humans)

A wild-bird-origin A(H5N8) virus detected in 2017 in South Korea (clade 2.3.4.4b) was used for experimental infection of ferrets (Kwon HI et al., 2018). The virus caused only moderate increase in

body temperature, slight weight loss and mild lethargy in infected animals and was detected in nasal wash samples 1–5 days post infection. There was no evidence of virus transmission to direct- and indirect-contact ferrets.

4.4.4. Human infection due to A(H7N4)

No human cases have been reported during the reporting period.

One human case was detected in China in February 2018 as described by World Health Organization (WHO) and in the previous report (EFSA et al., 2018; WHO, 2018b, c).

4.4.5. HPAI-LPAI A(H7N9)

4.4.5.1. Domestic and wild birds

Detection

Between 16 February and 15 May 2018, the Chinese authorities reported the detection of four HPAI A(H7N9) and four LPAI A(H7N9) positive samples from chicken and ducks farms. Two HPAI outbreaks were reported from medium-sized chicken farms in Ningxia Hui Autonomous Region in April. Two further outbreaks were detected on chicken farms in the neighbouring Shaanxi Sheng region in February and March 2018. The investigation of 132 771 virology samples collected from 28 provinces tested positive for LPAI A(H7N9) in four cases. The LPAIV was identified in Anhui, Fujian and Hubei province (see Figure 17, Figure 18 and Figure 19) (FAO, online-a; MoA, online). No LPAI or HPAI A(H7N9) were detected in wild birds during the relevant time period of this report. The results of the surveillance campaigns are published monthly by the Chinese Ministry of Agriculture (MoA, online) and are also available on the EMPRES-i website of the Food and Agriculture Organization (FAO) (FAO, online-a). Furthermore, the Chinese Ministry of Agriculture published in April 2018 that 91.26% of poultry samples, taken after the vaccination campaigns in 28 provinces, achieved the required immunity level (MoA, online). The nationwide A(H7N9) vaccination campaigns of poultry, with the exception of poultry in AI-free zones and export farms, started extensively in September 2017 (FAO, online-b).

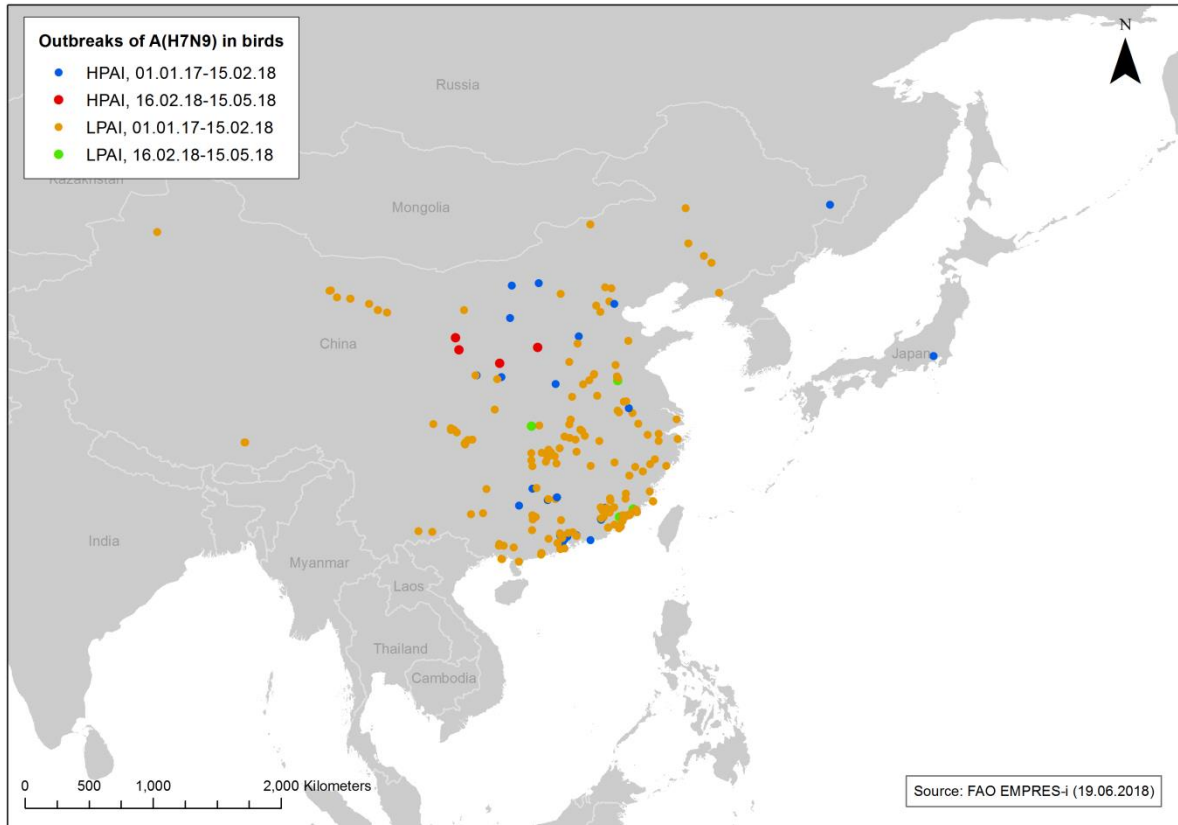


Figure 17: Distribution of confirmed LPAIV and HPAIV A(H7N9) in birds and environmental samples by place of reporting between 1 January 2017 and 15 May 2018 (FAO, online-a)

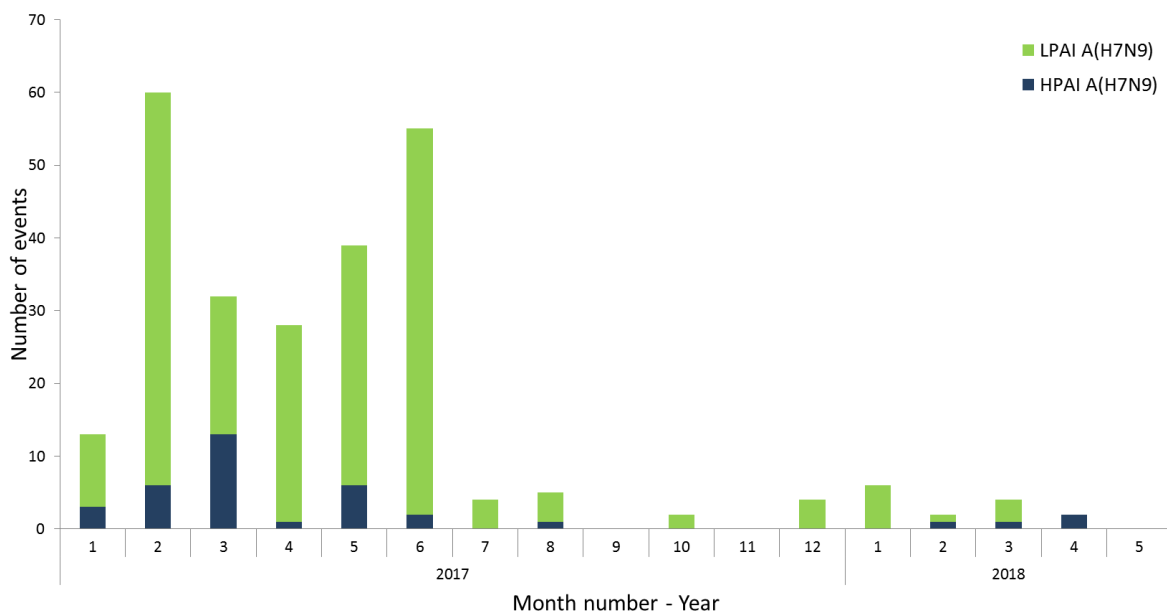


Figure 18: Number of confirmed LPAI and HPAI A(H7N9) events in birds and of contaminated environmental samples in China since January 2017 (status: 17.05.2018)

