GUMBORO SOLUTIONS

PROTECTED CHICK
IT ALL STARTS WITH EARLY VACCINATION

PROTECTED PULLET

MSD Animal Health

MSD ANIMAL HEALTH

100 years EXPERIENCE IN VACCINE R&D

Offers you a comprehensive range of Gumboro solutions. Because Gumboro challenges change continually we realise that one solution does not fit all. Therefore we offer mild, intermediate and intermediate plus conventional vaccines and vectored vaccines that will complement your vaccine program to adapt to your requirements.

INFECTIOUS BURSAL DISEASE

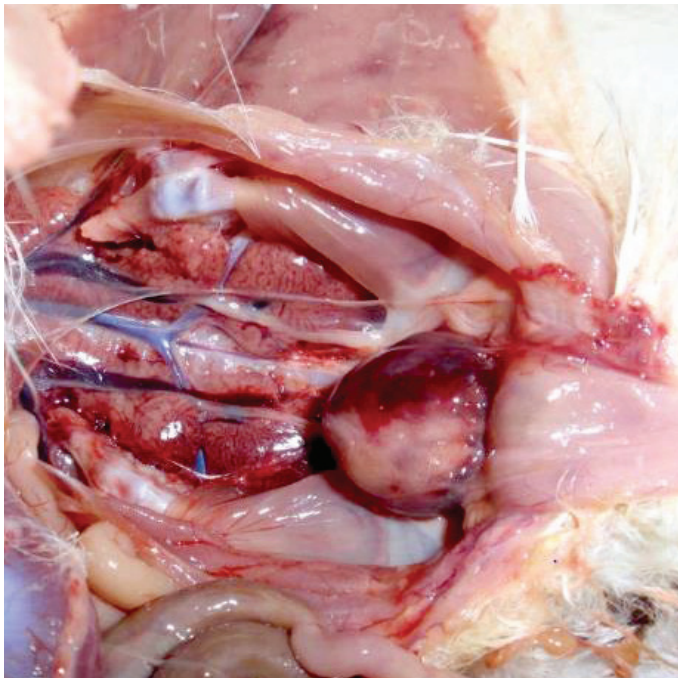
Infectious Bursal Disease (IBD), or Gumboro Disease, is a viral disease affecting young chickens. The disease has a worldwide prevalence. The target organ of the virus is the Bursa of Fabricius, an important organ in the young chicken's developing immune system.

The economic impact of an Infectious Bursal Disease Virus (IBDV) infection is two-fold:

1. Direct mortality that can reach levels in excess of 40 %, and
2. Secondary infections, due to a suboptimal immune system, having a negative impact on production efficiency.

Luckily the negative effects of IBDV can be successfully controlled by vaccination and implementing sound biosecurity principles.

BURSAS AT DIFFERENT STAGES OF INFECTION



INFLAMED HAEMORRHAGIC BURSA

VACCINATION

When vaccinating against Gumboro Disease, there are multiple live vaccine options:

1. Mild vaccines are effective in areas where the field challenge is low.
2. Intermediate vaccines have few side effects, but limited efficacy against very virulent IBD (vvIBD) in the field or in situations of high infection pressure.
3. Hot vaccines have a powerful and aggressive action, but can damage the bursa, impairing the immune response and response to other vaccinations.

Good protection is achieved by the induction of high levels of neutralising antibodies in the chicken. Antibodies neutralise the virus before infecting the bursa, or at lower antibody levels sufficient virus is neutralised to prevent clinical disease.

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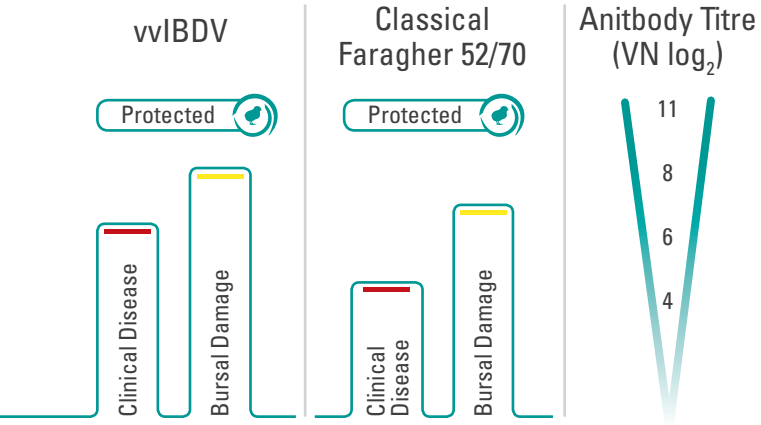


Schematic representation of IBDV titres (VN log_2) required to protect against IBD infection with a very virulent (D6948) and a classical (Faragher 52/70) IBDV strain.

