LOHMANN ANIMAL HEALTH

Gumboro vaccination – a matter of timing

Live IBD vaccines are categorised by their breakthrough titre, virulence and potential to induce immune suppression, into mild, intermediate and intermediate plus.

While the mild IBD vaccines show the lowest invasiveness, the intermediate plus have the highest virulence, breakthrough titre and potential to induce immune suppression.

Successful vaccination against IBD depends on variables such as the level of maternally-derived antibodies (MDA) in the chicks, the choice of the vaccine type (capability of the vaccine to break through this maternal immunity) and the field challenge. Hence, the effectiveness of a Gumboro vaccination programme depends heavily on whether the right vaccine is given at the right time.

The best way to establish the right time of vaccination for a flock depends on the information available.

Measuring and calculation

When testing methods are available, the antibody titres of the chicks can be measured. Together with the breakthrough titre of the vaccine, the right moment of vaccination can be calculated. Producers of ELISA kits have equations for such a calculation.

Estimation and adaptation

The vaccination programme of the parent flocks can be used to estimate the correct time of vaccination for the progeny.

Offspring from breeders vaccinated with inactivated IBDV vaccines tend to have higher levels of MDAs than offspring from breeders vaccinated with live IBD vaccines only.

Based on information on the vaccination programme of the parents and knowledge about the invasiveness of the vaccines for the progeny, timing for vaccination can be estimated.

Once this vaccination programme has been applied, the results of the performance can be used to adapt the programme for subsequent flocks.

Progeny from mixed flocks will have a greater variation of MDA levels, requiring more than one vaccination to cover all groups within the flock.

No information available

Often, there is no information on the immune status of parents and/or offspring. The strategy then should be to prevent as much risks as possible. The vaccination programme will have to cover progeny with different levels of MDAs. The possible presence of offspring with little or no MDAs poses a serious risk. When unvaccinated, they are an easy target for early field challenges, becoming a focus for the infection pressure to rise to uncontrollable levels. For this group, vaccination at 1-7 days with a mild vaccine is recommended.

Mild, intermediate or hot? – a matter of strategy

Intermediate strains are the most versatile type of IBD vaccines, usable in various circumstances. They are used under 'normal' conditions as a standard procedure under an IBD field pressure.

Mild vaccines are safe, even in day-old chicks without any MDAs, which would easily neutralise them, even at very low levels. Often, when breeder flocks have low IBDV titres, a percentage of the progeny hatches with insufficient maternal protection.

Thus, an early vaccination with a mild vaccine will protect this group and reduce the risk of transmitting field virus.

Intermediate plus vaccines are to be used in the presence of very virulent IBDV challenges, which infects young chicks at a very early age, in a time when intermediate vaccines will be still neutralised by the high levels of MDAs due to their lower breakthrough titre. To be able to compete with such vvIBD viruses and induce immunity in the face of still high MDA levels, more invasive IBDV vaccines strains are required.

Intermediate plus vaccines may have immunosuppressive effects, being mainly used to reduce mortality and the prevalence of vvIBDV in the flocks. Once this has been reached, it is recommended to return to the use of intermediate vaccines.

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Vaccination via the drinking water

Vaccination via the drinking water is a very common method of application for various live vaccines. Due to the dimension of today's poultry farms, not only is this mass application method preferred, it can also provide a better immune response for some vaccines such as salmonella or Gumboro.

Vaccination via the drinking water can have several advantages compared to other methods of application, for example injection. It is less labour intensive, animal welfare friendly (less stress for the bird) and it does not cause local reactions and, therefore, no delay in production or growth of the birds.

However, to ensure a good result it is extremely important that this method is performed correctly. A major concern of this method is to ensure the successful delivery of the vaccine to the birds. Problems mainly occur because of inadequate distribution, not all birds receiving a full dose of the vaccine, or sub-optimal water conditions and, therefore, a significant loss of titre during the vaccination time.

To prevent these main threats of water vaccination two main points have to be considered – the water quality and a sound vaccination procedure.

