

**A Review Avian Influenza Impact on Human and Birds**Janvi M Patel¹ and Dharmendra Singh Rajput^{2*}^{1,2}Department of Pharmacy Practice, Indubhai Patel College of Pharmacy & Research Centre, Dharmaj, Anand Gujarat, India**ABSTRACT**

Bird flu known as avian influenza, is a viral infection that can infect birds, also humans and other animals. Most forms of the virus are restricted to birds. Currently, the virus isn't known to spread via human-to-human contact. Still, some experts' worry that H5N1 may pose a risk of becoming a pandemic threat to humans. With the novel coronavirus still rampant, fear of a new virus — which causes bird flu — has spread. This virus does not normally spread from human to human — however, earlier outbreaks caused considerable losses to the poultry industry. Several states have reported deaths of birds, but mostly non-domesticated. After bird flu (avian influenza) was confirmed in Kerala, Rajasthan, Madhya Pradesh, Haryana, and Himachal Pradesh, high alert has been sounded in Maharashtra. Several states, which have been reporting deaths of birds, including crows and migratory species, are scrambling to have samples tested for the virus. As anxiety spreads, there is fear of a fresh blow to the poultry industry — reports have been coming in of people giving up chicken and eggs, and of prices beginning to fall. Bird flu symptoms in humans can vary and range from "typical" flu symptoms (fever, sore throat, muscle pain) to eye infections and pneumonia. The H5N1 virus is a particularly severe form of pneumonia that causes the disease leads to viral pneumonia and multiorgan failure in many people who become infected. Veterinarians and poultry workers usually treat bird flu in commercial outbreaks. In rare human outbreaks, primary-care physicians, pediatricians, and emergency-medicine specialists may initially treat patients but individuals with severe complications may be treated by infectious-disease specialists, critical-care specialists, hospitalists, and pulmonologists.

KEYWORDS

Floating Drug Delivery System (FDDS); Gastro retentive drug delivery system; gastrointestinal tract



INTRODUCTION

Bird flu (avian flu or avian influenza) refers to strains of influenza that primarily affect wild and domesticated birds. Bird flu is named H or N depending on the proteins found on the surface of the virus (5). Bird flu (avian influenza) is a disease caused by strains of influenza virus that primarily affects birds. In the late 1990s, a new strain of bird flu arose that was remarkable for its ability to cause severe disease and death, especially in domesticated birds such as ducks, chickens, or turkeys. As a result, this strain was called highly pathogenic (meaning very severe and contagious) avian influenza and termed H5N1. A new strain of bird flu was identified in China in 2013. The influenza A virus is termed H7N9 (H7N9 Chinese bird flu). The identification of the virus (H7N9) was reported Mar. 31, 2013; the strain is antigenically different from the H5N1 bird flu virus. Unfortunately, the H7N9 strain of bird flu seems to be genetically unstable. Since its discovery, at least 48 different subtypes of H7N9 have been identified. Because some H7N9 viruses are persistent in some chicken flocks in China, researchers are concerned that the strains will continue to swap genes with other flu viruses and may start a new pandemic. As of March 2015, no bird flu infections have been reported in humans in the U.S. Although the H1N1 "swine flu" pandemic strain contained some bird flu genes, it was not the same strain as the original H5N1 bird flu. (4)(5)

The virus spreads through infected birds shedding the virus in their saliva, nasal secretions, and droppings. Healthy birds get infected when they come into contact with contaminated secretions or feces from infected birds. Contact with contaminated surfaces such as cages might also allow the virus to transfer from bird to bird. Symptoms in birds range from mild drops in egg production to failure of multiple major organs and death.

The history of bird flu in humans is short. The first human case of illness from highly pathogenic avian influenza (termed HPAI in older literature) was identified in 1997. Since that time, H5N1 has infected 784 individuals with 429 deaths. Human cases of highly pathogenic bird flu have been largely confined to Southeast Asia (India, Bangladesh) and Africa. Mutations often occur in the virus, and it is possible that some mutations could create a more contagious virus that could cause a regional epidemic or a worldwide pandemic of bird flu among humans. (5, 11, 12, 16, 17)

INCIDENTS ACROSS INDIA:

Gujarat: 124 local birds, including 70 crows, and 6 migratory species reported dead