HYPERIMMUNISATION OF BREEDERS

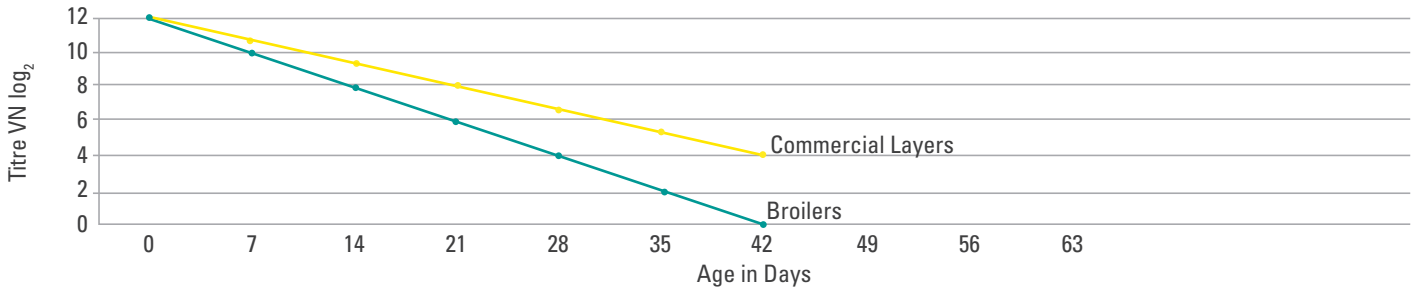
Parent breeder chickens are hyperimmunised against IBDV (immune system is boosted to achieve a high level of circulating IBDV antibodies). Hyperimmunisation is achieved by priming parents during the rearing phase with a live IBDV vaccine between 4 and 10 weeks of age, followed by an inactivated IBDV vaccine at 16 - 18 weeks of age. The resultant high level of IBDV neutralising antibodies induced in the parent bird is passively transferred to the day old chick via the yolk sac, so called maternally derived antibodies (MDA).

This strategy is implemented to protect the young chick during the first one to two critical weeks post hatch. The control of variant IBDV in broilers is achieved by hyperimmunising breeder flocks with inactivated variant IBDV vaccines.

DECLINE OF MDA IN PROGENY

MDA is protective when present at sufficiently high titres, however due to metabolism and growth the antibody titre declines at a rate of 1 log_2 VN titre every 3 to 5,5 days (broilers 3 to 3,5 days, broiler breeders 4,5 days and layers 5,5 days), thus 2 to 3 weeks post hatch the susceptibility of a chicken flock to an IBDV infection increases. MDA protects chickens against field infection but also neutralises live vaccines resulting in vaccine failure. Knowing the source of day old chickens and determining the level of circulating MDA is critical to the implementation of an effective live vaccination program.

Decline of MDA



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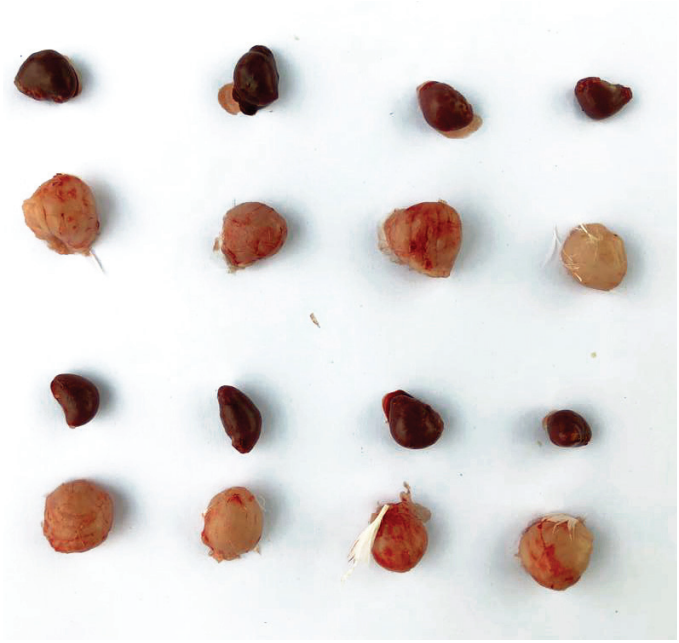
VACCINATION TIMING

Vaccination with live IBDV vaccines

Live vaccines are administered to achieve active immunity. Interference of MDA is the crucial problem in determining a successful live IBDV vaccination schedule.

- Vaccinating in the presence of high levels of MDA results in vaccine virus neutralisation and no immunity.
- Waiting until an age when MDA levels have declined to very low levels could result in a pathogenic field virus challenge before vaccination.



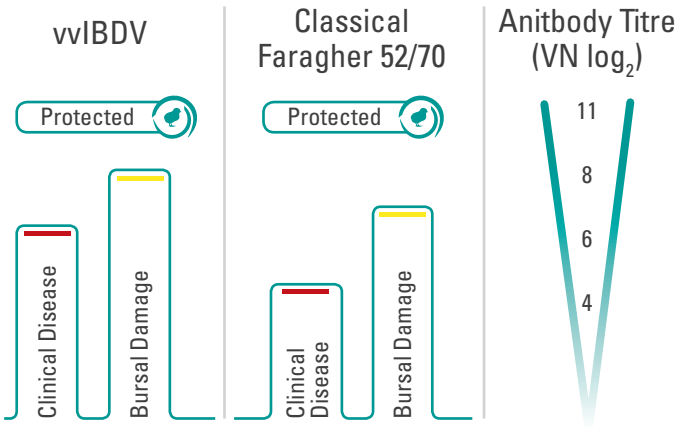
HEALTHY BURSAS COMPARED TO SPLEEN SIZE

VACCINATION

Classification of Live Vaccines

Live vaccines are classified into three groups according to their ability to break through MDA levels.