The water

It is important to ensure that the vaccine survives the hours after suspension in the drinking water or stock solution. The reason is that as live vaccines are re-suspended into tap water, the titre may reduce as it spends time dissolved in the water.

This is due to the natural survival rate of the micro-organism in a water suspension. Such reduction can even be accelerated when under sub-optimal water conditions.

Due to this effect the addition of skimmed milk powder or a commercial water stabiliser is highly recommended.

In general, make sure that all equipment used for vaccination is free of any trace of disinfectant, detergent or soap. Use chlorine free water for two days before, during and one day after vaccination. Only cold clean water of drinking water quality should be used. Estimate the amount of water and stabiliser according to the number of birds to be vaccinated. For vaccine water intake, in accordance with the age and type of bird, calculate on average the double of feed consumption in grammes (see management guide for each breed) and divide by three.

The vaccination procedure

For easy handling, the vaccine should be prepared in a small container (1 litre). Rinse the vial carefully underwater and empty it completely. Dilute the vaccine suspension in a larger vessel (5-10 litres) and mix well again.

The complete content of the vaccine vials should be used for one flock or drinking water system only. Splitting of vial contents or diluted vaccine may lead to dosage errors.

Vaccination of birds younger than three weeks of age is critical, because the intake of water in such young birds can be irregular.

As well as age, breed, type of feed, ambient temperature, length of water withdrawal time, lighting programme and the type of the drinker system all affect the water intake. If too much vaccine water or not enough water is consumed, probably not all birds will have taken their correct dose.

The treated water should be applied for up to two hours. It should be ensured that all birds drink during this period. The aim is to give every bird one dose of vaccine. A period of thirst of up to 2-3 hours before vaccination may be necessary to achieve this.

■ Floor operations: lift drinkers above the reach of the birds for the dry time. Tip/empty bell drinkers to drain the system down and clean them. Drain nipple drinker lines until vaccine solution is seen at the end of the lines. Only then can all lines be lowered to bird drinking height.

■ Cage operations: Drain the lines in the dark to prevent the uptake of unvaccinated water. Use of a torch (flashlight) may be needed.

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Vaccination against S. enteritidis

The poultry industry has successfully optimised the complex strategy of salmonella control, breaking the chain of contamination from animal to man. The whole concept is based on PREVENTION. Next to a salmonella managed environment, vaccination of the chickens plays a key role.

Vaccination is one of the many components of a 'shield' which must be build around the susceptible bird in order to prevent its infection with salmonella (among the other components are disinfection, hygiene, biosecurity, management, clean feeds, rodents control and constant monitoring).

The advantages of vaccination lie on the fact that:

- It induces a profound protection of the birds against salmonella infections.
- Shedding from infected birds is dramatically reduced.
- They do not promote any new antibiotic resistances.
- Consistent presentation of antigen to the immune system.

Vaccination, as an aid to control Salmonella enteritidis in poultry, is a procedure accepted by most veterinarian authorities. The European Commission just made vaccination against SE in laying hens obligatory from 2008 onwards for all Member States that showed a prevalence of more than 10% in the recently published baseline study (Commiss-ion regulation 1177/2006).

Under the National Poultry Improvement Plan (NPIP) of the USDA, a 'USS Enteritidis Monitored' standard and status has been created. Vaccination may be applied to flocks of breeder pullets or commercial layer pullets, which can meet the full status, according to NPIP, as well as their table eggs, hatching eggs and offspring. Eligibility is based on a set of procedures, but annulled by isolation of SE from birds sampled from such flocks.

Inactivated vaccines

Salmonella vaccination programmes with only inactivated vaccines will not stop the birds from being infected. However, they lessen the possibilities of invasion of internal organs and reduce shedding and spreading dramatically.

Widely used as an adjuvant to inactivated vaccines, water-in-oil emulsions are known as an efficient potentiator of immunity, enhancing protection against bacteria as Salmonella enteritidis.

