

A cross departmental Q&A guide on the interrelationship between human and bird flu written for the general public (not for the expert!)

1. What is influenza?

Influenza is a viral disease that affects a wide variety of animal species including birds, pigs and humans, with each species having their own “types” of flu virus. There are a family of influenza viruses grouped into three types, A, B and C. Influenza A and B viruses are of concern for human health, but only type A viruses cause **pandemics** (global outbreaks affecting large numbers of people)

2. What is bird flu (avian influenza)?

Bird flu is a **contagious** (spreads by contact) disease of animals caused by influenza A viruses. Avian influenza viruses are normally only found in birds, but may infect pigs and have been known to infect sea mammals, mink, horses and other mammals. On rare occasions some types of avian influenza viruses have infected humans but usually without involving human to human spread.

In domestic poultry, infection with avian influenza viruses causes two main forms of disease, distinguished by low and high extremes of **virulence** (intensity of the disease). The so-called “**low pathogenic**” form commonly causes only mild symptoms (ruffled feathers, a drop in egg production, respiratory signs) and may go undetected. The **highly pathogenic** form is far more dramatic. It spreads very rapidly through poultry flocks, causes disease affecting multiple internal organs, and can kill up to 100% of the infected birds, often within 48 hours.

3. What does H5N1 mean when we talk about avian influenza virus?

Many different subtypes of influenza exist. The subtypes are named after the combination of variants of two of the virus proteins. Each influenza A virus has one of 16 H subtypes and one of 9 N subtypes. Only avian viruses which have the combination of H5 and H7 subtypes are known to cause the highly pathogenic form of the disease. However, not all viruses of the H5 and H7 subtypes are highly pathogenic and not all will cause severe disease in poultry.

Low pathogenic avian influenza viruses appear to have the ability to become highly pathogenic by **mutation**, which appears to occur only after the H5 or H7 viruses have moved from their natural wild bird hosts into domestic poultry. Mutation is a process where there is an alteration in the genes of a cell or virus which is transmitted to the offspring.

Influenza A viruses contain 8 distinct RNA genes and **reassortment** of these can occur if two different viruses infect the same animal so that viruses emerge with a set of genes made up of some of the genes from one virus and some from the other. In the 20th Century there were 4 pandemics of influenza due to the emergence of new and genetically distinct strains in humans: 1918 (H1N1), 1957 (H2N2), 1968 (H3N2) and 1977 (H1N1). The 1957 and 1968 pandemic viruses differed from the preceding viruses in humans by the substitution of genes that came from avian viruses, suggesting they arose by genetic reassortment of viruses of human and avian origin.

Mutation and re-assortment happen continuously in the family of influenza viruses, but as can be seen pandemics have only occurred four times in 100 years and are unevenly spaced over time.

4. Why are we so worried about bird flu subtype H5N1?

The current outbreaks of highly pathogenic avian influenza, which began in South-east Asia in mid-2003, is one of the largest and most severe on record. Never before in the history of this disease have so many countries been simultaneously affected. The disease and attempts to halt its spread have resulted in the death or destruction of an estimated 150 million birds. The H5N1 virus is now considered **endemic** (regularly found) in many parts of Indonesia and Vietnam and in some parts of Cambodia, China, and Thailand.. Establishing control of this disease in poultry is expected to take several years.

The widespread persistence of H5N1 in poultry populations poses two main risks for human health.

The first is the small risk of direct infection when the virus passes from poultry to humans and causes severe disease. Of the very few avian influenza viruses that have infected humans, the current H5N1 virus has caused the largest number of cases of severe disease and death, although the disease has been self limiting. Unlike normal seasonal influenza, where infection causes only mild respiratory symptoms in most people, the disease caused by H5N1 follows an unusually aggressive clinical course, with rapid deterioration and high fatality. Primary viral pneumonia and multi-organ failure are common. In the present outbreak, 61 out of the 118 people known to have been infected with the virus have died. These figures contrast with the 12,000 annual 'normal flu' fatalities within the UK per annum and with the 400, 000 to 1.4 million worldwide. Unusually most cases have occurred in previously healthy children and young adults rather than the elderly or immunologically challenged. It is not known how many unreported mild or sub-clinical infections of humans with the H5N1 virus have occurred.

