

Newcastle Disease

Vaccination

Plan of Talk

- Introduction
- Types of ND vaccines
 - > Live
 - > Apathogenic strains.
 - > Lentogenic strains, conventional.
 - > Lentogenic strains, cloned.
 - > Mesogenic strains.
 - > Inactivated vaccines.
 - > Recombinant vaccines.

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Introduction

Before 1933

- Vaccination with the inactivated virus was considered a possibility for the control of ND at the time of the apparent emergence of the virus.

After 1933

- in England, an attenuated live vaccine was produced which was called strain H.
- Later, the naturally occurring USA isolates of low virulence, Hitchner B1 (HB1) and La Sota, became the most used veterinary vaccines throughout the world.

Cont. ...

The principle of vaccination against a viral disease is well-known:

To elicit an immunological response against the virus in a way that does not cause the disease.

Type of ND Vaccines

Inactivated vaccine

- Take the virus, kill it, and then inject it into the bird.

Live vaccine

- Select a naturally occurring virus that is not virulent enough to cause serious disease, and infect the birds with this virus.

Cloned live vaccine

- Take a non virulent natural virus and select a clone from the virus population with desirable properties, such as lack of vaccine reactions.

Recombinant vaccine

- Genetically engineer a vaccine by, for example, taking part of the genetic material of the virus that codes for a surface antigen, and inserting this into another.

Immunity Against ND

Passive immunity (MDA)

- Protects young bird through circulating IgG and IgM.
- Half life span 4.5 days.

Active Immunity

- Secretory (IgA, IgG) (resp. + Intes. + HG.)
- Cell mediated.
- Appear as early as 2-3 days post vaccination.

Humoral immunity

- Starts 6-8 days post vaccination.
- Maximized 3-4 weeks post vaccination.
- Declined much slower than development .
- Directed against HN and F glycoprotein surface antigen.

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Live Vaccine Vs Inactivated

- › Live vaccines differ from inactivated vaccines in that they can replicate in the host.
- › **Advantage of live vaccine against inactivated:**
 1. It is not necessary to vaccinate every bird individually, vaccine virus can spread on its own from one bird to another.
 2. Easy application, they can be applied to the drinking water or with an eye-dropper.

Cont. ...

> Disadvantage:

1. Post-vaccine reaction

- > Since an infection with a live virus is involved, this may result in **clinical signs** because of the virulence of the vaccine virus or by exacerbating other organisms that may be present, especially in the respiratory tract.
- > The severity of this reaction depends on the **vaccine strain** (Westbury *et al.*, 1984) and the **presence of concurrent infection with other pathogens.**

Cont. ...

- › Although NDV has essentially only **one serotype**, there is a **wide difference in the pathogenicity** of different strains, ranging from those that cause virtually no signs to those that kill within a few days.

Value Of Using Live Vaccine

1. It is based primary on stimulation of the **local immunity** in the **Harderian gland** and in the upper respiratory tract and/or the **gastrointestinal tract**.
2. The development of **humoral immunity** occurs secondly.
3. Vaccination via the eye-drop method with Hitchner B1 vaccine at day one increases the protection to **90%** as a result of enhancing the local immunity which adds the passive humoral immunity.
4. The **maternal antibody** present on day one provide **75%** protection.
5. Moreover, the same vaccination to chicks which have no maternal antibodies increase the protection on day one from **0% to 60%** (Bennejean et al., 1978).

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Apathogenic Enteric Vaccines

- › **They are:**
 - VG/GA (Avinew from Merial)
 - PHY.LMV.42 (Vitapest from Ceva)
 - Ulster 2C (Poulvac NDW from FORTE DODGE)
 - › Low virulence
 - › Enteric tropism nullifies the risks of any post-vaccine reaction associated with their use.

ICPI

- › 0.05ml of a diluted virus
- › Injected intracerebrally
- › Into 10 one-day-old chicks.
- › The birds are examined every 24 hours for 8 days.
- › At each observation the birds are scored:
 - 0 if normal.
 - 1 if sick.
 - 2 if dead.

Assessing Apathogenic Pneumotropic Vaccine Strains

Virus	Product	ICPI
Ulster 2C	Poulvac NDW	0.04 to 0.23
PHY.LMV.42	Cevac [®] VITAPEST L	0.16
Hitchner B ₁	Many	0.18
VG/GA	AVINEW [®]	0.30
Clone 30	Nobilis [®] ND Clone 30	0.25
La Sota	Many	0.4
Komarov		1.41

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Conventional Lentogenic Vaccines

- › The level of vaccine reaction is an important consideration for intensive commercial poultry.

Cont. ...

> HB1

- Because HB1 has very mild vaccine reactions, it has been widely used for initial vaccination of intensive poultry.

> La Sota

- La Sota produces moderate vaccine reactions, especially in immunologically naive birds and **is not usually recommended** for primary vaccination.
- In theory, La Sota would also be **unsuitable for vaccinating a multi-age population**. This is because the virus spreads and it is not practical to isolate the adults from the chicks.

Cont. ...

- › In practice, the degree of reaction from La Sota as a primary vaccine depends on:
 1. **The residual level of antibodies**, which could protect the birds from post vaccine reactions
 2. **The extent of other concurrent infections**, such as *Mycoplasma* spp, pathogenic *E. coli*, or infectious bursal disease virus and other respiratory viruses.
 3. In intensive systems, vaccination using **spray delivery systems** which produce small particle sizes, may also exacerbate the vaccine reaction.

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Conventional lentogenic vaccines

- › Some lentogenic vaccines have been cloned by taking a single infectious virus and grow a homogenous population from it, with the aim of **selecting a virus which gives less vaccinal reactions than a La Sota-like virus**, while retaining its superior immunogenicity compared to a HB1-like virus.
- › An example of this kind of vaccine is "clone 30".

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Mesogenic Vaccines

- › These produce severe vaccine reactions in an immunologically naive population.
- › The use of this kind of vaccine is **not advisable in situations where chickens are without any immune protection against the virus.**
- › Normally mesogenic vaccines, such as **Komarov** (Saifuddin *et al.*, 1990) and Mukteswar (Alexander, 1997) are used as secondary vaccines after a primary vaccination with a lentogenic vaccine.

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Inactivated Vaccines

- › **Inactivated vaccines are produced by:**
 1. Growing a ND virus in eggs.
 2. Then treating the infective allantoic fluid with an inactivating agent, such as formalin or betapropiolactone.
 3. An adjuvant, such as mineral oil, is usually then added to make the inactivated virus more immunogenic.

Cont. ...

- › Since the vaccine is no longer capable of replication or spread, it has to be injected individually into every bird needing vaccination.
- › It is normally injected into the back of the thigh muscle or the breast muscle, using 0.3 or 0.5 ml per bird.
- › Inactivated vaccines produce very high levels of antibodies against NDV, and provide good protection against the virulent virus.
- › Inactivated vaccines are usually applied after an initial priming vaccination with a live vaccine.

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Recombinant Vaccines

- › NDV has two surface glycoproteins:
 1. Fusion [F]
 2. Haemagglutinin/neuraminidase [HN].
- › The genes coding for either of these can be inserted into a different kind of virus to make a recombinant vaccine.
- › For example, the fusion gene inserted in herpes virus of turkeys produced a vaccine which gave good protection against virulent NDV.

Cont. ...

› **Advantage:**

1. The host virus may have better stability than NDV.
2. Antigens for multiple different pathogens can be inserted into the same host virus to produce a single vaccine against several different diseases.

› **Disadvantage of recombinant vaccines is:**

1. High cost.

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