The undesirable effects are the intense local reaction at the site of injection, which may lead to decreased feed intake, slowed growth and delay on onset of egg production. Still, when compared to the milder inactivated salmonella vaccines in aluminium hydroxide adjuvants, water-in-oil emulsions have shown to be more efficacious.

Live vaccines

These are offered for administration on drinking water, against Salmonella enteritidis and S. typhimurium. Especially designed for chickens, some live vaccines contain attenuated strains which are sufficiently invasive to induce immunity in the bird, but at the same time are made safe and sensitive to stress, resulting in very short duration of shedding from the birds and no survival in the environment. The principle of gut immunity, induced by such live oral vaccines, triggers several responses, from secretory IgA, immune exclusion and a key role of innate immunity.

Drinking water is probably the easiest and most cost effective alternative to injections. It is a well established method of application, with excellent coverage also in the day old chick.

It triggers appropriate immune response, increases flexibility with vaccination crew, there is no additional handling for injections, no risk of injury through manipulation, no delay in growth, it is animal welfare friendly, and it ideally does not interfere with serological monitoring.

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Vaccination against Newcastle disease

Newcastle Disease (ND) represents one of the most devastating poultry diseases, caused by a paramyxovirus serotype 1. Although ND virus has various avian hosts, it is of particular economic importance in chickens and turkeys.

Different strains of ND virus can be classified according to their pathogenicity (velogenic, mesogenic, lentogenic) as well as according to the preference they have for certain organs (pneumotropic, neurotropic, viscero-tropic).

Clinical signs of the disease may vary from mild ones, with few or no symptoms, to respiratory infections, diarrhoea and possible nervous symptoms. Mortality can be increased by secondary infections. In its most severe form ND is characterised by a short and acute course with sudden death and mortality up to 100%.

In breeders and layers, ND can lead to drop in egg production and reduced eggshell quality, resulting in serious economic losses. Protection against the disease is induced by vaccination with either live and/or inactivated ND vaccines.

Both humoral and mucosal immunity play an important part in the immune response to ND. Infection with ND virus usually results in virus replication and a subsequent systemic response with production of specific circulating antibodies (humoral immunity).

Usually there is good correlation between titre and level of protection: the higher the titre, the more complete the protection.

However, absence of titre does not necessarily mean absence of immunity. If chicks are derived from vaccinated parents, they will have high levels of MDA.

Live vaccine viruses, which are applied via the respiratory mucosa (for example by spray or oculonasal methods) will withstand neutralisation, replicate in the mucosa and lead to a local respiratory immunity which will fight ND field virus right at its entry.

But those high levels of MDA will prevent the vaccine virus from spreading throughout the body and from inducing a systemic immune response, meaning a measurable antibody titre.

Live vaccines

Classical live ND vaccines are based on field isolates of relatively low pathogenicity. Most are lentogenic strains, although some countries still use mesogenic strains, which can cause considerable losses from vaccination reactions.

Though they provide a good level of protection, classical live lentogenic ND vaccines have their limitations. Under adverse conditions, the classical Hitchner B1 does not afford adequate protection in the field, particularly when given to chickens with maternal immunity. This is especially important if the parents of those chickens have been vaccinated with inactivated ND vaccines. More-over, Hitchner B1 provides only a limited duration of immunity which requires regular boosters.

In order to overcome these limitations, more immunogenic strains are being used, such as La Sota. However, when used for primary vaccination these vaccines may cause vaccination reactions leading to increased mortality and poorer performance. Hence, primary vaccination with Hitchner B1 followed by a secondary vaccination with La Sota is a common strategy.

Killed vaccines

Killed vaccines take longer to induce reliable protection, but can produce higher titres and longer lasting immunity. They need to be given by injection, but have the advantage that various different components can be combined in a single dose.

