Lecture title: Newcastle disease

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- **ND:** viral disease affect many species of birds characterized by marked variation in PM. Lesions due to variation of pathotypes.

Cause

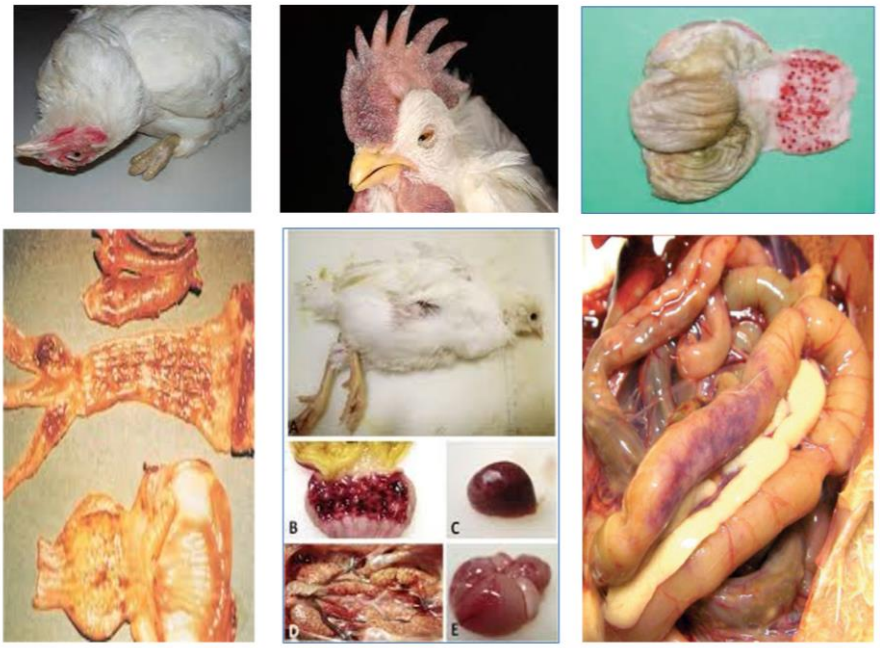
Newcastle disease is caused by a paramyxovirus. Avulavirus genus that contains Newcastle disease virus (NDV) and other avian paramyxoviruses (APMV). ND virus has mild strains (lentogenic), medium strength strains (mesogenic), and virulent strains (velogenic). The strains used for live vaccines are mainly lentogenic.

Recently, Genotype VII isolates are the most important group of NDV reported since 2000 and have been identified in several economically important disease outbreaks in Asia, the Middle East, South America, and South Africa. They have shown increased virulence in birds vaccinated with traditional Genotype I and II vaccines, like B1 and LaSota.

Transmission

- **Direct contact with feces, respiratory secretions**
- **Indirect contact**
  - **Feed, water**
  - **Equipment**
  - **Human clothing**
- **Contaminated or incompletely inactivated vaccines**
- **The incubation period is variable but usually about 3 to 6 days.**

- **Species affected**
- Chickens and turkeys.
- **Clinical signs**
- Newcastle disease causes high mortality with depression and death in 3 to 5 days
- The clinical signs of NDV infection depend on the pathotype of the strain.
- **Virulent Newcastle (vNDV) infection causes high mortality in the absence of clinical signs.**
- Viscerotropic vNDV often begins with listlessness, increased respiration, and weakness, leading to prostration and eventually death.
- Green diarrhea is commonly observed in birds that do not die early on.
- Prior to death, some birds may demonstrate torticollis (twisting or tilting of the head), muscular tremors, limb paralysis, and opisthotonos (head arched backwards).
- Birds may move in circles, show ataxia or walk backwards, while at other times appearing normal. Mortality can reach 100% in fully susceptible flocks.
- Neurotropic vNDV is characterized by sudden and severe onset of respiratory disease, followed by neurologic signs and a dramatic decrease in egg production.
- Labored breathing with wheezing and gurgling, accompanied by nervous signs.
- Egg production will decrease 30 to 50 % or more, returning to normal levels in about 2 weeks.
- Eggs may have thin shells and eggs without shells may also be found.
- In well-vaccinated chicken flocks clinical signs may be difficult to find.



