Current Concept on Bird Flu

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OPEN ACCESS

Keywords

Avian Influenza, Poultry, Zoonotic, Virus

How to cite this article

Dinani, O. P. 2023. Current Concept on Bird Flu. *Vigyan Varta* 4(3): 21- 24.

ABSTRACT

Avian influenza (AI), as per World Organization for Animal Health (OIE), is defined as an infection of poultry caused by any influenza A virus of the H5 or H7 subtypes or by any influenza A virus with an intravenous pathogenicity index (IVPI) greater than 1.2 (or as an alternative at least 75% mortality) as described below. Avian influenza or bird flu refers to the disease caused by infection with avian (bird) influenza (flu) Type A viruses. These viruses naturally spread among wild aquatic birds worldwide and can infect domestic poultry and other bird and animal species. Bird flu viruses do not normally infect humans. However, sporadic human infections with bird flu viruses have occurred. The first known cases in humans were reported in 1997, when an outbreak of avian influenza A virus subtype H5N1 in poultry in Hong Kong led to severe illness in 18 people, one-third of whom died proved its zoonotic potential.

INTRODUCTION

Synonyms-Bird flu, Fowl plague, Fowl pest, Brunswick bird plague, Fowl or bird grippe

Definition- Avian Influenza (AI) is defined as "any infection of poultry caused by either any influenza A viruses that has intravenous pathogenicity index (IVPI) in six weeks old chicken greater than 1.2 or any influenza A virus of H5 or H7 subtypes" (EU and OIE,2000).

Influenza viruses- Influenza viruses are RNA virus in family Orthomyxoviridae (Ortho means correct and myxo means mucous).It is spherical in shape having ribonucleioprotein.It has negative sense segmented RNA 100 nm diameter. This virus has 8 segments encodes for 10 proteins PA.PB1,PB2,HA,NA,NP,M1,M2,NS1 and NS2.Segment 4 codes for hemagglutinin (HA) which is rod like homotrimer and provides sides for attaching host cells. Segments 6 codes for neuraminidase (NA) which is mushroom shaped heterotrimer and it remove neuraminic

acid from mucin release from cell. There are 16 HA and 9 NA for influenza A virus.

Classification-Based on ribonucleioprotein and M protein, it is divided into three main types-Type A: Multiple species including human, horse, pig, birds *etc;*

Type B: Human, less severe and less common; and

Type C -Human and pig, mild to symptomless. Based on pathogenicity, it is of two types-

Low pathogenic Avian Influenza (LPAI) - Influenza A virus of H1 to H16.

Low pathogenic Avian Influenza (LPAI) of H5 or H7 origin may be transformed into HPAI due to mutation, antigenic shift or antigenic drift. It is most common and occurs occasionally worldwide.

Symptoms-Mild respiratory signs, ruffled feathers, reduced egg production *etc.*

Highly pathogenic Avian Influenza (HPAI)- Influenza A virus of H5 or H7 subtypes is in OIE list A disease while low pathogenic Avian Influenza (LPAI) is in neither in list A nor in list B of OIA. Wide range of host and expanding mammalian hosts, may act as mixing vessel.

Symptoms- It is much less common. It has sudden onset, Ulceration/Cyanosis and/Edema of head, neck, comb and wattle; blotchy discoloration of shank; haemorrage in mucous, serus membrane and fatty tissue; nasal and ocular discharge, sinusitis *etc.* Mortility may reach 100% in 48 hrs of onsets of signs.

Geographical distribution and transmission- Avian Influenza (AI) has worldwide distribution. Reservoirs of AI includes free flying aquatic birds, ducks, geese, shorebirds, gulls, terns, auks, psittacine, emu, ostrich *etc.* Source of infection are poultry birds, migratory waterfowl, pet birds.AI spread by aerosol, shared drinking water, fomites, secretions, excretions, eggs, litter materials etc.AI is not an egg born disease. It is not vertically transmitted. So far, the H5N1 virus has infected birds in >30 countries in Asia, Europe and Africa, while further geographical spread remains likely. H5N1 is most virulent and current concern (OIE, 2004). Horizontal transmission in human to human is rare and not reported. It also affect man, horse, pig, ferret, cat etc.AI is re-emerging with considerable zoonotic potential. The next pandemic would result in death of at least 5 million people with tens of millions requiring medical attention (WHO,2004).

Why AI viruses are so virulent?-There is no proof reading mechanism of AI virus. It has wide range of host and expanding mammalian hosts which may act as "mixing vessels". Frequent variations in AI viruses take place due to antigenic drift and antigenic shift.

Antigenic drift-It is minor amino acid changes in viral genome resulting in new antigenic variants of same subtypes under immune pressure, more after spread to domestic birds.