- **Mild** – these vaccine strains are highly attenuated, breaking through very low levels of MDA.
- **Intermediate** – attenuated IBDV strains breaking through MDA titres ≤ 6 $\log_2$ Viral Neutralisation (VN) (ELISA (IDEXX standard) titre 125).
- **Intermediate Plus/Hot** – attenuated IBDV strains breaking through MDA titres ≤ 8 $\log_2$ VN (ELISA (IDEXX standard) titre 500).



Schematic representation of IBDV titres (VN $\log_2$) required to protect against IBD infection with a very virulent (D6948) and a classical (Faragher 52/70) IBDV strain. Maximum breakthrough titres of the different vaccine types are represented on the right.

A potential disadvantage of live IBDV vaccines is inherent pathogenicity. This is specifically applicable to intermediate plus type vaccines and even more so in the case of so called "hot" vaccines. These vaccines must never be administered to chickens in the first 10 days post hatch. Bursal damage caused may result in immunosuppression.

VACCINATION SCHEDULES

There is no IBD vaccination schedule that can be routinely recommended. Factors influencing a vaccination schedule include:

- Type of chicken to be vaccinated (broiler or commercial layer).
- Level of MDA. The higher the start level of MDA, the later the age at which vaccination is possible.
- Uniformity of MDA. If the variation in MDA levels is too high (CV > 30 %) a second IBD live vaccination is required to effectively immunise the flock.
- MDA breakthrough titre of the vaccine being used (intermediate or intermediate plus).
- Field pressure.

Choice of live vaccine to be used depends on:

- Virulence of field infection (mild and intermediate vaccine strains have poor efficacy against very virulent IBDV as these vaccines cannot be administered at an early age due to MDA interference. Vaccination is thus too late for field infection).
- Age of chickens to be vaccinated (the earlier the vaccination the higher the level of MDA, requiring a stronger vaccine).
- Age at which Gumboro outbreak occurs (early outbreaks require earlier vaccination).

DEVENTER FORMULA

This formula was developed by J J de Wit, DVM, PhD. The formula has been made available to us to use and is an excellent tool in determining the optimal time of vaccination. Should you be interested please ask your Key Account Manager for more details.

FIELD TEST KITS

Viral Flex Seq testing is available for IBD testing and it can differentiate between IBD field and IBD vaccine strains using bursal impression smears.

MSD Animal Health is proud to offer you a complete range of Gumboro vaccines to suit each field situation.

UNIVAX-BD®

Description

Univax-BD® is a mild live tissue culture vaccine containing strain ST-12 of IBDV.

- Triple cloned to limit bursal damage.
- Offers broad-spectrum protection against standard and variant IBD strains.
- No concern for immunosuppression and secondary infections.
- Aids in creating a more uniform flock for easier management and marketing.
- Leads to improved feed conversion and production efficiency.

Administration and schedule

The vaccine can be administered by the *in-ovo* route, day-of-age subcutaneous injection or by the drinking water method for birds 7 days of age and older.

Presentation

Univax-BD® is available in 5 000 dose vials.

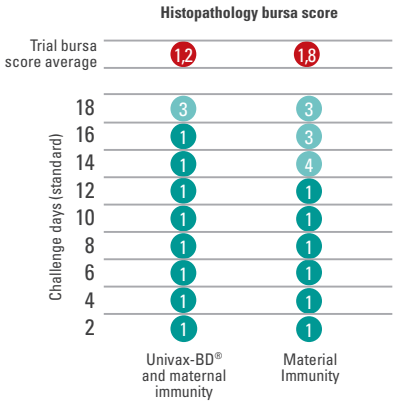
Univax-BD®: Trial Data

To test the protection given by day-of-age subcutaneous vaccination and *in-ovo* vaccination against standard challenge and

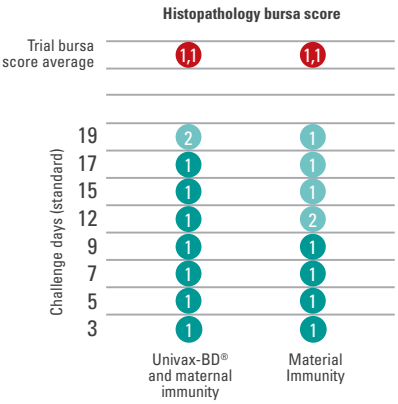
variant challenge, two floor pen trials were carried out with Univax-BD® in chickens with maternal immunity. Vaccinated and non-vaccinated groups of birds were challenged at different ages and protection was evaluated. Five days after challenge date, the Bursas of Fabricius were given histopathology scores from 1 (normal bursa) to 4 (severe IBD lesions); data was averaged per group. PCR detection of the challenge strain in the bursa was also carried out (bold scores corresponded to IDEXX RT/ PCR RFLP positive bursa for the challenge virus).