Combination live/killed

Although live vaccine, correctly applied, can provide early and effective immunity in day-old chicks, in some areas with severe field infection pressure, a more solid vaccination programme is needed. Killed ND vaccine given at day-old induces long lasting titres, but these titres take approximately 2-4 weeks to reach their peak. To bridge the gap in immunity during this time, a live vaccine can be given at the same time, to provide a rapid immunity.

by Dr Anne Beiersdorf – Marketing Poultry Vaccines, Lohmann Animal Health

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Protect progeny by vaccinating against CAV

Chicken Infectious Anaemia Virus (CAV) can be isolated in all countries with intensive poultry production. The virus impairs the thymus of very young chickens and, at the same time, it negatively affects the development of blood cells and the immune system.

As a result, the amount of red blood cells and T-lymphocytes is reduced in infected chickens. Clinically infected birds may appear pale, depressed and show reduced weight gain. In pathological examinations, anaemia, haemorrhages, atrophy of the thymus and changes in the bone marrow can be found.

Furthermore, the reduction of T-lymphocytes leads to immune suppression, a reduced prod- uction of antibodies and a higher susceptibility to secondary infections. With the addition of secondary infections, mortality in clinically ill flocks may reach up to 60%.

Besides the clinical form of CAV (mostly seen in birds without maternal antibodies against CAV), subclinical CAV also has to be considered when it comes to economic losses caused by the disease.

Broilers that have very low maternal antibody levels at hatch, become infected with CAV at a relatively early age.

They may appear healthy, but will show CAV titres around day of slaughter. Analysis of production parameters of such flocks shows that feed conversion and weight gain are lower compared to birds negative for CAV titres at slaughter.

Hence, both clinical and sub-clinical CAV infections can have a substantial effect on commercial broiler performance and profitability.

The disease normally occurs when layer or broiler breeder flocks with no previous exposure to the virus become infected during the production period.

Under these conditions, the virus is transmitted via the hatching egg (vertically) to the progeny, which show clinical signs of the disease from 10-14 days of age.

CAV can also spread horizontally, in a contaminated environment, to the progeny of breeders that are not protected by maternally derived antibodies.

In the last years, CAV outbreaks have increased due to more intensive biosecurity measures in the rearing period of breeder flocks. Higher hygiene standards prevent the natural horizontal infection of breeders during rearing.

Later, when egg production starts, those breeders do not have protective antibodies to be transmitted to the progeny.

In order to protect young birds from getting infected and to improve performance of broilers, vaccination of the breeder flocks with live vaccines is the method of choice.

By vaccinating young breeder pullets between 12-15 weeks of life, they have enough time to develop high levels of antibodies against CAV before being transferred to the laying house.

When egg production starts, they will transmit those protective antibodies to their progeny and by that protect them against early infections with CAV.

Besides that, vaccination also stops the horizontal spread of virus from possibly infected breeders, which again lowers the risk of susceptible birds to become infected by direct or indirect contact.

In summary, chicken anaemia is a disease which originates in breeders but the consequences are observed and felt in the progeny. Therefore the solution lies in the breeders. ■

by Dr Anne Beiersdorf – Technical Marketing Poultry Vaccines, Lohmann Animal Health

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Marek's disease and how to control it

Marek's disease, a highly contagious viral neoplastic disease in chickens, is caused by a herpesvirus and is one of the most widespread diseases afflicting the poultry industry.

It was first recognised by the Hungarian veterinarian Jozsef Marek in 1907, and was at one time the most common cause of losses in the poultry industry.

There are three serotypes of the virus. Serotype 1 and 2 are found in chickens, while serotype 3 is related to herpesvirus in turkeys (HVT).

Since the virus is not transmitted through the egg, chicks are born free of the disease. Chicks become infected at an early age, whilst the disease normally manifests itself at 8-24 weeks.

Infection occurs through the respiratory tract and infected birds can remain carriers long after infection. Incubation periods range from three weeks to months.

The infectious virus matures in the epithelium of feather follicles and infects other birds by inhalation of infected dust or dander.

The disease is immunosuppressive, and the degree of suppression is linked to the virulence of the virus strain. Most flocks are infected, although clinical disease is not always seen.

