AVIAN INFLUENZA

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Avian Influenza (AI) is an international problem.

On the list of WOAH

- HPAI (H5/H7)
- H5/H7 LPAI

It is on the list of compensated and notifiable animal diseases in Turkey

Between 1959 and 1999, only 18 outbreaks of HPAI were reported, and approximately 23 million poultry were affected during this period

Between 1999 and 2006, outbreaks caused by the H5N1 virus were reported, and more than 300 million poultry were affected

After 2006, H5N1 continued to spread widely, causing repeated outbreaks and considerable economic losses in many countries.

Human cases also continued to be reported, and large-scale HPAI activity persisted into the following years

Etiology

Orthomyxoviridae, **Influenza A virus**

Influenza viruses are classified into four groups (A, B, C and D), and **only Influenza A viruses cause disease in poultry**

AI viruses;

- low pathogenic (LPAI)
- highly pathogenic (HPAI)

Typing of AI viruses is based on the hemagglutinin (HA) and neuraminidase (NA) antigens;

- Hemagglutinin antigen (H1–H18)
- Neuraminidase antigen (N1–N11)

Avian Influenza (AI) Viruses

- The genetic material of the virus is **RNA**

Genome consists of 8 independent segments

High mutation rates and frequent genetic changes

✓**In poultry**;

16 hemagglutinin (H1–H16)

9 neuraminidase (N1–N9) subtypes

✓Avian influenza viruses are named according to their HA and NA subtypes,

such as H7N2 or H5N1.

Host distribution

- Influenza A viruses infect a wide range of hosts, including;
  - poultry,
  - humans,
  - horses,
  - pigs,
  - seals,
  - whales and mink.

- Among poultry and other birds, susceptible species include;
  - turkeys, chickens, ducks, geese, quail, ostriches, pheasants, guineafowl, seagulls, partridges, various sea birds and marsh birds, as well as budgerigars, peacocks and parrots.

Epidemiology

- Fecal–oral transmission
- Transmission via the respiratory tract
- Mechanical transmission
  (people, vehicles, equipment, insects, rodents)
- Aerosol transmission is limited
- Waterfowl, especially ducks, are known to be the natural reservoirs of the virus. They can carry the virus over long distances and contribute to its spread.
- The migration routes of wild birds facilitate the intercontinental dissemination of the virus. Therefore, the risk of outbreaks increases during the migration periods of wild waterfowl.

Spread of the virus and Migrant Birds

Migratory sea birds are defined as virus reserves

Clinical Signs (HPAI)

- The incubation period generally ranges from a few hours to 3 days, but in some cases it may extend up to 14 days
- Morbidity is usually very high
- Mortality can vary from negligible to 100%
- Respiratory signs include; rales, coughing, and nasal, oral and ocular discharge, accompanied by dyspnea.
- Due to the virus's effects on the central nervous system, neurological signs such as torticollis, opisthotonos, head and neck tremors, loss of balance, inability to stand, and paralysis may be observed.
- Severe diarrhea leading to dehydration and emaciation can occur.
- Edema, hemorrhages and cyanosis may develop in the comb and wattles, as well as cyanosis of the skin, head and legs.
- A sudden and marked drop in egg production, along with abnormalities in egg structure and quality, is common.
- Ruffled feathers and drooping wings are also characteristic findings

Clinical Signs (LPAI)

- It causes mild respiratory and digestive system disorders.
  - Nasal discharge,
  - Coughing,
  - A decrease in egg production,
  - Weight loss and loss of appetite may be observed

Necropsy findings (HPAI)

- Widespread hemorrhages, necrosis, and severe lesions in internal organs are characteristic.
- Hemorrhages on the skin and mucous membranes, cyanosis of the wings and legs, subcutaneous hemorrhages, and edema of the subcutaneous tissues may be observed.
- The trachea may show edema, hemorrhage and fibrin accumulation, while the lungs exhibit hyperemia and mucus accumulation in the respiratory tract.
- Necrosis of the myocardium may occur.
- Extensive endothelial necrosis and thrombosis are also common.
- The intestinal mucosa may show hemorrhages and necrotic lesions of the intestinal epithelium, with petechial and ecchymotic hemorrhages in the pancreas.
- Hepatomegaly, icterus and petechial hemorrhages may be present in the liver.
- Splenomegaly and hemorrhagic lesions of the spleen are frequently observed.

