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Bird Flu

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Abstract

50 million people died because of a human pandemic brought on by a particular strain of the influenza A virus in 1918. We now know far more about the genesis, evolution, and epidemiology of influenza epidemics than we did a century ago thanks to the development of sequencing technology and associated phylogenetic techniques. Here, we examine the evolution of avian influenza viruses through the perspective of their genetic makeup, commencing with the 1918 H1N1 strain and progressing through the highly deadly bird epidemics and zoonoses up to 2018.We outline how new influenza first appeared. A virus develops new strains through reassortment and evolution in wild and domestic bird populations, as well as through the contribution of long-distance wild bird migration. A description of the recent zoonotic spread of the avian H5 and H7 viruses into humans and the advent of highly dangerous avian influenza viruses is also provided. Even though domestic avian populations may be managed to reduce the risk to human health, the possibility of a novel avian influenza virus creating a pandemic is still present today.

Key words (influenza virus, human pandemic, epidemiology, zoonotic, human health)

Introduction

The H5N1 virus, which is extremely virulent and is pandemic in poultry, continues to spread and poses a serious threat to both animal and human health. Since avian influenza viruses are where the pandemic influenza virus got its start, the HPAI H5N1 virus must be viewed as a potentially major pandemic danger. It seems inevitable that there will be new influenza virus pandemics in the twenty-first century, but it is far from clear that H5N1 will be the next such virus. However, it is already the case that H5N1 viruses are having a significant negative impact on the poultry business in many developing nations, which has an effect on both the economic situation and social conditions

The potential impact of HPAI H5N1 virus (and human reaction to its spread) on wildlife and ecology has received less attention but is also worthy of consideration. The H5N1 virus can spread zoonotically from infected poultry to humans, however this method of transmission is nonetheless ineffective and frequently lethal. Although the virus replicates effectively in sick people, it has not yet developed an effective method of spreading from person to person. Therefore, H5N1 keeps posing problems for our comprehension of influenza virus interspecies transmission.

Figure 1 infected bird

In this article, we go over the biology and ecology of HPAI H5N1 viruses in the context of all other influenza viruses, both human and animal. We explore approaches for preventing H5N1 transmission in humans and animals and evaluate the threat of a pandemic. We specifically talk about the epidemiology, clinical manifestation, pathophysiology, diagnosis, and management of the human H5N1 sickness.

Causes of Bird Flu

Chickens, turkeys, ducks, and geese are examples of domestic poultry that can contract the bird flu, which naturally affects wild waterfowl. Contact with an affected bird's face or secretions from its eyes, mouth, or nose can spread the disease. Open-air markets, where eggs and birds are sold in crowded, unhygienic settings, are breeding grounds for the disease and can spread it across the neighbourhood.

Bird flu can be spread through raw poultry meat or eggs from infected birds. If poultry flesh has reached an internal temperature of 165 F, it is safe to consume (74 C). The yolks and whites of eggs should be cooked until they are set. The term "avian influenza" describes a condition that affects birds and is brought on by infection with Type A avian influenza viruses. Over 100 different species of wild birds throughout the world have avian influenza A viruses isolated from them. These viruses can infect domestic poultry, various bird and animal species, as well as wild aquatic birds around the world.

Wild aquatic birds include shorebirds like storks, plovers, and sandpipers as well as waterbirds (waterfowl) like ducks, geese, swans, gulls, and terns. Wild water birds are thought to serve as hosts or reservoirs for avian influenza A viruses, particularly dabbling ducks. Some species, like ducks, may not become ill despite contracting avian influenza A viruses in their intestines and respiratory systems.

Genomic structure of virus

The influenza virus is a member of the Orthomyxoviridae viral family, which includes single-stranded minus-sense RNA viruses with segmented genomes. The eight influenza RNA segments 11 viral proteins are encoded by a virus genome.