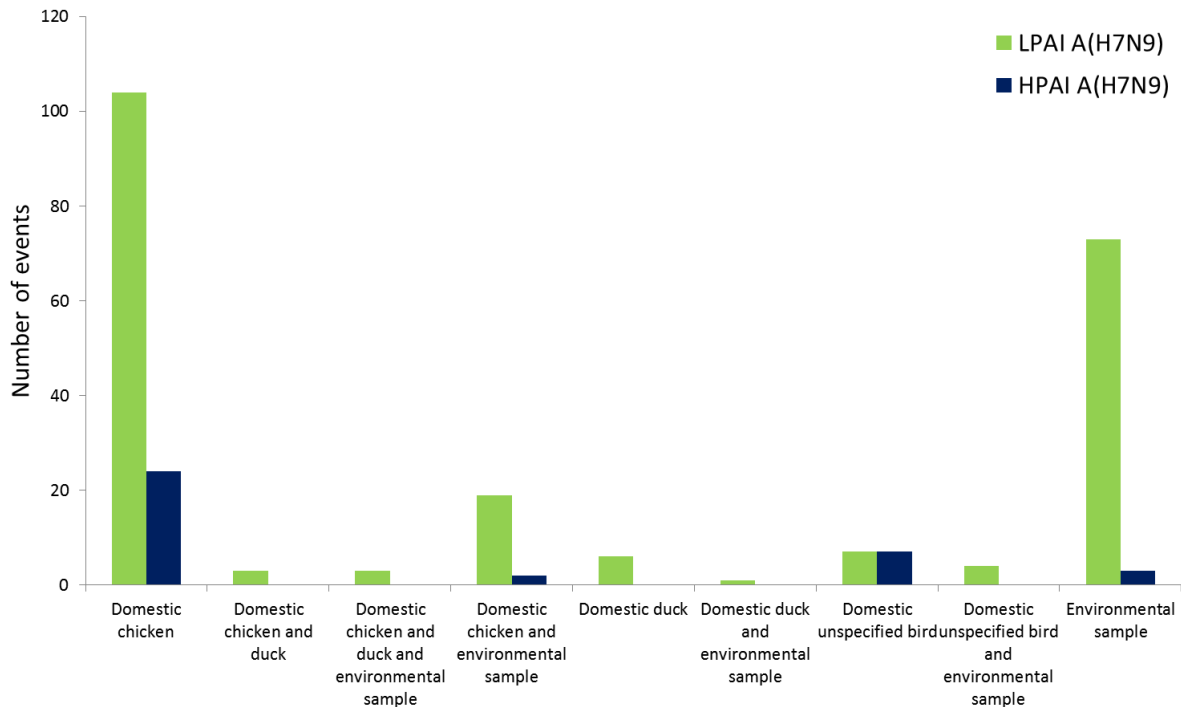


Figure 19: Number of confirmed LPAI and HPAI A(H7N9) events by species and of contaminated environmental sample type in China since January 2017 (status: 17.05.2018)

Phenotypic characterisation

Experimental infection of turkeys with the A/Anhui/1/13 H7N9 LPAI virus resulted in morbidity, systemic dissemination and efficient transmission combined with high mortality in contact turkeys (Slomka et al., 2018). Although an increase of the intravenous pathogenicity index measured in chickens from 0.0 to 0.39 was noted in the passaged isolate, the score was still below the value of 1.2 thus indicating LPAIV phenotype based on virulence criteria for chickens. The passaged virus acquired mutation L235Q in the haemagglutinin gene indicative of a reversion from a human to avian receptor binding. The authors explained the multi-organ tropism and high mortality of the LPAIV A(H7N9) in turkeys by the possible (not yet investigated) broader occurrence and distribution of α 2,3 receptors in the organs of turkeys in comparison to chickens, for which the virus retained low pathogenicity.

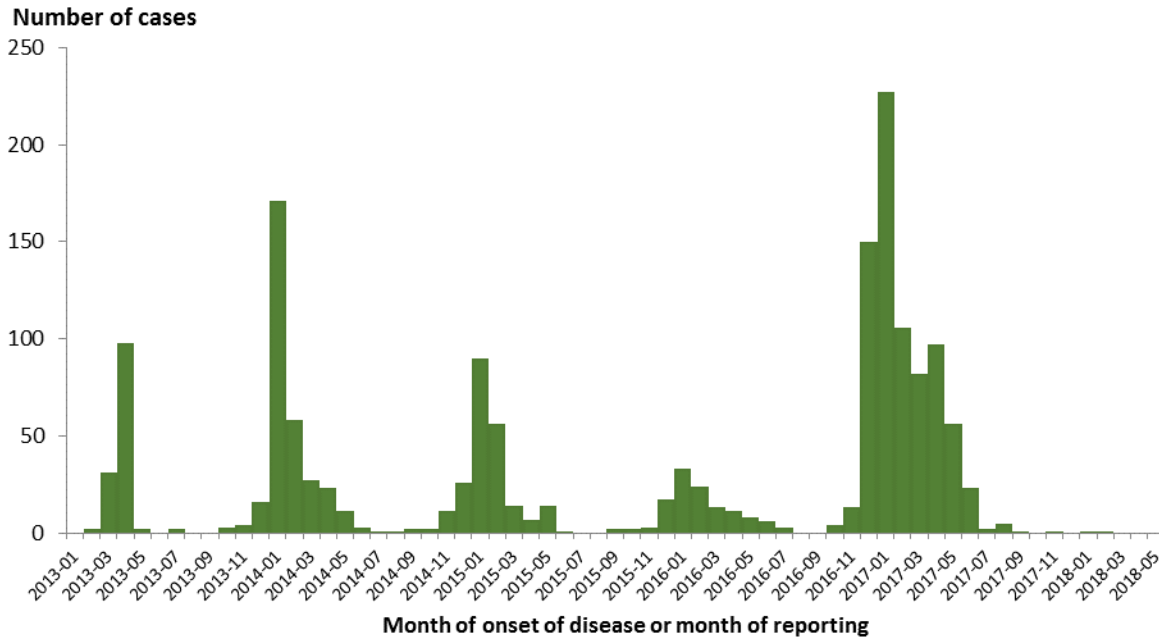
Genetic characterisation

Yao et al. (2018) reported on the first isolation and genetic characterization of an A(H7N9) virus from a magpie robin (*Copsychus saularis*) in China thus adding this species to the list of passerines susceptible to the A(H7N9) virus infection. The virus shared common ancestry with poultry viruses circulating in Jiangxi province around June 2014.

4.4.5.2. Human infections due to A(H7N9)

No additional human cases have been reported since the last report in March 2018 (EFSA et al., 2018; WHO, 2018c).

The total number of human cases since February 2013 remains at 1,567, all outside of Europe, including 569 with fatal outcome (WHO, 2018c); see Figure 20 and Table 6). According to the Chinese National Influenza Center (2018), 32 human cases have been infected with HPAI A(H7N9).



Source: Data from WHO (WHO, 2017a; CHP, 2018).

Figure 20: Distribution of confirmed human cases of A(H7N9) by month of onset of disease or month of reporting, February 2013 – 15 May 2018 (n= 1 567)

Table 6: Number of reported human cases and fatalities due to A(H7N9) infection up to 15 May 2018

	First wave (02/2013– 09/2013)	Second wave (10/2013– 09/2014)	Third wave (10/2014– 09/2015)	Fourth wave (09/2015– 10/2016)	Fifth wave (10/2016– 10/2017)	Sixth wave (10/2017– 05/2018)	Cumulative number of cases
Cases	135	320	223	120	766	3	1 567
Deaths	43	134	98	45	248	1	569
CFR (%)	32%	42%	44%	38%	32%	33%	36%

Source: Data from WHO (WHO, 2018c).

A report of a patient infected with HPAI A(H7N9) in Shaanxi, China in May 2017 supported the notion of a westward spread of the infection as well as the key role of poultry trade in driving the geographic distribution of the virus (Yang et al., 2018). The influence of weather conditions was investigated for the time period 2013–2016 (Liu et al., 2018). The risk of infection increased on cold-dry days with risk-associated temperatures and vapour pressures differing between the north (0-18C, 313mb) and south of China (7-21C, 3-17mb).

The genetic diversity of A(H7N9) viruses in China increased after emergence and during the first three waves but decreased in the recent waves indicating a more stable situation. It was during these more recent waves, however, that most human infections occurred (Zhu et al., 2018), possibly due at least in part to differences in gene composition. Genetic variability has also been observed in human patients infected with A(H7N9) viruses (Zou et al., 2018). However, it is not fully understood how high polymorphism and variation within different viral genes contributed to disease progression and severity overall.

A recurrent study describes a potential family cluster of A(H7N9) infection in China in 2016 (Wang J et al., 2018). A likely transmission occurred from the father to his daughter through close contact. Virological analyses identified nearly identical sequence data with three amino acid mutations in the HA protein that might have increased the binding affinity for the human receptor.

A retrospective study of hospitalised patients infected with A(H7N9) between 2013 and 2017 looked at the impact of treatment with neuraminidase inhibitors on virus shedding showed that RNA shedding was shorter in survivors than patients with fatal outcome (Wang Y et al., 2018). Corticosteroid administration and delayed antiviral treatment were associated with prolonged viral shedding.

4.4.6. LPAI A(H9N2)

4.4.6.1. Domestic and wild birds

Detection

As mentioned in the previous reports, A(H9N2) is the most commonly detected non-notifiable subtype of influenza viruses in poultry in Asia, the Middle East and North Africa. The endemic status of these regions continued between 16 February 2018 and 15 May 2018.