Necropsy findings (LPAI)

- Lesions are limited to mild respiratory tract infections with minimal systemic effects.
- Mild edema and hemorrhages may be present in the trachea.
- Necrosis is generally absent.
- Minimal lesions or no observable changes may be found in the intestines and other internal organs

Laboratory Diagnosis

Isolation and identification

Typing

Pathogenicity tests

Serology

Molecular methods

Differential Analysis

In cases of infection with sudden death

- ND
- ILT
- Acute poisonings

Lesions on comb and feathers may resemble those seen

- Acute Chicken Cholera
- Septicemic diseases

Zoonotic Importance

- HPAI viruses, especially H5N1, H7N9 and other H5N8 subtypes, pose a risk of transmission to humans.
- Influenza A viruses can infect humans through direct contact with infected poultry or through exposure to their feces, secretions and saliva.
- Contaminated water sources, feed and equipment also play an important role in virus transmission.
- In humans, symptoms may include;
  - fever,
  - cough,
  - chills,
  - muscle pain,
  - sore throat,
  - headache,
  - respiratory distress,
  - nasal and ocular discharge,
  - Diarrhea
- H5N1 infections in humans are characterized by high mortality, with case fatality rates exceeding 50%.

Infectious Bronchitis

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Etiology

Coronaviridae

- *Alfacoronavirus*
- *Betacoronavirus*
- ***Gammacoronavirus***
- ***Deltacoronavirus***

- It is a single-stranded RNA virus.
- IBV contains spike, membrane, envelope and nucleocapsid proteins.
- The S protein is particularly important, as it mediates the virus's attachment to the host cell.
- IBV strains are classified into different serotypes based on the antigenicity of the S protein.

Genotypic correlation of the IB Viruses

- Accurate classification of IBV genotypes requires both serotyping and genotyping
- Serotype/Genotype=Variant
- Genotyping: RT-PCR and Sequence analysis
- Protectotype: Different variants with cross protection

Epidemiology

- The virus has been reported in Africa, Asia, Australia, Europe and the Americas, with the exception of Antarctica.
- In our country, the most widespread genotype is the Israel variant-2.
- Transmission occurs primarily through aerosol droplets via direct or indirect contact, and through inhalation or ingestion of viral particles.
- Fecal–oral transmission occurs through ingestion of feed and water contaminated with feces.
- Vertical transmission has not been reported
- There is no evidence of vector involvement in the spread of the virus

IBV Infection in Turkey

- Problem in both broiler and layer hens
- Immun response after vaccination
- Serotyping/genotyping studies are not enough
- Other respiratory tract infections

Clinical Signs

- ✓ The diversity in the tissue tropism of IBV leads to different clinical manifestations in infected chickens.
- ✓ This allows IBV strains to be classified as
  - ✓respiratory,
  - ✓reproductive,
  - ✓or nephropathogenic

Clinical Signs

LAYING HENS

A marked decline in egg production and quality, resulting in pale, depigmented, misshapen eggs with soft or rough shells and watery albumen

The reduction in egg production may vary from 5–10% up to 70%.”

BROİLER

Reduced feed efficiency,

Increased water consumption,

Growth retardation,

Watery droppings,

Reluctance to move, lethargy,

Ruffled feathers,

Weight loss

Clustering under the heat source are commonly observed.

Clinical Signs

- **Nephropathogenic strains** impair kidney function.
- Clinical signs include
  - depression,
  - excessive water intake
  - wet droppings, and these forms are seen most frequently in broiler chickens.
- The kidneys appear swollen, pale and mottled.
- In laying hens, findings include the presence of yolk material in the abdominal cavity, deformation of the oviduct and failure of eggs to develop properly.

Necropsy Findings

- Serous, catarrhal or caseous exudate may be present in the trachea, nasal passages and sinuses.
- The tracheal mucosa and extrapulmonary bronchi are edematous and congested.
- The air sacs appear foamy, especially in acute infections, and later may become cloudy and contain yellow caseous exudate.
- Areas of pneumonia may also be observed

Diagnosis

Materials:

- Trachea
- Kidney
- Caecal tonsils

Laboratory examination:

- Tissue culture (TC) and embryonated eggs (EEC)
- RT-PCR
- Serology

Protection and Control

Laboratory diagnosis of IBV infections

Typing of IBV strains circulating in the region

Vaccine selection

Vaccination program design

Serological monitoring