Avian influenza

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Avian influenza, sometimes **Avian flu**, and commonly **Bird flu**, refers to "influenza caused by viruses adapted to birds."[1][2][3][4][5][6][7] Of greatest concern is **highly pathogenic avian influenza** (**HPAI**).

"Bird flu" is a phrase similar to "Swine flu," "Dog flu," "Horse flu," or "Human flu" in that it refers to an illness caused by any of many different strains of influenza viruses that have adapted to a specific host. All known viruses that cause influenza in birds belong to the species: *Influenza A virus*. All subtypes (but not all strains of all subtypes) of Influenza A virus are adapted to birds, which is why for many purposes avian flu virus *is* the Influenza A virus (note that the "A" does *not* stand for "avian").

Adaptation is non-exclusive. Being adapted towards a particular species does not preclude adaptations, or partial adaptations, towards infecting different species. In this way strains of influenza viruses are adapted to multiple species, though may be preferential towards a particular host. For example, viruses responsible for influenza pandemics are adapted to both humans and birds. Recent influenza research into the genes of the Spanish Flu virus shows it to have genes adapted to both birds and humans; with more of its genes from birds than less deadly later pandemic strains.

Genetics

Genetic factors in distinguishing between "dog flu viruses" and "avian flu viruses" include:

> **PB2**: (RNA polymerase): Amino acid (or residue) position 627 in the PB2 protein encoded by the PB2 RNA gene. Until H5N1, all known avian influenza viruses had a Glu at position 627, while all human influenza viruses had a lysine.
>
> **HA**: (hemagglutinin): Avian influenza HA bind alpha 2-3 sialic acid receptors while human influenza HA bind alpha 2-6 sialic acid receptors. Swine influenza viruses have the ability to bind both types of sialic acid receptors. Hemagglutinin is the major antigen of the virus against which neutralizing antibodies are produced and influenza virus epidemics are associated with changes in its antigenic structure. This was originally derived from pigs, and should technically be referred to as "Pig Flu" (see ref. 7a)

Subtypes

There are many subtypes of avian influenza viruses, **but only some strains of four subtypes have been highly pathogenic in humans**. These are types H5N1, H7N3, H7N7 and H9N2.

Examples of Avian influenza A virus strains:[9]

HA subtype designation	NA subtype designation	Avian influenza A viruses
H1	N1	A/duck/Alberta/35/76(H1N1)
H1	N8	A/duck/Alberta/97/77(H1N8)
H2	N9	A/duck/Germany/1/72(H2N9)
H3	N8	A/duck/Ukraine/63(H3N8)
H3	N8	A/duck/England/62(H3N8)
H3	N2	A/turkey/England/69(H3N2)
H4	N6	A/duck/Czechoslovakia/56(H4N6)
H4	N3	A/duck/Alberta/300/77(H4N3)
H5	N3	A/tern/South Africa/300/77(H4N3)
H5	N9	A/turkey/Ontario/7732/66(H5N9)

H5	N1	A/chick/Scotland/59(H5N1)
H6	N2	A/turkey/Massachusetts/3740/65(H6N2)
H6	N8	A/turkey/Canada/63(H6N8)
H6	N5	A/shearwater/Australia/72(H6N5)
H6	N1	A/duck/Germany/1868/68(H6N1)
H7	N7	A/fowl plague virus/Dutch/27(H7N7)
H7	N1	A/chick/Brescia/1902(H7N1)
H7	N3	A/turkey/England/639H7N3)
H7	N1	A/fowl plague virus/Rostock/34(H7N1)
H8	N4	A/turkey/Ontario/6118/68(H8N4)
H9	N2	A/turkey/Wisconsin/1/66(H9N2)
H9	N6	A/duck/Hong Kong/147/77(H9N6)
H10	N7	A/chick/Germany/N/49(H10N7)
H10	N8	A/quail/Italy/1117/65(H10N8)

H11	N6	A/duck/England/56(H11N6)
H11	N9	A/duck/Memphis/546/74(H11N9)
H12	N5	A/duck/Alberta/60/76/(H12N5)
H13	N6	A/gull/Maryland/704/77(H13N6)
H14	N4	A/duck/Gurjev/263/83(H14N4)
H15	N8	A/duck/Australia/341/83(H15N4)
H15	N9	A/shearwater/Australia/2576/83(H15N9)