Phenotypic characterisation

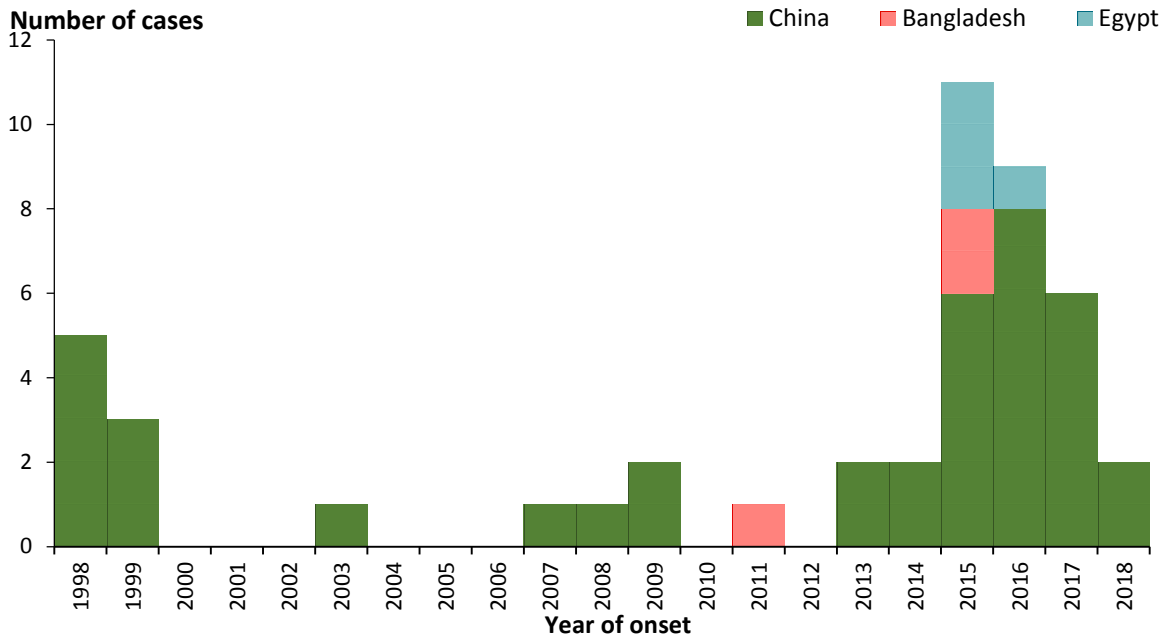
No new relevant information has been published during the reporting period.

Genetic characterisation

The genetic composition of an A(H9N2) virus isolated from a dove in China in 2014 revealed that the virus was generated through reassortment between G1-like and F98-like A(H9N2) viruses (Li D et al., 2018).

4.4.6.2. Human infections due to A(H9N2)

Since 1998 and as of 15 May 2018, 46 laboratory-confirmed cases of human infection with AI A(H9N2) virus, including one death, have been reported globally. These are three additional cases than those reported in the previous report (EFSA et al., 2018). Cases occurred in China (39), Egypt (4) and Bangladesh (3) (Figure 21). The latest case was reported in February 2018 from China (WHO, 2018c).



Source: WHO (WHO, 2018c)

Figure 21: Distribution of confirmed human cases of A(H9N2) by country of reporting, 1998 – 15 May 2018 (n=46)

4.4.7. Scientific analysis of AI spread from non-EU countries to poultry in the EU

In comparison with the last report (EFSA et al., 2018), Sections 4.4.1–4.4.6 showed for the time period of this report (16 February to 15 May 2018) the continuation of the epidemic in poultry and wild birds in Asia, southern Africa and in particular the Middle East. Several single outbreaks of clade 2.3.2.1c, A(H5N1), were reported from Asia, but only one outbreak was notified Africa – from Togo – in the reporting period. In contrast, several clade 2.3.4.4b, A(H5N8), outbreaks were notified from South Africa, and an increasing number of new outbreaks were detected in the Middle East, particularly in Saudi Arabia. As discussed in the last report, no introduction from Africa or the Middle East to Europe has yet been observed, despite the endemic presence of A(H5N1) and A(H5N8) viruses in Africa and in the Middle East. Therefore, it is estimated that the probability of entering the EU via this route is lower than the north-eastern route, but uncertainty remains high and close monitoring of the situation is required (EFSA AHAW Panel et al., 2017). Therefore, it is suggested that long-distance migrating wild birds from southern Africa, e.g. common tern (*Sterna hirundo*), are included in targeted active and passive surveillance schemes at a few priority locations in Europe (EFSA AHAW Panel et al., 2017). Outbreaks of novel zoonotic reassortant HPAI A(H5N6) belonging to clade 2.3.4.4c and HPAI A(H5N6) closely associated with clade 2.3.4.4b in poultry and wild birds are still confined to Asia. But the reassortant closely associated with clade 2.3.4.4b was also detected in migratory wild birds in South Korea and demonstrates that the continued circulation of this lineage in multiple geographical regions is likely mediated by wild bird spread. There is considerable uncertainty regarding the real geographical distribution of these viruses. Further, during the relevant period for this report, A(H7N9) and A(H5N1) viruses have not been detected on a large scale in wild waterfowl. Constant monitoring is warranted, despite the low risk associated with the incursion of these subtypes by means of wild birds due to the high degree of adaptation to gallinaceous poultry species.

The environmental stability of AI viruses will likely decrease with the higher temperatures and increased ultraviolet radiation in spring and summer, but possible incursion from contaminated environment into poultry holdings cannot be excluded due to the presence of HPAIV in the wild bird populations.

As mentioned in the last reports, there are several possible pathways through which AI viruses can be brought into the EU, including trade and illegal movements of poultry and poultry products, contaminated fomites and wild birds. Nevertheless the risk of AI viruses being transported to Europe through poultry trade is negligible as live poultry, day-old chicks and semen have been identified as the only non-wild bird pathways via which AI virus introduction is non-negligible and suitable risk management measures are in place, such as testing and quarantine (EFSA AHAW Panel et al., 2017). EU legislation (Regulation (EC) No 798/2008²) prohibits the importation of live poultry, day-old chicks and hatching eggs and other birds (captive birds such as parrots, finches and other ornamental birds for trade) from countries which cannot provide suitable health guarantees to comply with the required certification. The list of approved countries is therefore limited (for reference see Table F5 of Appendix F in EFSA AHAW Panel et al. (2017)). Furthermore, illegal movement of captive birds (passerines in particular) is a viable pathway for spread of the viruses, notably A(H5Nx), but the risk is difficult to assess due to the paucity of data.

4.4.8. Surveillance and diagnosis of human infections and public health measures for prevention and control

4.4.8.1. Surveillance in the EU

As outlined in the previous report (EFSA et al., 2018), human infections with zoonotic and other novel influenza strains are notifiable under EU legislation³ and the International Health Regulations (IHR) through the Early Warning and Response System and the IHR notification system (WHO, 2016).

Diagnosis

Routine laboratory diagnostics were described in the previous report (EFSA et al., 2018). All influenza A virus isolates or clinical samples that cannot be subtyped are to be submitted to the appropriate national reference laboratory (National Influenza Centres; NICs), and to a WHO Collaborating Centre for Reference and Research on Influenza for characterisation (WHO, 2017b). Influenza virus sharing is coordinated by the WHO Global Influenza Surveillance and Response System (GISRS) (WHO, online).

4.4.8.2. Options for public health control measures (in relation to the EU)

Options for public health control measures remain the same as outlined in the previous report and should follow the national guidelines and recommendations (EFSA et al., 2018).

Vaccines

Available and recommended vaccines or candidate vaccine viruses were described in the previous report (EFSA et al., 2018).

4.4.9. ECDC risk assessment for the general public in the EU

The risk of zoonotic influenza transmission to the general public in EU/EEA countries is considered to remain very low. The number of outbreaks due to AI viruses or detections of infected wild birds has been decreasing over the last few months. Monitoring and testing of wild birds and poultry in the EU is important in detecting further virus spread among birds, and reducing the possible risk of exposure of humans to infected birds. As the likelihood of zoonotic transmission of newly introduced or emerging reassortant AI viruses is unknown, the use of personal protective measures for people being exposed to avian influenza viruses will minimise the remaining risk.

The risk of travel-related importation of human cases due to AI particularly from Asia is low. Currently a very low number of human cases are reported from China and other countries in South-east Asia. This indicates a low level of virus circulation, e.g. of A(H7N9) viruses in poultry markets and the environment.

² Commission Regulation (EC) No 798/2008 of 8 August 2008 laying down a list of third countries, territories, zones or compartments from which poultry and poultry products may be imported into and transit through the Community and the veterinary certification requirements. OJ L 226, 23.8.2008, p. 1–94.