Antigenic shift (Reassortment)-It is exchange of RNA segments between two genetically different viruses infecting a single cell generating novel different subtype, in wild aquatic birds poultry markets. It is method to make large genetic changes in viral genomes. Reassortment is possible for segmented viruses like AI.

Controlling Avian Influenza (AI)

1. Depopulation-It can be done by various methods including manual killing/2-6% alpha chloralose/ Sodium phenobarbitone *etc.* Carcass burning or burial in pit 2×2×2.Then, cover with Ca(OH)2 with 40 cm layer of earth.

2. Quarantine-It is required to prevent the disease to neighboring farms, transboundary spread of disease through international trade. It is easy adoption of preventive and control measures.

3. Vaccination-It is a part of eradication program. It helps in reduction/ preventation/ elimination of clinical disease and virus

shedding. It increases the chance of breaking the infection cycle and enhances resistance among birds. Killed vaccines are available commercially. Recombinant vaccines, live vaccine and reverse genetic vaccines are under trial and will be available in near future. Recently government has approved LPAI vaccine for bird flu but government permission is needed for its use in India.

Drawbacks of vaccines-These are expansive. They produce no cross protection between 15 H subtypes. There is also possibility of creation of reasserting virus.

1. Chemoprophylaxis-Tamiflu (Oseltamivir phosphate) in tablet form used orally and Relenza (Zanamivir) in powder form used by inhalation are recommended by WHO. Oseltamivir and Zanamivir inhibit Neuraminidase (NA) to prevent virus release. Amantadine and Rimantidine can also be used which target M2 protein to block uncoating.Drugs are effective only during chemoprophylaxis period and mainly prevent spread of infection. Person involved in slaughter and disposal of birds and poultry farmers should also take these drugs during outbreak as chemoprophylaxis measure.

2. Biosecurity- The area within one km from the site of confirmed AI will be designated as "Infected Zone". Rest of the area within 10 km is the "Surveillance Zone". The State government, in consultation with the Government of India may change the radii of the infected zone by one more km each, maximum up to 3 km., if the foci of infection / mortality are scattered over a larger area. In such a case, the culling zone will be extended to one km radius from the new site of infection without notifying the disease again. Further/more occurrence of AI, if any, beyond 3 km. radius of this limit will require to be notified as a fresh/new outbreak.

3. List of disinfectants-Sprit, 1% Dettol (Chloroxylinol and Turpiniol) and Savlon (Chlorhexidine) for washing hands and feet of farm workers, 2% NaOH for foot bath, 2% sodium hypochlorite for equipments, Quaternary ammonium compounds for wall, floor and ceiling, 3% Ca(OH)2 for walls and floor; 20 g KMnO4 and 40 ml of 40% formalin per 100 sq. foot produce 1x strength containing fumes of formaldehyde gas which acts as potent disinfectant. For equipment 3x and house 5x strength to be used.

Surveillance and Reporting

Veterinary practitioners, Diagnostic laboratories, Owners should be encourage for disease reporting. Regular monitoring of laboratory submissions should be done. Seromonitoring of areas surrounding infected or now free areas by ELISA, AGID and RT-PCR *etc.*

Collection of samples-At least 5 dead birds for post mortem should be collected. Cloacal/Tracheal/Intestinal swab should be collected in 50% glycerin phosphate buffer (virus transport medium) and serum samples.

Reference laboratory for AI-Legnaro, Italy and Vietnam. Research laboratories in India include High Security Animal Diseases Laboratory, Bhopal; Regional Diseases Diagnosis Laboratory at Kolkata, Jalandhar, Bangalore, Guawahati; National Institute of Virology, Pune and National Institute of Communicable Diseases, New Delhi.

Food Safety Issues

There is no evidence of transmission to people by eating cooked eggs or chicken. Indians are in side due to food habits. AI virus present in fresh and frozen meat, eggs and survive for 35 days at 40 C and 6 days at 37^0 C. Cooking meat at 70^0 C for 30 minutes, egg 60^0 C for 3 minutes and egg white 55^0 C for 6 minutes kill virus. Keep and handle raw and cooked products separately and wash hands after each dealing.

Constraints and Challenges to HPAI Control

A major weakness is inadequate veterinary services. All bio-security measures are difficult to implement. There is need for more

E-ISSN: 2582-9467
Popular Article
Dinani (2023)

epidemiological expertise. Weak disease information system is problematic. Water fowl, duck, wild birds and migratory birds are important reservoir of AI virus are difficult to eradicate. Highly mutating and rapidly spreading nature of virus may cause pandemic outbreak anytime. Test and slaughter policy leads to huge economic loss. Economically feasible and effective should be developed along with bio-security measures should be strictly followed for control of AI.

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