

# The control of Gumboro disease in chickens

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Gumboro disease, or infectious bursal disease (IBD) is due to a small, non-enveloped virus, called Gumboro disease virus, or infectious bursal disease virus (IBDV).

Its control is everything but easy and straightforward. Poultry veterinarians in the field are facing an enemy that is widely spread, highly resistant, and of several possible pathogenic outcomes.

Any modern poultry rearing organisation cannot neglect the prevention of IBD, as it is responsible for significant economical losses.

They come from altered performances, such as a slower growth, or an increased feed conversion rate compared to standards. Because IBDV is replicating in the immature B-lymphocytes of the bursa of Fabricius, it is able to induce an immunosuppression.

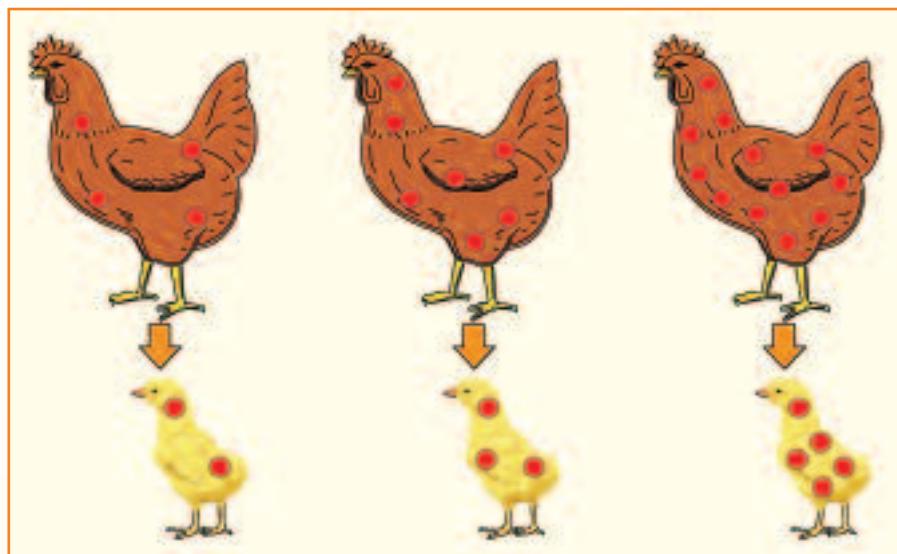
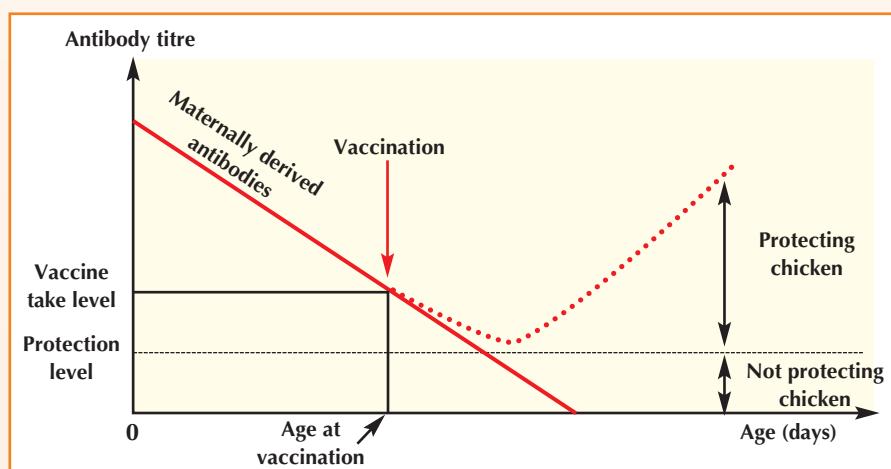
As a consequence, the IBDV infected birds become more susceptible to secondary 'opportunistic' pathogens (for example *E. coli*), and they are less able to build up an active immunity (either following infection or vaccination).

Finally, this induces higher medication costs. This form is called subclinical IBD. In other cases, IBD may appear more acutely, with associated mortality and haemorrhagic lesions at post mortem (for example in the bursa of Fabricius).

Such form is named very virulent IBD (vvIBD).

The subclinical (zootechnical) and the clinical (acute) form of the disease may co-exist in a given country.

**Fig. 1. The constant immunisation against Gumboro disease active immunity (.....) takes over from passive immunity (—) induced by MDA.**



**Fig. 2. Direct correlation between the infectious bursal disease antibodies in the breeder hen and in the progeny.**

In the United States, a third form has been described, with early infection of birds (before two weeks of age), only characterised by a strong atrophy of the bursa: this form is associated with the infection by variant IBD viruses.

Any poultry producer or poultry veterinarian must take into account several aspects to set up a control programme.

## ● What is the global hygiene status of the farm?

IBD virus is extremely resistant in the

outside environment. By infecting susceptible birds, it is able to replicate very quickly (within a few days), to disseminate in the body, and to be shed in the faeces.

One must reduce as much as possible the amount of field virus persisting in the farm to avoid a massive and early infection of the birds.

Such reduction is linked to the cleaning and disinfection procedures in force, to the quality of the products used, and to the skills of the technicians.

A reasonable rest period (at least two weeks) must be guaranteed between two consecutive flocks.

All these parameters are directly linked to the general biosecurity systems in place, to the farm management, the equipment and the monitoring systems.

## ● What is the quality of the day old chicks that have been delivered to my farms?

Good quality chicks are birds with significantly higher likelihood of becoming profitable broilers or layers.