Marek's disease manifests as tumours on the bird's spleen, liver, lung, kidney, and other tissues. Other disease symptoms include neurological disorders, such as partial paralysis in the bird's legs.

Classical Marek's disease is characterised by enlargement of peripheral nerves up to three times the normal size.

The acute form of the disease demonstrates lymphoma and enlargement of the liver, lungs, heart, gonads and kidney. Control of the disease is most effective through vaccination, in combination with proper management.

Since the disease is highly infectious and the virus is present in most flocks, good management is required to delay infection and suppress the risk of serious disease.

This should involve isolation of young chicks from older birds for the first 2-3 months. An all-in all-out housing policy, coupled with disinfection, is also recommended.

Vaccines are highly recommended as a supplementary control measure. The normal vaccination practice is to use a live vaccine in the hatchery, but chickens up to three weeks old can be vaccinated. As all vaccines require 7-14 days to produce an effective immunity, it is critical to reduce exposure during the first week or so post-hatching.

Strains of all three different serotypes are used as vaccine strains. The HVT-vaccine, a naturally avirulent serotype 3 strain first isolated from turkeys in 1968, is probably most widely used.

Serotype 2 vaccines originate from chickens and the best known candidate for that strain is the SB1 strain. Several attenuated serotype 1 Marek's disease vaccines are also available; of these, the CV1988/ Rispens strains appears particularly effective.

Freeze-dried and frozen live vaccines are on sale. The frozen vaccine is kept under liquid nitrogen, lyophilised vaccines can be stored at 2–8 °C.

Yet, both types require a diluent prior to use, and it is recommended to use them within one hour after reconstitution.

In all cases, proper handling of vaccines during thawing and reconstitution is crucial to ensure good vaccination results. ■

by Dr Eduardo Bernardi, Head of Marketing Poultry Vaccines, Lohmann Animal Health

M. gallisepticum – vaccines and vaccination

In poultry production Mycoplasma gallisepticum (MG) is one of the major infectious diseases with economic impact, resulting in higher production costs, reduced egg production, health problems and a decrease in egg quality.

There are many MG strains, with different virulence and pathogenicity patterns. Some strains are very mild; some are able to produce lethal toxins in turkeys and chickens.

MG infection depends on the capacity of mycoplasma to attach to the mucous membranes in the respiratory, digestive or reproductive tract. More aggressive strains are also able to avoid the immune system.

Those interactions can kill the cells, causing symptoms and lesions of the disease or leading to a chronic infection. MG can survive inside the cells, waiting for an opportunity (e.g. a viral infection) to multiply, cause disease and spread. MG can be transmitted horizontally and vertically.

Immunity

Both immune responses, cellular and humoral, are important for protection against MG. The T lymphocytes control MG at the mucous membrane and intra cellular sites.

Antibodies (IgG and IgA) are able to reduce the severity of the lesions and the vertical transmission. IgA protects the mucous membrane by reducing the opportunities for attachment by MG.

Antibodies are important to reduce the transmission, but good protection results can be ach-ieved, even though titres seen after vaccination are very low.

Control

Biosecurity procedures, disinfection and stocking with birds from negative sources are the basics in MG control. But once the farm or the flock is infected, is under the risk of infection or has a previous history of MG, treatment and vaccination are important tools.

Vaccines

There are two types of vaccines on the market – bacterins, which are inactivated MG, and live vaccines.

MG bacterins are oil-based emulsions that trigger the humoral response.

The protection provided by the bacterins is not enough to avoid mucosal infection and spreading, but can improve egg production and quality.

MG live vaccines have different levels of virulence, the F strain, the oldest one, is the most invasive. For some time, the milder live vaccines were used with good results.

Unfortunately the MG field infection started to surpass the protection; therefore, the F strain now shows better results in many cases. Live vaccines induce cellular immunity and IgA production.

The respiratory infection is reduced but MG still can be transmitted via the egg.

Combination – live and killed vaccines:

The combined vaccination programme shows excellent results in field trials when neither live nor killed vaccination programmes alone are able to control a MG problem.