Influenza pandemic

Pandemic flu viruses have some avian flu virus genes and usually some human flu virus genes. Both the H2N2 and H3N2 pandemic strains contained genes from avian influenza viruses. The new subtypes arose in pigs coinfected with avian and human viruses and were soon transferred to humans. Swine were considered the original "intermediate host" for influenza, because they supported reassortment of divergent subtypes. However, other hosts appear capable of similar coinfection (e.g., many poultry species), and direct transmission of avian viruses to humans is possible.[10] The Spanish flu virus strain may have been transmitted directly from birds to humans.[11]

In spite of their pandemic connection, avian influenza viruses are noninfectious for most species. When they are infectious they are usually asymptomatic, so the carrier does not have any disease from it. Thus while infected with an avian flu virus, the animal doesn't have a "flu". Typically, when illness (called "flu") from an avian flu virus *does* occur, it is the result of an avian flu virus strain adapted to one species spreading to another species (usually from one bird species to another bird species). So far as is known, the most common result of this is an illness so minor as to be not worth noticing (and thus little studied). But with the domestication of chickens and turkeys, humans have created species subtypes (domesticated poultry) that can catch an avian flu virus adapted to waterfowl and have it rapidly mutate into a form that kills in days over 90% of an entire flock and spread to other flocks and kill 90% of *them* and can only be stopped by killing every domestic bird in the area. Until H5N1 infected humans in the 1990s, this was the

only reason avian flu was considered important. Since then, avian flu viruses have been intensively studied; resulting in changes in what is believed about flu pandemics, changes in poultry farming, changes in flu vaccination research, and changes in flu pandemic planning.

H5N1 has evolved into a flu virus strain that infects more species than any previously known flu virus strain, is deadlier than any previously known flu virus strain, and continues to evolve becoming both more widespread and more deadly causing Robert Webster, a leading expert on avian flu, to publish an article titled "The world is teetering on the edge of a pandemic that could kill a large fraction of the human population" in *American Scientist*. He called for adequate resources to fight what he sees as a major world threat to possibly billions of lives.[12] Since the article was written, the world community has spent billions of dollars fighting this threat with limited success.

H5N1

The highly pathogenic Influenza A virus subtype H5N1 virus is an emerging avian influenza virus that has been causing global concern as a potential pandemic threat. It is often referred to simply as "bird flu" or "avian influenza" even though it is only one subtype of avian influenza causing virus.

H5N1 has killed millions of poultry in a growing number of countries throughout Asia, Europe and Africa. Health experts are concerned that the co-existence of human flu viruses and avian flu viruses (especially H5N1) will provide an opportunity for genetic material to be exchanged between species-specific viruses, possibly creating a new virulent influenza strain that is easily transmissible and lethal to humans.[13]

Since the first H5N1 outbreak occurred in 1997, there has been an increasing number of HPAI H5N1 bird-to-human transmissions leading to clinically severe and fatal human infections. However, because there is a significant species barrier that exists between birds and humans, the virus does not easily cross over to humans, though some cases of infection are being researched to discern whether human to human transmission is occurring.[10] More research is necessary to understand the pathogenesis and epidemiology of the H5N1 virus in humans. Exposure routes and other disease transmission characteristics such as genetic and immunological factors, that may increase the likelihood of infection, are not clearly understood. [14]

On January 18, 2009, A 27-year-old woman from eastern China has died of bird flu, Chinese authorities said, making her the second person to die this year from the deadly virus. Two tests on the woman were positive for H5N1 avian influenza, said the ministry, which did not say how she might have contracted the virus[15].

Although millions of birds have become infected with the virus since its discovery, 248 humans have died from the H5N1 in twelve countries according to WHO data as of January 2009.[*citation needed*] View the most current WHO Data regarding:Cumulative Number of Human Cases

The Avian Flu claimed at least 200 humans in Indonesia, Vietnam, Laos, Romania, China, Turkey and Russia. Epidemiologists are afraid that the next time such a virus mutates, it could pass from human to human. If this form of transmission occurs, another pandemic could result. Thus disease-control centers around the world are making avian flu a top priority. These organizations encourage poultry-related operations to develop a preemptive plan to prevent the spread of H5N1 and its potentially pandemic strains. The recommended plans center on providing protective clothing for workers and isolating flocks to prevent the spread of the virus.[16]