Avian flu and human health concerns
Response to H5N8 outbreaks in the EU

SUMMARY
Avian influenza (AI), a highly contagious viral disease, can affect wild birds as well as poultry raised for food. In February 2015, the World Health Organization (WHO) warned about the unprecedented diversity and geographical distribution of AI viruses circulating in wild and domestic birds. Genetic material is being exchanged very rapidly among the different viruses. This way novel viruses are emerging, whose potential impact on animal and human health is difficult to predict.

Some strains of avian flu, such as H5N1 and H7N9, can be transmitted to humans. The WHO is particularly concerned about the recent rapid increase in human H5N1 cases in Egypt and the continuing incidence of human H7N9 infections in China.

Due to strict food safety and veterinary measures, poultry meat and eggs sold in the EU can be considered as safe. Caution is needed, however, when handling infected poultry.

At the end of 2014, MEPs posed several written questions to the Commission about H5N8 – the new highly pathogenic strain of the avian flu virus found in Member States – enquiring about the measures taken to prevent a new epidemic and about the EU’s readiness to provide funding in the event of outbreaks.

Actions in response to the outbreaks in late 2014 included culling infected poultry, as well as monitoring of the situation by the Commission, the European Food Safety Authority (EFSA) and the European Centre for Disease Prevention and Control (ECDC).

Wild birds are natural reservoirs for AI viruses. To better understand how these viruses evolve and spread, experts propose a globally coordinated surveillance system for wild birds.

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- Risks of human infection
- Monitoring at EU- and global level
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Basic facts about avian flu

Avian influenza (AI, commonly known as 'avian' or 'bird' flu) is a highly contagious viral disease that can affect wild birds as well as poultry raised for food. Outbreaks of AI can have serious impacts on bird populations, local economies and international trade. AI viruses have several subtypes and strains. Most of them do not infect humans, but there is a risk of a virus mutating into a form that is transmitted to and between humans, potentially creating a pandemic.

In February 2015, the World Health Organization (WHO) warned over the current global situation of influenza viruses, including the trends regarding AI, saying that the diversity and geographical distribution of AI viruses circulating among wild and domestic birds are unprecedented. Genetic material is being exchanged very rapidly among the different viruses, giving rise to novel viruses, whose potential impact on animal and human health is difficult to predict.

AI viruses fall into two groups depending on their ability to cause disease (pathogenicity) in poultry. Highly pathogenic AI viruses (HPAI) spread rapidly and lead to serious disease in birds and a high mortality rate (up to 100% in affected poultry within 48 hours). Low pathogenic AI viruses (LPAI) generally cause a milder disease, which may not be detected at all. Since viruses mutate rapidly, the risks from different emerging strains of viruses are difficult to predict. Each new strain has to be evaluated individually to assess the risks it poses to animal and (potentially) public health. Low pathogenic viruses can also mutate into high pathogenic ones. Therefore early detection is important.

The subtypes H5 and H7 cause the most concern. They can mutate rapidly from mild into severe forms, resulting in devastating outbreaks. Since early 2014, 41 outbreaks among birds caused by seven different H5 and H7 viruses have been notified to the World Organisation for Animal Health (OIE) in 20 countries around the world. Several such outbreaks were caused by novel viruses that have only emerged in the past few years.

Avian influenza is becoming more and more frequent in all parts of the world, and is especially widespread in Asia. There is a persistent threat of viruses spreading from Asia to Europe and other parts of the world. In November 2014, a new virus subtype H5N8, previously only found in Asia, was detected in four EU Member States (further details below).

How an AI virus spreads

An AI virus can spread through traded poultry or through wild birds, via airborne secretions or contaminated material such as equipment, vehicles, feed, cages, shoes and clothing. Bird faeces contain large amounts of virus and contaminate soil and water. Open ponds and lakes, as well as drinking water or farm feed in the open air can be contaminated with AI viruses from wild birds. AI viruses can survive in faeces and in water for several weeks.