Protection against standard challenge

Univax-BD® day-of-age subcutaneous vaccination
Commercial birds with an average day-of-age Elisa titre of 9500

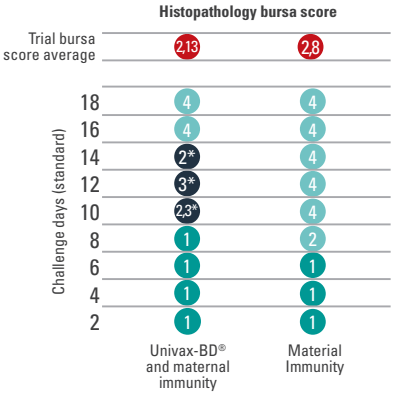


Univax-BD® day-of-age subcutaneous vaccination
Commercial birds with an average day-of-age Elisa titre of 1100



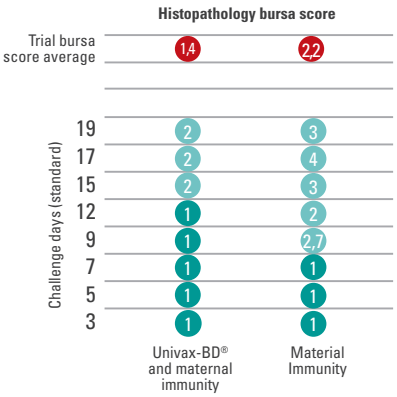
Protection against variant E challenge

Univax-BD® day-of-age subcutaneous vaccination
Commercial birds with an average day-of-age Elisa titre of 9500



* Mild lesions with no necrosis in opposition to the severe lesions of non-vaccinated birds

Univax-BD® day-of-age subcutaneous vaccination
Commercial birds with an average day-of-age Elisa titre of 1100



Univax-BD® early vaccination appeared to delay the age at which standard challenge virus could be detected in the bursa of the birds with maternal immunity. In the case of standard challenge, the infection was delayed by approximately 4 to 7 days and in the case of variant E challenge the delay was approximately 4 to 6 days. Furthermore Univax-BD® improved bursal health in the vaccinated groups, compared to the unvaccinated groups, over the trial period.

NOBILIS® GUMBORO D78

Description

- Nobilis® Gumboro D78 is a live freeze dried, plaque purified intermediate vaccine.
- Consists of a single virus sub-population.
- Allows for a predictable vaccine response.
- No risk of reversion to virulence.
- Breaks through higher levels of maternally derived antibodies (MDA) than other widely used intermediate Gumboro vaccines.

Administration and schedule

The vaccine can be administered through a spray, intranasal/eye drop instillation or via the drinking water. It may be safely administered at one day of age to chickens with no or a low level of maternal antibodies.

Future layers/breeders	Day
Parents vaccinated with an inactivated vaccine	21 – 28 *
Parents not vaccinated with an inactivated vaccine	14 – 24

Broilers	Day
Parents vaccinated with an inactivated vaccine	17 – 23 *
Parents not vaccinated with an inactivated vaccine	7 – 14

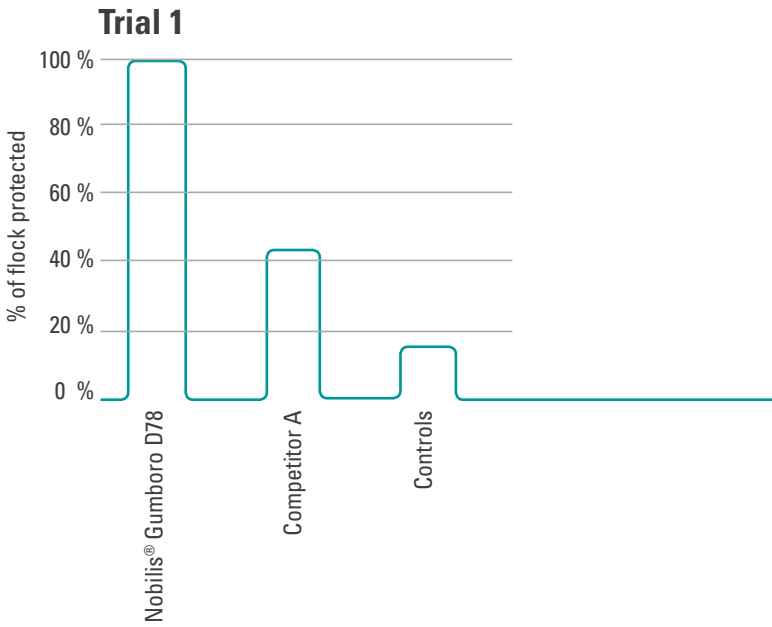
* When MDA titres are uniform, one vaccination will normally be sufficient.

