



Control of Newcastle and Infectious Bursal diseases in Poultry: Vaccines, Vaccination and Bio-security

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OUTLINE OF PRESENTATION



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- 4. ADMINISTRATION OF ND & IBD VACCINES**
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INTRODUCTION



Livestock forms an important component of the livelihoods of some 600 million people today, representing 70% of the world's poor

INTRODUCTION



Diseases have become a major threat to the livestock-industry and are often considered to be the biggest constraints to improving livelihoods and Resilience

INTRODUCTION



One of the most threatened livestock sectors is the Poultry industry and Newcastle (ND) and Infectious Bursal diseases (IBD) are the two most important diseases threatening especially the rural Poultry Industry in Africa

NEWCASTLE DISEASE (ND) DEFINITION



- ❑ Newcastle Disease (ND) is a highly contagious and fatal disease of mostly chickens, affecting the respiratory and nervous systems
- ❑ It is caused by a *paramyxovirus*, with the most virulent strains isolated in Africa

ND VIRUSES



- Newcastle disease viruses belong to a single and unique serotype, serotype 1 (APMV1).
- Slight antigenic variations but do not have any effect in on vaccination or protection

ND VIRUSES



ND strains grouped into five:

1. **Viscerotropic velogenic:** Highly pathogenic form with haemorrhagic intestinal lesions
2. **Neurotropic velogenic:** High mortality usually following respiratory and nervous signs

ND VIRUSES



3. **Mesogenic:** Respiratory signs, occasional nervous signs, but with low mortality
4. **Lentogenic** or respiratory: Mild or subclinical respiratory infection;
5. **Asymptomatic:** subclinical enteric infection.

INFECTIOUS BURSAL DISEASE (IBD) DEFINITION



- ❑ IBD also known as ‘Gumboro’ is a severe acute disease of 3–6-week-old birds is associated with high mortality, but a less acute or subclinical disease is common in 0–3-week-old birds.
- ❑ It is caused by a member of the genus Avibirnavirus of the family Birnaviridae.

INFECTIOUS BURSAL DISEASE (IBD) VIRUS



- ❑ IBDV is made of two serotypes designated serotypes 1 and 2 but clinical disease has been associated with only serotype 1 and all commercial vaccines are prepared against this serotype
- ❑ Variants of IBD serotype 1 described and may require special vaccines for maximum protection.

ND & IBD



- ❑ These two diseases combined are considered as the major cause of mortalities in rural chickens
- ❑ They are identified as a major constraint to the development of the Poultry industry in Africa, particularly village poultry production

Problems of ND & IBD control



- Commercial poultry industry: ND & IBD adequately managed by private veterinary services support
- Rural poultry sector: Lacks both government and private veterinary services support

Problems of ND & IBD control



- small flock sizes
- multi-age birds
- scattered flocks over a vast area, birds may not be adequately housed
- conventional vaccines are not available either in small-doses or in small-lot ampoules

CONTROL OF ND AND IBD



- ❑ Like all viral diseases, vaccination and appropriate Bio-security is the only viable control mechanism for ND & IBD
- ❑ Several vaccine seed strains are available and recommended by the OIE for the control of ND and IBD
- ❑ These represent the different types of ND and IBD vaccines available for control

ND AND IBD VACCINES



- ❑ Presently, 3 major types of vaccines are available for the control of both ND & IBD
 - ❑ Live attenuated vaccines
 - ❑ Killed/Inactivated vaccines
 - ❑ New generation vaccines

ND VACCINES



There are two major types of vaccines for the control of ND:

1. Live vaccines
 - Lentogenic
 - Mesogenic
 - Recombinant vaccines
2. Inactivated vaccines

1. LIVE ND VACCINES



- Replicate in the host & virus can spread on its own from one bird to another
 - May require cold chain
 - Applied in either drinking water or eyes
1. Lentogenic vaccines
 - HB1 – initial vaccination
 - Lasota – moderate vaccinal reactions