Although wild birds are often suspected to be the source of AI viruses, these can also originate in commercial poultry and be transmitted to wild birds. Migratory birds spread some of the viruses along their migration routes. Birds that survive the infection may still spread the virus for up to ten days.
Some species, such as certain domestic ducks, are resistant to some virus strains and may transmit them without showing any symptoms. A virus can also be carried by other animals such as pigs and rats.

Preventive measures
To prevent the spread of an AI virus, drastic measures need to be taken to stamp out the outbreak as quickly as possible. This goes for both low and high pathogenic forms of AI. In the event of an outbreak in a poultry farm, all poultry need to be culled, carcasses and eggs destroyed, and the holding cleaned and disinfected.

Vaccination of poultry against avian flu is generally forbidden in the EU, since vaccinated birds may still become infected without showing symptoms, and spread the virus further. Vaccination is allowed in exceptional cases: as an emergency measure to respond to a disease outbreak, or as a preventive measure in a certain area or for a specific poultry category (e.g. free-range), if there is a particular risk of the virus spreading. Vaccination can also be authorised for birds kept in zoos. In all these cases Member States have to present a vaccination plan, which has to be approved by the Commission and Member State representatives (Standing Committee on the Food Chain and Animal Health).

Vaccination plans must make it possible to differentiate infected animals from vaccinated ones (the 'DIVA' strategy). This is important for detecting any outbreak of the virus in vaccinated animals and for preventing its transmission to other animals. Marketing of meat and eggs from vaccinated poultry can be allowed under strict surveillance. Vaccination has been used, for example, in certain areas of northern Italy to limit the spread of LPAI, as well as in France and the Netherlands as a preventive measure against HPAI H5N1.

Risks of human infection
Of the 144 known AI viruses, only eight have been known to be transmitted to humans. In most cases, human AI infections cause only a mild illness. However, some viruses, such as certain strains of H5N1 and H7N9, can lead to very severe, even fatal, diseases. The most common source of infection is direct exposure to infected poultry or contaminated surfaces and objects. People most at risk are poultry farmers, veterinarians, people slaughtering and disposing of infected poultry, hunters and people working in live bird markets. Human-to-human transmission is very rare. There have been some cases where the infection has been transmitted from a person who has been in direct contact with infected birds to another close family member, or from a patient to a healthcare worker.

Symptoms of avian influenza range from symptoms typical of human influenza (fever, cough, sore throat, muscle pain), to eye infections, diarrhoea and other gastrointestinal symptoms, pneumonia, acute respiratory distress and sometimes other severe, life-threatening complications. As a cure, there are antiviral drugs that are effective against several avian influenza viruses.

Farms where humans, pigs and poultry live in close contact with each other are considered to be environments in which new virus strains might emerge, combining elements of human and animal influenza strains. Early detection and control of the disease in the animal population is therefore important.
The H5N1 virus
H5N1 is an HPAI virus that caused a global avian influenza crisis a decade ago, starting in late 2003 from Asia. By 2009 the virus had spread to 62 countries in Asia, the Middle East, Europe and Africa, with huge economic losses for poultry farmers and industry. It has been causing outbreaks almost continuously in Asia ever since, and has become endemic in some Asian countries and Egypt.

H5N1 can also cause severe illness in humans. Between 2003 and January 2015, 777 human cases of H5N1 virus infection were reported to the WHO by 16 countries. More than half (55.1%) of the patients died.

The WHO is particularly concerned about a new and sudden increase in human H5N1 infections in Egypt, which began in November 2014 and continued until February 2015. Over this period, there were 108 human cases and 35 deaths, which is more than the yearly total in any country since 2003. The most likely reason, according to health and agricultural officials in Egypt, is the widespread circulation of H5N1 in poultry, combined with the large number of households keeping small flocks of backyard poultry, without understanding the associated health risks.

According to the WHO, there is a risk that trading of poultry, whether legal or illegal, will introduce the virus to new countries, so everything should be done to try to reduce contamination levels in Egypt.