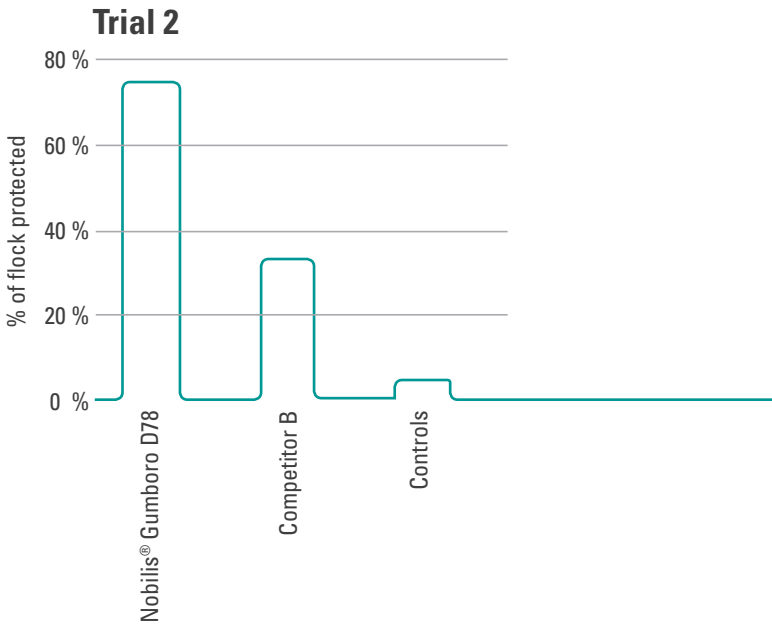
Presentation

Nobilis® Gumboro D78 is available in vials of 1 000, 2 500 and 5 000 and doses.

Nobilis® Gumboro D78: Trial data

Trials with recently isolated (2002) pathogenic strains of IBDV demonstrate that Nobilis® Gumboro D78 is outstandingly effective:





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NOBILIS® GUMBORO 228E

Description

Nobilis® Gumboro 228E is an intermediate plus vaccine containing live IBDV strain 228E.

Nobilis® Gumboro 228E has the power to break through higher titres of MDAs than other intermediate vaccines, but without permanent bursal damage and associated immunosuppression.

A global trend has emerged where Nobilis® Gumboro 228E has been used to displace the field strain from a house, the so called "cooling down effect". This allows the introduction of milder vaccines such as Nobilis® Gumboro D78 after three vaccination cycles with Nobilis® Gumboro 228E.

Administration and schedule

The vaccine is administered through the drinking water.

Future layers/breeders	Day
Parents vaccinated with an inactivated vaccine	21 – 28 *
Parents not vaccinated with an inactivated vaccine	14 - 24

Broilers	Day
Parents vaccinated with an inactivated vaccine	14 – 17 *
Parents not vaccinated with an inactivated vaccine	8 – 12

* When MDA titres are uniform, one vaccination will normally be sufficient

Presentation

Nobilis® Gumboro 228E is available in vials of 1 000, 2 500 and 5 000 and doses.

Nobilis® Gumboro 228E: Trial Data

Field Study, France

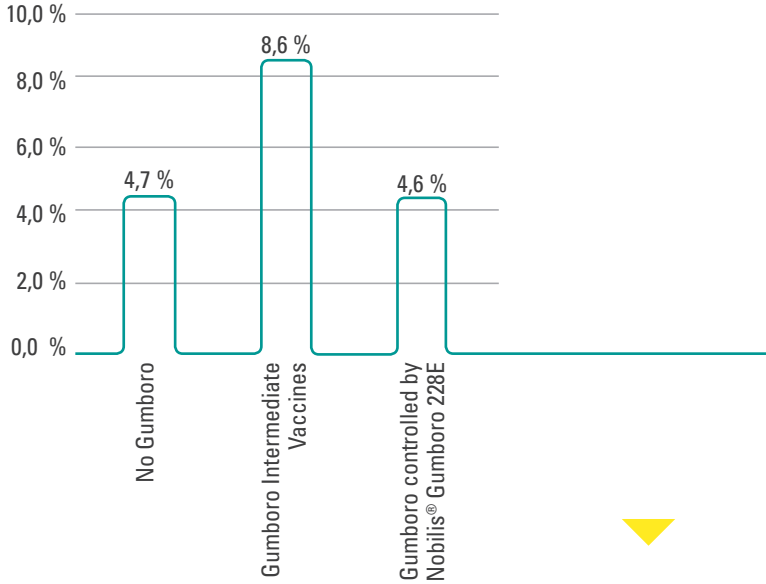
Permission was granted by the French government to use Nobilis® Gumboro 228E against a series of vvIBD outbreaks in a major poultry producing region of France.
Performance data was collected from over 170 million broilers, comprising:

- 151 flocks prior to the outbreak.
- 237 flocks during the outbreak, vaccinated with an intermediate vaccine.
- 252 flocks vaccinated with Nobilis® Gumboro 228E during the outbreak.

Results

- Intermediate vaccines failed to prevent fresh outbreaks.
- Nobilis® Gumboro 228E provided effective protection.
- Profitability of flocks vaccinated with Nobilis® Gumboro 228E returned to the levels recorded prior to the Gumboro outbreak.