These include the non-structural proteins (M1, M2), the matrix proteins (M1, M2), the polymerase proteins (PB1, PB2, PA, PB1-F2), the nucleocapsid protein, hemagglutinin, and neuraminidase (NS1, NS2).

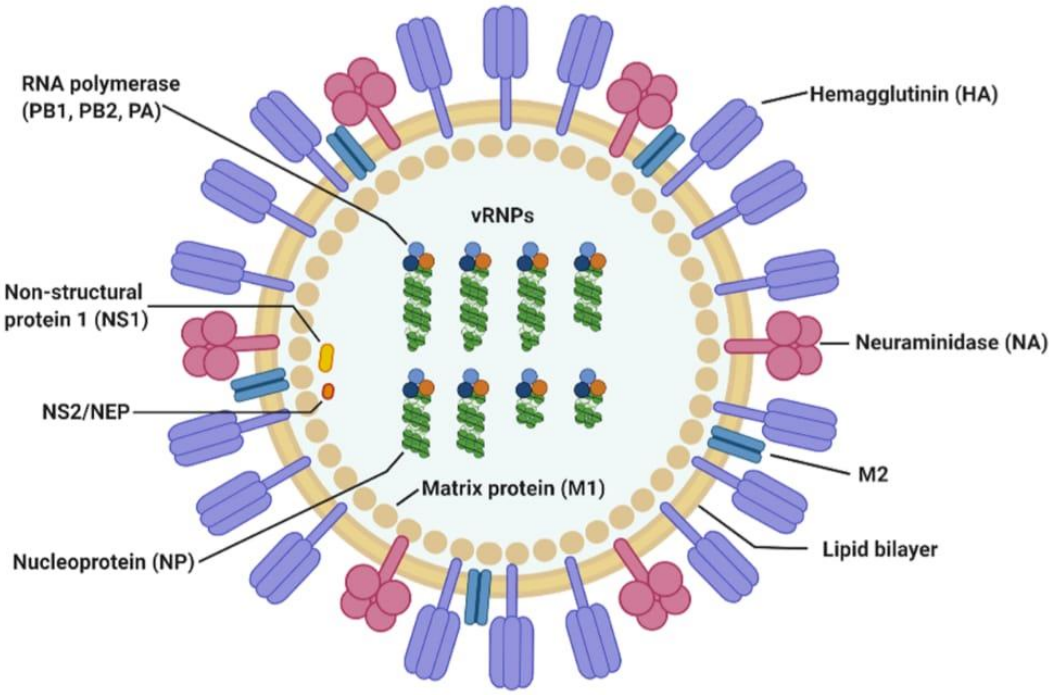

Figure 2 genomic structure of virus

The two main antigenic components that determine the subtypes of influenza A viruses are hemagglutinin and neuraminidase. There are 9 neuraminidase and 16 hemagglutinin (H1 to H16) kinds (N1 to N9).

By interacting to sialic acid receptors on the cell surface, hemagglutinin facilitates virus attachment to and entrance into host cells, which contributes to the host specificity of the distinct influenza A virus subtypes. However, altering just one amino acid in the H5 protein is enough to alter how specifically A/H5N1 viruses bind to receptors. Thus, it is simple to get beyond the barrier to interspecies infection.

By neutralizing antibodies, hemagglutinin also serves as the primary viral target of protective humoral immunity. Neuraminidase, the target of neuraminidase inhibitors, promotes the propagation of virions in the host by cleaving the glycosidic connections to sialic acid on host cells and the surface of viral particles. M2 is an ion channel that is essential for pH-dependent matrix protein separation from the nucleocapsid during viral uncoating and pH fluctuations across the trans-Golgi network during hemagglutinin molecular maturation.

