



# poultry focus

business news for the poultry industry



The actual mortalities caused by an outbreak of Infectious Bursal Disease (IBD or Gumboro disease) are likely to be just the tip of the iceberg. The effects of the subclinical disease, such as uneven growth rate or immuno-suppression are likely to be more apparent and economically damaging.

The virus that causes Gumboro disease is ubiquitous and highly resistant. In this issue of Poultry Focus we discuss the disease's relevance to:

- Production economics
- Uniform antibody levels in day old chicks
- Vaccination techniques using Nobilis D78 or Nobilis 228E



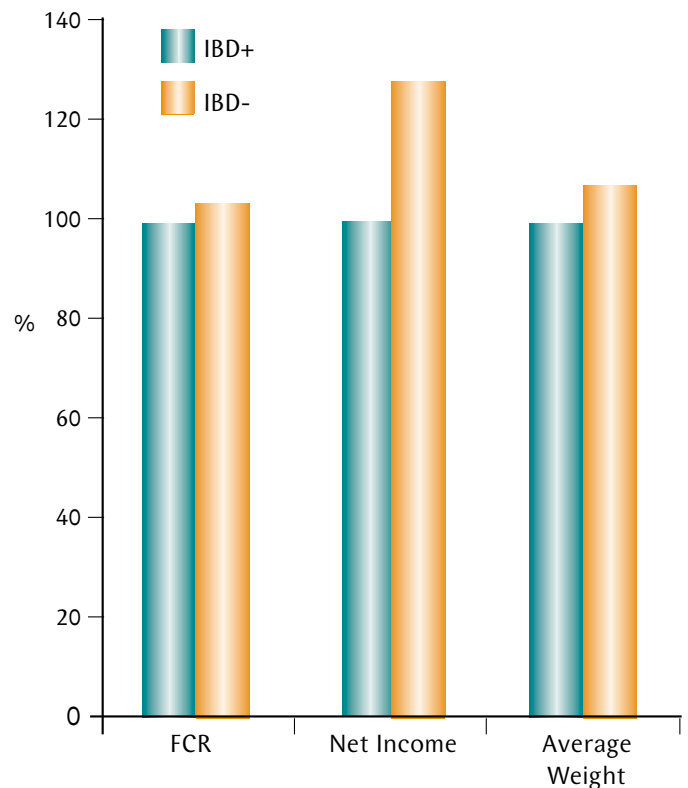
Diagram 1.  
Chicken suffering from acute IBD

## What is the economical impact of Gumboro disease?

A study was performed in 1993<sup>1</sup> in broiler flocks that were free from clinical IBD. The flocks were grouped into negative or subclinical IBD positive, based on the presence or absence of microscopic lesions of the bursa. Performance parameters of the subclinical Gumboro positive flocks were taken as 100%, and their performance was compared to flocks that had no bursal lesions at all.

The income from the IBD negative flocks was 28% higher than the subclinical IBD positive flocks (see Diagram 2 below.)

Diagram 2.  
Performance parameters of broilers affected by subclinical IBD



## The importance of uniform antibody levels in day old chicks

Vaccination programmes for infectious poultry diseases such as IB, ND or TRT offer a certain amount in administration time flexibility. However, with Gumboro vaccine, administration time is more critical.

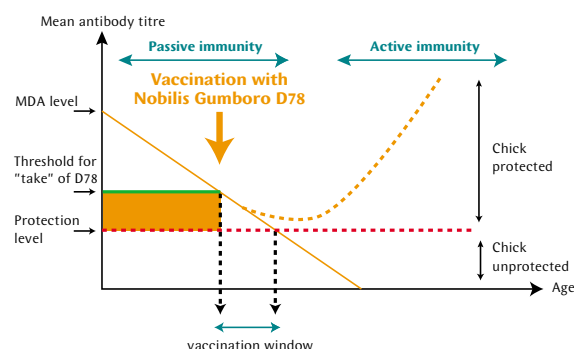
Vaccination of broiler breeders with live and killed Gumboro vaccines is common practice in the UK. In theory, vaccination with oil based inactivated vaccine will result in a higher level of protective maternally derived antibodies (MDA). These are transferred from the hen, through eggs, into the progeny. The MDA level is relatively high in day-old chicks, but declines as time progresses. This decline is noticeably slower in layer type birds than in broilers. As the level of MDA declines, **birds become suitably sensitive to vaccination, but they can also be exposed to field challenge.** Vaccine administration time should, therefore, be based on the maternal antibody status of day old chicks.

When Gumboro virus is known to be a threat, one wants to vaccinate chicks as soon as possible. For vaccines to be effective, the MDA level needs to have declined sufficiently to enable full immune stimulation, as explained in Diagram 3.