Average flock mortality



GUMBORO SOLUTIONS

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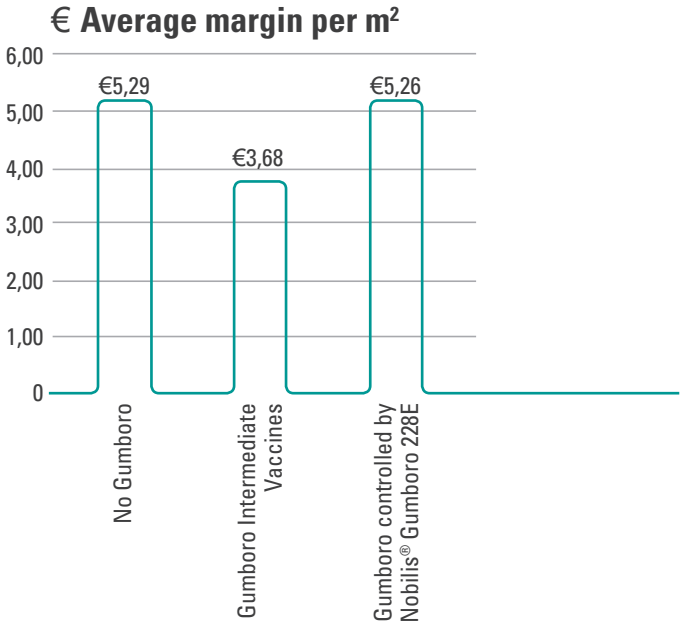
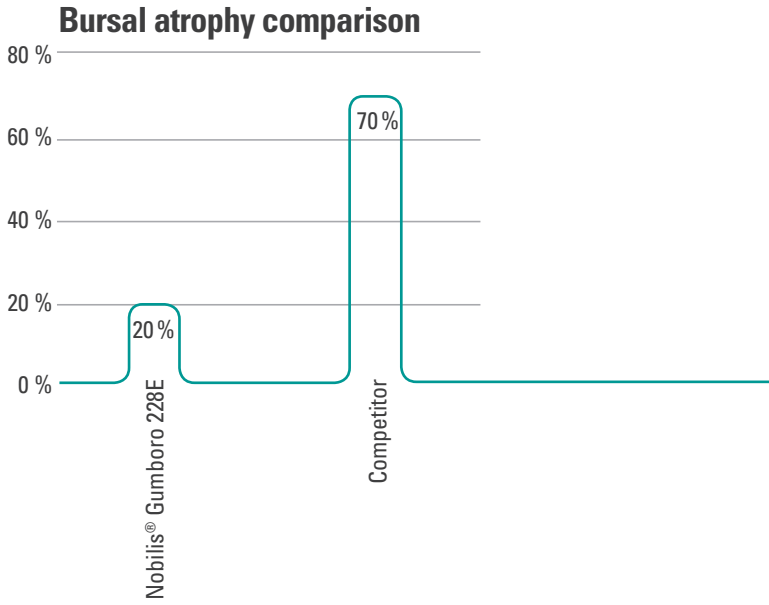
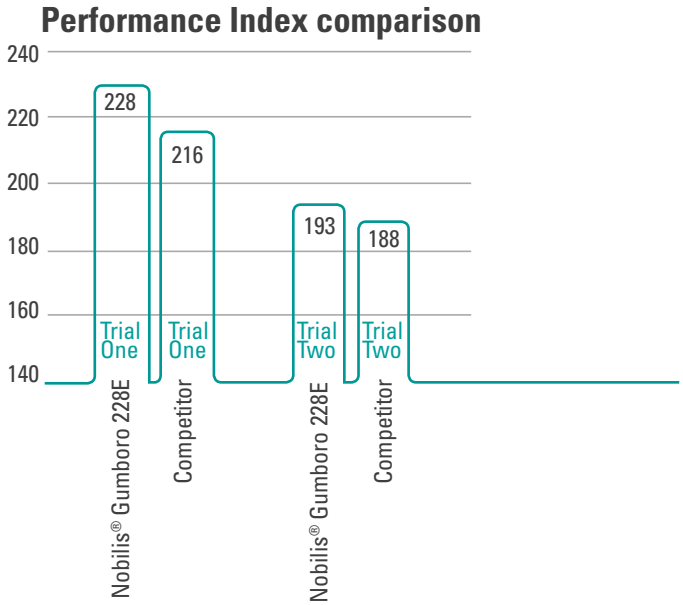




Nobilis® Gumboro 228E trials in Thailand

Two trials were conducted with commercial broiler flocks in Thailand, comparing the effects of vaccination with Nobilis® Gumboro 228E and a widely used "hot" vaccine. In Trial 1, vaccination was at 14 days, in Trial 2, at 14 and 21 days.



INNOVAX® ND-IBD

Dual-construct HVT vaccine for Infectious Bursal Disease, Newcastle Disease and Marek's Disease protection

Innovax® ND-IBD provides comprehensive, long-term protection against Newcastle Disease (ND), Infectious Bursal Disease (IBD) and Marek's Disease (MD) with just one injection.

It was the first ever dual-construct HVT vaccine available to the poultry industry. This unique development means protection against both IBD and ND is now possible in a single dose to deliver improved flock protection, increase productivity and minimise operational disruption.

Vaccination at the hatchery with a non-reactive HVT construct ensures more uniform protection while eliminating performance losses due to respiratory vaccination reactions or concerns about maternal antibody interference with traditional IBD vaccines.