Since 2000, this programme has been used in Colombia with good results, in both breeders and commercial layers.

The combination is one live vaccine, at 5-6 weeks of life, and one or two killed vaccines either at 14-16 weeks or at 12 and 18 weeks.

A trial was carried out on three commercial layer flocks. One received only the F strain vaccine and the other two received F strain at five weeks and a bacterin at 15 weeks of age.

Results

Results showed six eggs more per hen housed, lower costs compared with the treatment control programme and less respiratory reaction after vaccination against IB during production.

Conclusion

The combined vaccination programme, although not present in the poultry literature, is an excellent tool for improving production and health problems due to MG infection.

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Vaccination against fowl cholera

Fowl cholera (FC) is a septicaemic disease produced by P. multocida. In its acute manifestation, death with or without fever, anorexia, ruffled feathers and mucous discharge from the mouth may be observed. In the chronic stage, which may follow the acute stage, swollen wattles, sinuses, foot pads and sternal bursae are characteristic. Chronically infected birds may die or remain as healthy carriers.

The high variability in the pathogenicity, or virulence, of P. multocida has been associated with the ability of the bacterial strain to invade and reproduce in the host. According to their somatic antigens, there are 16 serotypes of P. multocida, with some isolates sharing characteristics of more than one serotype.

Treatment

Treatment of affected flocks with antibiotics, such as penicillin, streptomycin, oxytetracyclines and sulfas, has been extensively practised. Antibiotics, with selection based on sensitivity testing, decrease the severity of the disease and control mortality. However, recurrence of mortality, development of resistance and a permanent carrier stage after treatment reinforces the importance of prevention and control measures.

Prevention and control

Prevention of FC should start by effectively controlling reservoirs of P. multocida in poultry houses. P. multocida has been isolated from humans, wild birds, rodents, pigs, dogs, and cats. Since birds that have recovered from the disease are a constant source of infection, the control of FC in multi-age poultry complexes is very difficult. Young birds introduced into contaminated facilities are at constant risk of infection.

Vaccination against FC with commercial live or inactivated vaccines is a very important practice. Live vaccines (3x4 serotype) induce protection against heterologous serotype challenges and effectively stimulate an immune response. However, they have the potential to cause chronic FC. Live vaccines should be administered orally in turkeys and via the wing web in chickens.

Commercial bacterins usually contain the most common serotypes (1, 3, 4 and 3 x 4) inactivated and re-suspended in mineral oil or adsorbed in aluminium hydroxide. Bacterins can be administered intramuscularly in the breast or subcutaneously in the neck, tail or leg.

FC bacterins are very safe and provide a good protection against field serotypes included in the vaccines. However, no cross-protection against serotypes that are not present in the bacterins should be expected.

Vaccination programmes

In broiler breeders, vaccination programmes based on only live or killed vaccines consist of two inoculations, around 8-12 and 16-20 weeks of age. To minimise the risk of chronic FC induced by live vaccines, vaccination at least two weeks before movement to production houses, the use of tetracycline antibiotic in the first feed after movement and the use of bacterins containing the 3x4 serotype before the use of live vaccines are common practices.

In commercial layers, a first vaccination around 10-14 weeks followed by a second vaccination four weeks later is normally implemented. Birds in a second production cycle should be vaccinated just before moulting.

Since turkeys are more susceptible to FC than chickens, intensive vaccination programmes are implemented in the turkey industry. Live vaccine programmes in turkey breeders and meat turkeys consist of priming at around 6-8 weeks of age followed by re-vaccinations every 4-6 weeks via drinking water. Killed vaccine program- mes consist of a first vaccination around 6-8 weeks of age followed by several inactivated vaccines before onset of egg production.

Other species, such as geese and ducks, are usually vaccinated with bacterins, starting between 6-8 weeks of age followed by at least a second vaccination four weeks later. The high susceptibility of domestic and wild birds to fowl cholera infection and the presence of multiple reservoirs, including birds that have recovered from the disease, contribute to the continuous presence of fowl cholera in the field.

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