1. LIVE ND VACCINES



2. Heat tolerant vaccines

- Asymptomatic enteric viruses
greater heat resistance than more
conventional lentogenic viruses
 - ✓ NDV4-HR vaccine – Malaysia
 - ✓ ND I-2

1. LIVE ND VACCINES



3. Mesogenic vaccines

- These produce severe vaccinal reactions in an immunologically naïve population
 - ✓ Komarov – secondary vaccines

1. LIVE ND VACCINES



4. Recombinant vaccines

- Insertion of two surface glycoproteins, fusion [F] and haemagglutinin /neuraminidase [HN] into other viruses
 - Host may have better stability than NDV
 - Insertion of multiple pathogens into the same host virus for different diseases
 - monitoring of vaccine response independent of wild virus

2. INACTIVATED VACCINES



Generally used for both ND and IBD:

1. Produce longer immunity – high, long lasting & uniform levels of antibodies
2. Require priming of animal with live vaccine before administration
3. Require individual administration through injection
4. Usually require adjuvants and are more expensive than live vaccines to produce

VACCINE ADMINISTRATION



1. Spray
2. Eye drop
3. Drinking water
4. Injection
5. Feed

ADMINISTRATION IN DRINKING WATER



Provokes lower immunity than eye-drop, less uniform uptake and requires more frequent application. Ensure:

- . Remove water at least -2 hours prior
- . Provide water that the chickens will be able to finish in one hour (c 5-7 mL per bird).
- . Use clean, chlorine free water, add milk if necessary

ADMINISTRATION OF ND VACCINES



| AGE | TYPE OF VACCINE | METHOD OF ADMIN |
|----------------------|------------------------|-------------------------|
| 1 Day old | ND H-B1 | SPRAY/i-o |
| 18 – 21 days | ND H-B1 /Lasota | Spray or Drinking water |
| 35-42 days | Lasota (Revacc.) | Drinking water |
| 10 Weeks | Inactivated/Mesogenic | Injection |
| 16 – 20 weeks | ND Inactivated | Injection |

POST ND VACCINATION MONITORING



Essential to monitor immune response at flock level after vaccination:

- Haemagglutination Inhibition (HI) –
 - Single vacc. (Lentogenic) 4–6 log₂
 - Oil emulsion vaccines- up to 11 log₂
- ELISA

LIVE IBD VACCINES



All Live IBD vaccines produced from serotype 1 IBDV and are fully or partially attenuated

There are 3 main types of live attenuated vaccines against infectious bursal disease :

- ‘mild’,
- ‘intermediate’, or
- ‘intermediate plus’ (‘hot’)

IBD VACCINES



Vaccines should be selected based on types of viruses present in area

- live vaccines produce slight to moderate reactions, depending on strain and immune status
- The inactivated, recombinant and heat tolerant clones of vaccines do not induce vaccinal reactions.

IBD VACCINES



- A live recombinant vaccine expressing the VP2 antigen of IBDV has also been licensed recently.
- It is important that live vaccines be stable, with no tendency to revert to virulence on passage.
- To be effective, the inactivated vaccines need to have a high antigen content

ADMINISTRATION OF IBD VACCINE



| AGE | TYPE OF VACCINE | METHOD OF ADMIN |
|---------------------------|---------------------------------|-------------------------------------|
| 1 Day old | IBD Mild | SPRAY |
| 10 – 14 days | IBD Mild/Intermediate | Spray or Drinking water |
| 17 -24 days | IBD (Revacc.) Mild/Intermediate | Spray or Drinking water |
| 8 Weeks | IBD Mild/intermediate | Spray , Drinking water or injection |
| 18 weeks | IBD Inactivated | Injection |
| 18 days incubation | IBD Ag/Ab complex | Inoculation into embryonated eggs |

BIOSECURITY



Biosecurity involves all procedures and practices used to prevent the introduction and spread of disease-causing organisms in poultry flocks.