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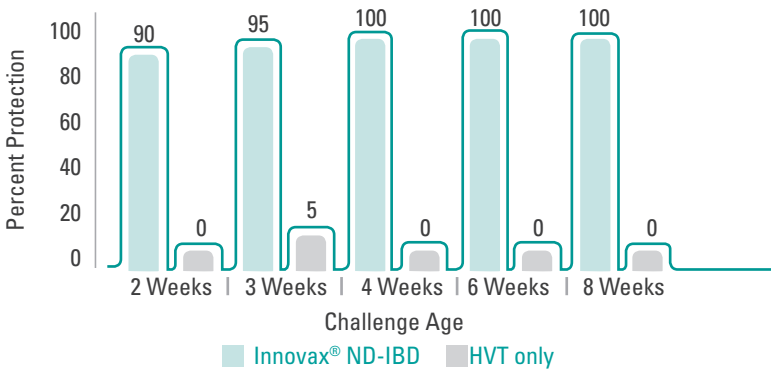
How it works

Innovax® ND-IBD is vaccinated into day-old chicks with care to ensure the viability of this cell associated vaccine. It is important to ensure that every chick or every hatching egg is properly vaccinated because HVT-based vaccines cannot spread from bird-to-bird in the field.

Once birds are vaccinated, the virus infects T and B lymphocytes, expressing and presenting the proteins for HVT, F and VP2. The immune system develops immunity (antibodies and cell mediated) to the HVT virus, but also to the IBD-VP2 and ND-F proteins expressed by the inserted genes. The antibodies against the F protein prevent ND challenge virus from fusing or attaching to cells, providing protection against ND. The antibodies against the VP2 protein prevent IBD challenge virus from infecting cells, providing protection against IBD with just one injection.

Infectious Bursal Disease onset of immunity

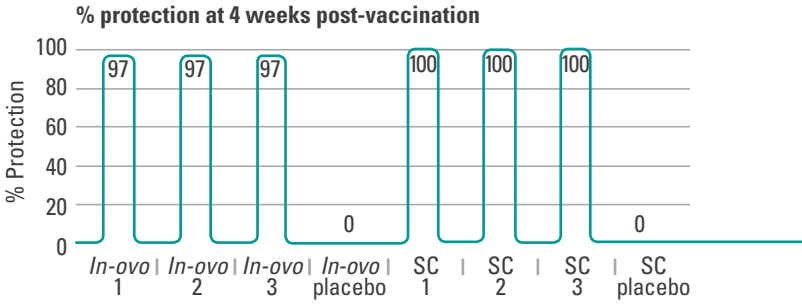
SPF birds were vaccinated with a minimum dose of Innovax® ND-IBD via subcutaneous route and challenged at 2, 3, 4, 6 and 8 weeks of age with very virulent IBD virus (vvIBDv) CS 89 according to monograph 0587 of the EU Pharmacopoeia. Controls were vaccinated with a regular HVT vaccine.



Innovax® ND-IBD has demonstrated protection against standard virulent ND and IBD as well as genotype VII ND and vvIBD challenges and classical, variant (Var E) and vvIBDV (CS89) challenges.

HVT-ND-IBD
Efficacy (STC APHIS)

- SPF birds were vaccinated by *in-ovo* and SC routes
- Challenged with IBDV STC APHIS strain.



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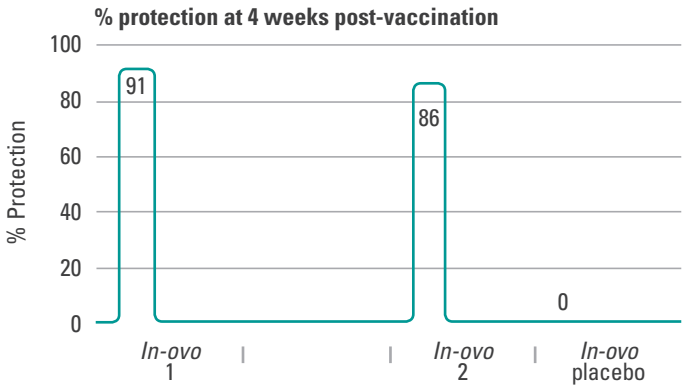
HVT-ND-IBD
Efficacy (Variant E)

- SPF birds were vaccinated by *in-ovo* route
- Challenged with IBDV Variant E strain (Bursa/Body weight ratio evaluation).