At the moment the virus does not appear to be able to spread readily between humans. However, a second risk, of even greater concern, is that the virus – if given enough opportunities – will change, by reassortment with human influenza viruses or by some other mechanism, into a form that is highly infectious for humans and spreads easily from person to person. Such a change could mark the start of a global outbreak (a pandemic).

5. How do people become infected?

Direct contact with infected poultry, or surfaces and objects contaminated by their faeces, is presently considered the main route of human infection. To date, most human cases have occurred in rural or urban fringe areas where many households keep small poultry flocks, which often roam freely, sometimes entering homes or sharing outdoor areas where children play. As infected birds shed large quantities of virus in their faeces, opportunities for exposure to infected droppings or to environments contaminated by the virus are abundant under such conditions. Moreover, because many households in Asia depend on poultry for income and food, many families sell or slaughter and consume birds when signs of illness appear in a flock, rather than disposing of the birds safely and this practice has proved difficult to change. Exposure is considered most likely during slaughter, defeathering, butchering, and preparation of poultry for cooking. There is no evidence that properly cooked poultry or eggs can be a source of infection.

Poultry keeping practices are very different in the UK and the risks of coming into contact with bird flu very much lower for the general population. There will be some risk for poultry keepers, veterinarians and those who assist them in the advent of an outbreak of H5N1 bird flu in the UK. Defra and other government departments and agencies have contingencies for this event.

6. Does the virus spread easily from birds to humans?

No. Though more than 120 human cases have occurred in the current outbreak only approximately 60 individuals have died in Asia. This is a small number compared with the huge number of birds affected and the numerous associated opportunities for human exposure, especially in areas where backyard flocks are common. It is not presently understood why some people, and not others, become infected following similar exposures.

7. Are we experiencing a bird flu pandemic?

No. There have been severe and prolonged outbreaks in birds in South East Asia but only sporadic and isolated occurrences in the rest of the world. The outbreaks cannot be described as a pandemic, there is not a **worldwide** outbreak of bird 'flu at this time.

8. What is the risk of a human 'flu pandemic?

We do not know. The H5N1 bird flu virus meets **two out of three** conditions necessary to cause a human pandemic. It infects humans and it causes serious illness, but **critically** it does not spread easily and sustainably between humans. If this virus subtype changes to spread easily and sustainably between humans it may have the capacity to cause a pandemic, but we cannot predict if this will happen or when or where this will happen. Nor can we predict whether the virus would retain its ability to cause serious disease. But we can take precautions to protect humans and we can take action where bird flu is identified in poultry.

9. What part do wild birds play in the spread of bird 'flu?

We do not know. Wild waterfowl e.g. ducks and geese are considered to be a natural reservoir for all type A influenza viruses and have probably carried them without apparent harm for centuries. There is circumstantial evidence that suggests that wild migratory birds can spread bird flu to domestic poultry and there is a theoretical possibility that wild birds are now directly spreading the H5N1 virus. However there is no direct evidence as yet and active monitoring of the wild bird population will soon give us more evidence on these uncertainties.

10. Further sources of information:

- 1) The World Health Organisation "Avian influenza frequently asked questions" from which much of the Q&A above has been directly drawn:
http://www.who.int/csr/disease/avian_influenza/en/
- 2) The Department of Health Pandemic Flu advice:
<http://www.dh.gov.uk/PolicyAndGuidance/EmergencyPlanning/PandemicFlu/fs/en>
3. The Defra Animal Health and Welfare Current information on Avian influenza: <http://defraweb/animalh/diseases/notifiable/disease/ai/index.htm>
- 4: The Health Protection Agency advice on avian influenza:
http://www.hpa.org.uk/infections/topics_az/avianinfluenza/menu.htm
- 5: The Food and Agriculture Organisation (of the United Nations) advice:
http://www.fao.org/ag/againfo/subjects/en/health/diseases-cards/special_avian.html