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Committed to providing appropriate solution to poultry disease problems in tropics.

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INFECTIOUS BURSAL DISEASE

-A CLOSER LOOK AT ITS PREVENTION AND CONTROL

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IBD is an acute, highly contagious viral infection of young chicken causing high mortality and economic loss to poultry farmers. IBD is a preventable catastrophe provided all stake holders of the poultry industry are made aware of the IBD virus and its appropriate prevention and control program.

The current management of poultry diseases in our country is complicated by the fact that almost all the flocks are immuno-compromised due to a variety of reasons including Aflatoxicosis, MD, CAV and possible exposure to LPAI. Also, negligence of routine bio-security measures and unwarranted changes in the vaccines and vaccination schedules have altered MAb of day old chicks.

Recently, Indovax undertook a detailed scientific study to examine relevance of currently available IBD vaccines. The study established that there is no variant of IBD in the country as determined by PCR analysis, CEP test and Challenge test. Molecular studies and extensive experimentation have conclusively shown that IBD vaccines of Indovax (Georgia, Bursa B2K and IV 95) are homologous to the field challenge and effective under field conditions.

IBD is an acute, highly contagious viral infection of young chicken that has lymphoid tissue as its primary target with a special predilection for the Bursa of Fabricius. Since the first outbreak occurred in the area of Gumboro, Delaware "Gumboro disease" is a synonym for this disease.

The emergence of virulent IBD virus in 1993 had a devastating effect on Indian poultry industry. The disease emerged first in pullets and then in broilers. Mortality in pullets ranged from 30% to 90% where as in broilers it was 15% to 40%. Morbidity and immuno-suppression were wide-spread. This brought the industry and the Scientists of Indovax together. Indovax successfully came out with Georgia, IV 95 and later on Bursa B2K, the three most potent Gumboro vaccines available in India today.

Currently Indian poultry is suffering from immuno-suppression due to occurrence of MD, CAV, LPAI etc. Given this scenario, there is a need to re-look at the IBD infection and its control program through vaccinations. This technical bulletin aims at apprising our farmer friends, learned consultants and practicing veterinarians about the nature of this disease, it's spread, damages caused by it and the difficulties created by concurrent infections.

The Gumboro Virus:

The virus is a single shelled, non-enveloped, double stranded RNA virion belonging to the family Birnaviridae and has a diameter in the range of 55-65 nm.

Molecular Structure of virus: The IBD virus has five viral proteins VP1 to VP5. VP2 contributes to both pathogenicity and immunogenicity of the virus.VP2 being hyper variable is subject to mutations, often leading to variable antigenicity and pathogenicity.

Serotypes : IBD virus strains are classified into two distinct serotypes which can be differentiated by Virus Neutralization Test. There is no evidence of cross protection between these serotypes:

Serotype 1: Both classical and highly pathogenic (vvIBD)

Pathotypes/ Strains of serotype 1	Value
Mild field and vaccine IBD strains	Can be differentiated by bursal lesions and mortality pattern
Classical IBD strains	
Hyper or very virulent IBD strains (vvIBD)	
Variant IBD strains	

Serotype 2: Turkey strains are non-pathogenic to chickens.

Host: Chicken (The poultry at risk includes young pullets and broilers. Light weight laying breeds are more susceptible than heavy broiler breeds. Males are more susceptible than females).

Transmission: IBD virus is not vertically transmitted. Chicken infected with the IBD virus shed the virus in their faeces. Virus shedding starts 36 hours after infection and lasts for 14 -16 days. Horizontal transmission is through feed, water and poultry house litter. It is also transmitted mechanically among the farms in an area by movement of people, equipment and vehicles. Transmission could also happen through wild birds, flies and insects. IBD virus does not spread through the air.

Incubation period: 18-36 hours

Pathogenicity: Severity of Infectious Bursal Disease depends on the pathogenicity of the virus, the age of the infected chicken, breed of the chicken and the presence or absence of maternally derived antibodies.

Virulence of the disease:

Classical IBD : This is sub-clinical ***disease of chicken less than 3 weeks of age.*** Young chicken exhibit no clinical signs of disease due to low levels of circulatory B lymphocytes (which might be destroyed by IBD virus) during the first two weeks. However, immuno-suppression occurs due to the damage to the developing Bursa of Fabricius (BF). As a result this leads to reduction in over all performance of the bird with high feed conversion ratios, slow growth rates and immuno-suppression. This is economically more damaging.

Virulent IBD : Severe form of the disease ***usually occurs in chicken from 3 to 6 weeks of age.*** It is caused by the hyper virulent strains (vvIBD virus) of Infectious Bursal Disease virus. The clinical disease has a sudden onset with acute depression & reluctance to move about.