The H7N9 virus
Previously, it was thought that only HPAI viruses can be fatal to humans. Lately, it has been discovered that LPAI viruses are also capable of causing severe medical conditions among humans. A worrying example is the H7N9 virus which was first identified in 2013 in China and had not previously been detected in animals or humans. It causes no obvious symptoms in birds, but a severe – even fatal – disease in humans. Since birds affected with H7N9 do not show any signs of illness, the detection of human cases triggered the search for the virus in birds.

Cases continue to be reported in China, and at the end of January 2015, two mild human infections were reported in Canada among travellers returning from China. The spread of the virus via humans is unlikely, though, as the virus does not seem to transmit easily from one person to another. The WHO notes, however, that it may transmit from poultry to humans more readily than H5N1.

Between 2013 and February 2015, 602 human H7N9 cases and 227 deaths have been reported to the WHO, the vast majority from China. About 36% of the reported human cases have been fatal, but it is not yet known if there are also asymptomatic or mild cases occurring but not being reported, which would lower the percentage of fatalities.

The European Centre for Disease Prevention and Control (ECDC) made a rapid risk assessment on human infections with H7N9 (3 February 2015). According to this study, people travelling to or living in China should avoid contact with birds, should not

Risk of pandemics
A pandemic occurs when an influenza virus changes so radically that people have no immunity against the new virus. AI viruses have the potential to cause pandemics. When an epidemic of avian flu in birds occurs at the same time as a normal seasonal human flu epidemic, the risk arises that the virus will interact with the human flu virus and change to a new strain that transmits more easily to humans and between humans. With the large number of international travelers, epidemics can spread quickly and become pandemics. In the past 100 years, there have been four pandemics: the Spanish Influenza (1918-19), Asian Flu (1957-58), Hong Kong Flu (1968-69) and the H1N1 pandemic, or Swine Flu (2009).
consume raw or incompletely cooked poultry meat and eggs from the affected areas, and should undergo rapid testing if they develop severe respiratory or flu-like symptoms. According to ECDC, the H7N9 viruses also have pandemic potential.

**Risks to food safety**

In the European Union, strict food safety and veterinary measures and controls are in place to prevent meat or eggs from unhealthy animals entering the food chain. Poultry and eggs marketed in the EU can therefore be considered safe. Imports from affected third countries are banned or strictly controlled.

Most AI viruses are only present in the respiratory and gastrointestinal tracts of birds, and not in meat. Certain highly pathogenic viruses, however, spread to virtually all parts of an infected bird, including its flesh.

Although sick birds normally stop laying eggs, eggs can be contaminated in the early phase of the disease. Eggs can contain the virus both inside, in the egg white and yolk, and outside, on the shell. Viruses present in faeces or egg shells can survive for several weeks. Eggs from areas with AI outbreaks should be thoroughly cooked to destroy the virus inside the egg.

Temperatures above 70°C destroy the virus, so well-cooked meat or eggs are safe even in the very unlikely event of the virus being present in the raw product. Refrigeration or freezing does not kill the virus present in meat. In rare cases AI viruses have been detected in frozen duck-meat imported from Asia, e.g. in Japan (2003) and Germany (2007).

The biggest health risk comes from handling infected poultry. Most infections are acquired from handling raw poultry meat before cooking. While this is not a major issue in Europe, many families in poorer countries of the world keep small flocks of backyard poultry. Changing behaviour is difficult because a diseased or dead chicken is considered too valuable to be wasted. In most countries, HPAI-infected poultry is prohibited from entering the food chain, but in some developing countries, sick poultry from non-commercial production may still end up in the food chain.

**Monitoring at EU and global level**

Avian influenza is a notifiable disease in the EU: under Directive 82/894/EEC the Member States must inform the Commission, via the Animal Disease Notification System, of outbreaks of HPAI and LPAI in poultry and captive birds. There is an online reporting system for LPAI in wild birds. Council Directive 2005/94/EC sets out the surveillance, control and eradication measures to be taken in the event of AI outbreak.