Regarding IBD, a particular attention must be paid to the maternally derived antibodies (MDA).

These MDA are passively transmitted from the breeder hen to the progeny

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through the egg yolk all the laying season long. They are extremely useful, since they are able to neutralise the field virus.

They are metabolised in parallel to the protein consumption of the growing chick.

By regular serology analysis, the IBD antibody level is regularly decreasing for two to three weeks up to total disappearance.

Moreover, the amount of MDA can vary according to the age of the breeder hen – the younger the hen, the higher the amount of MDA it is able to transmit to its chick.

Situation in the farm to be vaccinated	Subclinical IBD	vvIBD	Breeders priming
Situation in the neighbouring farms	No vvIBD	vvIBD	NA
<b>Suitable vaccine:</b>			
Intermediate	++	+	-
Intermediate plus	-	++	++

*– not recommended, + recommended, ++ highly recommended, NA not applicable*

**Table 1. Criteria for choosing an IBD vaccine according to the health situation in and around the farm (from Y. Gardin, 1998).**

To this aim, the breeders have to be properly immunised against IBD; this

includes a live priming programme for the rearing period, and a booster using a killed oily vaccine two to three weeks before the onset of lay.

The objective is to immunise them enough to induce a high, and long lasting transmission of the IBD MDA to the chicks. However, these MDA are also able to neutralise a vaccine virus when given too early to the chicks.

It means that the vaccination date has to be determined on a case by case basis. It is done using the IBD serology analysis by ELISA, theoretically for every new batch of chicks.

The initial level of MDA (at hatch or for the first three days of life) is the key to calculate a theoretically optimal vaccination date, using formulas (for example, Kouwenhoven).

The heterogeneity of the flock must also be taken into account. It is assessed using the coefficient of variation (CV), as a ratio between the standard deviation and the average mean titre.

A CV of more than 50% is reflecting a heterogeneous batch of chicks, which means that there is a significant amount of chicks with low levels of MDA, and concurrently there is a significant amount of chicks with high levels of MDA.

Such a scenario makes the decision on when to vaccinate more difficult. In chick batches with a high CV, a second (in broilers), or a third (in pullets) IBD vaccination may become necessary to immunise the whole flock.

### ● The epidemiological situation of IBD – am I facing subclinical, variant, or very virulent IBD?

The flock performances versus expectations, the clinical and necropsy signs, if any, and the information on the infectious pressure in the surrounding area will help identifying which form of IBD is prevailing in the farm.

This information will help to define the suitable strength of vaccine(s) to use. Basically, subclinical forms of the disease may be prevented using strains

known as 'intermediate' or 'mild'. The acute forms of the disease are due to a more pathogenic virus, of quicker replication capacity; as a consequence, they have to be prevented using stronger vaccine strains, known as 'intermediate plus' or 'hot'.

Lastly, the variants are controlled using killed vaccines in breeders in the United States to protect the progeny against the early infection.

### ● How to ensure an actual and optimal immunisation of the flock?

First of all, one must check the expiry date of the vaccine batch that is planned to be used and throw away any expired batch.

Secondly, the storage conditions of the vaccine vials must respect the cold chain using a fridge ensuring a temperature of +4 to +8°C (35 to 45°F).

The best vaccination route for IBD is the drinking water administration.

The vaccinators must know some basic, but extremely important, procedures in order to ensure a successful immunisation.

The water quality has immediate consequences upon the survival of the vaccine virus after reconstitution: bacteria like coliforms, chlorine, extreme pH, hardness, or metallic ions do hamper this survival, and hence decrease the quantity of effective live vaccine antigens that reaches the birds.

The vaccine virus in solution can efficiently be protected by the addition of skimmed milk powder, sodium thiosulphate, or other available compounds in the market.

Before distribution, the birds are made thirsty for about 1.5 hours (to be adapted to the climate); after distribution of the vaccine solution, the birds must drink quickly, and without too much competition to the drinkers.

Too few drinkers, or too long manual distribution, or clogged nipples result in uneven vaccine take by the flock. The addition of a blue dye (for example FD&C Blue No. 1) is a useful way to check if the vaccine solution has been taken by a sufficient amount of birds (ideally, by more than 90% of the birds).

A new generation of IBD vaccines are now appearing on the market. They have been designed to move one step forward in a better control of the several parameters to succeed the immunisation of a flock against IBD, as summarised here above.

They are of two types, basically: the immune-complex vaccines, and the recombinant vaccines.

Both of them have to be administered in the hatchery by injection, either at

one day of age, or by in ovo route at 18 days of embryonic development. In broilers, there is theoretically no need to vaccinate in the farm anymore, which eliminates the possible failures at this end.

These new vaccines ensure an individual immunisation, using a mass administration equipment.

Obviously, regular training of the workers and maintenance of the equipment must be guaranteed.

Such vaccines are suitable both to prevent subclinical and acute IBD.

The working mechanism (either progressive release of the immune complex, or persistent viraemia) is supposed to

ensure a right immunisation, regardless of the initial quantity of MDA that is transmitted to the chick.

The MDA quantity at hatch, the heterogeneity of the batch of day-old chicks, the water quality, and the epidemiological context do not have to be assessed any longer.

The control of IBD has been continuously improved for decades. Updated vaccination strategies are regularly proposed.

Undoubtedly, IBD virus will continue to challenge the poultry industry and the scientists to constantly improve the existing control methods and to develop new ones. ■