Very virulent strains of IBD (vvIBD) have been reported from various states of India since 1992. There are no variants of IBD recorded in India so far.

Clinical signs:

Affected bird has ruffled feathers, anorexia, whitish diarrhoea, dehydration & trembling followed by vent pecking. The flocks show depression for 5-7 days.

Mortality pattern has a typical bell shape curve, rising rapidly after the first two days, reaching the peak in four days and returning to normal within a week. Mortality in IBD depends on the presence of maternally derived antibodies and types of IBD vaccines used for the prevention of the disease. Mortality may be on a higher side in the presence of concurrent multiple infections in the flock. Sick birds may survive if management is good and stress factors are kept to a minimum. The morbidity in unvaccinated flocks is almost always 100%.

Postmortem lesions:

The Bursa of Fabricius : The Bursa of Fabricius is the first internal organ to show lesions. This occurs within 24 hours of infection. Cloacal bursa is enlarged, swollen and hemorrhagic. The infected bursa often shows necrotic foci and at times petechial hemorrhages on mucosal surface. Occasionally, hemorrhages are observed in the mucosa at the juncture of the proventriculus and gizzard. It is important that the sequence of changes be understood, while examining the birds for diagnosis.

Other associated lesions:

- Hemorrhages on thigh muscles
- Thymus opaque with thickened gelatinous capsule
- Hemorrhagic proventriculus-gizzard junction
- Bone marrow becomes fatty and yellow
- Liver may be swollen
- Kidneys are swollen and fatty

Diagnosis:

Virus Isolation: A filtered homogenate of the bursa of fabricius from infected birds, collected 2 to 10 days post infection, is inoculated into an embryonated egg. The homogenate is preferably inoculated into the chorio-allantoic membrane (CAM) or into the yolk sac. Embryo death occurs 3 to 7 days post inoculation. Typically an edematous congested embryo is seen with gelatinous appearance of the skin and hemorrhages in the toes or the encephalon. The liver appears pale, bile stained with white necrotic foci.

AGPT: Agar gel precipitation test (AGPT) can be used to detect viral antigen in the bursa of fabricius. A portion of the bursa is removed, homogenized, and used as antigen in a test against known positive antiserum. This is particularly useful in the early stages of the infection, before the development of an antibody response.

Immunofluorescence test: This test can also be used to detect antigen in bursal tissue. By using IBD-virus-specific chicken antiserum that has a fluorescent dye chemically linked to it. When a virus is present the IBD-specific chicken antiserum binds to the bursa tissue or cells and a bright fluorescence can be seen using a special microscope.

Prevention and Control:

There is no treatment for IBD. To prevent and control we need to have (a) sound bio-security and sanitation and (b) effective vaccination of parents and progeny.

Biosecurity: Bio-security measures are targeted at (a) reducing the level of field challenge and (b) making available a clean environment free from field virus to facilitate vaccine to perform.

IBD virus is very stable even at the peak of summer. It is a very hardy virus that can withstand high temperature (60°C) for 30 minutes, high pH variation (pH 2-12) and commonly used disinfectants. However, it is easily destroyed by 1% formalin, 1% cresol, 1% phenol in 1 hour. It can also be destroyed by chlorine, glutaraldehyde and iodophore based products.

Biosecurity should not be restricted to only hygienic measures or to liberal use of variety of disinfectants. It should also include verification of DOCs received on farm, vaccination history of parents, MAb profile of chicks and adequate down time between two flocks. Rigorous bio-security measures should be adopted if earlier flock was infected with IBD. Bio-security should be supported by separate brooding and growing facility.

Restricted entries, clean up, disposal of carcasses, rodent control, insect and pest control, personnel hygiene, disinfection of vehicles, eggs trays are various components of a comprehensive bio-security operation.

Vaccination: The objectives of an effective vaccination program is (a) prevention of morbidity, mortality and immuno-suppression associated with IBD infection in young chicken and (b) promoting high level maternal antibodies in day old chicks through vaccination in breeder stock.

There is a ready availability of live and inactivated vaccines for this purpose. Live vaccines are of three types (i) Intermediate, (ii) Invasive Intermediate and (iii) Invasive vaccines.

Vaccination Schedule:

Live Vaccines: In order to provide an effective vaccination schedule we need to understand the role of maternally derived antibody level of day old chicks.

The virulent field virus as well as vaccine virus is neutralized by MAb inherited by the progeny and fails to evoke an active immune response. Half life of MAb is 2.2 days in broiler chicks and 3.5 days in pullets. The time lag between the MAb level allowing the field virus and the development of protective immunity by the vaccine is proverbially designated as "Window of Opportunity".