Biosecurity has three major components:

- Isolation
- Traffic Control
- Sanitation

CONTAMINATION



Introduction of disease is usually done through contamination of existing flock

- Introduction of new Animals
- Equipment and Personnel
- Rodents, pests and wild birds
- Bad animal husbandry practices

ISOLATION



Introduction of disease is usually done through contamination of existing flock

- Quarantine new flock before introduction
- Segregate apparently sick or infected animals in the flock
- ✓ Inspect flock daily

TRAFFIC CONTROL



- Regulate the movement of visitors into the farm area (Persons & Vehicles)
- Limit visitation to other farms
- Keep other animals out of the poultry farm area
 - ✓ Sound rodent and pest control
 - ✓ Avoid contact with wild birds and other poultry

SANITATION



- Ensure good husbandry practices
 - ✓ Farm equipment
 - ✓ Appropriate use and disinfection of PPE by personnel
 - ✓ Maintaining good hygienic practices and keeping farm environment clean
 - ✓ Appropriate housing and Nutrition

ND and IBD VACCINES IN AFRICA



1. AU-PANVAC is the only Organization in Africa responsible for the Independent Quality Control of all Veterinary vaccines including ND & IBD vaccines in Africa
2. Supplies seed strains to all AUMS vaccine production laboratories in Africa free of charge.

ND and IBD VACCINES IN AFRICA



3. Presently AU-PANVAC has in its repository the ND Hitchner HB1, Lasota and ND I-2 strains only
4. AU-PANVAC is making efforts to acquire IBD vaccine seeds for distribution to AUMS laboratories

Establishment of AU-PANVAC



BRIEF OVERVIEW OF AU-PANVAC

- ❑ **1983 – 1986:** Concept of Independent Center to ensure QC of all RP Vaccines batches to support the Pan African Rinderpest Campaign (PARC)
- ❑ **1986 – 1993:** FAO TCP (TCP/RAF/6766 & TCP/RAF/6767), 2 Regional Vaccine QC and Training Center to ensure Vaccine QC.
 - ✓ Dakar (Senegal) for Central and Western Africa
 - ✓ Debre Zeit (Ethiopia) for Eastern and Southern Africa

Establishment of AU-PANVAC



BRIEF OVERVIEW OF AU-PANVAC

- ❑ **1993:** The two centers were combined into one site at Debre Zeit (Ethiopia) to be known as the **Pan African Veterinary Vaccine Centre (PANVAC)**
- ❑ **2004:** Institutionalized under the African Union as a specialized Centre of AU and became known as **AU-PANVAC**

EVALUATION REPORT: PARC, PACE



“ The success of PARC and PACE clearly demonstrated that no amount of vehicles, syringes, trained personnel and communication materials would have eliminated Rinderpest if the vaccine batches used were of poor quality.It was the secondary and independent level of quality control assessment assured by PANVAC which played a major role in this success”.

AU-PANVAC Mandate



1. Provide International Independent Quality Control of Veterinary Vaccines
2. Facilitate the standardization of veterinary vaccines production and harmonization of their quality control techniques in Africa
3. Promote the transfer of appropriate vaccine production technologies to Africa

AU-PANVAC Mandate contd...



4. Provide training and technical support services to veterinary vaccines and quality control laboratories
5. Produce and distribute essential biological reagents for animal disease diagnosis and surveillance

AU-PANVAC : MISSION



To Promote the availability of safe, effective and affordable veterinary vaccines; facilitate the development and the introduction of improved or new vaccines and strengthen Africa's capacity building in veterinary vaccine and reagent development, production and quality assurance.

AU-PANVAC : MISSION



“To promote the use of good quality vaccines and reagents for the control and eradication of animal diseases in Africa.”