Sign and Symptoms of Bird Flu

Symptoms and indicators of avian flu may occur two to seven days after infection, depending on the strain. They frequently have traits in common with conventional influenza, like

- Fever (Temperature of 100°F (37.8°C) or greater or feeling chills.
- Coughing
- Sore throat
- Difficulty breathing
- Conjunctivitis
- Headaches
- Runny nose
- Muscle and body aches
- Diarrhoea

Bird Flu in Animals and Pets

Some bird flu viruses not only infect and spread predominantly among wild migratory water birds and domestic poultry, but they can also infect and spread to other animals. Bird flu viruses have been documented to occasionally infect mammals, including but not limited to wild animals like foxes and skunks, stray or domestic animals like cats and dogs, and zoo animals such as tigers and leopards probably eats infected birds

Although it's unusual, it is possible for humans to contract bird flu viruses through contact with an infected wild, stray, feral, or domestic mammal. This is particularly true if unprotected exposure to an infected animal is extended.

If your pet dogs or cats go outside and maybe eat sick or dead birds that have been exposed to the virus, they could get bird flu. Although it's unlikely, it is possible for you to catch the avian flu from your sick pet. For instance, in New York City, a cat and a person were said to have contracted avian flu in 2016. a veterinarian he had encountered. ill animals repeatedly without wearing protective gear caught the virus and experienced minor symptoms.

Prevention of Bird Flu

Bird flu vaccine

The Food and Drug Administration has approved one H5N1 avian flu vaccination to prevent sickness. Although this vaccine isn't accessible to the general population, the American government has it in reserve and will give it out in the event of an outbreak.

In the early stages of an outbreak, this vaccine could be given to provide a basic level of protection while waiting for the development and production of a separate vaccine to provide protection against the particular strain of the virus that is causing the outbreak. According to a researcher, more bird flu vaccines are still being developed.

Avoid domesticated birds

Avoid going to open-air markets, small farms, and rural locations if you can.

Avoid Contact With Infected Birds

If found any wild bird laying down due to infection, then avoid touching with naked hands

Figure 3 touching infected bird with naked hands

Wash your hands

This is among the easiest and most effective methods for avoiding all diseases. When travelling, use an alcohol-based hand sanitizer that has at least 60% alcohol

Poultry and egg products

Although cooked poultry can cause heat to eliminate avian viruses, it poses no health risk. The handling and preparation of poultry should be done with caution, though, as it may have been contaminated with dangerous bacteria like salmonella.

Figure 4 poultry birds

Avoid cross-contamination

Cutting boards, cutlery, and any other surfaces that have come into touch with raw poultry should be washed with hot, soapy water.

Cook thoroughly

Cook the chicken until the juices flow clear and the internal temperature

reaches a minimum of 165 F. (74 C).

Antiviral Drugs Can Be Used to Treat Illness

For those who contract bird flu, the CDC presently advises seeking treatment as soon as possible using flu antiviral medications. The optimal time to begin antiviral medication is as soon as symptoms appear. Please get in touch with your state or local health department as well as a healthcare physician soon away if you become ill after having close contact with sick or possibly contaminated birds. You might be asked to get tested for the bird flu, and a doctor might give you a prescription for an antiviral medication to treat your condition. It's crucial to take the medication exactly as prescribed.

The majority of bird flu virus infections would respond to treatment with flu antiviral medications, if therapy is initiated soon after symptoms appear, according to data on the spread of bird flu viruses around the world. The H5N1 and H7N9 avian flu viruses, which were initially discovered in Asia, may make some flu antiviral medications less effective. Antiviral resistance is the term for when flu viruses change in a way that reduces the efficacy of antiviral medications. The CDC frequently checks the antiviral resistance of avian flu viruses.

Protective actions around birds

• As a general precaution, people should try to keep a space between themselves and wild birds whenever feasible.

• Avoid touching any surfaces that may have been touched by wild or domesticated bird faces, mucus, or saliva best prevention is to avoid sources of exposure

The best way to prevent avian (bird) influenza (flu) is to reduce your exposure to potentially dangerous scenarios. The virus is secreted by infected birds in their faeces, mucus, and saliva.