³ Decision No 1082/2013/EU of the European Parliament and of the Council of 22 October 2013 on serious cross-border threats to health and repealing Decision No 2119/98/EC. OJ L 293, 5.11.2013, p. 1–15.

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Abbreviations

ADNS	Animal Disease Notification System
AI	Avian Influenza
DPPA	Densely populated poultry area
EC	European Commission
ECDC	European Centre for Disease Prevention and Control
EFSA	European Food Safety Authority
EURL	European Reference Laboratory for Avian Influenza
FAO	Food and Agriculture Organization
FRZ	Further restriction zone
HPAI	Highly pathogenic avian influenza
IHR	International Health Regulations
LPAI	Low pathogenic avian influenza
OIE	World Organisation for Animal Health
PAFF	Plants, animals, food and feed
PZ	Protection zone
SAR	Special Administrative Region
SZ	Surveillance zone
TOR	Terms of reference
WHO	World Health Organization

Appendix A –Term of references

A.1. Background and terms of reference as provided by the requestor

Avian influenza is an infectious viral disease in birds, including domestic poultry. Infections with avian influenza viruses in poultry cause two main forms of that disease that are distinguished by their virulence. The low pathogenic (LPAI) form generally only causes mild symptoms, while the highly pathogenic (HPAI) form results in very high mortality rates in most poultry species. That disease may have a severe impact on the profitability of poultry farming.

Avian influenza is mainly found in birds, but under certain circumstances infections can also occur in humans even though the risk is generally very low.

More than a decade ago, it was discovered that virus acquired the capability to be carried by wild birds over long distances. This occurred for the HPAI of the subtype A(H5N1) from South East and Far East Asia to other parts of Asia, Europe and Africa as well as to North America. In the current epidemic the extent of the wild bird involvement in the epidemiology of the disease is exceptional.

Since late October 2016 up to early February 2017, highly pathogenic avian influenza (HPAI) of the subtype A(H5N8) has been detected in wild migratory birds or captive birds on the territory of 21 Member States, namely Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and the United Kingdom. In 17 Member States the virus has spilled over to poultry holdings leading also to lateral spread between holdings in a few Member States, in particular in those with a high density of duck and geese holdings where the poultry cannot sufficiently be protected against contacts with wild birds. A second HP AI subtype A(H5N5) has been detected in wild birds and recently also in poultry holdings in Germany.

The number of infected migratory wild birds found dead and the geographical extent of these findings are posing an immense threat for virus introduction into poultry or captive birds holdings as demonstrated by the high number of outbreaks (~700 as of 08/02/2017).

In the event of an outbreak of avian influenza, there is a risk that the disease agent might spread to other holdings where poultry or other captive birds are kept. As a result it may spread from one Member State to other Member States or to third countries through trade in live birds or their products.

There is knowledge, legislation⁴, technical and financial tools in the EU to effectively deal with outbreaks of avian influenza in poultry and captive birds. However, the very wide virus spread by wild birds and the increased risk of direct or indirect virus introduction into poultry or captive bird holdings has led to the largest HPAI epidemic in the EU so far. This situation calls for a reflection and evaluation how preparedness, risk assessment, early detection and control measures could be improved.

The Commission and Member States are therefore in need of an epidemiological analysis based on the data collected from the disease affected Member States. The use of the EFSA Data Collection Framework is encouraged given it promotes the harmonisation of data collection. Any data that is available from neighbouring third countries should be used as well, if relevant.

Therefore, in the context of Article 31 of Regulation (EC) No. 178/2002⁵, EFSA should provide the technical and scientific assistance to the Commission based on the following Terms of Reference:

⁴ Council Directive 2005/94/EC of 20 December 2005 on Community measures for the control of avian influenza and repealing Directive 92/40/EEC. OJ L 10, 14.1.2006, p. 16.

⁵ Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. OJ L 31, 1.2.2002, p. 1–24.

1. Analyse the epidemiological data on highly pathogenic avian influenza (HPAI) and low pathogenic avian influenza (LPAI), where co-circulating or linked within the same epidemic, from HPAI disease affected Member States.
2. Analyse the temporal and spatial pattern of HPAI and LPAI as appropriate in poultry, captive birds and wild birds, as well the risk factors involved in the occurrence, spread and persistence of the HPAI virus in and at the interface of these avian populations.
3. Based on the findings from the points above, describe the effect of prevention and control measures.
4. Provide for regular quarterly reports updating on the avian influenza situation within the Union and worldwide, in particular with a view to describe the evolution of virus spread from certain regions towards the EU. In case of significant changes in the epidemiology of avian influenza, these reports could be needed more frequently. These reports should in particular closely follow the developments of zoonotic avian influenza viruses (such as HPAI A(H5N6) and LPAI A(H7N9)) in collaboration with the European Centre for Disease Prevention and Control (ECDC).

A.2. Interpretation of the terms of reference

In reply to TOR 1 and 2, this scientific report gives an overview of the HPAI and LPAI outbreaks in poultry and captive birds as well as the HPAI events in wild birds detected in Europe between 16 February and 15 May 2018, mainly based on data submitted by Member States and neighbouring countries via ADNS. Member States where HPAI outbreaks occurred in poultry submitted additional epidemiological data to EFSA, which have been used to analyse the characteristics of poultry holdings affected between 16 February and 15 May 2018.

It was not possible to collect data for a risk factor analysis on the occurrence and persistence of HPAIV within the EU. Risk factor analysis requires not only case-related information, but also data on the susceptible population (e.g. location of holdings, population structure, etc.), which should be collected in a harmonised manner across the EU. Limitations in the performed data collection, reporting and analysis were reported in the first avian influenza overview report (EFSA et al., 2017b).

A description of the applied prevention and control measures (TOR3) is given based on case reports provided by representatives from Bulgaria, Italy, the Netherlands and Denmark and attached as Annex A to this report. The main topics covered are increasing awareness, release and repeal of housing order, strengthening biosecurity, preventive culling, and implementation of regional stand still, hunting and derogations from restriction zone implementation after a risk assessment.

The monitoring of the avian influenza situation on other continents (TOR 4) focuses on HPAI A(H5N1), HPAI A(H5N6), HPAI A(H5N8), A(H7N4), HPAI/LPAI A(H7N9) and LPAI A(H9N2). Background and epidemiology, detections, phenotypic and genetic characterisations are described based on information from confirmed human and poultry cases as well as wild bird events between 16 February and 15 May 2018. Possible actions for preparedness in the EU are discussed.

The report mainly describes information that became available since the publication of the previous report (EFSA et al., 2018) and that might affect the interpretation of risks related to avian influenza introduction and/or spread in Europe.

Appendix B –Data and methodologies

B.1. Data on animals

B.1.1. Overview of avian influenza outbreaks in Europe (TOR 1 and TOR 2)

The data on the avian influenza outbreaks occurred from 16 February to 15 May 2018 submitted by member States to the ADNS (European Commission, online-b) were taken into account for this report. In addition, Bulgaria, Italy, the Netherlands and Germany were asked to provide more detailed epidemiological data (see Table A.1, Appendix A in EFSA et al., 2017a) directly to EFSA on the AI outbreaks that occurred during the same period. The data model is the same used for data collecting of the previous report (EFSA et al., 2018). The collection of data was carried out by exchanging Excel files via email to the representative appointed by the Member States. Germany provided additional information only on the size of the affected domestic birds by species kept and on the detection of increased mortality due to avian influenza infection in the outbreak.

The slide presentations, which EU Member States affected by HPAI and LPAI presented to the Standing Committee on Plants, Animals, Food and Feed (SCOPEFF Committee), were consulted to extract relevant information reported in Sections 4.2.1, 4.2.2 and 4.2.3. The PDFs of these slide presentations are available on the European Commission website (European Commission, online-a).

B.1.1.1. Literature review on phenotypic characterisation of HPAI viruses circulating in EU

Information on the phenotypic characterisation of AI viruses circulating in the EU was extracted from the scientific literature performing a literature review.

Review question Update on the phenotypic characterisation of HPAI viruses circulating in the EU in domestic and wild birds within the reporting period.

Search The PubMed database was searched by using subject index terms and free text terms combined with the appropriate Boolean operators. The search was run on 16 May 2018. Information regarding the search strategy (terms and search string) is provided in Appendix C.1.

Relevance criteria Scientific articles added to the database from 16 February 2018 to 15 May 2018 and reporting information on presence/absence of clinical signs or pathological changes or mortality due to HPAI infection with viruses circulating in the EU in domestic or wild birds.

Eligibility criteria

- Host species all domestic birds or wild birds present in the EU
- The virus subtype should be reported
- Only for experimental studies the age of the infected animals should be reported (at least as juvenile/adult).