BIOSECURITY

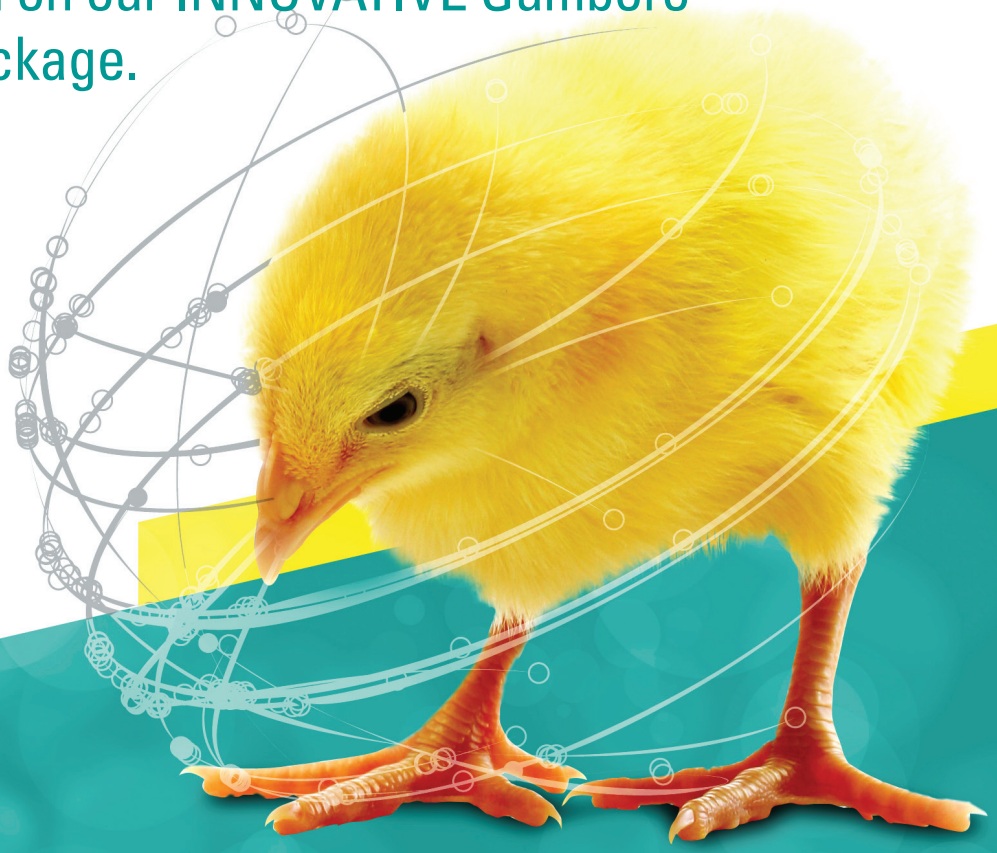
Basic management practices such as limited controlled site access, separate footwear and equipment for each site/house, and footbaths at the entrance to sites/houses all minimise the risk of introducing the virus. Due to the resilience of IBDV an infection on a site easily leads to an endemic situation. Hygienic measures are aimed at minimising infection pressure.

Priority is to remove contaminated litter from the site as soon as possible. A structured approach is required to prevent back tracking of the virus.

- **Dry clean:** removal and disposal of all organic material from the site. (In case of earthen floors this should include removing the top 4 - 5 cm of soil).
- **Wet clean:** cleaning poultry house using water at high pressure (35 – 55 Bar) to ensure removal of all organic material. It is advisable to add detergents to assist cleaning process.
- **Disinfection:** application of suitable disinfectant to reduce infectivity of any remaining virus particles. Applying disinfectants at the correct concentration with a suitable contact time is critical. Generally products containing formaldehyde, iodophores, chlorine-releasing agents or quaternary ammonium compounds are suitable.

The downtime between successive broiler flocks must be maximised. (A minimum of 10 days is recommended between successive flocks). Control of IBDV on multi-age sites is extremely challenging and requires strict control of the movement of personnel and equipment between houses.

Ask your MSD Animal Health representative for more information on our INNOVATIVE Gumboro Disease solution package.



Univax-BD®
Reg. No. G3674 (Act 36/1947)
Namibia Reg. No. V07/24.3/752 NS0
Univax-BD® is a live virus vaccine containing a mild strain (ST-12) of bursal disease (Gumboro) virus grown in tissue culture and combined with stabilising agents and gentamycin as preservative. Univax-BD® is supplied as a lyophilised vaccine contained in vials sealed under vacuum.

NOBILIS® GUMBORO D78
Reg. No. G2483 (Act 36/1947)
Namibia Reg. No. V98/24.3/667 NS0
Nobilis® Gumboro D78 is a live freeze-dried vaccine containing live Infectious Bursal Disease (Gumboro) virus strain D78 with stabilisers. Each dose contains at least 4,0 $\log_{10}$ $TCID_{50}$ of Infectious Bursal Disease (Gumboro) virus strain D78. The freeze-dried vaccine pellet contains stabilisers and gentamycin.

NOBILIS® GUMBORO 228E
Reg. No. G2423 (Act 36/1947)
Namibia Reg. No. V16/24.3/1371 NS0
Nobilis® Gumboro 228E contains 2,0 $\log_{10}$ EID_{50} of live Gumboro Disease virus strain 228E per dose. The freeze-dried vaccine pellet contains stabilisers and gentamycin.

INNOVAX® ND-IBD
Reg. No. G4375 (Act 36/1947)
Each dose of Innovax® ND-IBD (0,2 mℓ subcutaneous) of reconstituted vaccine contains:
Cell-associated live recombinant turkey herpes virus (strain HVP360), expressing the fusion protein of Newcastle disease virus and the VP2 protein of Infectious bursal disease virus: $10^{3,3} – 10^{4,6}$ PFU[1].

[1] PFU: plaque forming units.

References:
http://www.gumboro.com
Poultry Biologicals. Schering-Plough Animal Health. 2006.
Innovax® ND-IBD Technical Presentations Booklet 2017
Innovax® ND-IBD Detailer, Intervet International B.V. 2017

Intervet South Africa (Pty) Ltd, Reg. No. 1991/006580/07
20 Spartan Road, Spartan, 1619, RSA | Private Bag X2026, Isando, 1600, RSA
Tel: +27 (0) 11 923 9300 | Fax +27 (0) 11 392 3158 | Sales Fax: +27 (0) 86 603 1777
www.msd-animal-health.co.za | ZA-NOB-220300003

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