During the first 21 days of life, chick maternal antibodies can be seen to decline at a steady rate within the flock. As mentioned above, the starting level and uniformity is dependent on the success of breeder vaccination processes. The orange arrow on the graph, demonstrates when the antibody level has fallen in a sufficient number of birds to enable an active immune response from Nobilis D78 vaccine administration. An active immunity will then be stimulated in those susceptible birds providing protection against IBD. If the vaccination were to be administered prior to this date, there would be too many chicks failing to respond owing to high maternal antibodies. Delaying until after the vaccination window will result in too many chicks without passive immunity, risking disease.



Diagram 3: Role of MDAs in IBD vaccination



The following table summarises the factors that can influence the timing and success of IBD (Gumboro) vaccination.

| Factor   | Reason  |
|--|---|
| 1. High MDA in broilers                        | IBD specific maternal antibody will neutralize the vaccine, thus diminishing any development of immunity derived from the vaccine   |
| 2. Uniformity of the antibody level            | Correctly vaccinated parent stock will have a uniform level of antibodies. The uniformity within day old broiler chicks can be estimated by serological profiling and expressed as a percentage CV. Good uniformity is CV<30%, poor uniformity CV>30%.  |
| 3. Half life status of the maternal antibodies | The half life of MDA is dependent on the type of bird and the rate at which the bird is growing. The following are typical half lives:<br>Broilers = 3.5 days<br>Broiler breeders = 4.5 days<br>Layers =5.5 days  |
| 4. Vaccine specific MDA breakthrough titre     | The breakthrough titres of different vaccines depends on their type and virus strain. Intervet IBD vaccines are classified as follows:<br>Nobilis D78 (intermediate) - Effective vaccination at MDA VN titre log <sub>2</sub> 6 or lower<br>Nobilis 228E (intermediate plus) - Effective vaccination at MDA VN titre log <sub>2</sub> 8 or lower<br>Following vaccination with Nobilis 228E, bursal recovery is found to be faster than with similar other vaccines <sup>2</sup> resulting in a reduced immuno-suppressive effect on the chicken. |

This is also where the specifically designed **Deventer method** of calculation can be used to help demonstrate the optimal time for Gumboro vaccination, this method of calculation is not based on the mean MDA titre of the flock, unlike the Kouwenhoven formula, but **on the titre level when a certain percentage of the flock can be successfully vaccinated.** Based on field experience the Deventer formula uses 75% as a default percentage. To obtain reliable prediction dates a minimum of 18 day-old chicks per house should be sampled. Further explanation on the Deventer formula and the calculator spreadsheet are on a CD-ROM available from Intervet UK Ltd.

## Vaccination techniques

### HOW SHOULD I DECIDE WHETHER I NEED TWO VACCINATIONS?

**If the uniformity of the MDA is good (CV <30%), only one vaccination is needed.** Because most of the chicks have approximately the same MDA, their vaccination windows (see diagram 3) will overlap so vaccination on one day is effective.

**If the uniformity of the MDA is poor (CV > 30%) two vaccinations are needed.** Because of the high variation in MDA, too many birds will have high MDA and not be sensitive to the vaccine, at the age it must first be given to protect the birds with low MDA. A second dose, around 6 days later, is needed to cover the high-MDA birds.

The correct vaccination day(s) can be calculated once the MDA, CV% and half life are known. These are simply calculated using the Intervet IB CD-ROM

For example:- In a broiler flock

- The calculated day of vaccination is day 18.
- The uniformity of maternally derived antibodies >30%
- The MDA half life is 3.5 days.

The recommended vaccination timing is on days 15 and 21. The time between the two vaccination dates is equivalent to two half-lives.

### LIVE VS INACTIVATED GUMBORO VACCINES

**Live vaccines** can be further categorised as **intermediate** (e.g. Nobilis D78) and **intermediate plus** (eg Nobilis 228 E). The main difference between the two virus types is that the intermediate plus

vaccine is able to overcome the effect of MDA earlier than the intermediate vaccine. The use of an intermediate plus vaccine would prove beneficial in cases where early vaccination was required, due to a heavy early challenge. (e.g. on farms with history of acute Gumboro disease)

**Inactivated Gumboro vaccines** are used in breeder type birds to ensure a long lasting and high level of immunity is passed to progeny. Unfortunately, if this vaccine is not correctly administered, the immunity of the day old chicks will suffer and a certain proportion of the day old chicks will have low maternal antibody levels. They can act as miniature incubators for the field virus. After a few days these chicks pass into the environment millions of virus particles with every gram of faeces, thus posing a considerable threat to the other birds in their surroundings.

**If this situation occurs just before, during or immediately after vaccination, then significant losses from Gumboro disease will still occur.**



### HOW TO GET THE BEST FROM YOUR VACCINE?

#### Correct administration

Whether you are using Nobilis D78 or Nobilis 228E, correct administration of the vaccine in the drinking water is essential to ensure that birds are fully protected. Under practical conditions the aim should be to vaccinate as many of the flock as possible.