Results The search retrieved 112 papers. The articles were subsequently screened against the relevance and eligibility criteria and 109 of them were excluded because they did not describe the phenotype (26), or were reviews (2), or were not regarding birds (14), or were not about Europe (50), or were neither about HPAI (12) nor influenza (3), or because of more than one of the listed aspects (2). The remaining three papers were taken into consideration in the description of the phenotypic characterisation of HPAI viruses circulating in the EU in domestic and wild birds in the reporting period.

B.1.2. AI prevention and control measures (TOR 3)

Bulgaria, Italy and the Netherlands expressed an interest in supporting the analysis of the AI outbreaks from 16 February to 15 May 2018 and submitted case reports on the AI prevention and control measures based on the template that was generated for previous reports (EFSA et al., 2017a; EFSA et al., 2018). The case reports provided to EFSA can be consulted in Annex A.

B.1.3. Overview of AI outbreaks on other continents (TOR 4)

Data from FAO EMPRES-i (FAO, online-a) were used to map the distribution of HPAI A(H5N1), A(H5N6), A(H5N8) and A(H7N9) confirmed cases in poultry and wild birds in Africa, Asia and Middle East on the basis of the observation dates. Only when there was a strong discrepancy among the locality, the administrative regions and geo-coordinates, and the outbreaks were not officially reported to the OIE (e.g. National authorities), confirmed outbreaks were not taken into account in the analysis.

B.1.3.1. Literature review on phenotypic and genetic characterization of HPAI viruses circulating on other continents

Information on phenotypic and genotypic characterisation of HPAI viruses circulating on other continents and regions (Africa, Asia, the Middle East) in domestic or wild birds or mammals (excluding humans) were extracted from the scientific literature by performing a literature review.

Review questions Update on the phenotypic and genetic characterisation of HPAI viruses circulating in other continents and regions (Africa, Asia, the Middle East) in domestic or wild birds or mammals (excluding humans).

Search The PubMed database was searched by using subject index terms and free-text terms combined with the appropriate Boolean operators. The search was run on 16 May 2018. Information regarding the search strategy (terms and search string) is provided in Appendix C.2.

Relevance criteria Scientific articles added to the database from 16 February 2018 to 15 May 2018 and reporting information on presence/absence of clinical signs, pathological changes or mortality or genotypic characterisation due to HPAI infection with viruses circulating in Asia, Africa or the Middle East in domestic or wild birds or mammals other than humans.

Eligibility criteria

- Host species all domestic birds or wild birds present in the EU or mammals other than humans
- The virus subtype should be reported
- Only for experimental studies the age of the infected animals should be reported (at least as juvenile/adult).

Results The search retrieved 103 papers. The articles were subsequently screened against the relevant and eligibility criteria. Ten papers were in the end taken into consideration in the description of phenotypic and genotypic characterisation of HPAI viruses circulating other continents and regions (Africa, Asia, the Middle East) in domestic or wild birds or mammals (excluding humans) in the reporting period.

B.2. Data on humans

The collection of nNumbers of human cases due to infection with AI viruses has been collected performed by ECDC. Multiple sources are scanned regularly as part of epidemic intelligence activities at ECDC to collect information about laboratory-confirmed human cases as part of routine epidemic intelligence activities at ECDC. Data were extracted and line lists developed to collect case-based information on virus type, date of disease onset of disease, country of reporting, country of exposure, sex, age, exposure, clinical information (hospitalisation, severity) and outcome. All cases included in the line list and mentioned in the document are laboratory-confirmed cases. ECDC duty experts Double entries and validity of continuously check the data are continuously checked for double entries and validity at ECDC. The data on human cases covers the full period of time since the first human case was reported. Therefore, data on human cases refer to different time periods and are included irrespective of whether there have been new human cases during the reporting period.

Literature searches were performed until 15 May 2018 in the PubMed database with the key words: 'humans' and 'A(H5N1)'; 'A(H5N6)'; 'A(H5N8)'; 'A(H7N4)'; 'A(H7N9)'; 'A(H9N2)'; and narrowed to the most recent available publications as well as using specific search parameters such as 'seroprevalence'; 'risk factors'; 'transmission'; 'humans'; 'mammals'. The literature search was not systematic or comprehensive.

Appendix C – Literature search on phenotypic and genetic characterisation of AI viruses

C.1. Phenotypic characterisation of HPAI viruses circulating in the EU in domestic and wild birds in the reporting period

Terms

Concept	Terms
Avian influenza	Avian influenza, avian flu, influenza in birds, influenza in bird, bird flu, birds flu, bird influenza, birds influenza, influenza virus A, influenza viruses A, flu virus A, flu viruses A, influenzavirusA, influenza A, influenza A virus, Influenza A viruses, flu A, flu A virus, flu A viruses, fluvirus A, high pathogenic avian influenza, high pathogenic avian influenza virus, HPAI, HPAIV, HPAIVs, low pathogenic avian influenza, high pathogenic avian influenza virus, LPAI, LPAIV, LPAIVs, AIV, AIVs, H5N*, AH5N*, H7N*, AH7N*, H9N*, AH9N*, A(H5N*), A(H7N*), A(H9N*)
Birds	Bird, birds, aves, avian population, avian populations, poultry, poultries, fowl, fowls, chicken, chickens, gallus gallus, g. gallus, waterfowl, waterfowls, water fowl, water fowls, duck, ducks, swan, swans, anatidae, mallard, mallards, Anas platyrhynchos, A platyrhynchos, geese, goose, anser, turkey, turkeys, meleagris, quail, quails, coturnix, partridge, partridges, phasianidae, guineafowl, guineafowls, numida, numidae, ostrich, ostriches, struthio

Search strings (PubMed)

Search	Query	Items found
#4	Search #3 AND ("2018/02/16"[Date - Entrez] : "2018/05/15"[Date - Entrez])	112
#3	Search (#1 AND #2)	10 966
#2	Search "Influenza in Birds"[Mesh] OR "Influenzavirus A"[Mesh] OR (avian[tiab] AND (influenza*[tiab]OR flu[tiab])) OR "influenza in bird"[tiab] OR "influenza in birds"[tiab] OR "bird flu"[tiab] OR "birds flu"[tiab] OR bird influenza*[tiab] OR "birds influenza"[tiab] OR ((influenza*[tiab] OR flu[tiab]) AND ("virus A" OR "viruses A")) OR "influenza A"[tiab] OR "flu A"[tiab] OR "influenzavirus A"[tiab] OR "fluvirus A"[tiab] OR HPAI[tiab] OR HPAIV[tiab] OR HPAIVs[tiab] OR LPAI [tiab] OR IPAIV[tiab] OR AIV[tiab] OR AIVs[tiab] OR H5N*[tiab] OR H7N*[tiab] OR H9N*[tiab] OR AH5N*[tiab] OR AH7N*[tiab] OR AH9N*[tiab]	50 629
#1	Search "Birds"[Mesh] OR bird[tiab] OR birds[tiab] OR aves[tiab] OR "avian population"[tiab] OR "avian populations"[tiab] OR poultr*[tiab] OR fowl[tiab] OR fowls[tiab] OR chicken*[tiab] OR "gallus gallus"[tiab] OR "g gallus"[tiab] OR waterfowl*[tiab] OR duck[tiab] OR ducks[tiab] OR anatidae[tiab] OR mallard[tiab] OR mallards[tiab] OR swan[tiab] OR swans[tiab] OR "Anas platyrhynchos"[tiab] OR "A platyrhynchos"[tiab] OR geese[tiab] OR goose[tiab] OR anser[tiab] OR turkey[tiab] OR turkeys[tiab] OR meleagris[tiab] OR quail[tiab] OR quails[tiab] OR coturnix[tiab] OR partridge*[tiab] OR phasianidae[tiab] OR guineafowl*[tiab] OR numida*[tiab] OR ostrich*[tiab] OR struthio[tiab]	295 305

C.2. Phenotypic and genetic characterisation of HPAI viruses circulating on other continents in domestic or wild birds or mammals (excluding humans)

Terms

Concept	Terms
Highly pathogenic avian influenza	High/highly pathogen* avian influenza, high/highly pathogen* avian flu, high/highly pathogen* influenza in birds, high/highly pathogen* influenza in bird, high/highly pathogen* bird flu, high/highly pathogen* birds flu, high/highly pathogen* bird influenza , high/highly pathogen* birds influenza , high/highly pathogen* influenza virus A, high/highly pathogen* influenza viruses

	A, high/highly pathogen* flu virus A, high/highly pathogen* flu viruses A, high/highly pathogen* influenzavirusA, influenza A, high/highly pathogen* influenza A virus, high/highly pathogen* influenza A viruses, high/highly pathogen* flu A, high/highly pathogen* flu A virus, high/highly pathogen* flu A viruses, high/highly pathogen* fluvirus A, high/highly pathogen* AIV, high/highly pathogen* AIVs, HPAI, HPAIV, HPAIVs, H5N*, AH5N*, H7N*, AH7N*, H9N*, AH9N*, A(H5N*), A(H7N*), A(H9N*)
Animals	In order to simplify the retrieval of studies in animals, the search filter referenced below was used and adapted to include a better coverage of terms related to birds: Hooijmans CR, Tillema A, Leenaars M and Ritskes-Hoitinga M, 2010. Enhancing search efficiency by means of a search filter for finding all studies on animal experimentation in PubMed. Lab Anim, 44, 170-175. doi:10.1258/la.2010.009117 The search string is designed to retrieve studies in animal experimentation, but it also can be used to retrieve all type of studies in animals. It contains names of animals not relevant for avian influenza; these terms will not affect the results. However, the use of the already made filter simplifies the construction of the search string.

