

In ovo vaccination – products plus people produce perfection!

At the recent World Veterinary Poultry Congress in Marrakesh, Morocco (wvpc2009), Ceva Sante Animale hosted a symposium entitled Innovative Solutions for Hatchery Vaccination, which International Hatchery Practice attended.

The symposium started with a review of the immunology of the chick by Prof. Dr Vilmos Palya of Ceva-Phylaxia Vet. Biol. Co. in Budapest, Hungary.

Entitled 'Are day old chicks able to respond to immune stimulations?' Vilmos considered the components of the immune system and how and when these are established in the chick.

Functional immune system

For effective vaccination a functional adaptive immune system is needed which is able to respond to various invading pathogens, has high specificity and is able to develop immunological memory.

In essence, an adaptive immune system in the chick has dendritic cells which have appeared in the bursa of Fabricius and the spleen by day 15 of embryonic development, mature T cells that are able to develop into TH2 helper cells (TCR2 cells in the spleen by day 18 of embryonic development, and TCR3 cells, also in the spleen by the second day after hatching) and mature B cells that are able to develop into plasma cells.

Table 1. The limits of today's vaccination.

- **Limited efficacy:**
 - Interference from maternal antibodies
 - Short duration
 - Unspecified immunity
 - Limited or unknown effects on viral shedding
- **Limited safety** because of post vaccination reactions and reversion to virulence.
- **Cumbersome (poor) vaccine application.**
- **Compatibility and interference issues.**

- Vectormune FP-ND
- Vectormune FP-LT
- Vectormune FP-LT + AE
- Vectormune FP-MG
- Vectormune FP-MG + AE
- Vectormune HVT-IBD
- Vectormune HVT-IBD + SB-I
- Vectormune HVT-ND
- Vectormune HVT-ND + SB-I
- Vectormune HVT-LT
- Vectormune HVT-AI

Table 2. Ceva Sante Animale's range of vector vaccines.

In this last group gene conversion has occurred in B cells in the bursa by day 18 of embryonic development to produce IgM secreting plasma cells and in the cortical cells of the bursa and spleen two to four days post hatching to create IgG secreting plasma cells.

Importantly, by day 18 of embryonic development all the components that are needed for a highly specific and effective adaptive immune response are present in the chick embryo. Thus, the chick embryo is able to respond to in ovo vaccination.

Understand administration

Yannick Gardin, Ceva's scientific director, poultry vaccines, highlighted that vaccination is an aid in the prevention of disease that requires an understanding of how to administer the vaccine at farm level and an ability to design vaccination programmes at company and national levels.

In addition, he stressed that when it comes to vaccination, the better the target is identified, the greater the chance of success and this requires good diagnostic skills and abilities.

Yannick then went on to consider why in 2009 innovative vaccination is required (see Table 1) and he predicts that in the future there will be more sophisticated vaccination and that most broiler vaccination will be done at the hatchery. This will focus on reducing the consequences of the disease

and preventing agent shedding and spread. He highlighted how the development of immune complex vaccines, for example for IBD (infectious bursal disease or Gumboro disease) control, allowed for the control of vaccinal antigen release in the presence of maternal antibody by binding the antigen to specific antibodies that protect it from the host recognition system and the action of maternal antibodies.

In this way, the antigen release occurs exactly at the right time for each individual bird in the flock and if the vaccine is administered in ovo this can occur earlier if this is appropriate.

Virulence factors

Recent developments in molecular biology mean that we can now identify virulence factors/genes and protective factors/genes in disease causing viruses.

Knowledge of these virulence factors helps us to better understand pathogenicity, while an ability to identify these protective factors will lead to the development of new vaccines.

Once a gene encoding for the protective factor has been identified then it can be expressed by an expression system to ultimately produce a sub-unit vaccine or used in the case of RNA viruses to produce reverse genetic vaccines, which can be live or inactivated or, in the case of DNA viruses, live vector vaccines.

When it comes to vector vaccines Ceva has a comprehensive range of these vaccines based on fowl pox (FP) and turkey herpes virus (HVT) as can be seen in Table 2.

Yannick stressed that although a new vaccine may show good efficacy under laboratory conditions it takes time to understand what can be expected of them in the field against different types and strengths of infectious pressure since the product can not be widely used in the field until it is licensed.

For a variety of reasons, he felt that immune complex vaccines, when compared to other options currently available, give better clinical protection, a wider spectrum of protection, do not re-excrete the disease

Continued on page 13

Continued from page 11

causing virus and are not accompanied by the risk of selecting 'escape mutants'.

In his experience, immune complex IBD vaccines work better to control IBD than rHVT-IBD vector vaccines.

He also cited the benefits to be expected

Table 3. How to get an improvement in performance.

We only find what we look for . . .

- Sometimes we take it for granted that everything is perfect.
- A routine check of vaccination quality is essential.

We normally know what has to be done . . .

- But we may as well count on others to help.
- Specialists are available to be used.

We are always capable of finding the person responsible for the problem . . .

- But teaching and sharing are more important than blaming.
- Dedicated staff (including a leader) is critical.
- Constant training for your employees is fundamental.

Every detail is very important for performance improvement

from using Ceva's rHVT-ND Newcastle vector vaccine which produces higher vaccinal titres (2309 vs. 678) and better CVs (48.4 vs. 114.7%) at 37 days than a traditional vaccination approach, as seen in a recent Venezuelan trial.

Practical aspects

To round off the symposium Fabio Moreira de Souza, Ceva's poultry equipment international manager, reflected on practical aspects of hatchery vaccination.

A key benefit of vaccination in the hatchery is that you have one dedicated team of staff for vaccination which means that control and organisation of the work is possible.

This is a lot harder, if not impossible, to achieve when different people are doing the vaccination on a large number of farms.

So, with hatchery vaccination you have better control of the human factor and a better homogeneity of vaccine administration.

In addition, very efficient day old chick and in ovo vaccinators are now available. The result of all of these factors is an improvement of the vaccination protection achieved and better bird performance.

Fabio stressed the importance of correct vaccine handling and storage, correct vaccination application and having a good hatchery environment to work in and properly

organising the work. He stressed that it does not matter how good the vaccine is, it will only work if it is correctly administered into the bird and the objective of vaccination must be to ensure that each and every bird receives a full dose of vaccine.

Fabio went on to cite various examples in which the quality of vaccination improved once attention was given to how the job should be done and auditing was used to motivate staff.

Even so, he cited examples when further significant improvements occurred following an upgrading of vaccination equipment.

In one case, a steady vaccination efficiency figure of 90% rose to 99.69% following the installation of new and more advanced equipment! He summarised his session by focusing on people management (Table 3).

For all of the reasons covered in this symposium Ceva do not just bring you vaccines, they bring:

vaccines
+
equipment
+
techniques
+
audits and diagnosis
+
expertise

in their CHICK program. ■