Odisha: 120 poultry birds dead in Khurda district; government says all samples so far have returned negative for bird flu

Uttar Pradesh: At least 10 crows found dead in Sonbhadra district; officials say cold and pollution likely cause; samples sent for testing

Rajasthan: A total 2,166 birds dead up to Friday; including 1,706 crows and 136 peacocks

Chhattisgarh: 4 crows were found dead on Thursday; samples sent for tests. Samples have been picked from seven government poultry farms too

Delhi: Around 20 crows reported dead over the last few days in East Delhi; samples sent for testing (2)

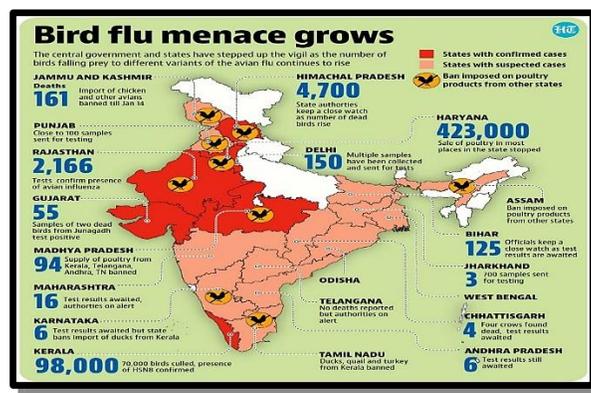


Figure 1. Incidents of Avian Influenza

Bird Flu in 2020

By the end of 2020 several outbreaks of avian flu of various varieties were reported in Europe. Since mid-October several European countries, including Belgium, Denmark, France, Germany, Ireland, the Netherlands, Sweden, and the United Kingdom have reported outbreaks of highly pathogenic avian influenza (HPAI) viruses, mostly in wild birds. Positive tests were also among poultry and captive birds. According to a report by the European Centre for Disease Prevention and Control (ECDC), three varieties of HPAI viruses were found, A (H5N8), A (H5N5) and A (H5N1), with H5N8 being the most commonly found. In Germany 29,000 chickens were killed to halt the spread of H5N8. In Belgium H5N5 was found on a poultry farm according to the World Organization for Animal Health (OIE). The outbreak was reported in Menen, near the border with France, and killed 600 birds and the culling of an additional 151,000 chickens from the flock. (6, 7, 8, 9)



ETIOLOGY OF BIRD FLU:

Bird flu is caused by strains of the influenza virus that have evolved to be specially adapted to enter avian cells. There are three main types of influenza: A, B, and C. The virus that causes bird flu is influenza A type with eight RNA strands that make up its genome. Influenza viruses are further classified by analyzing two proteins on the surface of the virus. The proteins are called hemagglutinin (H) and neuraminidase (N). There are many different types of hemagglutinin and neuraminidase proteins. For example, the recent pathogenic bird flu virus has type 5 hemagglutinin and type 1 neuraminidase. Thus, it is named "H5N1" influenza A virus (also termed HPAI or highly pathogenic avian influenza). The 2013 virus has different surface proteins, H7 and N9, hence the name H7N9. Other bird flu types include H7N7, H5N8, H5N2, and H9N2 (5). Although there are several types of bird flu, H5N1 was the first avian influenza virus to infect humans. The first infection occurred in Hong Kong in 1997. The outbreak was linked to handling infected poultry. H5N1 occurs naturally in wild waterfowl, but it can spread easily to domestic poultry. The disease is transmitted to humans through contact with infected bird feces, nasal secretions, or secretions from the mouth or eyes. Consuming properly cooked poultry or eggs from infected birds doesn't transmit the bird flu, but eggs should never be served runny. Meat is considered safe if it has been cooked to an internal temperature of 165°F (73.9°C). (3, 13, 14, 15, 16)



Figure 2 Transmission of Bird Flu (from Navbharat times New)

SIGN AND SYMPTOMS: Bird flu symptoms include: fever, cough, sore throat, and nausea. Diarrhea, respiratory difficulties, fever (over 100.4°F or 38°C), headache, muscle aches, malaise,



runny nose ,sore throat (3).Symptoms often progress to severe breathing problems, pneumonia, and acute respiratory distress syndrome (ARDS) (3) (5).Children get similar symptoms. This viral infection can progress to pneumonia and even respiratory failure. Bird flu causes a very aggressive form of pneumonia (acute respiratory distress syndrome or ARDS) that is often fatal.