Search strings (PubMed)

Search	Query	Items found
#4	Search (#3) AND ("2018/02/16"[Date - Entrez] : "2018/05/15"[Date - Entrez])	103
#3	Search (#2 AND #1)	7 903
#2	Search ((high pathogen*[tiab] OR highly pathogen*[tiab]) AND ("Influenza in Birds"[Mesh] OR "Influenzavirus A"[Mesh] OR (avian[tiab] AND (influenza*[tiab]OR flu[tiab])) OR "influenza in bird"[tiab] OR "influenza in birds"[tiab] OR "bird flu"[tiab] OR "birds flu"[tiab] OR bird influenza*[tiab] OR "birds influenza"[tiab] OR "influenza virus A"[tiab] OR "influenza viruses A"[tiab] OR "influenza A"[tiab] OR "flu virus A"[tiab] OR "flu A"[tiab] OR "influenzavirus A"[tiab] OR "fluvirus A"[tiab] OR AIV[tiab] OR AIVs[tiab])) OR HPAI[tiab] OR HPAIV[tiab] OR HPAIVs[tiab] OR H5N*[tiab] OR H7N*[tiab] OR H9N*[tiab] OR AH5N*[tiab] OR AH7N*[tiab] OR AH9N*[tiab])	10 015
#1⁶	Search "animal experimentation"[MeSH Terms] OR "models, animal"[MeSH Terms] OR "invertebrates"[MeSH Terms] OR "Animals"[Mesh:noexp] OR "animal population groups"[MeSH Terms] OR "chordata"[MeSH Terms:noexp] OR "chordata, nonvertebrate"[MeSH Terms] OR "vertebrates"[MeSH Terms:noexp] OR "mammals"[MeSH Terms:noexp] OR "primates"[MeSH Terms:noexp] OR "artiodactyla"[MeSH Terms] OR "carnivora"[MeSH Terms] OR "cetacea"[MeSH Terms] OR "chiroptera"[MeSH Terms] OR "elephants"[MeSH Terms] OR "hyraxes"[MeSH Terms] OR "insectivora"[MeSH Terms] OR "lagomorpha"[MeSH Terms] OR "marsupialia"[MeSH Terms] OR "monotremata"[MeSH Terms] OR "perissodactyla"[MeSH Terms] OR "rodentia"[MeSH Terms] OR "scandentia"[MeSH Terms] OR "sirenia"[MeSH Terms] OR "xenarthra"[MeSH Terms] OR "haplorhini"[MeSH Terms:noexp] OR "strepsirhini"[MeSH Terms] OR "platyrrhini"[MeSH Terms] OR "tarsii"[MeSH Terms] OR "catarrhini"[MeSH Terms:noexp] OR "cercopithecidae"[MeSH Terms] OR "hylobatidae"[MeSH Terms] OR "hominidae"[MeSH Terms:noexp] OR "gorilla gorilla"[MeSH Terms] OR "pan paniscus"[MeSH Terms] OR "pan troglodytes"[MeSH Terms] OR "pongo pygmaeus"[MeSH Terms] OR ((animals[tiab] OR animal[tiab] OR mice[Tiab] OR mus[Tiab] OR mouse[Tiab] OR murine[Tiab] OR woodmouse[tiab] OR rats[Tiab] OR rat[Tiab] OR murinae[Tiab] OR muridae[Tiab] OR cottonrat[tiab] OR cottonrats[tiab] OR hamster[tiab] OR hamsters[tiab] OR cricetinae[tiab] OR rodentia[Tiab] OR rodent[Tiab] OR rodents[Tiab] OR pigs[Tiab] OR pig[Tiab] OR swine[tiab] OR swines[tiab] OR piglets[tiab] OR piglet[tiab] OR boar[tiab] OR boars[tiab] OR "sus scrofa"[tiab] OR ferrets[tiab] OR ferret[tiab] OR polecat[tiab] OR polecats[tiab] OR "mustela putorius"[tiab] OR "guinea pigs"[Tiab] OR "guinea pig"[Tiab] OR cavia[Tiab] OR callithrix[Tiab] OR marmoset[Tiab] OR marmosets[Tiab] OR cebuella[Tiab] OR hapale[Tiab] OR octodon[Tiab] OR chinchilla[Tiab] OR chinchillas[Tiab] OR gerbillinae[Tiab] OR gerbil[Tiab] OR gerbils[Tiab] OR jird[Tiab] OR jirds[Tiab] OR merione[Tiab] OR meriones[Tiab] OR rabbits[Tiab] OR rabbit[Tiab] OR hares[Tiab] OR hare[Tiab] OR diptera[Tiab] OR flies[Tiab] OR fly[Tiab] OR dipteral[Tiab] OR	66 12 540

⁶ Animals search string adapted from: Hooijmans CR, Tillema A, Leenaars M and Ritskes-Hoitinga M, 2010. Enhancing search efficiency by means of a search filter for finding all studies on animal experimentation in PubMed. Lab Anim, 44, 170-175. doi:10.1258/la.2010.009117

drosophila[Tiab] OR drosophilidae[Tiab] OR cats[Tiab] OR cat[Tiab] OR carus[Tiab] OR felis[Tiab] OR nematoda[Tiab] OR nematode[Tiab] OR nematoda[Tiab] OR nematode[Tiab] OR nematodes[Tiab] OR sipunculida[Tiab] OR dogs[Tiab] OR dog[Tiab] OR canine[Tiab] OR canines[Tiab] OR canis[Tiab] OR sheep[Tiab] OR sheeps[Tiab] OR mouflon[Tiab] OR mouflons[Tiab] OR ovis[Tiab] OR goats[Tiab] OR goat[Tiab] OR capra[Tiab] OR capras[Tiab] OR rupicapra[Tiab] OR chamois[Tiab] OR haplorhini[Tiab] OR monkey[Tiab] OR monkeys[Tiab] OR anthropoidea[Tiab] OR anthropoids[Tiab] OR saguinus[Tiab] OR tamarin[Tiab] OR tamarins[Tiab] OR leontopithecus[Tiab] OR hominidae[Tiab] OR ape[Tiab] OR apes[Tiab] OR pan[Tiab] OR paniscus[Tiab] OR "pan paniscus"[Tiab] OR bonobo[Tiab] OR bonobos[Tiab] OR troglodytes[Tiab] OR "pan troglodytes"[Tiab] OR gibbon[Tiab] OR gibbons[Tiab] OR siamang[Tiab] OR siamangs[Tiab] OR nomascus[Tiab] OR symphalangus[Tiab] OR chimpanzee[Tiab] OR chimpanzees[Tiab] OR prosimians[Tiab] OR "bush baby"[Tiab] OR prosimian[Tiab] OR bush babies[Tiab] OR galagos[Tiab] OR galago[Tiab] OR pongidae[Tiab] OR gorilla[Tiab] OR gorillas[Tiab] OR pongo[Tiab] OR pygmaeus[Tiab] OR "pongo pygmaeus"[Tiab] OR orangutans[Tiab] OR pygmaeus[Tiab] OR lemur[Tiab] OR lemurs[Tiab] OR lemuridae[Tiab] OR horse[Tiab] OR horses[Tiab] OR pongo[Tiab] OR equus[Tiab] OR cow[Tiab] OR calf[Tiab] OR bull[Tiab] OR reptile[Tiab] OR reptilia[Tiab] OR reptiles[Tiab] OR snakes[Tiab] OR snake[Tiab] OR lizard[Tiab] OR lizards[Tiab] OR alligator[Tiab] OR alligators[Tiab] OR crocodile[Tiab] OR crocodiles[Tiab] OR turtle[Tiab] OR turtles[Tiab] OR amphibian[Tiab] OR amphibians[Tiab] OR amphibia[Tiab] OR frog[Tiab] OR frogs[Tiab] OR bombina[Tiab] OR salientia[Tiab] OR toad[Tiab] OR toads[Tiab] OR "epidalea calamita"[Tiab] OR salamander[Tiab] OR salamanders[Tiab] OR eel[Tiab] OR eels[Tiab] OR fish[Tiab] OR fishes[Tiab] OR pisces[Tiab] OR catfish[Tiab] OR catfishes[Tiab] OR siluriformes[Tiab] OR arius[Tiab] OR heteropneustes[Tiab] OR sheatfish[Tiab] OR perch[Tiab] OR perches[Tiab] OR percidae[Tiab] OR perca[Tiab] OR trout[Tiab] OR trouts[Tiab] OR char[Tiab] OR chars[Tiab] OR salvelinus[Tiab] OR "fathead minnow"[Tiab] OR minnow[Tiab] OR cyprinidae[Tiab] OR carps[Tiab] OR carp[Tiab] OR zebrafish[Tiab] OR zebrafishes[Tiab] OR goldfish[Tiab] OR goldfishes[Tiab] OR guppy[Tiab] OR guppies[Tiab] OR chub[Tiab] OR chubs[Tiab] OR tinca[Tiab] OR barbels[Tiab] OR barbuis[Tiab] OR pimephales[Tiab] OR promelas[Tiab] OR "poecilia reticulata"[Tiab] OR mullet[Tiab] OR mullets[Tiab] OR seahorse[Tiab] OR seahorses[Tiab] OR mugil curema[Tiab] OR atlantic cod[Tiab] OR shark[Tiab] OR sharks[Tiab] OR catshark[Tiab] OR anguilla[Tiab] OR salmonid[Tiab] OR salmonids[Tiab] OR whitefish[Tiab] OR whitefishes[Tiab] OR salmon[Tiab] OR salmons[Tiab] OR sole[Tiab] OR solea[Tiab] OR "sea lamprey"[Tiab] OR lamprey[Tiab] OR lampreys[Tiab] OR pumpkinseed[Tiab] OR sunfish[Tiab] OR sunfishes[Tiab] OR tilapia[Tiab] OR 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Annex A – Applied prevention and control measures on avian influenza in Bulgaria, Italy, the Netherlands and Denmark