Serum neutralization tests, ELISA and AGPT are the methods commonly applied to detect MAb profile of day old chicks.

Suggestion of vaccination schedule based on MAb:

- Intermediate vaccines can be used for primary vaccination and re-vaccination if IBD values on ELISA scale are below 25.
- In case IBD values are high, Intermediate vaccines are neutralized by maternally derived antibodies. In such cases Invasive Intermediate strains should be used as they are capable of penetrating high antibody levels.
- In case MAb values are uneven and have a wide range starting from very low to very high (< 25- 150), Intermediate vaccine should be used in first 10 days, followed by the use of Invasive Intermediate vaccines in 2nd or 3rd week.
- Even when ELISA values of day old chicks (DOC) are uniform and high there may be circumstances which warrant the use of Intermediate Invasive vaccines on a farm (e.g. with repeated history of IBD outbreaks). In such cases Intermediate Invasive vaccine should be used for three successive flocks and one should revert to Intermediate vaccine. Invasive vaccines should be avoided.

N.B.: (ELISA values depend on the type of ELISA kits used. Indovax uses ELISA kits from Affinitech, U.S. According to manufacturer of these kit units less than 15 are considered as negative, units between 15 and 75 as positive and more than 75 as strongly positive).

Determining the age of vaccination: The timing of vaccination remains critical for the success of any IBD vaccination program. If we know the ELISA values of day old chicks, the optimum age of vaccination can be assessed by a formula suggested by Kouwenhoven and Van der Bos (1996):

Mean *SQRT - 22.36/2.82 + 1	When Intermediate vaccine is used
Mean *SQRT - 22.36/2.82 + 7	When Intermediate Invasive vaccine is used

*(Mean here refers to mean of MAb values found in the flock)

Vaccination Schedule for pullets:

Day	Vaccine	Route
3-4	Georgia	I/O
14	IV 95/ B2K	Oral drop
24	IV 95/ B2K/ Georgia	Drinking water
34	Georgia	Drinking water

For breeder stock, apart from the above schedule of Live Vaccines, Inactivated Vaccine is to be given around 17 to 18 weeks and again on 38 to 42 weeks of age. This vaccination schedule is suggested looking into the current scenario of IBD out breaks at around 2 months of age.

Vaccination Schedule for broilers:

Day	Vaccine	Route
4	Georgia	I/O
13	B2K	Oral drop

Activities desired during a field outbreak of IBD:

- Improving the conditions in the chicken house, like better temperature and ventilation which can reduce stress and assist in reduction of the overall mortality
- Sick birds often suffer from severe dehydration with damaged kidneys. Administration of electrolytes in drinking water and reduction in protein levels of the ration for four to five days can assist in the birds' recovery
- Antibacterial therapy is sometimes required to minimize secondary infection. Make sure not to use medications which are eliminated through the kidneys
- Supplementation of multivitamins in drinking water is also recommended

Current Status of IBD in Indian Poultry:

Even today IBD raises his head in different parts of the country. Recently sporadic IBD outbreaks were witnessed all across the country. Indovax undertook an exhaustive experimentation with all the available IBD vaccines and the findings are as under:

- The entire range of Indovax IBD vaccines i.e. Georgia, Bursa B2K and IV 95 give sufficient protection against field challenge
- All the three vaccines (Georgia, Bursa B2K and IV 95) are non immuno-suppressive
- The vaccine strains are homologous with the field challenge virus
- The RT-PCR studies show that the IBD field virus has not changed at all. There are no variants of IBD virus in the country at present

The reasons for sporadic field outbreaks of IBD are :

- Negligence of routine bio-security measures in some areas
- Unwarranted changes in vaccines and vaccination schedules
- Variations in parent vaccination practices that have altered MAbs. Breeders have ignored the use of IBD killed vaccines at point of lay and then at mid-lay
- Chicks hatched from multiple age group parents have high heterogeneity in MAbs on the day of hatch both in pullets and broilers. Therefore, vaccination schedule based on assumed MAb titers may has led to vaccine failures
- Farmers have ignored proper route of vaccine administration
- Quality of water in terms of chlorination or sanitization may be detrimental to vaccine virus if vaccine is used in drinking water
- Since natural host of IBD is chicken, disease will first emerge in unvaccinated flocks, then partially immunized flocks and finally in vaccinated flocks. Therefore, no poultry flock should be left unvaccinated. In India many small broiler farmers are not vaccinating their flocks even today
- The disease profile in the country has changed significantly and almost all flocks are immuno-compromised due to a variety of reasons including Aflatoxicosis, MD, CAV and possible exposure to LPAI.