RISK FACTORS:

H5N1 has the ability to survive for extended periods of time. Birds infected with H5N1 continue to release the virus in feces and saliva for as long as 10 days. Touching contaminated surfaces can spread the infection.

You may have a greater risk of contracting H5N1 if you are:

- a poultry farmer
- a traveler visiting affected areas
- exposed to infected birds
- someone who eats undercooked poultry or eggs
- a healthcare worker caring for infected patients
- a household member of an infected person(3)
- Humans may get bird flu from contact with infected birds (chickens, for example) or their infected droppings and secretions. Risk factors include caring for sick birds, killing sick birds, and preparing sick birds for consumption. Despite the large number of people who have contact with poultry every day in the world, human cases of bird flu remain rare. This highlights how difficult it is for the bird flu virus to infect human cells, but mutations like antigenic shifts may reduce such difficulties. The H1N1 pandemic that started in Mexico is an example of such a mutation (swine flu to human flu).(5)
- Although direct contact with sick poultry poses the highest risk for bird flu, indirect exposure to bird feces or other materials such as bird eggs is also a risk. Contact with unwashed eggs from sick birds or water contaminated by poultry feces poses a potential risk of disease.(5,19)

Is bird flu contagious?

Bird flu is very contagious among many bird species. In general, bird flu is not very contagious to humans, even to poultry workers. However, human-to-human spread has occurred in isolated cases. In human outbreaks, the first individual to become infected usually has had contact with



infected birds or poultry and then caregivers become infected. Thus, caring for a person infected with bird flu is also a risk factor for the disease. There is a theoretical risk in laboratory workers who handle the avian flu virus. One alleged incident in 2009 occurred when a company inadvertently sent live avian flu virus samples to research laboratories, which subsequently were used to vaccinate ferrets. The contaminated vaccine did not result in any human infections. (5, 15, 16)

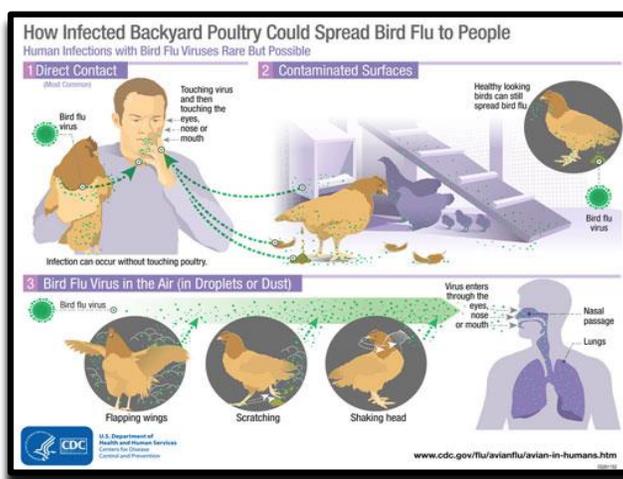


Figure 3 how it can infect?

PATHOPHYSIOLOGY:

There are many types of influenza viruses, and most prefer to live in a limited number of animals. Thus, swine flu primarily infects swine, and bird flu primarily infects birds. Human influenza strains are best adapted to humans. A few cases may occur in an accidental host, such as when people who have extensive contact with sick birds get the bird flu. Influenza viruses mutate easily and often. These mutations can arise spontaneously in a single virus or can occur when two different influenza strains get close enough together to exchange genetic material. There are two major types of mutations in influenza viruses: antigenic shifts, where large RNA segments are interchanged between different influenza virus type, and antigenic drifts, where small RNA sequences are changed. The antigenic shifts are usually responsible for developing new strains. New mutations can allow the virus to evade the body's immune system and makes older **vaccines** ineffective. Sometimes a flu virus will mutate in a way that makes it able to infect a new species. Serious pandemic influenza occurs when a relatively new strain of the influenza



virus arises that is highly contagious to humans. The disease is spread from region to region by migratory birds and through international trade in live poultry. Humans who are in close contact with sick birds—for example, poultry farmers and slaughterhouse workers—are at the greatest risk of becoming infected. Virus-contaminated surfaces and intermediate hosts such as pigs can also be sources of infection for humans. (5, 12, 13, 18, 22, 20)