Scope

This document provides a brief overview of specific prevention and control measures applied in Italy, Bulgaria, the Netherlands and Denmark between 16 February and 15 May 2018 in relation to avian influenza. Information is only provided if it is considered relevant to the implementation of the following selected measures: increasing awareness of stakeholders and the general public, housing order, strengthening biosecurity measures (other than poultry confinement), preventive culling, regional stand-still, derogations from restriction zone implementation after risk assessment and hunting. This document is made to support the EFSA working group in generating an overview on the application of the selected measures at EU level.

Timing of the applied prevention and control measures

Tables A1, A2 and A3 provide timelines on the main events that triggered actions in relation to the selected prevention and control measures in Italy, Bulgaria and Denmark respectively. More information on the actions taken is provided in the sections below the tables.

A.1 Bulgaria

Aleksandra Miteva

Animal Health and Welfare, and Feed Control Directorate

Bulgarian Food Safety Agency

Table A1: Overview of main communication actions

Date	Event that triggered action	Type of action taken	Target audience (if applicable)
02.03.2018	Confirmation of primary HAPI poultry outbreak (on laying hen farm)	Enforcing all restrictive measures according to Council Directive 2005/94/EC on Community measures for the control of avian influenza and the national contingency plan for avian influenza.	Official vets, poultry associations, farmers, hunters
04.04.2018	Confirmation of primary HAPI poultry outbreak (on duck farm)		
10.04.2018	Confirmation of primary HAPI poultry outbreak (on duck farm)	Awareness-raising activities, organizing regular meetings with poultry associations and farmers; training for hunters (with regard to biosecurity and passive surveillance).	
17.04.2018	Confirmation of primary HAPI poultry outbreak (on captive birds)	Close cooperation with public health authority, sharing of information on outbreaks confirmed and measures taken.	
19.04.2018	Confirmation of primary HAPI poultry outbreak (on duck farm)		
24.04.2018	Confirmation of primary HAPI poultry outbreaks (4 outbreaks on duck farms)		

Increasing awareness of the stakeholders and the general public

As mentioned in Table A1 regular meetings (on a weekly basis) with poultry associations and hunting associations, and information campaigns with farmers at regional level were conducted for the purpose of increasing awareness. Each opportunity for other meetings dedicated to different animal health topics was used for the purpose of raising awareness, keeping the persons in question up to

date with the avian influenza epidemiological situation in Europe and in Bulgaria (present and past), the measures taken and lessons learnt.

Housing order

Precautionary measures such as keeping poultry indoors, taking steps to separate them from wild birds and ensuring feed and water is not accessible to wild birds were also required. Special focus was given to backyard flocks, due to the lack of biosecurity measures applied in that setting.

Strengthening biosecurity measures (other than housing orders)

Precautionary measures such as keeping poultry indoors, taking steps to separate them from wild birds and ensuring feed and water is not accessible to wild birds were also required. Special focus was given to backyard flocks, due to the lack of biosecurity measures applied in that setting.

Preventive culling

Not applied.

Regional stand still (beyond the restriction zones specified in the EU Regulation)

Not applied.

Derogations on restriction zone implementation after risk assessment

Not applied.

Hunting

Hunting was not forbidden.

A.2 Italy

Azzolini Alessandra, Mulatti Paolo, Bonfanti Leana, Marangon Stefano

Istituto Zooprofilattico Sperimentale delle Venezie

Table A2: Overview of main communication actions

Date	Event that triggered action	Type of action taken	Target audience (if applicable)
19/02/2018	Ministerial Provision n 4122, which sets out measures to reduce the risk of AI infection, and biosecurity	Identification of regions exposed at higher risk of H5 and H7 AI introduction; Definition of measures to prevent or reduce the risk; Definition of potential derogations	Regional veterinary services
02/03/2018	First H5N8 HPAI poultry outbreak in housed laying hen farm (Bergamo)	3 km protection zone (PZ) and 10 km surveillance zone (SZ) in place, with all associated visits and testing.	Poultry and backyard/captive bird keepers in the restriction zone only
08/03/2018	Second H5N8 HPAI poultry outbreak in housed laying hen farm (Brescia)	3 km PZ and 10 km SZ in place, with all associated visits and testing.	Poultry and backyard/captive bird keepers in the restriction zone only
12/03/2018	Third H5N8 HPAI poultry outbreak in housed fattening turkey farm (Bergamo)	3 km PZ and 10 km SZ in place, with all associated visits and testing.	Poultry and backyard/captive bird keepers in the restriction zone only
27/04/2018	Ministerial Provision n 10648, which extend the duration of measures indicated in Provision 4122 of 19 February 2018	Extension of the duration of control measures previously indicated in Provision 4122 to 30 June 2018	Regional veterinary services

Increasing awareness of the stakeholders and the general public

Details on avian influenza outbreaks that occurred in Italy and on the epidemiological situation at the European level are provided and updated on the website of Istituto Zooprofilattico Sperimentale delle Venezie (IZSve), where the National Reference Laboratory for avian influenza and Newcastle Disease has dedicated sections: <http://www.izsvenezie.it/temi/malattie-patogeni/influenza-aviaria/situazione-epidemiologica-HPAI/>; <http://www.izsvenezie.it/temi/malattie-patogeni/influenza-aviaria/situazione-epidemiologica-hpai-europa/>.

Other websites at the local/national level from various stakeholder groups and association (e.g. associations of poultry farmers, national and regional veterinary associations, etc) link directly to the IZSve website for updates on avian influenza epidemiological situation.

Official communications by the competent authority (Ministry of Health) on a new outbreak are forwarded for information to regional veterinary services, poultry farmer unions, poultry production companies and, veterinary associations.

Housing order

Ministerial provision n. 2307 of 31 January 2018 extended until 28 February 2018 the measures provided by Ministerial Provision n. 26651 of 21 November 2017, which updated the further restriction zone (FRZ), defining a densely populated poultry area (DPPA) and a medium populated poultry area.

Measures applied at farm level within the FRZ:

- Census of industrial poultry holdings
- Birds shall be kept inside closed buildings and measures should be taken to reduce the risk of direct/indirect contact with wild birds
- Pre-movement clinical inspection and virological testing
- Enforcement of increased biosecurity measures regarding the vehicles and the personnel entering and exiting farms
- Gathering of domestic birds for fairs, exhibitions and live-bird markets is banned
- Restocking of meat turkey farms is prohibited. A derogation from this measure can be authorised only when an official veterinarian has verified the compliance with new biosecurity standards (these requirements have been recently established and applied to strengthen the level of biosecurity considering also the risk of avian influenza virus introduction from the wild reservoir) and IZSve has evaluated the geographical risk of the farm according to the poultry density in the area and the proximity to other poultry premises.