Laboratory Analysis of IBD & ND vaccines



All tests based on the OIE Manual 2008-20012

1. IDENTITY TEST : PCR



REAL TIME PCR MACHINE

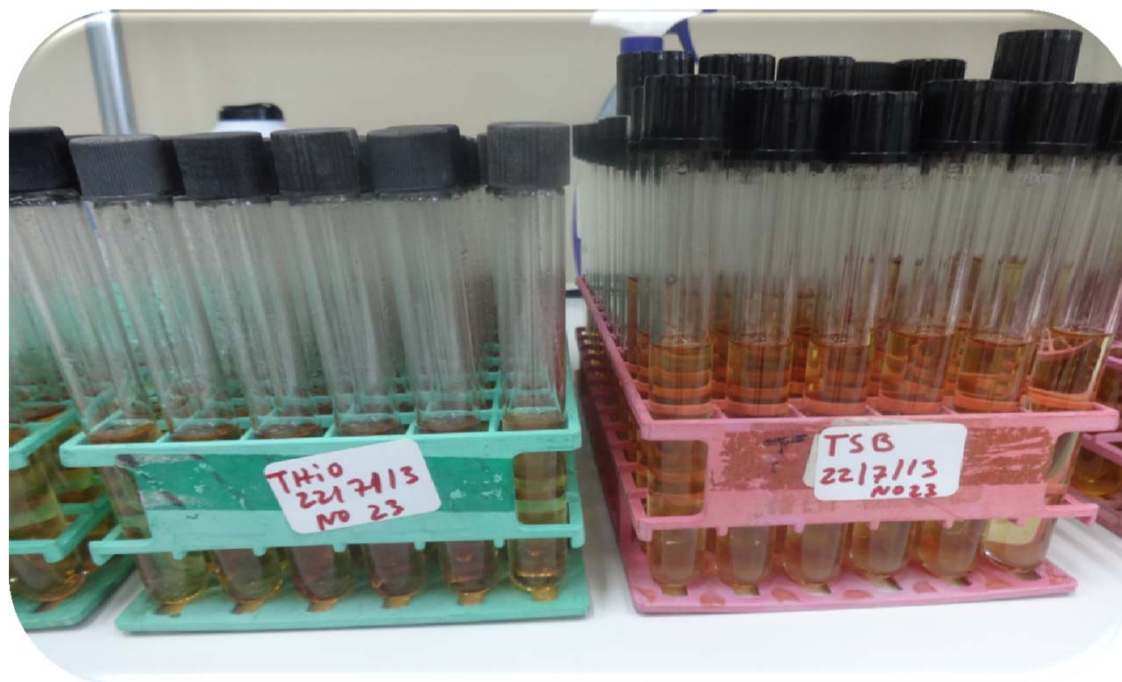


CONVENTIONAL PCR PLATFORMS



2. STERILITY TEST

- Bacterial
- Viral
- Fungal



VACCINE QUALITY CONTROL TESTS FOR IBD & ND



3. SAFETY TEST : in 2 weeks old chicks



VACCINE QUALITY CONTROL TESTS FOR ND



4. POTENCY TEST

- i. Titrations in embryonated chicken eggs

5. STABILITY TEST

- a. Vacuum test
- b. Residual Moisture Estimation
- c. Accelerated Stability Studies



AU-PANVAC ACTIVITIES ON ND



1. AusAID, KYEEMA Foundation and AU-PANVAC project on “Control Newcastle disease in village chickens using the I-2 vaccine”
2. GALVmed and AU/PANVAC working on the transfer of a Tablet thermostable vaccine technology to Africa
3. Annual training of laboratory technicians on Vaccine Production and Quality Control
4. Technical assistance to laboratories in need

CONCLUSION



The use of good Quality Vaccines, good vaccination protocols and implementation of appropriate Bio-security measures will contribute significantly to the control of Newcastle and Infectious bursal diseases on the African continent



**AFRICAN UNION PAN AFRICAN VETERINARY VACCINE CENTRE
(AU-PANVAC)**

**THANK
YOU**

Assuring Good Quality Vaccines for better Animal Protection !!!