Application of live vaccines through the drinking water offers reduced labour costs, minimal bird stress and stimulation of good mucosal immunity. The main disadvantages are inconsistencies of vaccine dosage due to variable water intakes and the potential for some birds to receive no vaccine at all. An incomplete coverage of the flock can result in a post vaccinal reaction and/or 'heating up' of vaccine virus due to repeated bird to bird transmission.

#### Take care of the vaccine

There are a number of precautions that need to be taken for the vaccination to be effective and reliable. The vaccine should not be exposed to bright sunlight, heat, heavy metals, disinfectants and detergents, chlorine, and organic matter.



Some mains water supplies have chlorine added (at around 2ppm) which can affect the vaccine. This level of chlorination can be inactivated by the addition of 2% skimmed milk.

Making sure that the vaccine is administered to the birds within **two hours** after it is made up will maximise the chances of birds receiving an effective dose. Rapid administration will depend not only on birds being thirsty enough to want to drink, but also by minimising dead space within the drinker system in place. This **can only** be achieved by draining and priming lines. There should also be enough vaccine solution for all birds to get a dose - this can be calculated from water meter readings or header tank levels.



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## Additional technical information

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### PCR TESTING AND VARIANT VIRUSES

Gumboro Disease is caused by double stranded RNA birnaviruses. These viruses can be divided into two serotypes (1 and 2) on the basis of antigenic differences. Serotype 1 is of pathological importance to chickens but to date, no disease has been attributed to serotype 2. Within serotype 1, antigenic variations exist in some countries alongside considerable variation in virulence; from apathogenic strains to very virulent strains. Within this same group, we can also distinguish between classical and variant viruses based on their surface proteins (antigens) or based on their genetic material (RNA).

Variant IBD viruses have so far only been isolated from the American continent but there are indications that they are present in the Far East and also in some European countries. All the current vaccines used in the UK belong to the classical group of IBD viruses and provide adequate protection against known European IBDV isolates.

Using molecular biological techniques like RT-PCR (reverse transcriptase polymerase chain reaction) IBD strains can be subdivided into molecular groups, such as Variant-A type, Variant-E type, Baxendale type ("Group 4", including D78), Lukert type ("Group 5", including the Bursine range viruses), etc. This typing is useful for epidemiological surveys, but severely limited in predicting vaccine effectiveness. This is because it only reflects nucleic acid (the building blocks of RNA) sequence information. A change in a sequence may or may not have relevance to the amino acid composition of the virus's surface proteins, which are responsible for the antigenic profile.

***"RT-PCR and other molecular biological techniques can be used to predict the relative similarities and differences among IBD strains but determining the actual antigenic variations between viruses requires testing in vivo."***

(D.Jackwood et.al- Avian diseases 45:330-339, 2001)

The protective value of a vaccine against new field isolates (classical or variant) can only be assessed in challenge experiments.



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### THE PROTECTIVE VALUE OF D78 HAS RECENTLY BEEN DEMONSTRATED AGAINST A UK GUMBORO FIELD ISOLATE

A field Gumboro virus was obtained from a clinical outbreak in a UK broiler flock. The isolate was tested in the Service Lab of Intervet International and was found to be a classical type virus.

Two-week-old SPF broiler chickens were vaccinated with one dose of Nobilis Gumboro D78 via eye drop. Two weeks later the chickens were challenged with 100 EID<sub>50</sub> of the UK isolate also via eye drop. The challenge response was assessed by examination of the bursae (removed at 3.5 days or at 10 days post challenge) for the presence of IBDV challenge virus by ELISA. In addition, the bursae were examined for the presence of IBD lesions induced by challenge virus replication by means of microscopic examination.

#### RESULTS

After challenge, 10% of the control chickens died and examination of the bursae revealed that all other control chickens were affected by the IBD challenge.

Examination of the bursae further revealed that all vaccinated chickens were protected against challenge with the IBD UK isolate.

**This demonstrates that Nobilis Gumboro D78 sufficiently protects chickens against infection with the IBD UK isolate.**

#### REVIEWING TECHNIQUES

Intervet UK Ltd, with direction from your veterinary surgeon, is happy to offer a vaccine audit service to users of Nobilis vaccines. This service aims to facilitate best vaccine administration practices on farm.

**Please contact Intervet UK to request this service.**

Nobilis® Gumboro D78 live is a freeze dried virus vaccine against gumboro (infectious bursal disease). Each dose contains at least 10<sup>4</sup> log<sub>10</sub> TCID<sub>50</sub> Gumboro disease virus (strain D78). For reconstitution and administration in water.

Nobilis® Gumboro 228E is a live, freeze dried viral vaccine containing Gumboro disease strain 228E (>2.0 log<sub>10</sub> TCID<sub>50</sub> per dose). For reconstitution and administration in the drinking water.

Reference: 1. S G McIlroy et al. 2. Data on file.

Legal category: **POM** Can only be prescribed by a veterinary surgeon, from whom advice should be sought. Further information is available from Intervet's poultry department.