Other biosecurity measures were also included, as indicated below ('Strengthening biosecurity measures (other than housing orders)').

The FRZ, and the other measures included in Ministerial Provision n. 2307 of 31 January 2018, have been revoked starting on 1 March 2018.

Strengthening biosecurity measures (other than housing order)

In accordance with Ministerial Provision n. 4122 of 19 February 2018, extended to 30 June 2018 by Ministerial Provision n. 10648 of 27 April 2018, Piedmont, Lombardy, Emilia-Romagna, Friuli Venezia Giulia, Veneto, Umbria and, Lazio have been designed as high-risk regions, taking into account:

- the epidemiological situation
- risk factors for HPAIV introduction
- risk factors for HPAIV spread
- the outcomes of avian influenza surveillance plan.

High risk areas have been identified within the high-risk regions, taking into account the Ministerial provision of 26 August 2005, and its further amendments.

Specific biosecurity measures were applied within the high-risk regions by means of:

- a ban on free-range poultry rearing
- a ban on using superficial water reservoirs (sources that can be accessed by wild birds)
- feed and bedding materials stocks must be protected from wild birds or other animals
- a ban on exhibitions, fairs, and live-bird markets (a derogation from this measure can be authorised by the regions and autonomous provinces following a risk-based evaluation)
- a ban on using live decoy birds and/or rearing them in such conditions that allow them to have contact with wild birds.

Fattening turkey housing in the high-risk areas is allowed only after favourable assessment of biosecurity requirements. Such evaluation is carried out by official veterinary service by means of a new check list (Annex V of Ministerial Provision n. 4122 of 19 February 2018).

Preventive culling

As provided for in art.15 and art.17 in Council Directive 2005/94/EC, preventive culling was applied at three industrial poultry farms, with 98 466 birds culled. The criteria used to decide which holdings should be depopulated were: i) proximity to infected farms; ii) potential direct contacts (sharing personnel, farms belonging to the same owner, farms belonging to familiars of the owner).

Outbreak	Preventive culling – productive type	Culled birds	End of culling	Related outbreak	Outbreak confirmation
BERGAMO	MEAT TURKEYS	17 346	06/03/2018	first	02/03/2018
BERGAMO	MEAT TURKEYS	20 900	06/03/2018	first	02/03/2018
BRESCIA	LAYING HENS	60 220	10/03/2018	second	08/03/2018

Regional stand still (beyond the restriction zones specified in the EU Regulation)

In accordance with Ministerial provision n. 26651 of 21 November 2017, fattening turkey housing was prohibited inside a DPPA defined within the FRZ. A derogation from this measure could be authorised by the regions following a risk-based evaluation made by the National Reference Laboratory for Avian Influenza and a favourable assessment of biosecurity requirements carried out by the official veterinary service. Measures included in Ministerial Provision 26651 of 21 November 2017 had been extended until 28 February 2018 by Ministerial Provision n. 2307 of 31 January 2018.

Derogations on restriction zone implementation after risk assessment

In the restriction zones of all the cases, bird movement and housing derogations were applied as follows:

- in PZ: derogations were discussed in the context of the Central Crisis Unit (UCC);
- in surveillance zones (SZ): derogations were discussed in the context of the UCC if the farm was located within a DPPA; if the farm was located outside of the DPPA, derogations were granted by the local veterinary service (the approval of more than one regional authority was needed, in the event that the derogation affected more than one region). Derogations from poultry housing restrictions were granted in the case of severe welfare issues: e.g. ready-to-lay pullets, and breeders belonging to small companies and needing to be moved in premises within the SZ (and which would have been culled due to the impossibility of being moved to the new farms).

Hunting

Ministerial Provision n. 4122 of 19 February 2018 prohibits the use of live decoy birds (anseriformes and charadriiformes orders) for hunting activities in the high-risk regions.

References

Besides the National Provisions of the Ministry of Health discussed in the main text of the report, the Provision of the Ministry of Health of 26 August 2005: 'Control measures to reduce the risk of transmission for infectious poultry diseases' laid the basis for the application of biosecurity measures

A.3 The Netherlands

MAH. Spierenburg DVM LLM

Netherlands Food and Consumer Product Authority (NVWA), Ministry of Agriculture, Nature and Food Quality (Min LNV)

Table A3: Overview of main communication actions

Date	Event that triggered action	Type of action taken	Target audience (if applicable)
24/02/2018	Second outbreak HPAI serotype A(H5N6) positive commercial poultry holding (breeding chickens)	Measurements for protection and surveillance zone: As of 24 of February culling HPAI-positive commercial poultry holding, implement protection and surveillance zones around HPAI-positive commercial poultry holding with transport restrictions for all birds including commercial poultry and poultry products, sperm, manure and feed as well transport restrictions for domestic mammals, feed, sperm, milk and manure of these domestic mammals.	e.g. poultry associations, general public, etc.
		Measures valid for the whole country: 1: ban on visits to commercial poultry holdings and other holdings or locations where birds are held. 2: mandatory visitor registration. 3: ban on races and exhibitions with birds. 4: housing order for commercial poultry confinement and housing order for hobby birds and other non-commercial captive bird confinement. 5: measures regarding cover and application of litter on duck holdings. 6: using a hygiene protocol for visiting commercial poultry holdings.	
12/03/2018	Third outbreak HPAI serotype H5N6 positive commercial poultry holding (fattening ducks)	Measurements for protection and surveillance zone: As of 12 March, culling at HPAI-positive commercial poultry holding, implement protection and surveillance zones around HPAI-positive commercial poultry holding with transport restrictions for all birds including commercial poultry and poultry products, sperm, manure and feed as well as transport restrictions for domestic mammals, feed, sperm, milk and manure of these domestic mammals.	

Thirty days after cleansing and disinfection of the HPAI-positive holdings where culling was implemented, all the measures were lifted as of 13 April 2018 with the exception of one measure valid for the whole country: Using a mandatory hygiene protocol for visiting commercial poultry holdings.

Increasing awareness of the stakeholders and the general public

Development of biosecurity measures during crisis in contact with the poultry sector. Communication from both the Ministry and poultry sector as follows. Directly published on the government website (www.rijksoverheid.nl): legal information, information to parliament, information for the press, questions and answers, phone centre for questions from both poultry owners and the general public, in direct contact with poultry advisers, communication department in close contact with the press, meetings for all stakeholders and communication by the media to the general public.

Housing order

The housing order was implemented in mandatory national legislation as of 8 December 2017 after a risk assessment by the Commission of animal disease experts which consists on this matter of avian influenza experts. This Commission advised the Chief Veterinary Officer and the Minister to introduce measures against HPAI. The trigger for implementing the housing order was the HPAI H5N6 outbreak on the commercial poultry holding in Biddinghuizen on 8 December. It was decided to lift the housing

order after the execution of a risk assessment by the Commission of animal disease experts in April 2018

Strengthening biosecurity measures (other than housing order)

Service level agreements have been concluded with suppliers that can deliver cleaning and disinfection equipment 24/7 within four hours of being called by the Dutch government for culling at any location in the whole country.

Preventive culling

It was applied but there were no other commercial poultry holdings inside the one kilometre radius zone around the index holding.

Regional stand still (beyond the restriction zones specified in the EU Regulation)

No, only the 1 km/3 km and 10 km zones (protection and surveillance zones).

Derogations on restriction zone implementation after risk assessment

No

Hunting

As of 9 January 2018 the ban on hunting ducks or to hunt in general in wet areas with waterfowl was lifted.

A.4 Denmark

Pernille Dahl Nielsen, Torben Grubbe

Division of Animal Health, The Danish Veterinary and Food administration

Table A.4: Overview of main actions

Event that triggered action	Date	Type of action taken
Confirmation of HPAI A(H5N6) in a dead eagle	01/03/2018	a. Press release about the finding with information about biosecurity especially aimed at owners of hobby poultry/backyard flocks b. Contact with the poultry industry. The poultry industry sent out information with a warning about avian influenza in wild birds to all their members with a focus on biosecurity
	05/03/2018	Meeting in the avian influenza expert group, discussion of possible measures to take. Decided to await the situation and focus on information about biosecurity
	23/03/2018	a. Press release about new findings of positive wild birds with recommendation of sharpened attention on biosecurity b. Contact with the poultry industry. The poultry industry sent out information with a warning about avian influenza in wild birds to all their members with a focus on biosecurity
	10/04/2018	Press release about finding of several dead wild birds with HPAI H5N6 around Easter, once again recommendation of sharpened attention on biosecurity