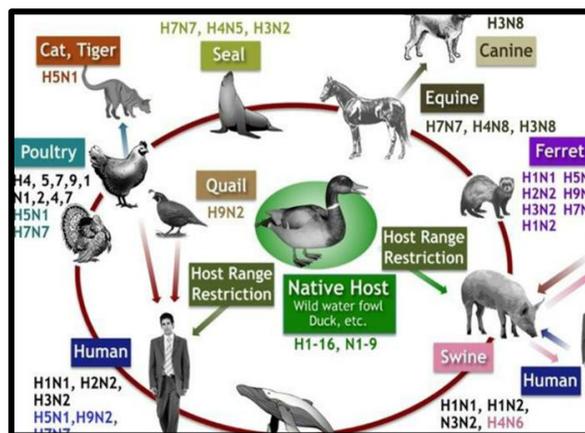


Figure 4 Different types of Influenza Transmission

DIAGNOSIS:

The Centers for Disease Control and Prevention (CDC) Trusted Source has approved a test designed to identify avian influenza. The test is called influenza A/H5 (Asian lineage) virus real-time RT-PCR primer and probe set. It can offer preliminary results in only four hours. However, the test isn't widely available.

Your doctor may also perform the following tests to look for the presence of the virus that causes bird flu:

- auscultation (a test that detects abnormal breath sounds)
- white blood cell differential
- nasopharyngeal culture
- chest X-ray

Additional tests can be done to assess the functioning of your heart, kidneys, and liver [1, 3]. Early detection of bird flu is important in preventing and controlling outbreaks. One way the virus can be detected is by polymerase chain reaction (PCR), in which nucleic acids from blood or tissue samples are analyzed for the presence of molecules specific to bird flu. Other methods include viral antigen detection, which detects the reaction of antibodies to



viral antigens in samples of skin cells or mucus, and viral culture, which is used to confirm the identity of specific subtypes of influenza based on the results of PCR or antigen detection and requires growth of the virus in cells in a laboratory. Tests based on lab-on-a-chip technology that take less than an hour to complete and can accurately identify specific subtypes of bird flu are being developed. This technology consists of a small device (the “chip”) that contains on its surface a series of scaled-down laboratory analyses requiring only a tiny volume of sample (e.g., picolitres of saliva). These chip-based tests, which are portable and cost-effective, can be used to detect different subtypes of influenza in both poultry and humans. (4)

TREATMENT:

Different types of bird flu can cause different symptoms. As a result, treatments may vary.

In most cases, treatment with antiviral medication such as oseltamivir (Tamiflu) or zanamivir (Relenza) can help reduce the severity of the disease. However, the medication must be taken within 48 hours after symptoms first appear. (3)

The virus that causes the human form of the flu can develop resistance to the two most common forms of antiviral medications, amantadine and rimantadine (Flumadine). These medications shouldn't be used to treat the disease. (3)

Your family or others in close contact with you might also be prescribed antivirals as a preventive measure, even if they aren't sick. You'll be placed in isolation to avoid spreading the virus to others.

Your doctor may place you on a breathing machine if you develop a severe infection. (3)

Vaccine Development

Because of the many immunologically distinct viral subtypes that cause influenza in animals and the ability of the virus to rapidly evolve new strains, preparation of effective vaccines is complicated. The most effective control of outbreaks in poultry remains rapid culling of infected farm populations and decontamination of farms and equipment. This measure also serves to reduce the chances for human exposure to the virus.

In 2007 the U.S. Food and Drug Administration approved a vaccine to protect humans against one subtype of the H5N1 virus. It was the first vaccine approved for use against bird flu in humans. Drug manufacturers and policy makers in developed and developing countries worked toward establishing a stockpile of the vaccine to provide some measure of protection against a



future outbreak of bird flu. In addition, scientists worked to develop a vaccine that is effective against another subtype of H5N1, as well as a vaccine that might protect against all subtypes of H5N1. Studies suggest that antiviral drugs developed for human flu viruses would work against bird flu infection in humans. The H5N1 virus, however, appears to be resistant to at least two of the drugs, amantadine and rimantadine. (4)

The flu virus changes from year to year. Vaccines provide protection against the most common strains of the flu each year. The flu vaccine works by stimulating the immune system to create antibodies to fight the infection.