Even though bird flu infections in humans are rare, they can happen if enough of the virus gets in someone's eyes, nose, or mouth, or if they breathe it in. A person can contract a virus by touching something with a virus on it and then touching their lips, eyes, or nose, or by breathing in a virus that is in the air. When a person comes into close, prolonged, and unprotected (without gloves or other protective clothing) contact with an infected bird and subsequently touches their body, they are most likely to contract the bird flu. protective measures for those who work with birds that are afflicted with the avian flu

Transmission of Avian Influenza Viruses to Humans

The potential for avian influenza By experimentally infecting 81 healthy human volunteers, the ability of viruses of the subtypes H1N1, H3N8, H3N2, H6N2, H6N1, H9N2, H4N8, and H10N7 to reproduce in humans was examined. The nasopharynx of some volunteers who had been experimentally exposed to the H4N8, H10N7, or H6N1 virus displayed signs of viral replication, and some of the participants also experienced moderate upper respiratory symptoms. Using the standard hemagglutination inhibition (HI) test, none of them showed any indication of growing antibody titters. The reactions of neutralizing antibodies were not evaluated. It was unsuccessful to artificially spread H6N1 from one volunteer to another. Although there was no sign of virus replication in the nasopharynx in volunteers who had been exposed to the avian H1N1, H3N2, H3N8, H6N2, or H9N2 viruses, some of them developed serological reactions to the virus that had infected them. It was hypothesized.

The cross-reacting immunity that stopped avian viral multiplication may have been produced by unintentional infections by human viruses of subtypes H1 or H3 and N1 or N2. These results show that avian influenza viruses can infect people, at least after experimental challenge, and also show that such infections are underestimated by traditional HI testing.

The first human Report History

In 1997, Hong Kong recorded the first H5N1-related illness in humans, with 18 cases and six fatalities. The live poultry markets where chickens, ducks, geese, and other smaller poultry species (such as quail, pheasant, chukka, pigeon, etc.) were sold for human consumption seemed to be the cause of the human illness. A father and son who had just returned from vacationing in the People's Republic of China's Fujian Province were found to have H5N1 sickness in Hong Kong in February 2003, as the world braced itself to deal with severe acute respiratory syndrome. These two patients were infected with a genotype Z virus, but it was classified genotype Z+ since it did not have a deletion in the NA's stalk region.

This virus's receptor binding profile was altered to identify both the human SA -2,6 receptor and the avian SA -2,3 receptor due to an amino acid substitution at position 227 (H3 numbering) in the receptor binding pocket of the HA. But by itself, this didn't seem to alter its ability to spread from person to person. In retrospect, a second H5N1 case was reported in the People's Republic of China's capital city of Beijing in November 2003. As the H5N1 virus spread more widely among poultry, additional human cases from Vietnam, Thailand, Cambodia, Indonesia, and other countries were later documented.

In a few cases, the discovery of a human case in an area was the first sign that an infection in poultry existed there. Collectively, the winter and spring months seem to see an upsurge in human cases. This is consistent with the seasonality of viral detection in chickens.

Conclusion

Not because an H5N1 pandemic is inevitable but because of the potential serious harm it could cause to people's health. Such a pandemic might very likely be extremely virulent in humans, especially if it originates by direct adaptation rather than genetic reassortment with a pre-existing human virus. Consequently, an H5N1 pandemic is a low-probability occurrence with a high impact on human health.

However, it is apparent that the H5N1 pandemic is already having an effect on human health through its economic and nutritional effects on rural populations as well as through sporadic zoonotic transmission, which causes severe human illness with its associated social consequences.

. The disappearance of a significant source of protein for many people makes protein deficiency just as dangerous as zoonotic "bird sickness." Given the endemicity of the H5N1 virus in poultry and its expanding geographic distribution, as well as its potential (but unproven) presence in wild bird populations, H5N1 is expected to continue to pose a major threat to human health for some time to come.

It is obvious that efforts should be made to contain the current panzootic in poultry. If not, the associated H5N1 pandemic danger will keep posing a problem for public health.

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