- **On the basis of virulence and tissue tropism in poultry, isolates are categorized into five groups or pathotypes:**
- **Viscerotropic velogenic isolates causing severe fatal disease characterized by haemorrhagic intestinal lesions (Doyle's form)**
- **Neurotropic velogenic isolates causing acute disease characterized by nervous and respiratory signs with high mortality (Beach's form)**
- **Mesogenic isolates causing mild disease with mortality confined to young birds (Beaudette's form)**
- **Lentogenic isolates causing mild or inapparent respiratory infection (Hitchner's form)**
- **Asymptomatic enteric isolates associated with sub-clinical intestinal infection by lentogenic strains and are commonly used as live ND vaccines in commercial poultry**

- **Note:** Viruses of the asymptomatic enteric pathotype have a tropism for the gastrointestinal tract, and are not thought to cause or contribute to clinical disease and are also used as live vaccines.
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- **Morbidity and mortality**:
- Morbidity: up to 100%
- Mortality: 90%
- **Varies greatly depending on**

- Virulence and strain
- Avian species and susceptibility of host
- Environmental conditions
- Vaccination history
- Some species show few or no signs
- Carrier state may exist Virus is shed in all excretions and secretions.
- Transmission usually occurs by aerosols or by ingestion of contaminated feed or water
- Mechanical transfer of infective material through the movement of personnel and equipment
- Captive and wild birds can contribute to the spread of infection
- Pigeons are susceptible to all strains of NDV and may play a role in the transmission of Newcastle disease

- **Pathology**
- **Gross Lesions**
- Gross lesions vary with the strain and pathotype of virus, as well as host and other factors. Virulent ND outbreaks causing
- rapid mortality may not show gross lesions.
- Viscerotropic vNDV commonly presents with hemorrhagic lesions in local lymphoid tissues of the gastrointestinal tract, particularly found in the cecal tonsils, Peyer's patches, and at the junction between the proventriculus and the gizzard (ventriculus).
- Hemorrhages are also often noted in the spleen and thymus, and the spleen may appear enlarged and mottled.
- Mucosal hemorrhage and congestion of the eyelids and trachea may occur.

- Airsacculitis may be observed, but is typically associated with secondary bacterial infections (usually E.coli).
- **Edematous ovaries, hemorrhagic ovarian follicles, egg yolk peritonitis, and hemorrhagic lesions in the oviduct may be observed in layers.**
- **Diagnosis:**
- Laboratory confirmation by isolation and identification of the virus is necessary.
- Tracheal and cloacal swabs from live birds are suitable for virus isolation
- Virus isolation is carried out in embryonated eggs from specific pathogen-free (SPF) flocks, usually by inoculation into the allantoic cavity. After incubation, allantoic fluid is tested for haemagglutination activity.
- Haemagglutination-inhibition test
- virulence of NDV isolates is assessed using in vivo tests including :
- intracerebral pathogenicity index (ICPI)
- intravenous pathogenicity index (IVPI)in SPF chicks
- The mean death time (MDT) using embryonated eggs has been employed to classify isolates as
- 1- velogenic (embryonic death (ED) in less than60 hours)
- 2- mesogenic (ED between 60 and90 hours)
- 3- lentogenic (ED after morethan 90hours).
- RT-PCR has also been used successfully in ND outbreaks
- Commercial ELISA kits are available.
- Demonstration of viral antigen in tracheal sections or impression smears using immunofluorescence is a less sensitive technique than virus isolation.
- AGID

- **Differential Diagnosis**
- The clinical presentation of other diseases, such as aspergillosis , mycoplasmosis, infectious laryngotracheitis, fowl cholera, infectious bronchitis, and highly pathogenic avian influenza, can be confused with ND.

Control:

- locating poultry farms several kilometres apart
- cleaning and disinfection of vehicles and equipment
- restriction of movement between poultry farms.
- Vaccination is particularly important
- Lentogenic or mesogenic strains of NDV propagated in eggs or tissue culture are used in live vaccines
- They are administered as a spray, in drinking water or by intranasal or intra conjunctival instillation
- The presence of maternally-derived antibodies interferes with the efficacy of live vaccines
- Vaccination should be delayed until 2 to 4 weeks of age
- Revaccination is normally carried out 3 to 4 weeks later
- Several recombinant vaccines employing different vector viruses have been developed