To create an effective vaccine, the World Health Organization Trusted Source determines which strains of the flu virus to include in the next year's vaccine. The vaccine contains either an inactive or weakened form of the flu virus.

The virus is mixed with other ingredients, such as preservatives and stabilizers. Once you receive the flu vaccine, your body begins producing antibodies. This helps fight any exposure to the virus.

After getting a flu shot, you may have flu-like symptoms, such as a low-grade fever, a headache, or muscle aches.

However, the flu shot doesn't cause the flu. These symptoms typically go away within 24 to 48 hours. The most common complication of the flu vaccine is tenderness at the injection site.

PREVENTION: It's important to protect yourself and your family from the virus because of the potential for complications. Since the flu virus can be transmitted from person to person, make sure you wash your hands frequently with soap or use alcohol-based hand sanitizer. Also avoid touching your nose and mouth with unwashed hands. The flu virus can live on hard surfaces and objects for up to 48 hours Trusted Source. Use disinfectant wipes or spray on commonly touched surfaces in your home or at work to further protect yourself. If you're caring for someone who has the flu, wear a face mask to protect yourself. You can help stop the spread of the flu by covering your cough and sneezes. It's best to cough or sneeze into your elbow instead of your hands. Additionally, consider getting an annual flu vaccination. The vaccine is recommended for everyone over the age of 6 months. It protects against common strains of the flu virus. Although the vaccine isn't 100 percent effective, it can reduce the risk of flu by 40 to 60 percent Trusted



Source, according to the CDC. The flu vaccine is administered by injection in the arm. There's also a nasal spray flu vaccine option for nonpregnant individuals between the ages of 2-49. (3)

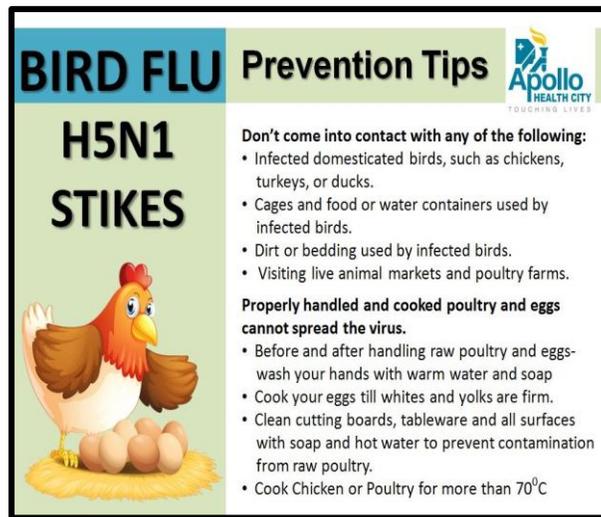


Figure 5 Prevention of Avian Influenza

The Best Prevention is to Avoid Sources of Exposure

Currently, the best way to prevent infection with avian influenza A viruses is to avoid sources of exposure whenever possible. Infected birds shed avian influenza virus in their saliva, mucous and feces. Human infections with bird flu viruses can happen when enough virus gets into a person's eyes, nose or mouth, or is inhaled. This can happen when virus is in the air (in droplets or possibly dust) and a person breathes it in, or when a person touches something that has virus on it then touches their mouth, eyes or nose. Rare human infections with some avian viruses have occurred most often after unprotected contact with infected birds or surfaces contaminated with avian influenza viruses. However, some infections have been identified where direct contact was not known to have occurred.

People who work with poultry or who respond to avian influenza outbreaks are advised to follow recommended biosecurity and infection control practices; these include use of appropriate personal protective equipment and careful attention to hand hygiene. Additionally, CDC recommends that people responding to poultry outbreaks should get a seasonal influenza vaccination every year, preferably at least two weeks before engaging in an outbreak response. Seasonal influenza vaccination will not prevent infection with avian influenza A viruses, but can reduce the risk of co-infection with human and avian influenza A viruses. These people should



also be monitored for illness during and after responding to avian influenza outbreaks among poultry. (2)

Protective actions around birds

- As a general precaution, people should avoid wild birds and observe them only from a distance
- Avoid contact with domestic birds (poultry) that appear ill or have died
- Avoid contact with surfaces that appear to be contaminated with feces from wild or domestic birds(OWN)



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