The public health aspects of avian influenza are addressed by the Commission’s DG for Health and Food Safety and the European Centre for Disease Prevention and Control (ECDC). The European Food Safety Authority (EFSA) provides scientific advice on possible food safety issues related to AI.

Also all novel influenza strains are notifiable diseases under EU legislation. An Early Warning and Response System is in place for Member States to send alerts, share information and coordinate their measures. In addition, the European Commission’s Joint Research Centre (JRC) has developed a Health Emergency and Diseases Information System (HEDIS) to support the Commission and Member States during disease outbreaks and health emergencies. Human infections with HSN1 must be notified according to Decision 1082/2013/EU on serious cross-border threats to health.
The EU works closely with the World Organisation for Animal Health (OIE), the World Health Organization (WHO) and the Food and Agriculture Organization (FAO), which have rapid alert and notifications systems to monitor the situation globally. WHO, FAO and OIE also have a joint system, the Global Early Warning System (GLEWS), combining their alert mechanisms. The guiding principle is the 'One Health' approach, according to which human and animal health are closely linked. Therefore collaboration between human-health and animal-health professionals is needed, and the focus must be on the interaction between animals, humans and their environments.

**European Parliament**


There is an ongoing legislative procedure concerning a proposal for a new regulation on animal health. The regulation is meant to replace the current complex system composed of numerous directives, regulations and secondary legislative acts, and lay down rules for prevention and control of animal diseases transmissible to animals or humans. In the first-reading resolution (rapporteur Marit Paulsen, ALDE, Sweden) adopted on 15 April 2014 by the outgoing Parliament, the EP maintains that the Commission must be empowered to adopt urgent measures to tackle diseases that have a major impact on public health, agricultural production or animal welfare and health. Parliament also insists that both it and the Council should have proper scrutiny over the measures and the possibility of repealing them if necessary. A political agreement on the proposal was reached in trilogue negotiations on 1 June 2015, which now needs to be confirmed by the EP and Council with the aim of sealing an early-second-reading agreement.

In November and December 2014, MEPs posed several written questions (E-009509/14, P-009485/14, E009590/14, P-010352/14, P-010474/14) to the Commission about the H5N8 virus found in Member States, warning that there might be an even greater risk of outbreaks during the bird migration period in the spring of 2015. They enquired about the measures the Commission is taking to prevent a new epidemic and about the financial contribution the EU is ready to make for preventing or countering outbreaks. The Commission replied that for 2015, the EU has earmarked roughly €2.2 million for AI surveillance programmes. In addition, the EU can contribute to emergency measures linked to outbreaks. The EU may also reimburse 50% of the compensation costs Member States pay producers for the compulsory culling of infected animals, and adopt exceptional market-support measures in the case of restrictions on trade.

**Member States' responses to recent H5N8 outbreaks**

According to Directive 2005/94/EC Member States are required to carry out regular surveillance programmes aimed at detecting AI virus subtypes H5 and H7 in different bird species. In November 2014, outbreaks of H5N8 – a highly pathogenic avian influenza subtype, previously only detected in Asia – were found in poultry in Germany, the Netherlands, United Kingdom and Italy.

The directive sets out the measures that Member States are required to take. The holding suspected of being affected by an outbreak must be placed under surveillance.
Epidemiological investigations must be carried out to identify the possible source of the virus and its possible spread from the affected holding. Control zones must be established around the holding, in which the movement of live poultry and poultry products is restricted, and strict disinfection measures must be used at the entrances and exits. All poultry must be kept indoors to minimise contact with wild birds.

Once an outbreak is confirmed, all poultry must be killed and destroyed, carcasses and eggs disposed of, the holding and all contaminated equipment cleaned and disinfected.

Table 1 – Outbreaks of HPAI H5N1 and H5N8 in EU Member States

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Data sources: Eurosurveillance/OIE (updated 18 March 2015).

Monitoring at EU level

When the outbreaks were confirmed by the respective national laboratories, the Commission approved the protective measures planned in each of the affected Member States, and measures were published in the Official Journal of the European Union.

The situation is regularly reviewed by EU Member State experts in the Standing Committee on Plants, Animals, Food and Feed (PAFF). In December 2014, the Standing Committee adopted a statement calling for high awareness in the poultry sector and application of biosecurity measures on farms as well as along the whole poultry and egg production chain. It further invited the general public, birdwatching organisations and hunters to support veterinary authorities by reporting abnormalities in wild bird populations.

EFSA has assessed the possible entry routes of the H5N8 virus into Europe. The precise route still remains uncertain, but one hypothesis is cross-infection between migrating...
The virus had been detected in wild birds in Germany and the Netherlands, but direct contact between wild birds and farmed birds was unlikely, as all affected farms used indoor housing facilities. The virus may have entered the farms indirectly, via humans, live animals or animal products, vehicles or equipment contaminated by infected wild birds.

The ECDC issued a rapid risk assessment on the outbreaks. It observed that the ability of the virus to infect wild birds without them showing symptoms increases the risk of spread and outbreaks. Continuous monitoring and testing of wild birds and domestic poultry in the EU is therefore essential. Although no human infections with this virus have been reported, ECDC called for prudence on the basis of the evolutionary history of the H5N1 virus. People in direct contact with infected birds and their carcasses might be at risk and should use protective equipment.

**Current situation in EU and globally**

The outbreaks in Italy, the UK and the Netherlands were successfully eradicated, with no new cases since December 2014. In Germany cases were still found in January 2015. A new outbreak emerged at the end of February 2015 in a Hungarian duck holding; the same virus strain was found in two dead swans in Sweden at the end of March 2015.

Cases continue to be reported from South Korea, where the outbreaks which started in early 2014 had reached a total of 212 by the end of March 2015. Taiwan has reported a total of 280 outbreaks and Japan 16, in both wild birds and poultry. In the United States, there have been 20 outbreaks of H5N8, most in wild birds but also in two commercial holdings.

The United States has been particularly hard hit by HPAI viruses (mainly of subtype H5N2) during spring 2015. The AI outbreaks have caused the death of more than 46 million birds and brought serious disruptions to US egg and turkey markets.

**Expert opinion**

In response to the global H5N1 crisis, international cooperation has been enhanced, with a resulting improvement in disease surveillance and control worldwide. The development of laboratories and laboratory networks – with the support of the international community in developing countries – has made diagnosing avian and human influenza faster and more accurate. Countries in which human cases of avian influenza have occurred are able to detect cases quickly and are aware of the importance of keeping a close eye on possible human-to-human transmission.

Despite this, global surveillance of influenza viruses has been criticised for being too reactive, only responding to disease outbreaks, whereas sustained surveillance is needed in order to monitor how viruses evolve and spread.

In addition, the data collected are not geographically representative: only a handful of countries collect samples systematically. Poorer countries tend to have fewer surveillance resources, and farmers in these countries are more reluctant to report outbreaks, since they receive little or no compensation for their culled animals. Countries may also not be too eager to find and report cases, simply to avoid trade problems.

Some experts, including the joint OIE-FAO global network of expertise on animal influenza (OFFLU), propose to establish a globally coordinated and standardised surveillance system for wild birds (which are natural reservoirs for AI viruses), rather
than focus on recent outbreaks. This kind of upstream tracking could provide comparable information on the likely evolution and movement of AI viruses and create a critical early warning system. Surveillance efforts should primarily target high-risk species in specific seasons, migration stopover sites and ‘reassortment hotspots’ – places where exchanges of genetic material between viruses are likely to occur.

**Main references**


*Comparing introduction to Europe of highly pathogenic avian influenza viruses A(H5N8) in 2014 and A(H5N1) in 2005*, C. Adlhoch et al., Eurosurveillance, 19 (50), December 2014.


*H5N8 Highly Pathogenic Avian Influenza (HPAI) in poultry and wild birds*, UNEP/CMS and FAO Scientific Task Force on Avian Influenza and Wild Birds, December 2014.


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eprs@ep.europa.eu
http://www.eprs.ep.parl.union.eu (intranet)
http://epthINKtank.eu (blog)